October 16, 2017

Stephen Posner
EFSEC Manager
1300 S Evergreen Park Drive SW
PO Box 43172
Olympia, WA 98504-3172

Via Hand Delivery

Dear Mr. Posner:

On behalf of TUUSSO Energy, LLC ("TUUSSO"), I am pleased to submit to the Washington Energy Facility Site Evaluation Council ("EFSEC") the enclosed Application for Site Certification ("ASC") to develop, construct and operate the Columbia Solar photovoltaic projects ("Projects"). A cashier's check in the amount of fifty thousand dollars ($50,000.00) is enclosed herewith in accordance with RCW 80.50.071.

TUUSSO proposes to site facilities that would generate and transmit 25 MWac of electrical power through five solar arrays and two generation tie lines to be constructed on 200 of approximately 232 leased acres in Kittitas County, Washington. The Kittitas Valley is one of the sunniest areas of the state, and the array sites are in close proximity to existing Puget Sound Energy ("PSE") electrical infrastructure. The locations were selected based on several criteria, including consistency with the Kittitas County zoning code and comprehensive plan, land use efficiencies, placement on previously disturbed farmland to avoid environmentally sensitive areas, and the minimization of new electrical infrastructure by locating close to existing distribution lines.

TUUSSO seeks to obtain site certifications for the Columbia Solar Projects pursuant to RCW 80.50.060(2). The proposal is an alternative energy facility as defined in RCW 80.50.020(17). The Projects would generate qualifying renewable solar energy for use in meeting the Renewable Portfolio Standards targets mandated by Initiative 937 and codified in RCW 19.285, the Washington Energy Independence Act. The current need and appetite for cleaner, renewable energy in the Pacific Northwest is reflected by the current 2017 Requests for Proposals for renewable energy issued by PSE, PacifiCorp and Portland General Electric. The electricity generated would be sold under a long-term Power Purchase Agreement to Puget Sound Energy to satisfy PURPA obligations.

In accordance with both RCW 80.50.075 and Ch. 463-43 WAC, TUUSSO respectfully asks EFSEC to use its expedited process for review and approval of the Columbia Solar Projects ASC. An application is eligible for expedited review when the Council finds (1) the environmental impact of the proposed energy facility would be mitigated to a non-significant level under the State Environmental Policy Act ("SEPA") and (2) the project is consistent and in compliance with city, county, or regional land use plans. *See* WAC 463-43-030.

In furtherance of this request for findings that support an expedited 180-day review, we submit herewith the materials set forth in WAC 463-60-117, including (1) a completed SEPA checklist; (2) a statement demonstrating that the environmental impacts, the areas potentially affected, the cost and magnitude of the proposed energy facilities, and the degree to which the proposed energy facilities represent a change in the use of the proposed sites are not significant enough to warrant a full review; and (3) a discussion of WAC 463-60 and 463-62.

TUUSSO believes that based on the comprehensive package of materials presented, the Council can and should make the findings necessary to enable expedited review and recommend approval of the Columbia Solar Projects. While consolidation of the Projects' site information into a single submittal facilitates the review process and paperwork, it is respectfully requested that each location be issued a separate Site Certification Agreement to assist both EFSEC and TUUSSO during construction and operations on a location-by-location basis.

I look forward to working with the Council and EFSEC staff during the review of our submittal. Please contact me at 206-303-0198 or jason.evans@tuusso.com with questions regarding this ASC for the Columbia Solar Projects.

Sincerely,

Jason Evans
Vice President



TUUSSO ENERGY, LLC
COLUMBIA SOLAR PROJECTS
WASHINGTON ENERGY FACILITY SITE EVALUATION COUNCIL
APPLICATION FOR SITE CERTIFICATION



EFSEC Docket Number: EF-170823

October 16, 2017

SWCA ENVIRONMENTAL CONSULTANTS
SEATTLE, WASHINGTON

TABLE OF CONTENTS

1 General Project Information 1
1.1 General — Organization — Index 463-60-012 1
1.2 General — Description of Applicant 463-60-015 1
1.3 Council Recognizes Pressing Need for Energy Facilities 463-60-021 2
1.4 General — Designation of Agent 463-60-025 2
1.5 General — Application Review Costs and Funding 463-60-035 3
1.6 General — Where Filed 463-60-045 3
1.7 General — Form and Number of Copies 463-60-055 3
1.8 General — Full Disclosure by Applicant 463-60-065 4
1.9 General — Assurances 463-60-075 4
1.10 General — Mitigation Measures 463-60-085 5
1.11 General — Sources of Information 463-60-095 13
1.12 General — Consultation 463-60-101 13
1.13 General — Graphic Material 463-60-105 18
1.14 General — Specific Contents and Applicability 463-60-115 18
1.15 General — Amendments to Applications, Additional Studies, Procedure 463-60-116 18
1.16 General — Applications for Expedited Processing 463-60-117 19
1.16.1 The proposed facilities' environmental impact is not significant. 19
1.16.2 As to the second criteria, the Columbia Solar Projects are consistent with and in compliance with city, county, or regional land use plans or zoning ordinances. 23
1.17 References – Chapter 1 29
2 Solar Project Proposal Descriptions 31
2.1 Site Description 463-60-125 31
2.1.1 Kittitas County Overview 31
2.1.2 Solar Project Sites 33
2.2 Legal Descriptions and Ownership Interests 463-60-135 41
2.2.1 Camas Solar Project Site 41
2.2.2 Fumaria Solar Project Site 42
2.2.3 Penstemon Solar Project Site 43
2.2.4 Typha Solar Project Site 44
2.2.5 Urtica Solar Project Site 45
2.3 Construction on Site 463-60-145 57
2.3.1 Overview of TUUSSO'S Columbia Solar Projects 57
2.3.2 Columbia Solar Projects Facilities and Infrastructure 57
2.3.3 Solar Project Sites 67
2.4 Energy Transmission Systems 463-60-155 81
2.5 Electrical Transmission Facilities 463-60-160 81
2.6 Water Supply 463-60-165 81
2.6.1 Construction Water Use 82

2.6.2 Operational Water Use 82
2.7 System of Heat Dissipation 463-60-175 85
2.8 Characteristics of Aquatic Discharge Systems 463-60-185 85
2.9 Wastewater Treatment 463-60-195 87
2.10 Spillage Prevention and Control 463-60-205 88
2.10.1 Construction Phase Spill Prevention, Control, and Countermeasure Plan 88
2.10.2 Operational Phase Spill Prevention, Control, and Countermeasure Plan 89
2.11 Surface-Water Runoff 463-60-215 89
2.11.1 Short-term Construction 90
2.11.2 Long-term Operation 91
2.12 Emission Control 463-60-225 92
2.13 Carbon Dioxide Mitigation 463-60-230 93
2.14 Greenhouse Gases Emissions Performance Standards 463-60-232 93
2.15 Construction and Operation Activities 463-60-235 94
2.15.1 Project Phases and Schedule 94
2.15.2 Construction Workforce and Workspace 95
2.15.3 Site Preparation and Grading Activities 95
2.15.4 Ongoing Operations and Maintenance 95
2.16 Construction Management 463-60-245 96
2.16.1 Construction Management and Organizational Structure 97
2.16.2 Quality Assurance/Quality Control 98
2.16.3 Environmental Protection 99
2.17 Construction Methodology 463-60-255 99
2.17.1 Pre-construction and Site Preparation Including Revegetation Activities 100
2.17.2 Grade and Install Construction Entrance and Fencing 100
2.17.3 Install SWPPP Measures Including Perimeter Protection 100
2.17.4 Install Interior All-weather Access Roads 101
2.17.5 Layout Arrays, Combiner Box, Trenching, and Inverter Locations 101
2.17.6 Install Piles 101
2.17.7 Install Trackers 101
2.17.8 Install Panels and Complete Racking 101
2.17.9 Trenching for AC and DC Cabling 102
2.17.10 Install Medium Voltage DC Collection System 102
2.17.11 Install Inverters 102
2.17.12 Install AC Collection System 102
2.17.13 Construction of Interconnection Facilities 103
2.17.14 Site Restoration 103
2.18 Protection from Natural Hazards 463-60-265 103
2.18.1 Earthquakes 103
2.18.2 Volcanic Eruption, Tsunami, Avalanches, or Landslides 103

2.18.3 Floods/Storm Events 103
2.19 Security Concerns 463-60-275 104
2.19.1 Fencing 104
2.19.2 Lighting/Cameras 104
2.20 Study Schedules 463-60-285 104
2.20.1 Natural Resources Site Visits with the Washington Department of Fish and Wildlife (April 12, 2017) 104
2.20.2 Natural Resource Surveys (April 3–12, 2017) 104
2.20.3 Wetland Delineations (April 3–12, 2017) 105
2.20.4 Archaeological Surveys (April 4–17, 2012) 105
2.20.5 Built Environment Surveys (April 5–6, 2017) 106
2.21 Potential for Future Activities at Site 463-60-295 106
2.22 Analysis of Alternatives 463-60-296 106
2.23 Pertinent Federal, State, and Local Requirements 463-60-297 (Compliance Evaluation) 107
2.23.1 Pertinent Federal Statutes, Regulations, Rules, and Permits 110
2.23.2 Pertinent State Statutes, Regulations, Rules, and Permits 112
2.23.3 Pertinent Local Ordinances and Permits 117
2.24 References – Chapter 2 124
3 Natural Environment Affected Environment and Impacts 127
3.1 Earth 463-60-302 127
3.1.1 Affected Environment for Geology 127
3.1.2 Impacts to Geology 128
3.1.3 Mitigation Measures for Geology 130
3.1.4 Affected Environment for Soils 130
3.1.5 Impacts to Soils 137
3.1.6 Mitigation Measures for Soils 141
3.1.7 Affected Environment for Topography 141
3.1.8 Impacts to Topography 142
3.1.9 Unique Physical Features 142
3.1.10 Erosion/Enlargement of Land Area (Accretion) 143
3.1.11 Seismic Hazards 143
3.2 Air 463-60-312 143
3.2.1 Affected Environment for Air Quality 143
3.2.2 Impacts to Air Quality 145
3.2.3 Affected Environment for Odor 146
3.2.4 Impacts to Odor 146
3.2.5 Affected Environment for Climate 146
3.2.6 Impacts to Climate 147
3.2.7 Affected Environment for Climate Change 148
3.2.8 Impacts to Climate Change 148

3.2.9 Affected Environment for Dust 149
3.2.10 Impacts to Dust 149
3.3 Water 463-60-322 149
3.3.1 Affected Environment for Water Resources 149
3.3.2 Impacts to Water Resources 168
3.3.3 Mitigation Measures for Water Resources 170
3.3.4 Affected Environment for Surface Water 175
3.3.5 Impacts to Surface Water 183
3.3.6 Affected Environment for Runoff/Absorption 184
3.3.7 Impacts to Runoff/Absorption 184
3.3.8 Mitigation for Runoff/Absorption 185
3.3.9 Affected Environment for Floodplains 186
3.3.10 Impacts to Floodplains 186
3.3.11 Affected Environment for Groundwater 189
3.3.12 Impacts to Groundwater 191
3.3.13 Mitigation for Groundwater 191
3.3.14 Public Water Supply 191
3.4 Habitat, Vegetation, Fish, and Wildlife 463-60-332 192
3.4.1 Affected Environment for Habitat and Species 192
3.4.2 Affected Environment for Special-status Species 218
3.4.3 Impacts to Habitat 223
3.4.4 Impacts to Special-status Species 228
3.4.5 Impacts to Fish and Wildlife 229
3.4.6 Mitigation for Habitat and Species 232
3.5 Wetlands 463-60-333 239
3.5.1 Affected Environment for Wetland Delineations 239
3.5.2 Affected Environment for Wetland Categories 242
3.5.3 Affected Environment for Water Sources 261
3.5.4 Impacts to Wetlands 263
3.5.5 Impacts to Wetland Buffers 264
3.6 Energy and Natural Resources 463-60-342 271
3.6.1 Affected Environment for Energy and Natural Resources 271
3.6.2 Impacts to Energy and Natural Resources 272
3.7 References – Chapter 3 278
4 Built Environment Affected Environment and Impacts 285
4.1 Environmental Health 463-60-352 285
4.1.1 Affected Environment for Noise 285
4.1.2 Impacts to Noise 287
4.1.3 Kittitas County Noise Regulations/Guidelines 292
4.1.4 Washington Noise Regulations/Guidelines 293

4.1.5 Federal Noise Regulations/Guidelines 294
4.1.6 Construction Phase Spill Prevention, Control, and Countermeasure Plan 297
4.1.7 Operational Phase Spill Prevention, Control, and Countermeasure Plan 298
4.1.8 Environmental Protection and Compliance Program 298
4.1.9 Solid or Semi-solid Wastes 298
4.2 Land and Shoreline Use 463-60-362 301
4.2.1 Affected Environment for Land Use and Zoning 301
4.2.2 Impacts to Land Use and Zoning 304
4.2.3 Light and Glare 308
4.2.4 Affected Environment for Aesthetics 310
4.2.5 Impacts to Aesthetics 317
4.2.6 Affected Environment for Recreation 319
4.2.7 Impacts to Recreation 326
4.2.8 Washington State Department of Archaeology and Historic Preservation Consultation 327
4.2.9 Tribal Consultation 327
4.2.10 Affected Environment for Historical and Cultural Preservation 328
4.2.11 Impacts to Historic and Cultural Preservation 358
4.2.12 Affected Environment for Agriculture 361
4.2.13 Impacts to Agriculture 363
4.3 Transportation 463-60-372 364
4.3.1 Construction Traffic Volumes 364
4.3.2 Affected Environment for Transportation 365
4.3.3 Impacts to Transportation 368
4.3.4 Affected Environment for Waterborne, Rail, and Air Traffic 373
4.3.5 Impacts to Waterborne, Rail, and Air Traffic 374
4.3.6 Affected Environment for Parking 374
4.3.7 Impacts to Parking 374
4.4 Socioeconomics 463-60-535 375
4.4.1 Overall Economy 380
4.4.2 Workforce, Employment, and Unemployment 380
4.4.3 Affected Environment for Housing 386
4.4.4 Impacts on Housing, Motels, and Campgrounds 389
4.4.5 Affected Environment for Tax Revenues 392
4.4.6 Impacts to Tax Revenues 394
4.4.7 Affected Environment for Fire Protection and Safety Services 396
4.4.8 Impacts to Fire Protection and Safety Services 398
4.4.9 Affected Environment for Police 399
4.4.10 Impacts to Police 401
4.4.11 Affected Environment for Schools 401
4.4.12 Impacts to Schools 404

4.4.13 Affected Environment for Parks and Other Recreational Facilities 404
4.4.14 Impacts to Parks and Other Recreational Facilities 405
4.4.15 Affected Environment for Utilities 405
4.4.16 Impacts to Utilities 407
4.4.17 Affected Environment for Maintenance 407
4.4.18 Impacts to Maintenance 407
4.4.19 Affected Environment for Communications 407
4.4.20 Impacts to Communications 407
4.4.21 Affected Environment for Water and Stormwater 408
4.4.22 Impacts to Water and Stormwater 411
4.4.23 Affected Environment for Sewer and Solid Waste 414
4.4.24 Impacts to Sewer and Solid Waste 416
4.4.25 Affected Environment for Other Governmental Services 416
4.4.26 Impacts to Other Governmental Services 417
4.4.27 Affected Environment for Local Government Revenues 418
4.4.28 Impacts to Local Government Revenues 422
4.5 References – Chapter 4 422
5 Applications for Permits and Authorizations 433
5.1 Air Emissions Permits and Authorizations 463-60-536 433
5.2 Wastewater/Stormwater Discharge Permit Applications 463-60-537 433

APPENDICES AND ATTACHMENTS

Appendix A: Washington SEPA Environmental Checklist
Appendix B: Vegetation Management Plan
Appendix C: Habitat, Vegetation, Fish, and Wildlife Assessment Report
Appendix D: Visual/Aesthetic Assessment Report
Appendix E: Solar Glare Hazard Analysis Report
Appendix F: Decommissioning Plan
Appendix G: Camas Solar Project Site Reports and Permit Applications
G-1: Camas Solar Project Critical Areas Report
G-2: Camas Solar Project Cultural Resources Report
G-3: Camas Solar Project Permit Applications
G-4: Camas Solar Project Geotechnical Engineering Study
G-5: Camas Solar Project Drainage Report
Appendix H: Fumaria Solar Project Site Reports and Permit Applications
H-1: Fumaria Solar Project Critical Areas Report
H-2: Fumaria Solar Project Cultural Resources Report
H-3: Fumaria Solar Project Permit Applications
H-4: Fumaria Solar Project Geotechnical Engineering Study
H-5: Fumaria Solar Project Drainage Report

Appendix I: Penstemon Solar Project Site Reports and Permit Applications
- I-1: Penstemon Solar Project Critical Areas Report
- I-2: Penstemon Solar Project Cultural Resources Report
- I-3: Penstemon Solar Project Permit Applications
- I-4: Penstemon Solar Project Geotechnical Engineering Study
- I-5: Penstemon Solar Project Drainage Report

Appendix J: Typha Solar Project Site Reports and Permit Applications
- J-1: Typha Solar Project Critical Areas Report
- J-2: Typha Solar Project Cultural Resources Report
- J-3: Typha Permit Applications
- J-4: Typha Solar Project Geotechnical Engineering Study
- J-5: Typha Solar Project Drainage Report

Appendix K: Urtica Solar Project Site Reports and Permit Applications
- K-1: Urtica Solar Project Critical Areas Report
- K-2: Urtica Solar Project Cultural Resources Report
- K-3: Urtica Solar Project Permit Applications
- K-4: Urtica Solar Project Geotechnical Engineering Study
- K-5: Urtica Solar Project Drainage Report

Appendix L: TUUSSO Solar Project Site Plans and Designs

LIST OF TABLES

Table 1.10-1. Summary of Mitigation Measures for the Columbia Solar Projects Potential Construction and Operational Impacts 5
Table 1.12-1. Agency and Tribal Consultation 14
Table 1.16-1. Kittitas County Comprehensive Plan GPO General Policy Statements 26
Table 1.16-2. Kittitas County Comprehensive Plan GPO Zoning Implementation Statements 27
Table 2.11-1. Potential Columbia Solar Project Pollutants 91
Table 2.15-1. Columbia Solar Projects Construction Schedule 94
Table 2.17-1. Construction Equipment 99
Table 2.23-1. Pertinent Federal, State and Local Codes, Ordinances, Statutes, Rules, Regulations, and Permits 108
Table 2.23-2. Kittitas County Comprehensive Plan GPO General Policy Statements 120
Table 3.1-1. Estimated Wind Pressure Loads on Solar Panels Calculated Using Maximum Wind Speeds 129
Table 3.2-1. Representative Meteorological Conditions in the Proposed Action Area 144
Table 3.2-2. National Ambient Air Quality Standards 145
Table 3.2-3. Emissions Inventory in Tons per Year for Kittitas County, Washington 147
Table 3.2-4. Construction-Related Emissions in Tons Resulting from the Proposed Solar Project (Per Project Site) 147
Table 3.3-1. Summary of the WAC Water Typing System 150
Table 3.3-2. Summary of Water Features within and near the Columbia Solar Project Sites 166
Table 3.3-3. Water Typing and Minimum Buffer Distance Summary for each Columbia Solar Project Site 167
Table 3.3-4. Proposed Water Resources Impact Summary for each Columbia Solar Project Site 168
Table 3.3-5. Water Protection Buffers and Project Encroachment within Each Columbia Solar Project Site 171
Table 3.3-6. FEMA-Mapped 100-year Floodplain Project Encroachment and Impacts within Each Columbia Solar Project Site 187
Table 3.4-1. Available Habitat Types within the Columbia Solar Project Analysis Areas 196
Table 3.4-2. Noxious Weeds Documented in the Columbia Solar Projects Project-scale Analysis Areas 207
Table 3.4-3. Representative Species Observed or Likely to Occur in the Columbia Solar Project Analysis Areas 209
Table 3.4-4. Special-status Species with Potential to Occur in the Columbia Solar Project Project-scale Analysis Areas 219
Table 3.4-5. Construction and Operation Impacts: Acres of Habitat Types Potentially Affected by Construction Activities and from Fencing during Long-term Operation of the Columbia Solar Project 224
Table 3.4-6. Acres of Habitat Types Potentially Affected by Impervious Areas from Long-term Operation of the Columbia Solar Projects 226
Table 3.4-7. Acres of Special-status Species Habitat Impacted by Fencing and Conversion to an Impervious Area of the Columbia Solar Projects 229
Table 3.4-8. Acres of Representative Species Habitat (in the Landscape-scale Analysis Area) Impacted by Fencing and Conversion to an Impervious Area of the Columbia Solar Projects 230
Table 3.4-9. Nesting Seasons for Raptor Species Likely to Occur in the Analysis Areas 234
Table 3.4-10. Surface Waters in the Project-scale Analysis Areas and Applicable Buffers 234
Table 3.5-1. Wetland Size, Rating, and Classification for Wetlands within the Study Areas for Each Columbia Solar Project Site 241
Table 3.5-2. Washington State Department of Ecology Wetland Rating System Categories 242
Table 3.5-3. Wetland Rating and Minimum Buffer Distance Summary for each Columbia Solar Project Site 258
Table 3.5-4. Proposed Wetland Impact Summary for each Columbia Solar Project Site 263
Table 3.5-5. Wetland Buffers and Project Encroachment within Each Columbia Solar Project Site 265
Table 4.1-1. Representative Existing Conditions Based on Land Use 286
Table 4.1-2. Nearest Sensitive Receptor to Each Solar Project 286

Table 4.1-3. Maximum Noise Levels for Common Construction Equipment....287
Table 4.1-4. Calculated Noise Levels at Nearest Receptor Due to Construction of the Camas Solar Project Site....288
Table 4.1-5. Calculated Noise Levels at Property Boundary Due to Operation of the Camas Solar Project Site....289
Table 4.1-6. Calculated Noise Levels at Nearest Receptor Due to Construction of the Fumaria Solar Project Site....289
Table 4.1-7. Calculated Noise Levels at Property Boundary Due to Operation of the Fumaria Solar Project Site....290
Table 4.1-8. Calculated Noise Levels at Nearest Receptor Due to Construction of the Penstemon Solar Project Site....290
Table 4.1-9. Calculated Noise Levels at Property Boundary Due to Operation of the Penstemon Solar Project Site....290
Table 4.1-10. Calculated Noise Levels at Nearest Receptor Due to Construction of the Typha Solar Project Site....291
Table 4.1-11. Calculated Noise Levels at Property Boundary Due to Operation of the Typha Solar Project Site....291
Table 4.1-12. Calculated Noise Levels at Nearest Receptor Due to Construction of the Urtica Solar Project Site....292
Table 4.1-13. Calculated Noise Levels at Property Boundary Due to Operation of the Urtica Solar Project Site....292
Table 4.1-14. Washington State Maximum Allowed Amount of Noise Coming into a Property....293
Table 4.2-1. Kittitas County Comprehensive Plan Land Use Designations and Acreages....301
Table 4.2-2. Elements of Line, Form, Color, and Texture Common to all Five Columbia Solar Project Sites....311
Table 4.2-3. Summary of Five Columbia Solar Project KOP Locations, Directions of View, and Viewsheds....312
Table 4.2-4. Recreational Use Rates in the SCORP North Cascades Region and Washington....320
Table 4.2-5. Previous Cultural Resource Investigations Within Approximately 1 Mile of the Project Area....334
Table 4.2-6. Previously Recorded Sites Within Approximately 1 Mile of the Project Areas....337
Table 4.2-7. Agricultural Characteristics for Kittitas County and Washington (2012)....361
Table 4.3-1. Estimated Construction Vehicle Traffic Volumes....364
Table 4.3-2. Construction Equipment....365
Table 4.3-3. Highway and Access Road Information for the Five Columbia Solar Project Sites....367
Table 4.3-4. Potential Construction Vehicle Impacts for Columba Solar Project Sites....368
Table 4.4-1. Population and Growth Rate Data for Kittitas County, the Cities, and Washington (2000, 2010, and 2015)....377
Table 4.4-2. Percent Minority Population in Kittitas County, the Cities, and Washington (2015)....378
Table 4.4-3. Population by Race/Ethnicity, Including Hispanic or Latino in Kittitas County, Ellensburg, and Washington (2015)....378
Table 4.4-4. Median Annual Household and Per Capita Incomes, and Percent of the Population Below the Poverty Level (2015)....379
Table 4.4-5. Workforce, Employment, and Unemployment in Kittitas County, the Cities, and Washington (2015)....381
Table 4.4-6. Employment by Industry in Kittitas County, Ellensburg, and Washington (2015)....381
Table 4.4-7. Top 10 Employers in Kittitas County (2014)....382
Table 4.4-8. Columbia Solar Projects Construction Schedule....382
Table 4.4-9. Peak Construction Workforce Characteristics for the Five Columbia Solar Projects....383
Table 4.4-10. Housing Characteristics in Kittitas County, the Cities, and Washington (2015)....386
Table 4.4-11. Housing Characteristics in Kittitas County, the Cities, and Washington (2000)....386
Table 4.4-12. Representative Hotels, Motels, and Bed & Breakfasts in Kittitas County....387
Table 4.4-13. Representative RV and Camping Parks in Kittitas County....388
Table 4.4-14. Potential Columbia Solar Projects Construction and Operations Employees Washington State Occupational Wages (May 2016)....391
Table 4.4-15. Kittitas County Top 10 Property Tax Payers, 2014 Assessment for 2015 Tax....392

Table 4.4-16. Sales Tax Rates in Kittitas County and the Cities, 3rd Quarter 2017 393
Table 4.4-17. City of Ellensburg Top 10 Property Tax Payers, 2014 Assessment for 2015 Tax 393
Table 4.4-18. Operational Kittitas County Property Tax Payments from the Five Columbia Solar Projects 395
Table 4.4-19. Kittitas County Emergency Services Facilities 396
Table 4.4-20. Public Education Facilities in the Ellensburg and Western Kittitas County Areas 402
Table 4.4-21. Puget Sound Energy 2014 Electricity Fuel Mix 405
Table 4.4-22. Kittitas County PUD Electricity Use and Costs by Customer Class 406
Table 4.4-23. Kittitas County PUD Electric Generation by Fuel Source Mix 406
Table 4.4-24. Kittitas County Group A Water Systems 408
Table 4.4-25. Kittitas County Sanitary Sewer Facilities 414
Table 4.4-26. Kittitas County Waste and Recycling Facilities (2014) 415
Table 4.4-27. Kittitas County Waste and Recycling Facilities and Quantities (2014) 416
Table 4.4-28. Kittitas County 2016 Annual Budget Summary 418
Table 4.4-29. Kittitas County General Fund – Revenue by Department (2016) 419
Table 4.4-30. City of Ellensburg 2016 Annual Budget Summary 420
Table 4.4-31. City of Ellensburg City Budget by Fund (2016) 421

LIST OF FIGURES

Figure 2.1-1. Columbia Solar Project site locations. 32
Figure 2.1-2. Camas Solar Project site location. 34
Figure 2.1-3. Fumaria Solar Project site location. 36
Figure 2.1-4. Penstemon Solar Project site location. 37
Figure 2.1-5. Typha Solar Project site location. 39
Figure 2.1-6. Urtica Solar Project site location. 40
Figure 2.2-1. Camas Solar Project site. 47
Figure 2.2-2. Fumaria Solar Project site, Map 1 of 5. 48
Figure 2.2-3. Fumaria Solar Project site, Map 2 of 5. 49
Figure 2.2-4. Fumaria Solar Project site, Map 3 of 5. 50
Figure 2.2-5. Fumaria Solar Project site, Map 4 of 5. 51
Figure 2.2-6. Fumaria Solar Project site, Map 5 of 5. 52
Figure 2.2-7. Penstemon Solar Project site. 54
Figure 2.2-8. Typha Solar Project site. 55
Figure 2.2-9. Urtica Solar Project site. 56
Figure 2.3-1. Camas Solar Project preliminary project plan. 59
Figure 2.3-2. Fumaria Solar Project preliminary project plan. 60
Figure 2.3-3. Penstemon Solar Project preliminary project plan. 61
Figure 2.3-4. Typha Solar Project preliminary project plan. 62
Figure 2.3-5. Urtica Solar Project preliminary project plan. 63
Figure 2.16-1. Columbia Solar Projects management structures. 97
Figure 2.23-1. Shoreline of the State encroachment areas for the Typha Solar Project. 114
Figure 3.1-1. Boring locations at the Camas Solar Project site. 131
Figure 3.1-2. Boring locations at the Fumaria Solar Project site. 133
Figure 3.1-3. Boring locations at the Penstemon Solar Project site. 135
Figure 3.1-4. Boring locations at the Typha Solar Project site. 136
Figure 3.1-5. Boring locations at the Urtica Solar Project site. 138
Figure 3.3-1. Camas Solar Project site map showing water resources, north portion. 151
Figure 3.3-2. Camas Solar Project site map showing water resources, south portion. 152
Figure 3.3-3. Fumaria Solar Project site map showing water resources, Map 1 of 8. 153
Figure 3.3-4. Fumaria Solar Project site map showing water resources, Map 2 of 8. 154
Figure 3.3-5. Fumaria Solar Project site map showing water resources, Map 3 of 8. 155
Figure 3.3-6. Fumaria Solar Project site map showing water resources, Map 4 of 8. 156
Figure 3.3-7. Fumaria Solar Project site map showing water resources, Map 5 of 8. 157
Figure 3.3-8. Fumaria Solar Project site map showing water resources, Map 6 of 8. 158
Figure 3.3-9. Fumaria Solar Project site map showing water resources, Map 7 of 8. 159
Figure 3.3-10. Fumaria Solar Project site map showing water resources, Map 8 of 8. 160
Figure 3.3-11. Penstemon Solar Project site map showing water resources. 161
Figure 3.3-12. Typha Solar Project site map showing water resources, north portion. 162
Figure 3.3-13. Typha Solar Project site map showing water resources, south portion. 163
Figure 3.3-14. Urtica Solar Project site map showing water resources, east portion. 164
Figure 3.3-15. Urtica Solar Project site map showing water resources, west portion. 165
Figure 3.3-16. Penstemon Solar Project water buffer encroachment. 173
Figure 3.3-17. Urtica Solar Project wetland and water buffer encroachment. 174
Figure 3.3-18. Proposed drainage conditions for the Camas Solar Project site. 176
Figure 3.3-19. Proposed drainage conditions for the Fumaria Solar Project site. 178
Figure 3.3-20. Proposed drainage conditions for the Penstemon Solar Project site. 179
Figure 3.3-21. Proposed drainage conditions for the Typha Solar Project site. 181
Figure 3.3-22. Proposed drainage conditions for the Urtica Solar Project site. 182
Figure 3.4-1. Columbia Solar Projects project-scale analysis areas. 193
Figure 3.4-2. Columbia Solar Projects landscape-scale analysis area. 195
Figure 3.4-3. Habitat types within the project-scale analysis area for the Camas Solar Project site. 197
Figure 3.4-4. Habitat types within the project-scale analysis area for the Fumaria Solar Project, Map 1 of 4. 198

Figure 3.4-5. Habitat types within the project-scale analysis area for the Fumaria Solar Project, Map 2 of 4. 199
Figure 3.4-6. Habitat types within the project-scale analysis area for the Fumaria Solar Project, Map 3 of 4. 200
Figure 3.4-7. Habitat types within the project-scale analysis area for the Fumaria Solar Project, Map 4 of 4. 201
Figure 3.4-8. Habitat types within the project-scale analysis area for the Penstemon Solar Project. 202
Figure 3.4-9. Habitat types within the project-scale analysis area for the Typha Solar Project. 203
Figure 3.4-10. Habitat types within the project-scale analysis area for the Urtica Solar Project. 204
Figure 3.5-1. Camas Solar Project site map showing water resources, north portion. 243
Figure 3.5-2. Camas Solar Project site map showing water resources, south portion. 244
Figure 3.5-3. Fumaria Solar Project site map showing water resources, Map 1 of 8. 245
Figure 3.5-4. Fumaria Solar Project site map showing water resources, Map 2 of 8. 246
Figure 3.5-5. Fumaria Solar Project site map showing water resources, Map 3 of 8. 247
Figure 3.5-6. Fumaria Solar Project site map showing water resources, Map 4 of 8. 248
Figure 3.5-7. Fumaria Solar Project site map showing water resources, Map 5 of 8. 249
Figure 3.5-8. Fumaria Solar Project site map showing water resources, Map 6 of 8. 250
Figure 3.5-9. Fumaria Solar Project site map showing water resources, Map 7 of 8. 251
Figure 3.5-10. Fumaria Solar Project site map showing water resources, Map 8 of 8. 252
Figure 3.5-11. Penstemon Solar Project site map showing water resources. 253
Figure 3.5-12. Typha Solar Project site map showing water resources, north portion. 254
Figure 3.5-13. Typha Solar Project site map showing water resources, south portion. 255
Figure 3.5-14. Urtica Solar Project site map showing water resources, east portion. 256
Figure 3.5-15. Urtica Solar Project site map showing water resources, west portion. 257
Figure 3.5-16. Camas Solar Project wetland buffer encroachment. 267
Figure 3.5-17. Typha Solar Project wetland buffer encroachment. 268
Figure 3.5-18. Urtica Solar Project wetland buffer encroachment. 270
Figure 4.2-1. Columbia Solar Project site locations. 302
Figure 4.2-2. SGHAT tool results example. 309
Figure 4.2-3. Kittitas County selected major state recreational parks. 321
Figure 4.2-4. Camas Solar Project cultural and built environment resources, north portion. 339
Figure 4.2-5. Camas Solar Project cultural and built environment resources, south portion. 340
Figure 4.2-6. Fumaria Solar Project cultural and built environment resources, Map 1 of 7. 342
Figure 4.2-7. Fumaria Solar Project cultural and built environment resources, Map 2 of 7. 343
Figure 4.2-8. Fumaria Solar Project cultural and built environment resources, Map 3 of 7. 344
Figure 4.2-9. Fumaria Solar Project cultural and built environment resources, Map 4 of 7. 345
Figure 4.2-10. Fumaria Solar Project cultural and built environment resources, Map 5 of 7. 346
Figure 4.2-11. Fumaria Solar Project cultural and built environment resources, Map 6 of 7. 347
Figure 4.2-12. Fumaria Solar Project cultural and built environment resources, Map 7 of 7. 348
Figure 4.2-13. Penstemon Solar Project cultural and built environment resources. 350
Figure 4.2-14. Typha Solar Project cultural and built environment resources, north portion. 353
Figure 4.2-15. Typha Solar Project cultural and built environment resources, south portion. 354
Figure 4.2-16. Urtica Solar Project cultural and built environment resources, east portion. 356
Figure 4.2-17. Urtica Solar Project cultural and built environment resources, west portion. 357
Figure 4.3-1. Columbia Solar Project locations, highways, and roads. 366
Figure 4.4-1. Kittitas County and cities overview map. 376

1 GENERAL PROJECT INFORMATION

1.1 General — Organization — Index 463-60-012

Except as may be otherwise approved by the council and except as otherwise provided below with respect to applications covering nuclear power plants, the contents of the application shall be organized in the same order as these guidelines.

(1) To aid in the council's review under SEPA and chapter 463-47 WAC, WAC 463-60-302 through 463-60-372 are similar to the elements required in an environmental impact statement.

(2) In the case of an application covering a nuclear power plant, the environmental report prepared for the nuclear regulatory commission may be substituted for the comparable sections of the site certification application, provided that the environmental report is supplemented as necessary to comply with this chapter and that an index is included listing these guidelines in order and identifying where each applicable guideline is addressed.

This Washington Energy Facility Site Evaluation Council (EFSEC) Application for Site Certification (ASC) for TUUSSO Energy, LLC's (TUUSSO's), Columbia Photovoltaic Solar Projects has been organized according to the regulations, providing the requirement verbatim first, followed by the responses to the requirement. A table of contents is provided above, to identify the requirements and the page locations where they are addressed. This application has been organized into four major parts/chapters:

Chapter 1: General Project Information

Chapter 2: Solar Project Proposal Descriptions

Chapter 3: Natural Environment Affected Environment and Impacts

Chapter 4: Built Environment Affected Environment and Impacts

A number of appendices follow these major chapters including, for each of the five Columbia Solar Project sites, copies of the wildlife and habitat assessment reports, critical areas (wetlands and water) reports, cultural resources reports, visual resources report, solar glare report, draft permit applications, site plans, and other materials.

1.2 General — Description of Applicant 463-60-015

The applicant shall provide an appropriate description of the applicant's organization and affiliations for this proposal.

TUUSSO is a privately-owned, Seattle-based utility-scale solar developer. The owners of TUUSSO comprise Pivotal Investments (a Portland-based venture capital firm), the principals and co-founders (Owen Hurd, Jason Evans, Vivek Nayak, and Byron Crawford), and a number of family and friends investors.

TUUSSO is composed of the following board and advisors:

John Cooper, Director
Owen Hurd, Director
John Miner, Director
Mark Liffmann, Advisor

TUUSSO's Management Team includes:

Owen Hurd, President, Chief Financial Officer
Jason Evans, General Counsel and Vice President of Business Development
Vivek Nayak, Vice President of Operations
Bryan Crawford, Vice President of Project Origination

TUUSSO was formed in late 2008 and has developed over 100 MWac of solar photovoltaic (PV) projects across the United States, from California to Maryland, ranging in size from 15 to 45 MWac. These projects are owned by large independent power producers and utilities, including Dominion Power and NRG.

1.3 Council Recognizes Pressing Need for Energy Facilities 463-60-021

RCW 80.50.010 requires the council to "recognize the pressing need for increased energy facilities." For that reason, applications for site certification need not demonstrate a need for the energy facility.

As indicated, no action is required by TUUSSO to meet this regulatory requirement. However, please note that the State of Washington has enacted aggressive legal and policy standards in pursuit of more renewable energy, including a Renewable Portfolio Standard of 15% by 2020. TUUSSO's five proposed Columbia Solar Projects would help the State to meet those objectives.

1.4 General — Designation of Agent 463-60-025

The applicant shall designate an agent to receive communications on behalf of the applicant.

Please direct all communications as follows:

Jason Evans
500 Yale Avenue North
Seattle, WA 98109
Email: Jason.evans@tuusso.com
Phone: 206-303-0198

With a CC to:

Stoel Rives LLP
Attn: Tim McMahan
760 SW Ninth Avenue, Suite 3000
Portland, OR 97205
Email: tim.mcmahan@stoel.com
Phone: 503-294-9517

1.5 General — Application Review Costs and Funding 463-60-035

The statutory initial charges shall accompany an application and shall be a condition precedent to any action by the council. The initial costs and any additional funds needed for the review of an application, including the method of payment, shall be in accordance with chapter 463-58 WAC.

In accordance with WAC 463-58-020, a deposit shall accompany the application as required by Revised Code of Washington (RCW) 80.50.071. RCW 80.50.071 was updated in 2016 establishing the application deposit in an amount up to fifty thousand dollars ($50,000), or such greater amount as specified by EFSEC after consultation with the Applicant. TUUSSO is providing the initial $50,000 deposit with this Application for Site Certification for the five proposed Columbia Solar Projects.

1.6 General — Where Filed 463-60-045

Applications for site certification shall be filed with the council at the council office.

This application is filed with the Council at the following address:

Washington Energy Facility Site Evaluation Council
Utilities & Transportation Commission
1300 S Evergreen Park Drive SW
Olympia, WA 98504-3172

1.7 General — Form and Number of Copies 463-60-055

(1) Applications shall be on 8-1/2 by 11" sheets, in loose-leaf form with a hard cover binder. The applicants shall supply a sufficient number of copies of the application to the council, the number to be determined by the council in consultation with its staff, consultants and the applicant. The applicants shall also supply two copies to each county, two copies to each city, and one copy to each port district in which the proposed project would be located. In addition, one copy shall be supplied to each intervenor on admission to the proceedings. Information later submitted shall be by page-for-page substitutions suitable for insertion in the application binder, bearing the date of the submission.

In accordance with this requirement, TUUSSO is submitting 15 copies of the ASC to EFSEC and one copy to Kittitas County, where all five Columbia Solar Projects would be located.

(2) An applicant shall also provide the council copies of its application in a digital format for use in personal computers. Digital format shall be determined by the council in consultation with its staff, consultants and the applicant.

In accordance with this requirement, TUUSSO is submitting 50 electronic copies of the ASC to EFSEC for its use and review.

(3) At the time of submittal of the application, the applicant shall submit one copy of the applicable land use plans and zoning ordinances for the project site.

Per this requirement, one hard copy of the Kittitas County Comprehensive Plan and Zoning Ordinances have been provided along with the ASC to EFSEC.

1.8 General — Full Disclosure by Applicant 463-60-065

It is recognized that these guidelines can only be comprehensive in a relative sense. Therefore, and in addition to the other guidelines contained herein, the council adopts the basic guideline that an applicant for site certification must identify in the application all information known to the applicant which has a bearing on site certification.

TUUSSO has provided in this application and accompanying documentation all information known to TUUSSO that might have a bearing on site certification for the Columbia Solar Projects.

1.9 General — Assurances 463-60-075

The application shall set forth insurance, bonding or other arrangements proposed in order to mitigate for damage or loss to the physical or human environment caused by project construction, operation, abandonment, termination, or when operations cease at the completion of a project's life. The application shall describe the applicant's commitment to the requirements of chapter 463-72 WAC, Site restoration and preservation.

TUUSSO will comply with the requirements of Washington Administrative Code (WAC) 463-72, Site Restoration and Preservation. A preliminary Decommissioning Plan is being submitted with this application for the Council's review, and an Initial Site Restoration Plan would be submitted to the Council at least 90 days prior to the beginning of site preparation, in accordance with WAC 463-72-040.

TUUSSO is committed to mitigating for the potential of any damage or loss to the physical or human environment at all phases of the five proposed Columbia Solar Projects. Prior to construction, in accordance with WAC 463-72-020(2), TUUSSO would provide evidence of pollution liability insurance coverage, as well as financial assurance in a form and an amount sufficient to ensure the restoration and decommissioning of the five solar project sites, in accordance with the EFSEC-approved Initial Site Restoration and Decommissioning Plan. Such financial assurance would be provided to ensure the availability of said funds to EFSEC in the event that TUUSSO fails to timely or adequately perform its decommissioning duties, as described in the Initial Site Restoration and Decommissioning Plan. The utilization of said funds shall be restricted to decommissioning operation and requirements as detailed by the Plan. Residual funds (not used specifically for reclamation or remediation) shall be returned to TUUSSO once the decommissioning operations have been completed to the satisfaction of EFSEC. The financial assurance shall be in the form of a site closure bond, sinking fund, or other financial instrument or security deemed satisfactory to, and enforceable by, EFSEC. Such funds shall remain in place until decommissioning is completed to the satisfaction of EFSEC.

TUUSSO would provide a report to EFSEC staff every 5 years after approval of the ASC, confirming that the performance and financial assurance guarantees are sufficient to ensure performance and implementation of the Initial Site Restoration and Decommissioning Plan. The report shall provide a decommissioning pro-forma budgetary analysis summarizing the residual value of the salvageable property. The pro-forma shall include, at a minimum, the expected revenue from all salvageable property, the then-current cost of decommissioning the sites, and the then-current value of any performance and financial guarantees.

During construction, TUUSSO and/or its engineering, procurement, and construction (EPC) firm, as appropriate, would hold a full suite of insurance products to mitigate risks, including general liability and property insurance, pollution liability insurance, contractor/builder's risk insurance, and worker's

compensation. Once the sites are operational, TUUSSO would continue to maintain general liability insurance and pollution liability insurance, as well as an operational property insurance to cover against all risks associated with physical damage caused by a wide range of physical perils.

1.10 General — Mitigation Measures 463-60-085

(1) Mitigation measures summary. The application shall summarize the impacts to each element of the natural or built environment and the means to be utilized to minimize or mitigate possible adverse impacts during construction, operation, and decommissioning of the proposal, all associated facilities, and any alternatives being brought forward.

Table 1.10-1 summarizes the mitigation measures that TUUSSO plans to implement during construction and operation of the five Columbia Solar Projects. Potential construction and operational impacts of the Columbia Solar Projects are summarized in greater detail below in Section 1.16, Table 1.16-1.

Table 1.10-1. Summary of Mitigation Measures for the Columbia Solar Projects Potential Construction and Operational Impacts

Technical Resource	Mitigation Measures
Earth	Geology Construction: Complete several test borings to determine whether piles could be placed without damage. The purpose of this testing would be two-fold: 1) it is necessary to determine that the piles can be driven into the bearing soils to the required embedment depth without damaging the pile and 2) it is required to load test the resulting piles to determine that adequate bearing capacity is being developed. Operation: There would be no long-term operational mitigation measures for geology. Soils Construction: • Planned BMPs include those from stormwater management guidelines applicable to eastern Washington. • If excavated site soils are to be used as structural fill, they would be protected from moisture while stockpiled. • Stockpiled topsoil would not be mixed with structural fill, if it is planned for use in non-structural areas. • Temporary excavations like utility excavations and foundation excavations with heights in excess of 4 feet would be sloped no steeper than 1.5H:1V. If seepage is observed in these excavations, they may need to be sloped at 2H:1V to prevent sloughing due to seepage pressure. Dewatering measures may also be needed to control seepage. • Temporary construction ingress and egress would be completed prior to the start of ongoing construction traffic at the solar project sites. A temporary construction entrance would be constructed of 8 to 12 inches of quarry spalls. If the soils in the entrance locations are soft, a layer of geotextile fabric would be laid down as a barrier prior to placement of quarry spalls. The quarry spalls would provide a stable entrance/exit to the sites and would limit tracking of mud onto the existing public and private roads during and after wet weather. • Infiltration and temporary erosion and sedimentation control (TESC) measures would consist of installation of silt fencing as needed around the solar project site entrances, around the perimeter of the low side of the sites, and at discharge points where sediment-laden surface water might enter off-site drainage features. Because the solar project sites are flat and slope very gently to the south, silt fencing would probably not be necessary at the southern perimeters. Operation: Planned BMPs include those from stormwater management guidelines applicable to eastern

Technical Resource	Mitigation Measures
	Washington. Topography, Unique Physical Features, and Seismic Activities Construction and Operation: No mitigation measures are proposed for these technical resources because there would be no significant impacts from the proposed solar projects related to these resources.
Air	Construction: Dust from access roads would be controlled by applying gravel or watering, as necessary. Operation: There would be no long-term operational mitigation measures for air.
Water	Water Resources Construction: • TUUSSO utilized avoidance measures during the solar project designs to avoid, reduce, or eliminate impacts to water resources. • At unavoidable crossings of water resources, TUUSSO would utilize the existing bridge infrastructure to the extent possible and, where bridge improvements are needed, techniques would be utilized that would not require impacting water resources below their ordinary high water marks (OHWMs), such as spanning existing bridges. • Proper BMPs to reduce or eliminate runoff of contaminants would be utilized, including the proper use of silt fencing, to protect water resources from contamination and sedimentation. Operation: • Once construction is completed, seeding would be conducted in accordance with the Restoration and Vegetation Management Plan to reduce erosion of bare ground. • Once the solar project sites have been adequately re-vegetated, the operational use of the solar project sites would be limited to the installed infrastructure and would not involve any activities that could affect water resources. Surface Water Construction and Operation: The mitigation measures for Soils (above) and Runoff/Absorption (below) would also reduce the potential for significant surface water impacts. Runoff/Absorption Construction: • Off-site flows have been calculated for the solar project sites, and would bypass the sites via the existing flow paths, which run throughout the sites in poorly defined flow paths. The solar project sites have been laid out to minimize the area that would encroach into the flow paths. Where limited grading would occur, the solar project sites would be graded such that surface water is directed away from structures and slopes. • Surface water would not be allowed to pond near the tops or toes of slopes. • Stormwater discharge BMPs would be implemented to control runoff from the solar project sites. • Sediment-laden surface water would be treated such that water discharged from the solar project sites meets all water quality standards. • Stormwater would not be discharged over the project site slopes to the north of each site. Operation: The measures implemented during the operation phase would be the same as those discussed above for the construction phase of the projects. Floodplains Construction: • TUUSSO utilized avoidance measures during the solar project designs to avoid, reduce, or eliminate impacts to the FEMA-mapped 100-year floodplain within the Columbia Solar Project sites. • In areas of the FEMA-mapped 100-year floodplain that would be unavoidable, TUUSSO

Technical Resource	Mitigation Measures
	would limit site grading, except in areas where roads and transformers would be located, so as not to substantially alter the floodplain storage area. All transformers would be located outside of the FEMA-mapped 100-year floodplain. • Footings for the solar panel modules would be installed using vibratory driven H-piles, which would not result in any soil spoil piles and would minimize the overall footprint of the solar panel modules. Operation: Once construction is completed, no additional measures would need to be taken to mitigate for the operational use of the solar project sites, which would be limited to the installed infrastructure and would have minimal changes in elevation or grade in FEMA-mapped 100-year floodplain areas. Groundwater Construction: Groundwater control measures would be on-site or readily available, including trash pumps, sumps, and discharge ditches. Operation: Groundwater control measures would be on-site or readily available, including trash pumps, sumps, and discharge ditches.
Habitat, Vegetation, Fish, and Wildlife	Construction: Buffers and Seasonal Timing: • To ensure compliance with MBTA, vegetation clearing would ideally be undertaken from August 1 through the end of February. • If construction or vegetation clearing is required between March 1 and August 1, nest surveys would be required in the proposed area of disturbance. If active migratory bird nests (including raptor nests) are encountered during the surveys, land-disturbing construction activities should be avoided while the birds are allowed to fledge. An appropriate species avoidance buffer, as determined in conjunction with WDFW and local agencies, would apply to all active nests for migratory bird species. Riparian Corridors: • Avoidance buffers have been incorporated into the solar project designs for the Yakima River and streams in the vicinity of the proposed solar projects. • To additionally protect riparian corridors and habitats, peak construction activities would be conducted during the dry season as much as possible, to minimize erosion, sedimentation, and soil compaction. Noise: All noise-generating construction activities would be conducted between the hours of 7 a.m. and 10 p.m., in accordance with WAC 173-60-050 and local bylaws and noise ordinances, including but not limited to KCC 9.45.010, Public Disturbance Noises. These practices would avoid night-time noise disturbances to wildlife species. Design and Construction Techniques: • Avoid, when possible, construction in sensitive areas such as riparian zones and wetlands. • Flag sensitive habitat areas (e.g., raptor nests, wetlands, etc.) near proposed areas of construction activity, and designate such areas as off limits to all construction personnel. • During the nesting season, monitor raptor nests within 0.25 mile of the sites for nesting activity; coordinate construction timing and activities with WDFW to avoid impacts to nesting raptors. • Minimize new road construction by improving and using existing roads and trails, instead of constructing new roads. • Develop and implement a Fire Control Plan, in coordination with local fire districts, to minimize the risk of accidental fires during construction, and respond effectively to any fire that does occur. • Designate an environmental monitor during construction to monitor construction activities and

Technical Resource	Mitigation Measures
	ensure compliance with mitigation measures. • Implement a trenching protocol during the installation of underground electrical facilities, to allow for conservation of surface soils. • Require construction personnel to avoid driving over or otherwise disturbing areas outside of the designated construction areas. • Properly store and manage all wastes generated during construction. • Use certified weed-free straw bales during construction to avoid introduction of noxious or invasive weeds. • There would be one straight row of barbed wire, not circular barbed wire, at the top of the perimeter fences. This would avoid birds becoming trapped in circular barbed wire. • For poles installed by TUUSSO, when feasible: o equip overhead power lines with raptor perch guards to minimize risks to raptors and o space overhead power line conductors to minimize potential for raptor electrocution. Erosion and Sediment Control: • Use BMPs to minimize construction-related surface water runoff and soil erosion. • Implement temporary erosion and sediment control measures, as appropriate, both during and after construction. • Flag sensitive habitat areas (e.g., riparian zones, wetlands, etc.) near proposed areas of construction activity, and designate such areas as off limits to all construction personnel. • Limit disturbances to the minimum necessary when working in or near waterbodies, and install stakes or flagging to restrict vehicles and equipment to designated routes and areas. • Delineate construction limits within 200 feet of waterbodies, as specified in the Stormwater Pollution Prevention Plan (SWPPP), with a sediment fence, straw wattles, or similarly approved methods to eliminate sediment discharge into waterways and wetlands, minimize the size of construction disturbance areas, and minimize removal of vegetation, to the greatest extent possible. Restoration and Noxious Weed Control: • Quickly revegetate habitats temporarily disturbed during construction with native species. • Reseed all temporarily disturbed areas with an appropriate mix of native plant species as soon as possible after construction is completed, to accelerate the revegetation of these areas and to prevent the spread of noxious weeds. • Consult with WDFW regarding the appropriate native seed mixes to include in the Vegetation Management Plan for revegetation of the solar project sites. • As further detailed in the Vegetation Management Plan, implement noxious weed control measures. • Develop a Noxious Weed Control Plan prior to construction, and implement the plan over the life of the solar projects as mitigation. Herbicide application could be a noxious weed control method used. Operation: Fire Control Plan: Implement the Fire Control Plan in coordination with local fire districts, to minimize the risk of accidental fires during operation, and respond effectively to any fire that does occur. Erosion and Sediment Control: Use BMPs to minimize operation-related surface water runoff and soil erosion. Noxious Weed Control: Implement the Noxious Weed Control Plan (as further detailed in the Vegetation Management Plan) over the life of the solar projects as mitigation.
Wetlands	Construction: • TUUSSO utilized avoidance measures during the solar project designs to avoid, reduce, or eliminate impacts to wetlands. • At the unavoidable crossing of wetland TW03 on the Typha Solar Project site, TUUSSO would utilize the existing land-bridge to the extent possible to improve the crossing of this wetland. Minor wetland fill would occur, but minimization of impacts would be achieved and

Technical Resource	Mitigation Measures
	would keep the wetland fill below 1,000 square feet, which is below the threshold for which wetland mitigation is required. • All other wetlands would be avoided through the solar project designs. • Proper BMPs to reduce or eliminate runoff of contaminants would be utilized, including the proper use of silt fencing, to protect wetlands from contamination and sedimentation. Operation: • Once construction is completed, seeding would be conducted in accordance with the Restoration and Vegetation Management Plan to reduce erosion of bare ground. Once the site has been adequately re-vegetated, the operational use of the solar project sites would be limited to the installed infrastructure and would not involve any activities that could affect wetlands. • In accordance with the Restoration and Vegetation Management Plan, some seeding and planting within wetlands would occur within the first two years of operations at the Typha and Urtica Solar Project sites. These actions would have a net benefit to the quality of wetlands at these two project sites. • Additional operational vegetation management actions would involve some minor herbicide treatments to control noxious weeds, potentially near wetland areas.
Energy and Natural Resources	Construction and Operation: Because there would be minimal or no construction or operational impacts to Energy and Natural Resources, no mitigation measures are proposed.
Environmental Health	Noise Construction: All noise-generating construction activities would take place within the hours of 7:00 a.m. to 10:00 p.m. so that it is exempt from local noise standards. Operation: Operation of the Fumaria, Penstemon, Typha, and Urtica Solar Projects would not exceed the Washington State Noise Maximum and no mitigation is required. Preliminary estimates of the noise levels at the Camas Solar Project property boundary exceed the Washington State Noise Maximum. Post-construction noise monitoring would be conducted and any further mitigation, such as installing a noise-mitigating barrier, would be completed to comply with the noise standard. Risk of Fire or Explosion Construction and Operation: Because there would be minimal risks and potential impacts of fire during construction or operation of the solar project sites, and no risks of explosion, no mitigation measures are proposed. Spill Prevention and Control Construction and Operation: Because there would be no construction or operational impacts to Spill Prevention and Control from the solar project sites, no mitigation measures are proposed. Solid Wastes Construction and Operation: Because there would be no construction or operational impacts to Solid Wastes from the solar project sites, no mitigation measures are proposed.
Land and Shoreline Use	Land Use and Zoning Construction and Operation: Because there would be no construction or operational impacts to Land Use and Zoning from the solar project sites, no mitigation measures are proposed. Light and Glare Construction and Operation: Because there would be no construction or operational impacts to light and glare from the solar project sites, no mitigation measures are proposed.

Technical Resource	Mitigation Measures
	Aesthetics General: • Vegetation or fencing would be used to interrupt the line of sight from nearby KOPs at or near the same elevation of the projects. • Vegetation and ground disturbance would be minimized near roads, and the use of existing clearings would be maximized. • The use of non-necessary and/or non-safety-related signs and project construction signs should be minimized; necessary signs would be made of non-glare materials and use unobtrusive colors; reverse sides of signs and mounts would be painted or coated using the most suitable color to reduce color contrasts with the existing landscape; however, placement and design of any signs required by safety regulations must conform to regulatory requirements. • "Good housekeeping" procedures would be developed to ensure that the sites are kept clean of debris, garbage, fugitive trash or waste, and graffiti; to prohibit scrap heaps and dumps; and to minimize storage yards. Design features regarding waste management would be applied. • A lighting plan would be prepared that documents how lighting would be designed and installed to minimize night-sky impacts during facility construction and operations phases. Lighting for facilities would not exceed the minimum number of lights and brightness required for safety and security, and would not cause excessive reflected glare. Full cut-off luminaires would be used to minimize upward shining lighting. Lights would be directed downward or toward the area to be illuminated. Light fixtures would not spill light beyond the project boundary. Lights in high illumination areas not occupied on a continuous basis would have switches, timer switches, or motion detectors so that the lights operate only when the area is occupied. Where feasible, vehicle-mounted lights would be used for night maintenance activities. Wherever feasible, consistent with safety and security, lighting would be kept off when not in use. The lighting plan would include a process for promptly addressing and mitigating complaints about potential lighting impacts. • Each of the five solar sites would be adequately screened by either existing or new vegetation or through the application of perimeter fencing to reduce contrast from glint and glare for KOPs with level views. Construction: • Project developers would integrate visual and aesthetics mitigation elements early in the construction, which may include treatments such as thinning and feathering vegetation along project edges, salvaging landscape materials from within construction areas, etc. • Visual impacts would be reduced during construction by clearly delineating construction boundaries. Within areas not intended for long-term use, impacts would be reduced by minimizing areas of surface disturbance within those boundaries; preserving vegetation to the greatest extent possible; using undulating surface disturbance edges; controlling erosion; using fugitive dust suppression techniques; and restoring exposed soils to their original contour and vegetation. • An interim reclamation plan would be in place prior to construction. Interim reclamation of the construction site would begin immediately after construction to reduce the likelihood of visual contrasts associated with erosion and invasive weed infestation and to reduce the visibility of impacted areas as quickly as possible. • Existing rocks, vegetation, and drainage patterns would be preserved to the maximum extent practicable, particularly within temporary use areas. • Brush-beating or mowing, or using protective surface matting rather than vegetation removal would be done where feasible. • For interim reclamation areas, slash from vegetation removal would be mulched and spread to cover fresh soil disturbances as part of the revegetation plan. Slash piles would not be left in sensitive viewing areas. • No paint or permanent discoloring agents would be applied to rocks or vegetation to indicate surveyor construction activity limits, except in areas defined and designated for disturbance. • All stakes and flagging would be removed from the construction area and disposed of in an approved facility.

Technical Resource	Mitigation Measures
	Operation: • The project developer would maintain revegetated surfaces until a self-sustaining stand of vegetation is re-established and visually adapted to the undisturbed surrounding vegetation. For new areas of disturbance (beyond the scope of this project), no new disturbance would be created during operation. • Interim restoration would be undertaken during the operating life of the projects as soon as possible after disturbances. • Maintenance activities would include noxious weed control. • Road maintenance activities would avoid blading existing vegetation in ditches and adjacent to roads. • Painted facilities would be kept in good repair and repainted when color fades or flakes increase visual contrast. Recreation Construction and Operation: Because there would be no construction or operational impacts to Recreation from the solar project sites, no mitigation measures are proposed. Cultural and Historical Preservation Construction: • Two historic properties were recommended potentially eligible for listing in the NRHP. The Cascade Canal is 42 miles long and a portion passes through the Fumaria Solar Project generation tie line corridor. The Ellensburg Power Canal passes through the Typha Solar Project generation tie line corridor. However, both resources are located outside of proposed fenced solar facilities and would not be subject to construction impacts. • SWCA recommends that an Inadvertent Discovery Plan be prepared for the solar project sites prior to project construction, to inform construction personnel what to do in the event that previously unidentified cultural resources are discovered during excavation. In addition, it is understood that DAHP may recommend additional mitigation measures after reviewing the reports on the cultural resource surveys conducted for the proposed solar projects. Operation: Because there would be no operational impacts to Cultural and Historic Preservation, no mitigation measures are proposed. Agriculture Construction and Operation: Because there would be no construction or operational impacts to Agriculture from the solar project sites, no mitigation measures are proposed. Shorelines of the State Construction and Operation: • The Typha Solar Project fencing and solar arrays overlap 0.19 acre of the shoreline area that is within 200 feet of a Shoreline of the State, the Yakima River. All project impacts would be at least 144 feet from the Yakima River ordinary high water mark for fence installation and at least 154 feet from the Yakima River ordinary high water mark for solar array installation. Impacts to all wetlands associated with the shoreline of the Yakima River would be avoided through project design, except for 0.01 acre of fill in wetland TW03 for a culvert replacement for site access. Wetland fill impacts of less than 1,000 square feet would not require mitigation, and no significant adverse effects are proposed to the shoreline environment. In addition, the 0.19 acre of shoreline jurisdictional area within 200 feet of the Yakima River ordinary high water mark would be planted with low-growing native plant species, which would be an improvement to the current vegetation community dominated by actively grazed non-native and invasive species.
Transportation	Vehicles Construction: • Because there would be less than a 5% increase in average daily traffic volumes and, thus,

Technical Resource	Mitigation Measures
	no impacts to vehicle traffic for the Camas, Penstemon, Typha, and Urtica Solar Project sites, no mitigation measures are proposed. • Because the Fumaria Solar Project site would have ADT increases on Clarke Road (37.88%), Faust Road (12.44%), and Hungry Junction Road (9.23%) for the 3-month construction period (spread over 6 to 9 months of intermittent construction), representing minor to moderate temporary impacts to traffic volumes but which would not exceed road designs, no mitigation measures are proposed. Operation: Because there would be minimal operational staff levels and vehicle trips, and no negative impacts from the solar project sites, no mitigation measures are proposed. Waterborne, Rail, and Air Traffic Construction and Operation: Because there would be no construction or operational impacts to Waterborne, Rail, or Air Traffic from the solar project sites, no mitigation measures are proposed. Parking Construction and Operation: Because there would be no construction or operational impacts to Parking from the solar project sites, no mitigation measures are proposed.
Socioeconomics	Employment, Housing: Tax Revenues, Fire Protection, Police, Schools, Parks and Recreation, Utilities, Maintenance, Communications, Water and Stormwater, Sewer and Solid Waste, Other Governmental Services, and Local Government Revenues Construction and Operation: Because there would be minimal or no construction or operational impacts to these socioeconomic characteristics, public services, or public infrastructure from the solar project sires, no mitigation measures are proposed.

(2) Fair treatment. The application shall describe how the proposal's design and mitigation measures ensure that no group of people, including any racial, ethnic, or socioeconomic group, bear a disproportionate share of the environmental or socioeconomic impacts resulting from the construction and operation of the proposed facility.

No residential or commercial facilities exist on any of the leased parcels for the five Columbia Solar Projects, and thus no non-white or low-income populations, or anyone else, would be displaced as a result of constructing or operating/maintaining the proposed solar facilities.

As described in Section 4.4.2.2, construction of the five Columbia Solar Projects would employ up to 100 workers per day during the peak construction period. It is estimated that approximately 80 of the workers would be hired locally, and could include individual hires as well as employees of existing construction-related firms and businesses that might be retained for various phases of construction. It is assumed these local workers would be hired from within Kittitas County, or a maximum commuting distance of 75 miles from Ellensburg such as from as Yakima (36 miles away), Wenatchee (70 miles), or Moses Lake (71 miles).

The remaining 20 non-local hires might elect to commute to the Ellensburg area on a daily basis, or to stay in either a personal recreational vehicle (RV) at a camp site, or to rent a motel room. Thus, it is not anticipated that construction of the solar projects would result in the permanent relocation or in-migration of any of the construction workforce. Thus, although the construction of the solar facilities might provide some temporary employment opportunities to low-income or minority residents, the levels would be minimal and there would be minimal beneficial impacts to employment.

As described in Section 4.4.2.3, it is anticipated that the operational workforce performing ongoing operations would be relatively small and would typically be off-site, and that an additional four to five maintenance personnel would make about two to three visits per year to each of the five Columbia Solar Project sites to conduct the on-site maintenance functions. This latter workforce would be comprised of general laborers for cleaning the PV panels; skilled electricians for visual inspections and performance testing of the inverters, transformers, and switchyard equipment; and skilled mechanics to inspect and maintain the mechanical portions of the tracking system. It is not anticipated that operation of the solar projects would result in the permanent relocation or in-migration of any operational workforce. Thus, although operation of the solar facilities might provide some long-term employment opportunities to low-income or minority residents, the levels would be minimal and, thus, there would be no beneficial impacts to employment.

1.11 General — Sources of Information 463-60-095

The applicant shall disclose sources of all information and data and shall identify all pre-application studies bearing on the site and other sources of information.

Reference lists of the documents, websites, and other information cited in responses to EFSEC requirements for the ASC are provided at the end of each major part/chapter, including the following sections:

1.17 References – Chapter 1

2.24 References – Chapter 2

3.7 References – Chapter 3

4.5 References – Chapter 4

In addition, each of the attached reports in the appendices have their own reference sections for documents, websites, and other information that were used in the preparation of those reports.

Pre-application wildlife and habitat assessment, wetland delineation and waters, archaeological, and built environment field studies were conducted from April 3 to 17, 2017. Detailed descriptions of those studies are provided in Section 2.20 and in the appended study reports.

1.12 General — Consultation 463-60-101

(1) Pre-application consultation. The application shall summarize all consultation that the applicant has conducted with local, state and federal agencies and governments, Indian tribes, nonprofit organizations and community citizen and interest groups prior to submittal of the application to the council.

Table 1.12-1 summarizes the agency and Tribal communications beginning in January 2017 between TUUSSO's representatives and the representatives of EFSEC, Yakama Nation, Washington State Department of Archaeology and Historic Preservation (DAHP), Washington Department of Fish and Wildlife (WDFW), Kittitas County Board of Commissioners, Kittitas County Fire Marshal, and Kittitas County Department of Public Works.

Table 1.12-1. Agency and Tribal Consultation

Date	Contact	TUUSSO Representative	Type of Contact
Washington Energy Facility Site Evaluation Council (EFSEC)			
March 7, 2017	Stephen Posner EFSEC Manager	Jason Evans TUUSSO	Mr. Posner responded to TUUSSO's February 13 letter, stating that one ASC could be submitted for all five proposed Columbia Solar Projects, requesting some information, and indicating that it appeared that the projects might be consistent with the Kittitas County land use requirements (but that a final land use consistency determination would be made by EFSEC).
February 13, 2017	Stephen Posner EFSEC Manager	Jason Evans TUUSSO	Mr. Evans sent a letter to Mr. Posner providing an overview of the five proposed Columbia Solar Projects, indicating that TUUSSO wished to obtain permits for each of the five sites through the EFSEC Site Certification process, and asking several questions for clarification about the process.
January 20, 2017	Stephen Posner EFSEC Manager	Jason Evans, Vivek Nayak, and Joy Potter TUUSSO Greg Poremba SWCA Environmental Consultants (SWCA)	TUUSSO met with Mr. Posner to provide him an overview of the five proposed Columbia Solar Projects, and to discuss the EFSEC standard and expedited permitting processes.
Yakama Nation			
June 15, 2017	Johnson Meninick and Jessica Lally Yakama Nation	Joy Potter TUUSSO	Ms. Potter met with Mr. Meninick and Ms. Lally to discuss the five proposed Columbia Solar Projects and to discover any concerns that the Yakama Nation might have.
March 30, 2017	Johnson Meninick Cultural Resources Program at the Confederated Tribes and Bands of the Yakama Nation	Mike Cannon SWCA	SWCA sent, via certified mail, a letter notifying the Cultural Resources Program about the five proposed Columbia Solar Projects and the cultural resource surveys that would be conducted, providing Mr. Meninick the opportunity to provide input.
March 23, 2017	Tribal Council of the Confederated Tribes and Bands of the Yakama Nation	Mike Cannon SWCA	SWCA sent, via certified mail, a letter notifying the Tribal Council about the five proposed Columbia Solar Projects and the cultural resource surveys that would be conducted, providing them the opportunity to provide input.
Washington State Department of Archaeology and Historic Preservation (DAHP)			
June 12, 2017	Gretchen Kaehler DAHP	Mike Cannon SWCA	Ms. Kaehler called Mr. Cannon to inform him that the DAHP would await EFSEC notifying them that the ASC was received, before beginning their review of the five proposed Columbia Solar Project cultural resources reports.
June 9, 2017	DAHP website	Rhiannon Held SWCA	SWCA submitted five TUUSSO Energy Kittitas County solar project cultural resources reports for DAHP review.

Date	Contact	TUUSSO Representative	Type of Contact
February 10, 2017	Lance Wollwage DAHP	Joy Potter TUUSSO	Ms. Potter called to Mr. Wollwage to discuss the DAHP requirements for conducting cultural resources field surveys and the approach for determining what potential resources might exist on the five proposed Columbia Solar Project sites.
Washington Department of Fish and Wildlife (WDFW)			
July 17, 2017	Scott Downes and Brent Renfrow WDFW	Jamie Young SWCA	Mr. Downes confirmed his receipt of the six reports submitted on July 11, 2017.
July 11, 2017	Scott Downes and Brent Renfrow WDFW	Jamie Young SWCA	Ms. Young made electronic copies available to Mr. Downes and Mr. Renfrow of the Wildlife and Habitat Assessment Report, and each of the five Critical Areas (Wetlands and Waters Delineation) Reports for the proposed Columbia Solar Project sites.
May 3, 2017	Scott Downes and Brent Renfrow WDFW	Jamie Young SWCA	Ms. Young sent Mr. Downes and Mr. Renfrow an email requesting Priority Habitats and Species (PHS) mapper geographic information system (GIS) data. Mr. Downes responded and provided WDFW contact information to obtain those data on the same day.
May 1, 2017	Scott Downes and Brent Renfrow WDFW	Jamie Young SWCA	Mr. Downes sent Ms. Young an email, in response to her April 28 email.
April 28, 2017	Scott Downes and Brent Renfrow WDFW	Jamie Young SWCA	Ms. Young sent an email to Mr. Downes and Mr. Renfrow about field-observed nesting species, asking for WDFW input.
April 20, 2017	Scott Downes and Brent Renfrow WDFW	Jamie Young SWCA	Mr. Downes sent Ms. Young an email providing additional information for use in designing and evaluating the five proposed Columbia Solar Projects, as well as identifying additional WDFW potential issues of concern.
April 12, 2017	Scott Downes and Brent Renfrow WDFW	Jamie Young and Evan Dulin SWCA	SWCA conducted the in-field reviews of all five proposed Columbia Solar Project sites with Mr. Downes and Mr. Renfrow, obtaining their input.
April 5, 2017	Scott Downes and Brent Renfrow WDFW	Jamie Young SWCA	SWCA arranged an in-field site visit with Mr. Downes and Mr. Renfrow, and emailed them a geodatabase and PDF overview map for the five proposed Columbia Solar Project sites.
March 14, 2017	Scott Downes and Brent Renfrow WDFW	Evan Dulin SWCA	Mr. Dulin contacted Mr. Renfro regarding the PHS Mapper and other information sources for PHS site-specific information, as well as stream and wetland buffers. Mr. Downes emailed back requesting that WDFW be invited to a site-specific field visit.
Washington State Department of Ecology			
July 26, 2017	Lori White Washington State Department of Ecology	Jamie Young SWCA	Ms. White confirmed her receipt and initiation of her review of the six reports submitted on July 19, 2017.

Date	Contact	TUUSSO Representative	Type of Contact
July 19, 2017	Lori White Washington State Department of Ecology	Jamie Young SWCA	Ms. Young made electronic copies available to Ms. White of the Wildlife and Habitat Assessment Report, and each of the five Critical Areas (Wetlands and Waters Delineation) Reports for the five proposed Columbia Solar Project sites.
July 13, 2017	Gwen Clear Washington State Department of Ecology	Jamie Young SWCA	Ms. Young sent a letter and made electronic copies available to Ms. Clear of the Wildlife and Habitat Assessment Report, and each of the five Critical Areas (Wetlands and Waters Delineation) Reports for the five proposed Columbia Solar Project sites.
Kittitas County			
August 3, 2017	Kittitas County: Dan Carlson, Community Development Director Lucas Huck, County Engineer Paul Jewell, Commissioner Mike Florey, Building Official	Jason Evans and Joy Potter TUUSSO	Mr. Evans and Ms. Potter met with representatives of Kittitas County to provide updates about the five Columbia Solar Projects, and also discussed county administrative permits.
August 1, 2017	Anna Lael District Manager, Kittitas County Conservation District	Joy Potter TUUSSO	Ms. Potter and Ms. Lael discussed ongoing riparian habitat, stream monitoring, and restoration projects.
July 3, 2017	Paul Jewell and Laura Osiadacz Kittitas County Board of Commissioners	Joy Potter TUUSSO Robert Kahn TUUSSO PR Consultant	Ms. Potter and Mr. Kahn met with Mr. Jewell and Ms. Osiadacz, separately, to discuss the results of the TUUSSO voter solar power issues telephone survey (see responses to Item (2), below, for more information about the survey results).
June 28, 2017	Josh Hink Kittitas County Fire Marshal	Jason Evans TUUSSO Marc Kirkpatrick Encompass	Mr. Evans and Mr. Kirkpatrick met with Mr. Hink to discuss fire protection access issues/requirements, potential fire issues, and permitting requirements for all five proposed Columbia Solar Projects.
May 31, 2017	Mark Cook Kittitas County Director of Public Works	Joy Potter TUUSSO	Ms. Potter met with Mr. Cook to discuss potential temporary access road bridge options and issues for some of the proposed solar project sites.
May 15, 2017	Obie O'Brien Kittitas County Board of Commissioners	Jason Evans and Joy Potter TUUSSO	Mr. Evans, Ms. Potter, and Mr. O'Brien discussed the five proposed Columbia Solar Projects when Mr. O'Brien attended the TUUSSO Solar Energy Open House (see responses to Item (2), below, for more information about the open house).
March 10, 2017	Paul Jewell Chair Kittitas County Board of Commissioners	Jason Evans and Joy Potter TUUSSO	Mr. Evans and Ms. Potter met with Mr. Jewell to introduce TUUSSO and the five proposed Columbia Solar Projects to the Board of Commissioners.

(2) Meaningful involvement. The application shall describe all efforts made by the applicant to involve the public, regardless of race, ethnicity, or socioeconomic status, prior to submittal of the application to the council. The application shall also set forth information for contacting local interest and community groups to allow for meaningful involvement of all people, regardless of race, ethnicity or socioeconomic status. For example, such information may include contacts with local minority radio stations and news publications.

On July 7, 2016, TUUSSO Energy sent letters to the 34 surrounding landowners that were unable to attend the previous June 27 and 28, 2016, meetings between TUUSSO and other surrounding landowners (see the next paragraph), to provide those landowners an update about the proposed five Columbia Solar Projects.

On June 16, 2017, TUUSSO Energy sent letters to 45 surrounding landowners within 100 feet of each of the five proposed Columbia Solar Project sites, inviting them to a meeting with TUUSSO representatives on June 27 and 28, 2017, to learn more about the five proposed solar projects and to provide their input. Approximately 20 landowners attended those two sets of meetings held by TUUSSO to discuss the solar projects.

On May 15, 2017, TUUSSO Energy held a solar energy open house for the public and any interested parties from 4:30 to 6:00pm at the Armory Building, 901 E 7th Avenue in Ellensburg. The solar energy open house was widely advertised in the county. Two display ads were placed in the Ellensburg Daily Record on May 6 and 12, 2017, and postcards were mailed to 120 property owners located within 0.25 mile of each of the sites. The Kittitas County Chamber of Commerce also posted notices of the open house on their Facebook page, in their weekly membership newsletter, and on their home webpage. In addition, Central Washington University sent email notifications about the open house to all students involved in the renewable/solar energy program, as well as passing out flyers to students. During the open house, TUUSSO had several staff members available to answer any questions, and maps and other information were available for review. In addition, other solar-related organizations had staffed exhibits, including Puget Sound Energy, the Kittitas County Public Utility District, Ellensburg Solar (a private solar installation company), Central Washington University Institute for Integrated Energy Studies, and the Kittitas County Chamber of Commerce. More than 30 people attended TUUSSO's solar energy open house.

During May 4 to 7, 2017, TUUSSO Energy conducted a renewable and solar power issues survey of Kittitas County voters to determine whether residents supported solar project developed within the county. Telephone interviews were conducted with a representative sample of 250 Kittitas County voters, over landlines and cell phones. That survey found that the most popular renewable energy sources for development were solar (33%), wind (30%), and hydroelectric (26%). When asked whether private property owners should be allowed to develop renewable energy projects, such as wind and solar, on their property even if some neighbors or residents were opposed to such developments, 72% said they should be allowed to do so with 53%in strong agreement with this sentiment. Only 16% of sampled voters said that private landowners should not be allowed to develop such electric facilities. In addition, 33% found solar panels to be very or somewhat attractive, 50% found them to be neither attractive nor unattractive, and 14% found them to be somewhat or very unattractive. When asked how many would be likely to consider installing solar panels on their property, 59% said they would be very or fairly likely to do so and 37% said they would not be likely or would be very unlikely to do so.

1.13 General — Graphic Material 463-60-105

It is the intent that material submitted pursuant to these guidelines shall be descriptive and shall include illustrative graphics in addition to narration. This requirement shall particularly apply to subject matter that deals with systems, processes, and spatial relationships. The material so submitted shall be prepared in a professional manner and in such form and scale as to be understood by those who may review it.

TUUSSO has submitted descriptive material, including illustrative graphics, to facilitate EFSEC's review. This graphic material has been prepared in a professional manner, and in such form and scale as to be understood by those who may review the ASC.

1.14 General — Specific Contents and Applicability 463-60-115

It is recognized that not all sections of these guidelines apply equally to all proposed energy facilities. If the applicant deems a particular section to be totally inapplicable the applicant must justify such conclusion in response to said section. The applicant must address all sections of this chapter and must substantially comply with each section, show it does not apply or secure a waiver from the council. Information submitted by the applicant shall be accompanied by a certification by applicant that all EFSEC application requirements have been reviewed, the data have been prepared by qualified professional personnel, and the application is substantially complete.

TUUSSO hereby certifies that all EFSEC application requirements have been reviewed, the data in this ASC and accompanying appendices have been prepared by qualified professional personnel, and that the ASC is substantially complete.

1.15 General — Amendments to Applications, Additional Studies, Procedure 463-60-116

(1) Applications to the council for site certification shall be complete and shall reflect the best available current information and intentions of the applicant.

This application is complete and reflects the best available information and intentions of TUUSSO, for the five proposed Columbia Solar Projects. It provides and uses the most readily available current federal, state, county, city, agency, and public information, as well as the results of extensive cultural resources, historical resources, biological, and wetlands fieldwork completed in April 2017.

(2) Amendments to a pending application must be presented to the council at least thirty days prior to the commencement of the adjudicative hearing, except as noted in subsection (3) of this section.

TUUSSO does not anticipate that amendments will be required to its application. If, however, EFSEC requests clarification or additional information, we will do so in compliance with this subsection.

(3) Within thirty days after the conclusion of the hearings, the applicant shall submit to the council, application amendments which include all commitments and stipulations made by the applicant during the adjudicative hearings.

In compliance with this subsection, TUUSSO will submit all amendments, commitments, and stipulations made during the adjudicative hearings to EFSEC within the required 30 days of completion of those hearings.

(4) After the start of adjudicative hearings, additional environmental studies or other reports shall be admitted only for good cause shown after petitions to the council or upon request of the council, or submitted as a portion of pre-filed testimony for a witness at least thirty days prior to appearance.

TUUSSO does not anticipate that additional environmental studies or reports will be required to its application. If, however, additional information becomes available and can be provided to EFSEC, we will do so in compliance with this subsection.

1.16 General — Applications for Expedited Processing 463-60-117

(1) Request for expedited processing. Requests for expedited processing shall be accompanied by a completed environmental checklist delineated in WAC 197-11-960. The request for expedited processing shall also address the reasons for which the following are not significant enough to warrant a full review of the application for certification under the provisions of chapter 80.50 RCW:

Pursuant to RCW 80.50.075, RCW 80.50.110, and WAC 463-60-117, TUUSSO requests expedited consideration by EFSEC for its application to develop, own, and operate the five Columbia Solar Projects and two associated generation tie lines. EFSEC can grant expedited processing of certification application upon a finding: 1) that the proposed energy facility's environmental impact is not significant or can be mitigated to a non-significant level under the State Environmental Policy Act (SEPA) and 2) that the project "is found under RCW 80.50.090(2) to be consistent and in compliance with city, county, or regional land use plans *or* zoning ordinances" (RCW 80.50.075(1), emphasis added), "in effect as of the date of the application" (RCW 80.50.090[2]).

1.16.1 The proposed facilities' environmental impact is not significant.

WAC 463-60-117 describes application materials for expedited processing. Through these materials an applicant can demonstrate that the proposed energy facility's environmental impact is not significant or can be mitigated to a non-significant level under SEPA. WAC 463-60-117 requires that an application for expedited consideration include: 1) a completed SEPA Environmental Checklist; 2) a statement demonstrating that the environmental impacts, the areas potentially affected, the cost and magnitude of the proposed energy facilities, and the degree to which the proposed energy facilities represent a change in the use of the proposed sites are not significant enough to warrant a full review; and 3) a discussion of WAC 463-60 and 436-62. Each of these items is discussed below.

1. A completed SEPA Environmental Checklist is attached as Appendix A.

2. Expedited processing is appropriate because the following are not significant enough to warrant a full review of the application for certification under RCW 80.50:

(a) The environmental impact of the proposed energy facility;

The environmental impacts from the proposed five Columbia Solar Projects and two associated generation tie lines would not be significant enough to warrant a full environmental impact statement (EIS) review. Below is a discussion of the minor impacts from the construction and operation of the projects.

The Earth components would not experience significant impacts from construction or operation of the Columbia Solar Projects. The geology, soils, and topography could see minor impacts from installation of the projects' support beams and the minimal grading associated with construction. Because the sites are relatively flat, erosion risk is low. The only unique physical feature, the Yakima River, would not be impacted by the projects. The nearest planned fencing is located 144 feet from the river and the nearest solar arrays are located 154 feet from the river.

Air resources would experience minimal impacts from construction of the Columbia Solar Projects. Anticipated emissions of carbon dioxide equivalent (CO_2e), nitrogen oxides (NO_X), carbon monoxide (CO), and PM_{10} would result in at most 0.12% of Kittitas County's emissions inventory for each pollutant during construction. Once construction is complete, the air impacts would stop, as operating the projects would not cause air emissions.

Impact to water resources would also be limited to isolated impacts. Construction would not cause any impacts to water resources that the Columbia Solar Projects must cross because TUUSSO plans to span water resources rather than constructing in them. Two water resource buffers would experience minor permanent impacts through encroachment of 7 square feet on the Penstemon Solar Project and 0.39 acre on the Urtica Solar Project. All other buffers would be avoided and experience no impacts. Similarly, wetlands and streams would be buffered with at least 20-foot setbacks. At the Typha Solar Project site, due to the project's proximity to the Yakama River, Shoreline Management Act substantial development and conditional use permits would be needed, and considered separately from the zoning code authorization (RCW 80.58.020[22]). The designated Shoreline of the State within 200 feet of the Yakima River would be encroached upon by 0.19 acre by fencing and solar array installation by the Typha Solar Project, which would also include an additional 0.01 acre of wetland fill in an associated wetland within Shoreline of the State jurisdiction for a culvert replacement required for site access. The Shoreline Act permits would confirm that the Typha Solar Project would only have minor negative impacts on the Yakama River's habitat and would have no negative impacts to other protected attributes. Since no stormwater discharges are proposed and less than 5% impervious surface would be added, any increased runoff would be negligible compared to the reduction in current flood irrigation methods. In addition, the Columbia Solar Projects can meet their stormwater discharge obligations through coverage under the Construction Stormwater General Permit. The 100-year floodplain would experience minor permanent impacts from fill at only two locations: 0.19 acre at the Camas Solar Project site and 0.38 acre at the Urtica Solar Project site. Finally, groundwater might see impacts through seepage if construction occurs in rainy winter months, but control measures would be readily available and groundwater otherwise would not be impacted.

The impacts to habitat, vegetation, fish, and wildlife would not be significant. Within the Columbia Solar Projects' 223 fenced-in acres (not the entire 232 leased acres), the most prevalent wildlife "habitat" that would be affected are areas under agricultural production (138 acres). The projects would result in modification or removal of less than 1% of the total available habitat in the landscape analysis area. No sensitive or special-status plants occur on the project sites. Fish and wildlife might experience low levels of impacts during construction through temporary displacement to adjacent habitat or temporary habitat alteration, with some species (e.g., small rodents, snakes, and insects) also suffering minor levels of

mortality from direct contact with construction equipment that would not adversely impact those populations. In addition, 11.86 acres (approximately 5% of the projects) would be converted to impervious surfaces, 6 acres of which would have been under agricultural production. This impervious surface accounts for 1% of the spotted skunk's habitat on the projects and less than 1% for other species. Finally, no long-term operational impacts to special-status animal species are anticipated beyond the fencing of 2 acres and removal of 0.07 acre of bald eagle habitat, and the fencing of 3 acres and removal of 0.11 acre of Columbia spotted frog habitat. The impacts to habitat, vegetation, fish, and wildlife are not significant.

One wetland on the Columbia Solar Projects would experience a minor permanent impact, and wetland protection buffers would experience minor permanent and temporary impacts. To provide access to the Typha Solar Project, approximately 0.01 acre of wetland fill would be placed in wetland TW03 to address a culvert replacement. This minor fill would require a Joint Aquatic Resource Permit Application. All other wetlands would be avoided and experience no impacts. Approximately 0.01 acre of wetland protection buffers at the Typha Solar Project would experience minor permanent impacts from road construction, while wetland protection buffers at the Camas, Typha, and Urtica Solar Projects would experience minor temporary impacts. These minor impacts to wetlands and wetland protection buffers are not significant.

The Columbia Solar Projects would cause no impacts to energy sources, as the projects are not anticipated to place a demand on energy supplies. Similarly, the projects would cause no impacts to soil, sand, gravel, or wood products or other natural resources in the Ellensburg area, as the resources needed for the projects are readily available. Water demand would also not impact water sources because the limited project water demand would be met by on-site sources or water trucked from readily available municipal sources.

Environmental health, including noise, fire risk, spills, and solid waste, would experience only minimal impacts. One project, the Camas Solar Project, might cause minimal, daytime-only, impacts from noise at the property boundary with a commercial facility. While this noise level would occur during the time allowance provided by regulation, TUUSSO is committed to ongoing monitoring and mitigation, as needed to ensure the impacts are not significant.

Fire and explosion impacts would be minimal. Potential fire risks and impacts from the Columbia Solar Projects would be minimal because the projects' equipment has fire protection and prevention measures and project water can be diverted for firefighting. Moreover, the risk of explosion is low because fossil fuels would be transported, stored, or used on the projects in small quantities.

Like fossil fuels, toxic, hazardous, or solid waste materials are unlikely to pose impacts because they would be generated in such small quantities. To the maximum extent possible, these materials would be recycled and the remainder would be landfilled.

Construction and operation of the Columbia Solar Projects would cause minor visual changes but would not substantially degrade the existing visual character or quality of the vicinity of the projects. While the projects would be visible from key observation points (KOPs), none of the KOPs would experience a major or significant change to the characteristic view. The projects would create a minor visual contrast in the viewshed, but they would be less likely to be visible as the viewer moves further away. The projects' mitigation measures are intended to decrease the aesthetic impacts of construction of the Columbia Solar Projects.

While some land uses and resources, like recreation facilities and parking, would see no impacts from the Columbia Solar Projects, some land uses and resources could experience some non-significant impacts. Isolated cultural resources that are not eligible for the National Register of Historic Places would be minimally to moderately impacted by the projects, but such impacts are not expected to be significant.

The majority of the roads in the area would see no impacts from the projects, but the three county roads that access the Fumaria Solar Project would experience temporary minor to moderate impacts from increased traffic. Similarly, during construction, traffic from slow-moving construction vehicles could cause minor, temporary impacts. None of these impacts are expected to be significant.

The Columbia Solar Projects would have minimal beneficial to no impacts on socioeconomics and employment, with the likely minimal benefit to employment coming from temporary construction hiring. Similarly, no impacts are expected on housing and potentially beneficial impacts are expected on tax revenues, with an estimated $4,880,000 in property tax revenues for Kittitas County over the 30-year project life. Because of the projects' on-site fire prevention and protection measures, the risk and impacts of potential fires are minimal. Impacts on police and law enforcement would be limited to minimal impacts from responding to traffic issues, emergency medical calls, and coordination in the unlikely event of a fire. Finally, no impacts would occur for other city services, like schools, communications, utilities, maintenance, and sewer and solid waste, since no permanent relocations or in-migration is anticipated and no toilet, septic, or sewer system connections would be made at the project sites.

The Columbia Solar Projects' impacts to the natural and human environment are, in many cases, minor and/or temporary. In fact, a number of resources would not be impacted at all by the projects. Based on the discussion above, the environmental impacts should be viewed as not significant enough to warrant a full review of this application.

(b) The area potentially affected;

The Columbia Solar Projects would be located in unincorporated Kittitas County, east of the Cascade Mountains, within the Kittitas Valley, outside of the city of Ellensburg. Approximately 232 acres of leased land would potentially be affected. The land is currently agricultural and is being used principally for hay production, grazing, or is fallow, with common weed infestation. The described 232 acres represent only 0.13% of the total 183,124 acres of farmlands in Kittitas County and 0.34% of the 68,314 acres of total croplands. By choosing agricultural lands, the TUUSSO has intentionally avoided areas of significant habitat, such as shrub steppe and other areas that are important wildlife habitat. The projects are not anticipated to affect areas beyond the solar sites' footprints and generation tie lines, encompassed within the described 232 acres.

(c) The cost and magnitude of the proposed energy facility; and

Each of the five proposed Columbia Solar Projects is estimated to cost $8 to $10 million, for a total estimated cost of $40 to $50 million for all five projects. As to magnitude, the projects would generate approximately 5MWac each, approximately 25 MWac in total. Please refer to the responses in Sections 2.1 and 2.2 for more detailed information about the magnitude of the five proposed Columbia Solar Projects.

(d) The degree to which the proposed energy facility represents a change in use of the proposed site.

Each of the five Columbia Solar Project sites is active or fallow agricultural land:

- Camas Solar Project site – 51.21 acres of active agricultural land, growing alfalfa
- Fumaria Solar Project site – 35.24 acres of fallow agricultural land
- Penstemon Solar Project site – 39.38 acres of active agricultural land, growing Sudangrass
- Typha Solar Project site – 54.29 acres, primarily consisting of irrigated agricultural land being used for grazing pasture

- Urtica Solar Project site – 51.94 acres, primarily consisting of active agricultural land, growing common timothy hay

The proposed Columbia Solar Projects represent changes from the sites' current agricultural uses, but the projects' impacts would be minimal and isolated, and the projects are an allowable use under the current zoning and land use. Solar project development is a permitted conditional use in these areas under their designated zoning of Commercial Agriculture or Rural Working – Agriculture 20. Moreover, as noted above, the combined 232 acres represents only 0.13% of the total 183,124 acres of farmlands in Kittitas County and 0.34% of the 68,314 acres of total croplands.

(2) Contents. Applications for expediting processing submitted to the council in accordance with the requirements of chapter 463-43 WAC must address all sections of chapters 463-60 and 463-62 WAC.

3. A discussion of WAC 463-60 and 436-62.

WAC 463-60 and 463-62 criteria are discussed below in Chapters 3 and 4.

None of the environmental impacts, the areas affected, the cost and magnitude of the Columbia Solar Projects, and the degree of land use change are sufficiently significant to warrant full review of this application.

1.16.2 As to the second criteria, the Columbia Solar Projects are consistent with and in compliance with city, county, or regional land use plans or *zoning ordinances.*

Pursuant to RCW 80.50.075, to be eligible for expedited processing, an applicant must show "that the project is consistent with and in compliance with city, county, or regional land use plans or zoning ordinances." The five Columbia Solar Projects and two associated generation tie lines are located in an unincorporated portion of Kittitas County and are consistent and compliant with the Kittitas County Code and the December 2016 Kittitas County Comprehensive Plan.

Since Kittitas County is a full-planning Growth Management Act county, the Kittitas County Code, including its zoning code, must be consistent with the county's comprehensive plan. As a result, compliance with the Kittitas County Code also serves as compliance with the comprehensive plan.

Under the Kittitas County Code, each of the Columbia Solar Projects is a "major alternative energy facility" because each is a solar farm that is not a "minor alternative energy facility" (see KCC 17.61.010[9, 11]). As major alternative energy facilities, the projects can be authorized as conditional uses in Rural Working – Agriculture 20 (A-20) and Commercial Agriculture zones (see KCC 17.61.020). In designating solar PV generation facilities as permitted conditional uses, Kittitas County has made the legislative decision (based on its comprehensive plan policies) that these projects are allowable within the A-20 and Commercial Agricultural zones, subject to site-specific review and conditions to address potential, *localized, substantiated impacts* to the uses of agricultural land in the vicinity. Specifically, none of the projects would interfere with any adjacent or surrounding agricultural land uses and would in no way cause or force conversions to any non-agricultural land uses. The Camas, Penstemon, and Typha Solar Projects would be located on land zoned as Commercial Agriculture. The Fumaria and Urtica Solar

Projects would be located on land zoned as A-20. As a result, the Columbia Solar Projects are consistent and compliant with siting and zoning pursuant to the Kittitas County Code and Comprehensive Plan.[1]

The Columbia Solar Projects can be authorized as conditional uses in A-20 and Commercial Agriculture zones because the projects meet the Kittitas County Code review criteria for conditional uses. In accordance with RCW 80.50.110 and WAC 463-28-020, EFSEC will make all decisions related to permitting and authorization of the projects. In considering the county's land use plan and zoning code, EFSEC can apply the county's criteria. In doing so, a conditional use may be authorized when the following requirements are met:

1. The proposed use is essential or desirable to the public convenience and not detrimental or injurious to the public health, peace, or safety or to the character of the surrounding neighborhood. KCC 17.60A.015(1).

The Columbia Solar Projects are essential or desirable to the public convenience because the projects would help the state meet Washington's Renewable Portfolio Standard mandates for 9% of Washington's electricity to be generated from renewable sources by 2016, increasing to 15% by 2020. The projects would also provide clean, locally produced power that would be delivered directly to the Puget Sound Energy electricity grid.

Washington has a policy to increase the use of renewable energy facilities through focusing on local sources such as solar (RCW 82.16.110 and 82.16.110). The legislature also found it in the public interest to encourage private investment in renewable energy resources, to stimulate the state's economic growth and to enhance the continued diversification of energy resources used in the state (RCW 80.60.005). The Columbia Solar Projects meet this policy because they would be funded by private money, with an estimated total cost of $40 to $50 million, which should stimulate economic growth and would diversify energy resources further through additional solar facilities.

Finally, the Columbia Solar Projects would not be detrimental or injurious to the public health, peace, safety, or character of the surrounding neighborhoods. As discussed above, the projects would have minimal impacts to the environment and available agricultural lands, and would cause no negative impacts to surrounding agricultural operations.

2. The proposed use at the proposed location will not be unreasonably detrimental to the economic welfare of the county and that it will not create excessive public cost for facilities and services by finding that:

    (a) The proposed use will be adequately serviced by existing facilities such as highways, roads, police and fire protection, irrigation and drainage structures, refuse disposal, water and sewers, and schools; or

    (b) The applicant shall provide such facilities; or

[1] On July 18, 2017, the Kittitas County Board of Commissioners extended until January 9, 2018, a moratorium on accepting applications for major alternative energy facilities in the form of solar farms (Ordinance 2017-004 [July 18, 2017]). The moratorium temporarily precludes accepting applications but does not preclude approving facilities. In addition, it does not alter the Kittitas County Comprehensive Plan or Kittitas County Code which allow (via a Conditional Use Permit) solar facilities on Commercial Agriculture and Rural Working – Agriculture 20 zoned lands. Therefore, the moratorium does not alter findings that the Columbia Solar Projects are consistent and compliant with the Comprehensive Plan and Kittitas County Zoning Code.

(c) The proposed use will be of sufficient economic benefit to offset additional public costs or economic detriment (KCC 17.60A.015[2]).

The Columbia Solar Projects would not be unreasonably detrimental to the economic welfare of Kittitas County or create excessive public costs. The projects would not have a detrimental impact on the county's economic welfare but rather a positive impact. During peak construction, the projects would employ up to 100 workers per day, hired locally when possible, and should increase local spending. The projects would also provide an estimated $4,880,000 in property tax revenues for Kittitas County over the 30-year project life, as well as consistent revenue to the landowners through lease payments, aiding agricultural landowners in weathering variable market and weather events, bolstering the operations with a predictable and steady stream of income from a use that is compatible with surrounding agricultural operations. In addition, as described in Sections 4.3 and 4.4, existing services would adequately serve the projects with no anticipated significant impacts to police, fire, school, irrigation, refuse, water or septic systems, or health care services. TUUSSO would have facilities available at the projects to address fire prevention and protection. Finally, the projects should generate a positive tax-related impact for the area that could help expand services.

3. The proposed use complies with relevant development standards and criteria for approval set forth in this title or other applicable provisions of Kittitas County Code (KCC 17.60A.015[3]).

TUUSSO and the Columbia Solar Projects would comply with all relevant development standards and criteria in the Kittitas County Code, including applicable stormwater guidelines and operation and best management practices, as well as:

KCC Title 8 Health, Welfare, and Sanitation
KCC Title 9 Public Peace, Safety, and Morals
KCC Title 10 Vehicles and Traffic
KCC Title 12 Roads and Bridges
KCC Title 13 Water and Sewers
KCC Title 14 Buildings and Construction
KCC Title 15 Environmental Policy
KCC Title 17 Zoning
KCC Title 17A Critical Areas
KCC Title 20 Fire and Life Safety

4. The proposed use will mitigate material impacts of the development, whether environmental or otherwise (KCC 17.60A.015[4]).

As discussed in the SEPA Environmental Checklist and this application's Section 1.10 and Chapter 3, the Columbia Solar Projects would mitigate potential impacts through the mitigation plan and measures. TUUSSO is committed to developing well-sited, well-constructed projects.

5. The proposed use will ensure compatibility with existing neighboring land uses (KCC 17.60A.015[5]).

The Columbia Solar Projects would be compatible with the existing neighboring uses by creating very limited visual and auditory impacts and generating almost no traffic during operations. The projects are an allowed use, considered to be compatible with the County's Comprehensive Plan and an accepted rural land use. Solar PV facilities are therefore compatible with the rural nature of Kittitas County. The projects satisfy this criteria in that the solar PV facilities will not cause any impacts to the ongoing adjacent and surrounding farming operations, and would in no way cause or force the conversion to non-farming land uses. To the contrary, solar farms in Kittitas County discourage the costly conversion of agricultural lands to sprawling, low-density residential development, provide farmers with a cushion in variable markets with a new source of income, and provide a new and steady stream of new tax revenues for Kittitas County.

6. The proposed use is consistent with the intent and character of the zoning district in which it is located (KCC 17.60A.015[6]).

The Kittitas County Code allows major alternative energy facilities as conditional uses in A-20 and Commercial Agriculture zones. A major alternative energy facility can be a solar farm that is not a minor alternative energy facility (KCC 17.61.010[9]). As a result, the Columbia Solar Projects would be major alternative energy facilities that can be allowed as conditional uses in A-20 and Commercial Agriculture zones. The projects are consistent with the intent and character of the zoning districts, as they are expressly allowed, and satisfy the Growth Management Act's intent that the county allow a range of land uses in rural areas, discouraging residential sprawl, to meet local economic needs. The projects would not cause any significant conversion of lands to non-agricultural uses. Instead, the solar facilities are considered under the county's zoning code to be a permitted, compatible use. As a conditional use, the projects must be authorized unless the facilities would cause an impact that discourages and impedes the ongoing use of the surrounding lands for farming.

7. For conditional uses outside of Urban Growth Areas the use:

    (a) Is consistent with the intent, goals, policies, and objectives of the Kittitas County Comprehensive Plan, including the policies of Chapter 8, Rural and Resource Lands;

Kittitas County has established goals, policies, and objectives (GPOs) to provide its intent toward land use planning and the implementation of county wide planning policies. The county created these GPOs in response to identified needs within the county and to guide legislative actions in adopting zoning. Tables 1.16-1 and 1.16-2 summarize the GPOs related to the lands where the Columbia Solar Projects would be located and the projects themselves, and are intended to direct the county in its legislative process in the adoption of specific zoning ordinances.

Table 1.16-1. Kittitas County Comprehensive Plan GPO General Policy Statements

GPO Number	General Policy Statements
2.15	The development of resource based industries and processing should be encouraged in all areas of Kittitas County. When such uses are located in rural and resource lands, criteria shall be developed to ensure the protection of these lands to ensure compatibility with rural character. Consider adding a definition for "resource based industry" to the definitions in Title 17, Zoning.
6.18	Decisions made regarding utility facilities should be consistent with and complementary to regional demand and resources and should reinforce an interconnected regional distribution network.
6.36	Develop a study area encompassing the entire county to establish criteria and design standards for the siting of solar farms.

GPO Number	General Policy Statements
8.1	Rural lands are characterized by a lower level of services; mixed residential, agricultural and open space uses; broad visual landscapes and parcels of varying sizes, a variety of housing types and small unincorporated communities.
8.3	The County shall promote the retention of its overall character by establishing zoning classifications that preserve rural character identified to Kittitas County.
8.4	Development in rural areas is subject to agricultural and forestry activities that may take place as a right on adjacent properties.
8.8	A certain level of mixed uses in rural areas and rural service centers is acceptable and may include limited commercial, service, and rural industrial uses
8.11	Policies will reflect a “right to farm” in agricultural lands.
8.13	Encourage development activities and establish development standards which enhance or result in the preservation of rural lands.
8.14C	Development shall be located distances from streams, rivers, lakes, wetlands, critical areas determined necessary and as outlined within existing Shorelines Management Program, the Critical Areas Ordinance and other adopted resource ordinances in order to protect ground and surface waters.
8.15	Uses common in rural areas of Kittitas County enhancing rural character, such as agriculture uses in Lower Kittitas and rural residential uses and recreation uses in Upper Kittitas shall be protected from activities which encumber them.
8.17	Land use development within the Rural area that is not compatible with Kittitas County rural character or agricultural activities as defined in RCW 90.58.065(2)(a) will not be allowed
8.44	Growth and development in Rural lands will be planned to minimize impacts upon adjacent natural resource lands.
8.129	Encourage development projects whose outcome will be the significant conservation of farmlands.
8.16	Give preference to land uses in Rural designated areas that are related to agriculture, rural residential development, tourism, outdoor recreation, and other open space activities.
8.21	Kittitas County will provide criteria within its zoning code to determine what uses will be permitted within rural zone classifications in order to preserve rural character.

Table 1.16-2. Kittitas County Comprehensive Plan GPO Zoning Implementation Statements

GPO Number	Zoning Implementation Statements
6.7	Decisions made by Kittitas County regarding utility facilities will be made in a manner consistent with and complementary to regional demands and resources.
6.9	Process permits and approvals for all utility facilities in a fair and timely manner, and in accordance with development regulations that ensure predictability and project concurrency.
6.10	Community input should be solicited prior to county approval of utility facilities, which may significantly impact the surrounding community.
6.23	Kittitas County reserves the right to review all applications for utilities placed within or through the County for consistency with local policies, laws, custom and culture.
8.5	In order to protect and preserve Resource Lands, non-resource development and activities on adjacent Rural lands shall require preservation of adjacent vegetation, existing landforms (e.g. ravines) or use of other methods that provide functional separation from the resource land use.
8.9	Protecting and preserving resource lands shall be given priority. Proposed development allowed and adjacent to resource lands shall be conditioned to protect resource lands from negative impacts from that development.
8.21B	Functional separation and setbacks found necessary for the protection of water resources, rural character and/or visual compatibility with surrounding rural areas shall be required where development is proposed. The first sentence of this policy shall not apply to agricultural activities as defined in RCW 90.58.065(2(a). When required by the county shoreline master program or critical area regulations, buffers shall be provided.

The above GPOs are directed at the legislative effort to adopt zoning codes that implement the intent and policy direction of Kittitas County, and these GPOs therefore have little to no direct application to the Columbia Solar Projects. Given this, while the zoning code references the comprehensive plan, the plan itself is not a regulatory mandate, does not include regulatory criteria capable of reliable and predictable implementation, and is not directly applicable or enforceable as such.

However, the Columbia Solar Projects are consistent with the above listed GPOs from the Kittitas County Comprehensive Plan, including policies in Chapters 2 (Land Use), 6 (Utilities), and 8 (Rural and Resource Lands). The projects implement the intent under the Growth Management Act for land uses that are compatible with agricultural uses, provide economic opportunity to the residents and landowners, minimize and mitigate impacts to rural and resource lands, and recognize the emphasis the GPOs place on the character and use of these lands. The projects are consistent particularly with GPO 6.36, which focuses on developing and studying the county for siting solar farms, showing an intent to address solar facilities for the county.

(b) Preserves “rural character” as defined in the Growth Management Act (RCW 36.70A.030[15]);

The Columbia Solar Projects preserve rural character as defined in the Growth Management Act by being compatible with the county’s rural patterns of land use and development. The projects maintain natural landscapes, open space, and the visual landscape. The panels used in the projects are quiet, unobtrusive structures with very few moving parts and minimal maintenance requirements that would not significantly impact viewsheds or alter the county’s rural character during operations. The panels would have native vegetation planted under them and would be surrounded by native habitat, including native plants, where possible. The projects would also be compatible with current rural uses of the land. The projects would not impact traditional rural lifestyles, rural-based economies, or opportunities to live and work in rural areas. Local farming practices can (and TUUSSO anticipates would) continue on the properties adjacent to the projects, particularly where the projects would operate on portions of larger parcels. The projects would not in any way interfere with existing, surrounding agricultural practices and would not force or compel any conversions to non-agricultural land uses.

The Columbia Solar Projects would also not cause inappropriate conversion of undeveloped lands to incompatible uses. Given this, the projects help advance the Growth Management Act mandate that expands economic use of rural areas and strongly discourages incompatible uses that require imprudent and costly extensions of roads and other public services. In short, the projects would be temporary and provide an opportunity for diversified farming income that disincentivizes sprawling, low-density development. Finally, as discussed in (c) immediately below, the projects would not require the extension of urban governmental services.

The Columbia Solar Projects would also maintain the rural character of the wildlife habitat and protection of natural surface water and groundwater flows, recharge, and discharge. The projects would also be compatible with local wildlife habitat. TUUSSO would continue to work with the Washington Department of Fish and Wildlife to manage existing wildlife habitat. In addition, the projects would maintain current patterns of surface water and groundwater flow and recharge and discharge areas, as well as surface water and groundwater uses. The projects are anticipated to have no stormwater discharges and would use water under existing water allocations or water that is trucked in from municipal water sources.

(c) Requires only rural government services; and

The Columbia Solar Projects would require only rural government services, such as police and fire services. The projects would have on-site fire prevention and protection measures. In addition, with minor improvements, the roads and infrastructure would be sufficient to serve the project's construction and operation. As mitigated, the projects would not increase the need for police, fire, school, irrigation, refuse, water or septic systems, or health care services. As mitigated, there should be no costs or detriments to offset.

(d) Does not compromise the long term viability of designated resource lands (KCC 17.60A.015[7]).

The Columbia Solar Projects would not compromise the long-term viability of the surrounding agricultural lands. The projects would temporarily remove approximately 232 acres of land from its current agricultural use or fallow status, introducing native vegetation, and providing sound weed management practices beneficial to the surrounding farmlands. Throughout the projects' life, the projects would not compromise agricultural and rural use on the surrounding land. Moreover, after the removal of all solar equipment after the lease terms, the land would be returned to its original state and can be returned to agricultural production.

For the foregoing reasons, this application should be granted expedited processing. The application meets the requirements of RCW 80.50.075 and WAC 463-60-117 through demonstrating that the proposed facilities' environmental impacts are not significant or can be mitigated to a non-significant level under SEPA and that the projects are consistent with and in compliance with city, county, or regional land use plans or zoning ordinances.

(3) Funds. The applicant shall submit those funds and costs for independent consultant review and application processing pursuant to RCW 80.50.071 (1)(a) and (b) and chapter 463-58 WAC with the understanding that any unexpended portions shall be returned to the applicant at the completion of application processing.

In accordance with WAC 463-58-020, a deposit shall accompany the application as required by RCW 80.50.071. RCW 80.50.071 was updated in 2016, establishing the application deposit in an amount up to fifty thousand dollars ($50,000), or such greater amount as specified by EFSEC after consultation with the Applicant. TUUSSO is providing the initial $50,000 deposit with this ASC for the five proposed Columbia Solar Projects.

1.17 References – Chapter 1

Materials from other documents were not used in the preparation of this chapter.

2 SOLAR PROJECT PROPOSAL DESCRIPTIONS

2.1 Site Description 463-60-125

The application shall contain a description of the proposed site indicating its location, prominent geographic features, typical geological and climatological characteristics, and other information necessary to provide a general understanding of all sites involved, including county or regional land use plans and zoning ordinances.

2.1.1 Kittitas County Overview

TUUSSO Energy, LLC's (TUUSSO's), Columbia Solar Projects would be located in unincorporated Kittitas County, east of the Cascade Mountains, within the Kittitas Valley, outside of the city of Ellensburg, but relatively close to the northwest, southwest, and southeast of the city (see Figure 2.1-1, and below for additional details).

The topography of each of the five sites is relatively consistent and fairly flat, with surface elevations ranging from 1,455 to 1,750 feet above mean sea level (amsl), depending on the site. The sites are not within any mapped geologically hazardous areas. No erosion/landslide geologic hazard areas, snow avalanche hazards, or mine hazard areas are mapped on any of the parcels (Kittitas County 2016). As a result, the projects would not require specialized engineering to ascertain that the properties are suitable for development.

Historical (1971–2000) average annual rainfall is 8.96 inches, as obtained from the closest wetlands climate analysis (WETS) climate station, the Ellensburg National Weather Service (NWS) station (ELBW1) at the Ellensburg Wastewater Treatment Plant, located south of Ellensburg, Washington.

Land use in Kittitas County is guided by the Kittitas County Comprehensive Plan (Kittitas County 2016). The plan is currently being revised, is the subject of public review, and is scheduled to be adopted in April 2018. The 20-year plan will be the guiding document for land use for the county through 2037. All five of the proposed TUUSSO Columbia Solar Project sites would be located on land zoned either as "Commercial Agriculture" or as "Rural Working – Agriculture 20."

The "Commercial Agriculture" land use zone "is an area wherein farming and ranching are the priority." The purpose of this zoning classification, "is to preserve fertile farmland from encroachment by nonagricultural land uses and protect the rights of those engaged in agriculture." The Commercial Agriculture zone only allows for agricultural land use with no more than two residential dwellings per 20 acres. According to Kittitas County Code (KCC) 17.15.050.01, utilities, including "solar farms" as defined by County Code 17.61, are a permitted use of a Commercial Agriculture zone.

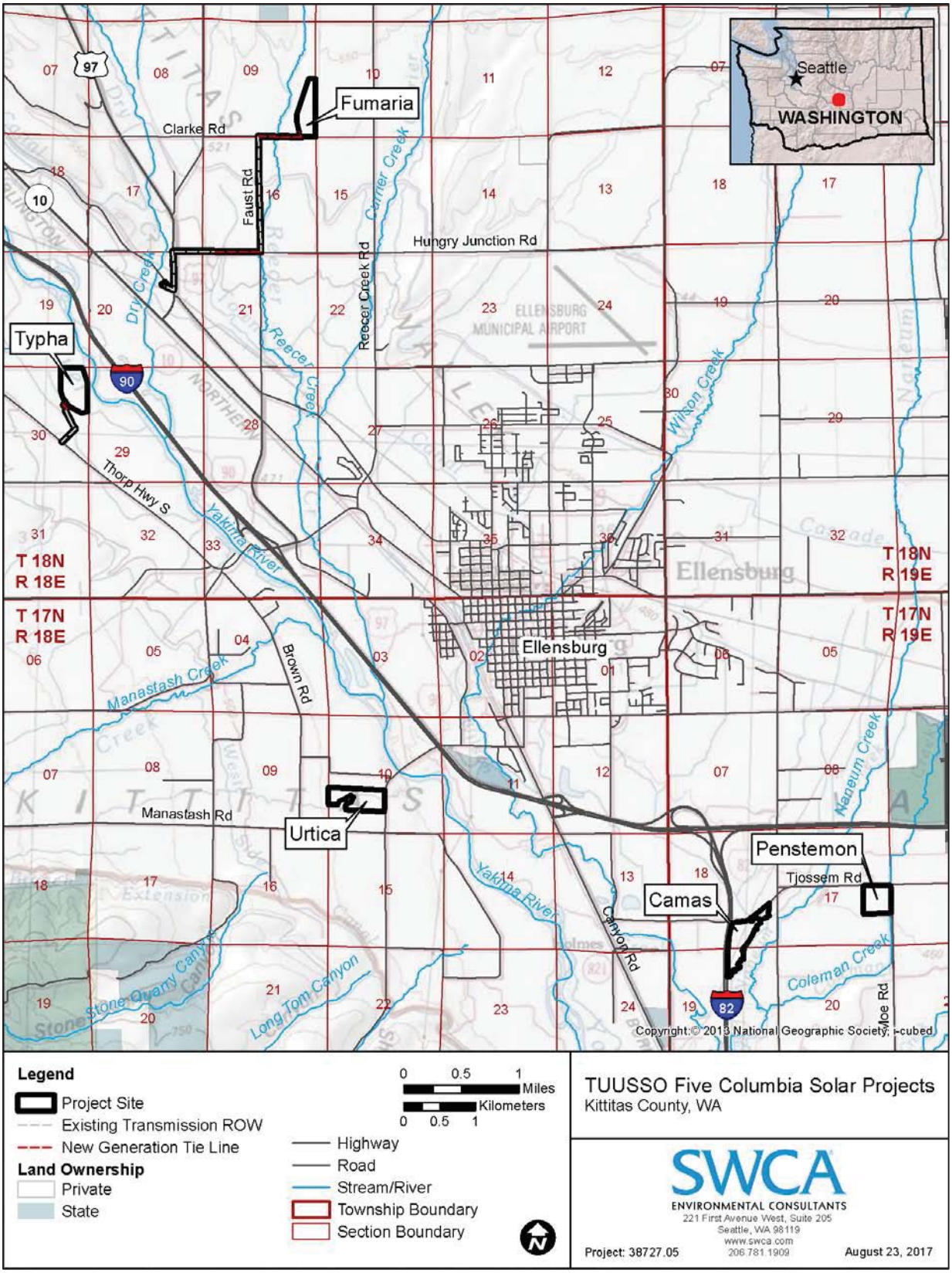


Figure 2.1-1. Columbia Solar Project site locations.

The “Rural Working” general land use designation “generally encourages farming, ranching and storage of agriculture products, and some commercial and industrial uses compatible with a rural environment and supporting agriculture and/or forest activities.” The purposes of the Rural Working designation are to:

- Provide preservation of agriculture activities where producers can live and work on their own lands separate from resource lands.
- Support the continuation, whenever possible, of agriculture, timber, and mineral uses on lands not designated for long-term commercial significance.
- Provide some buffer between rural residential lands and resource lands.
- Provide areas of low intensity land use activities within the agriculture and forest activities.

Within the “Rural Working” general land use designation are areas zoned as “Agriculture 20” (A-20). According to KCC 17.29.10, the A-20 zone “is an area wherein farming, ranching and rural life styles are dominant characteristics. The intent of this zoning classification is to preserve fertile farmland from encroachment by nonagricultural land uses; and protect the rights and traditions of those engaged in agriculture.” According to KCC 17.15.060.1, utilities, including “solar farms” as defined by County Code 17.61, are a permitted use within an A-20 zone.

2.1.2 Solar Project Sites

2.1.2.1 Camas Solar Project Site

TUUSSO is proposing to construct a new photovoltaic (PV) solar facility on approximately 51.21 acres of private agricultural land, which would connect into the existing Puget Sound Energy (PSE) distribution transmission line along Tjossem Road, located southeast of Ellensburg, in unincorporated Kittitas County, Washington. The Camas Solar Project is intended to provide up to 5 MW of solar energy to PSE for use within their service area.

The Camas Solar Project site is active agricultural land, growing alfalfa, located immediately southeast of the intersection of Tjossem Road and Interstate 82 (I-82). The project would be located approximately 2.25 miles southeast of the Ellensburg city center, in Sections 18 and 19 of Township (T) 17 North (N), Range (R) 19 East (E), Willamette Meridian (Figure 2.1-2). Topography of the site is fairly flat and slopes to the south toward Little Naneum Creek, with surface elevations ranging from 1,465 to 1,455 feet amsl.

The Camas Solar Project site would be located on land zoned as Commercial Agriculture, and would be a permitted conditional use under KCC 17.15.050.01.

2.1.2.2 Fumaria Solar Project Site

TUUSSO is proposing to construct a new PV solar facility on approximately 35.24 acres of fallow pasture land, including the construction of a switchyard with a short (2.56-mile-long, 25.4-acre) generation tie line into an existing PSE substation, located northwest of Ellensburg, in incorporated Kittitas County, Washington. The Fumaria Solar Project is intended to provide up to 5 MW of solar energy to PSE for use within their service area.

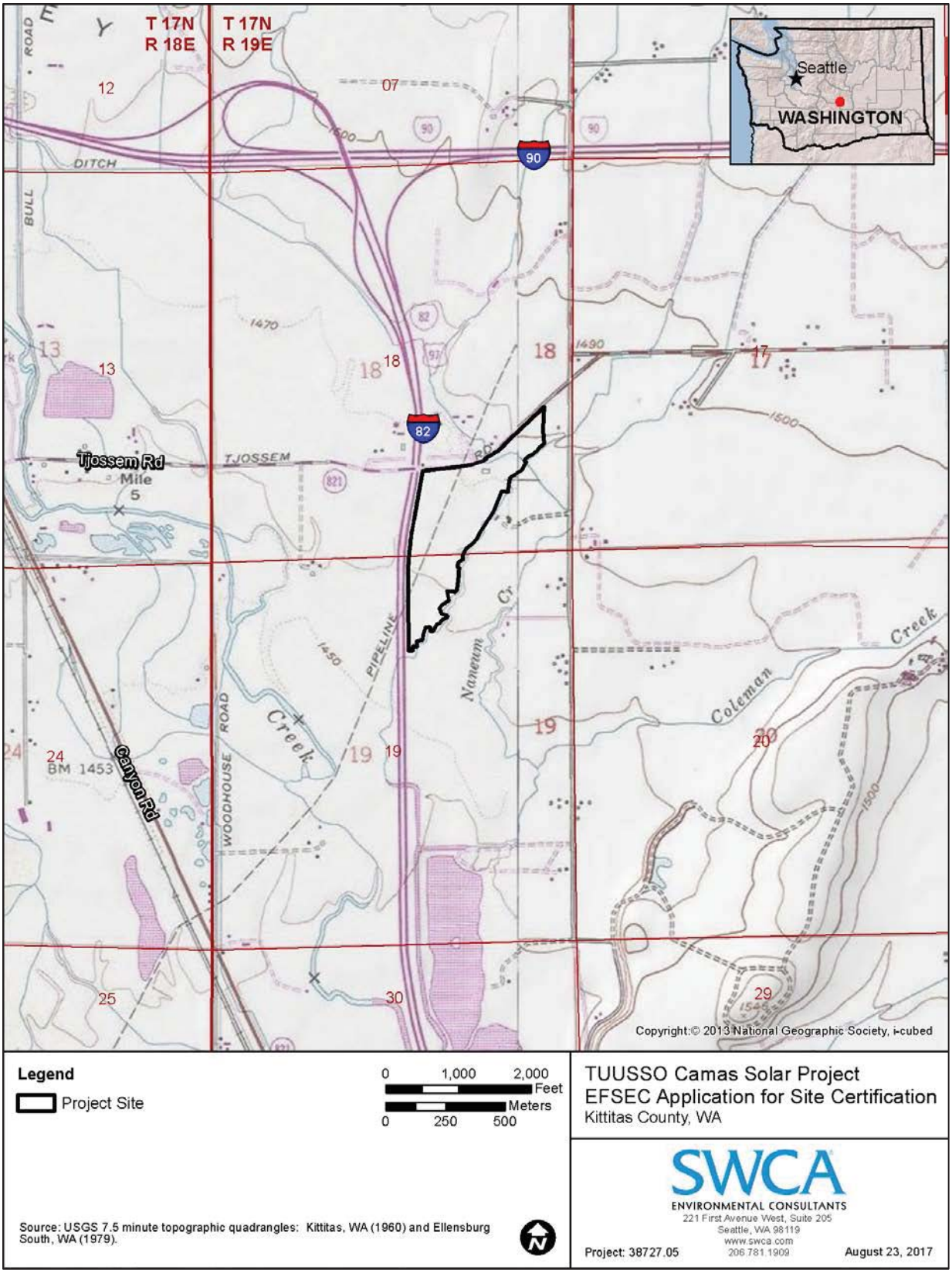


Figure 2.1-2. Camas Solar Project site location.

The Fumaria Solar Project site primarily consists of fallow pasture land. The project would be located approximately 1.5 miles northwest of the intersection of Hungry Junction Road and Reece Creek Road, in Sections 9, 16, 17, and 20, T18N, R18E, Willamette Meridian (Figure 2.1-3). The generation tie line would originate from the southwestern site boundary corner and follow Clarke Road, along one of two proposed alignments, to Faust Road, where it would parallel Faust Road south along an existing transmission corridor (sharing poles with an existing distribution line) on the east side of the road right-of-way (ROW) to Hungry Junction Road, where it would turn west and travel along the north side of the road ROW for roughly 2,000 feet, and then continue to travel along the north side of the road ROW within an existing transmission corridor (sharing poles with an existing distribution line) to U.S. Highway 97, where it would travel south along the west side of the road ROW down to just south of McManamy Road, where it would turn northwest to connect into an existing PSE substation (a total of 2.6 miles). The two proposed alignments along Clarke Road comprise one that follows the north side of the road (ROW A), and one that follows the south side of the road (ROW B).

The Fumaria Solar Project study area totals approximately 67.0 acres (35.24 acres for the solar site and 25.4 acres for the generation tie line). Topography of the site generally slopes to the south toward the Cascade Irrigation District Canal. Surface elevation within the study area ranges from 1,750 to 1,600 feet amsl, the lowest elevation being along the southern study area boundary near the existing PSE substation and the highest elevation being at the northern end of the solar site.

The Fumaria Solar Project site would be located on land zoned as Rural Working – Agriculture 20, and would be a permitted conditional use under KCC 17.15.060.1.

2.1.2.3 Penstemon Solar Project Site

TUUSSO is proposing to construct a new PV solar facility on approximately 39.38 acres of private agricultural land, which would connect into the existing Puget Sound Energy (PSE) distribution transmission line along Tjossem Road, located southeast of Ellensburg, in unincorporated Kittitas County, Washington. The Penstemon Solar Project is intended to provide up to 5 MW of solar energy to PSE for use within their service area.

The Penstemon Solar Project site is active agricultural land, for growing export hay products (such as timothy and alfalfa), located immediately southwest of the intersection of Tjossem Road and Moe Road. The project would be located approximately 4 miles southeast of the Ellensburg city center, in Section 17, T17N, R19E, Willamette Meridian (Figure 2.1-4). Topography of the site slopes to the south, with surface elevations ranging from 1,498 to 1,509 feet amsl.

The Penstemon Solar Project site would be located on land zoned as Commercial Agriculture, and would be a permitted conditional use under KCC 17.15.050.01.

2.1.2.4 Typha Solar Project Site

TUUSSO is proposing to construct a new PV solar facility on approximately 54.29 acres of private agricultural land, including the construction of a switchyard with a short (0.45-mile-long, 4.4-acre) generation tie line into an existing PSE distribution transmission line, located northwest of Ellensburg, in unincorporated Kittitas County, Washington. The Typha Solar Project is intended to provide up to 5 MW of solar energy to PSE for use within their service area.

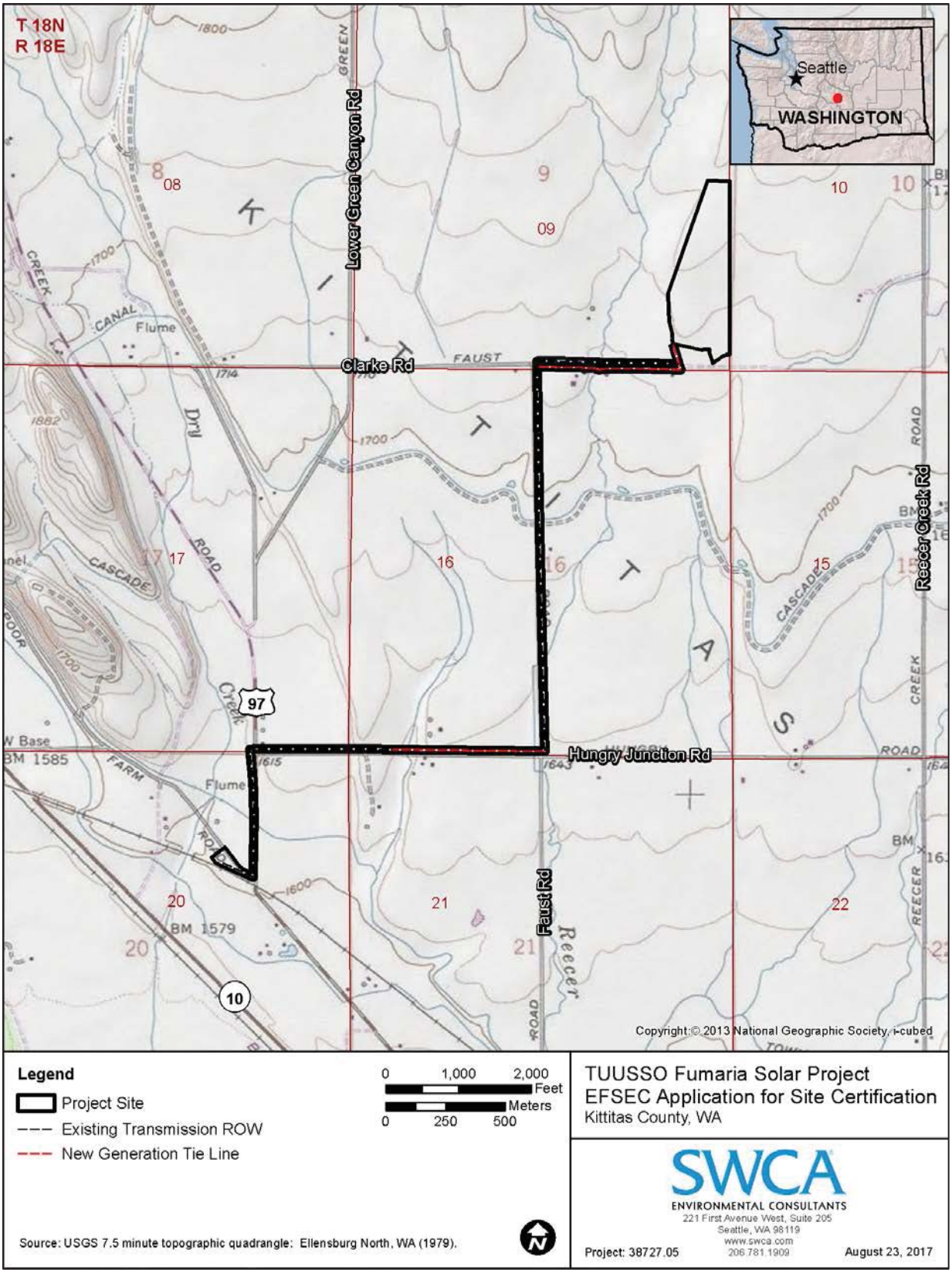


Figure 2.1-3. Fumaria Solar Project site location.

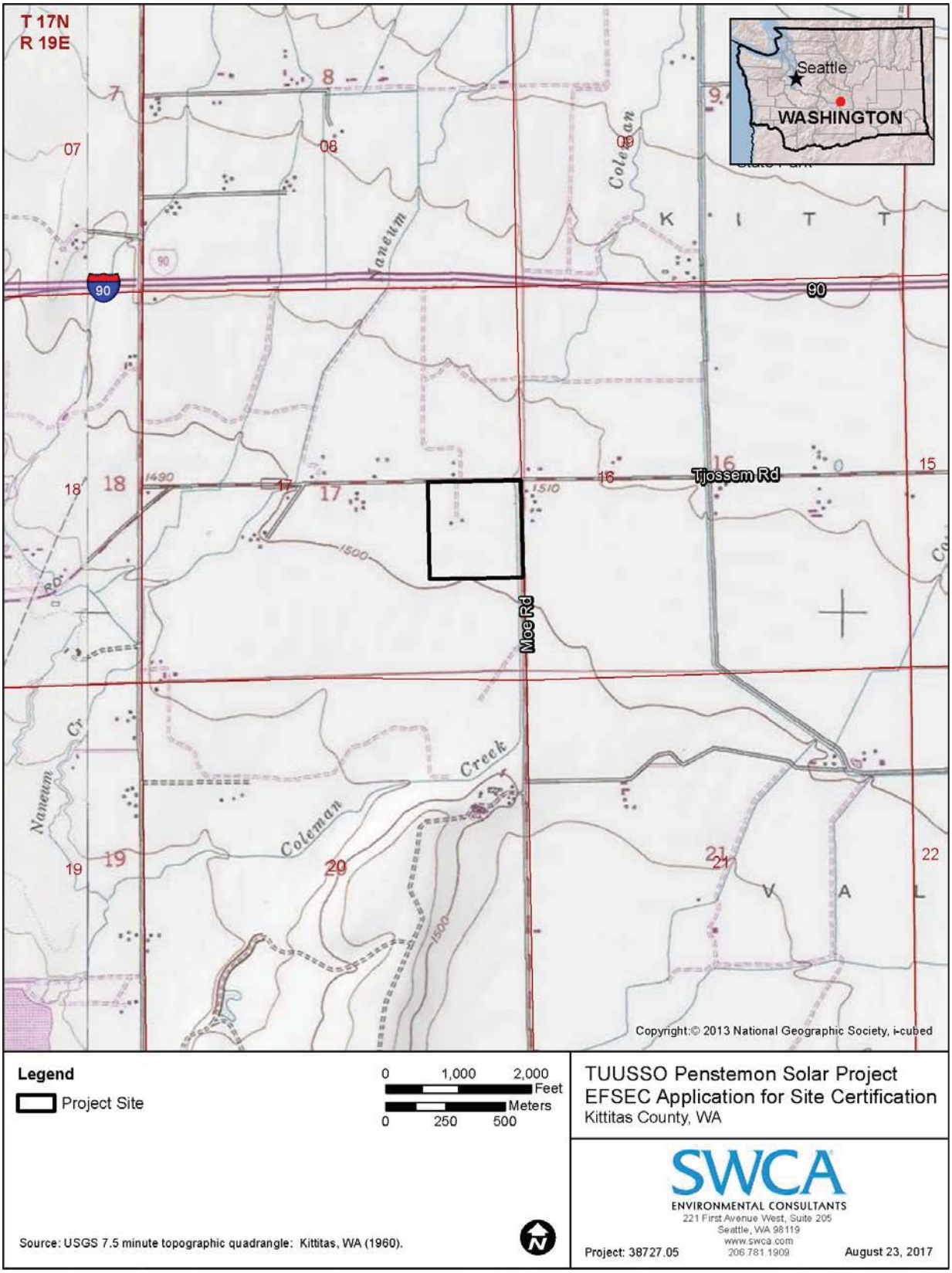


Figure 2.1-4. Penstemon Solar Project site location.

The Typha Solar Project site primarily consists of agricultural land (irrigated and grazed pasture) located just west of the Yakima River and north of Thorp Highway South. The project would be located approximately 1.1 miles east of the intersection of Thorp Highway South and Cove Road, in Section 30, T18N, R18E, Willamette Meridian (Figure 2.1-5). The generation tie line would originate from the southwestern site boundary and follow existing transmission lines to cross south along an existing access road, crossing the Ellensburg Power (EP) Canal three times, and passing through the Ellensburg Golf and Country Club to connect to the existing PSE distribution transmission line along Thorp Highway South. Topography of the site generally slopes to the east toward the Yakima River. Surface elevation within the study area ranges from 1,570 to 1,614 feet amsl, the lowest elevation being along the eastern site boundary closest to the Yakima River and the highest elevation being at the southern end of the generation tie line near Thorp Highway South.

The Typha Solar Project site would be located on land zoned as Commercial Agriculture, and would be a permitted conditional use under KCC 17.15.050.01.

2.1.2.5 Urtica Solar Project Site

TUUSSO is proposing to construct a new PV solar facility on approximately 51.94 acres of private agricultural land, which would connect into the existing PSE distribution transmission line along Umptanum Road, located southwest of Ellensburg, in unincorporated Kittitas County, Washington. The Urtica Solar Project is intended to provide up to 5 MW of solar energy to PSE for use within their service area.

The Urtica Solar Project site primarily consists of active agricultural land, growing common timothy, located on the west side of Umptanum Road and approximately 0.2 mile southwest of the Yakima River, with McCarl Creek flowing through the site from west to east. The project would be located approximately 0.2 mile north of the intersection of Umptanum Road and Manastash Road, in Section 10, T17N, R18E, Willamette Meridian (Figure 2.1-6). Topography of the site generally slopes to the east toward Umptanum Road and toward McCarl Creek, which flows through the site. Surface elevation within the project area ranges from 1,539 to 1,575 feet amsl, the lowest elevation being within the eastern portion of the McCarl Creek channel along Umptanum Road and the highest elevation being along the western site boundary.

The Urtica Solar Project site would be located on land zoned as Rural Working – Agriculture 20, and would be a permitted conditional use under KCC 17.15.060.1.

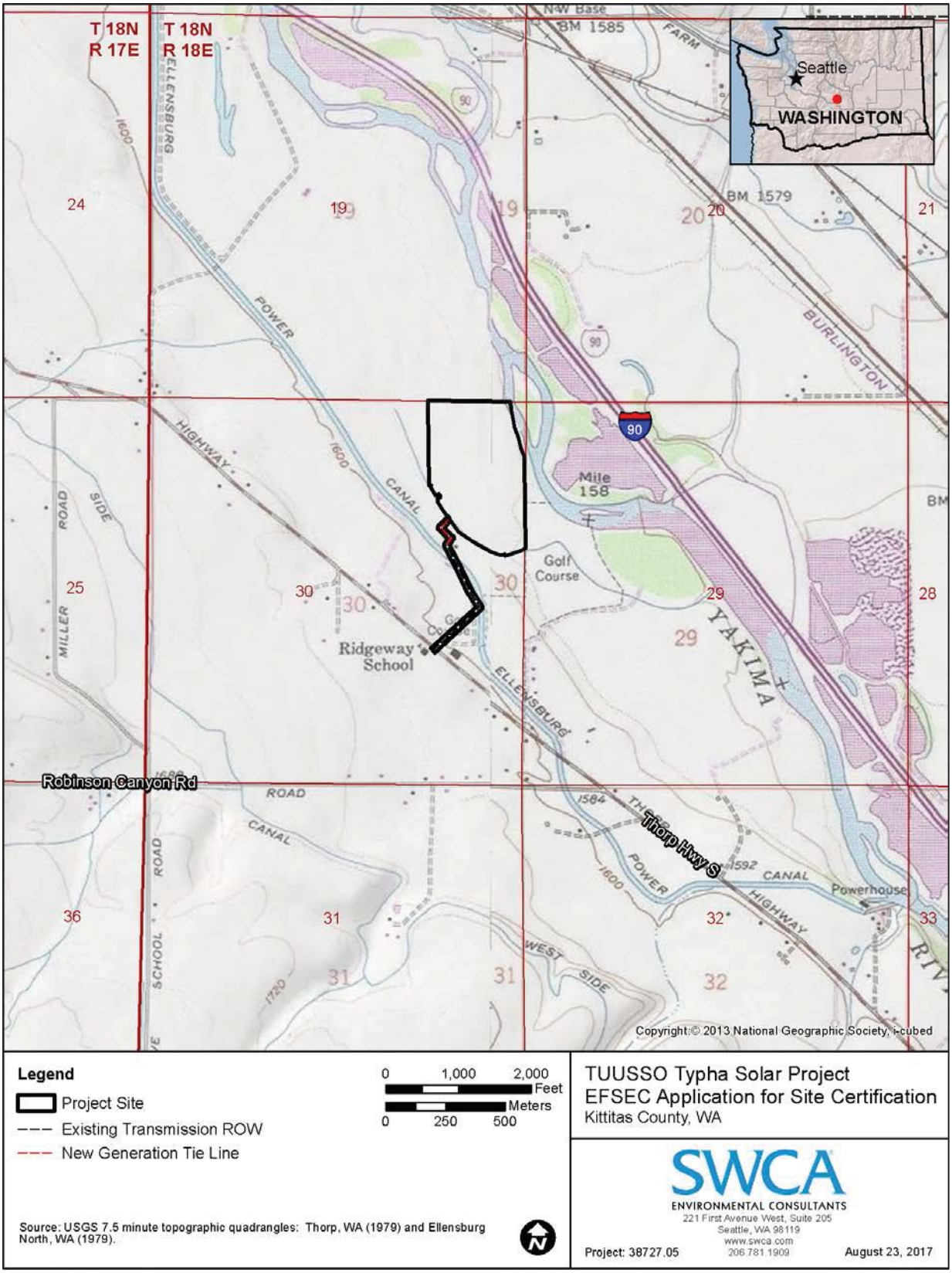


Figure 2.1-5. Typha Solar Project site location.

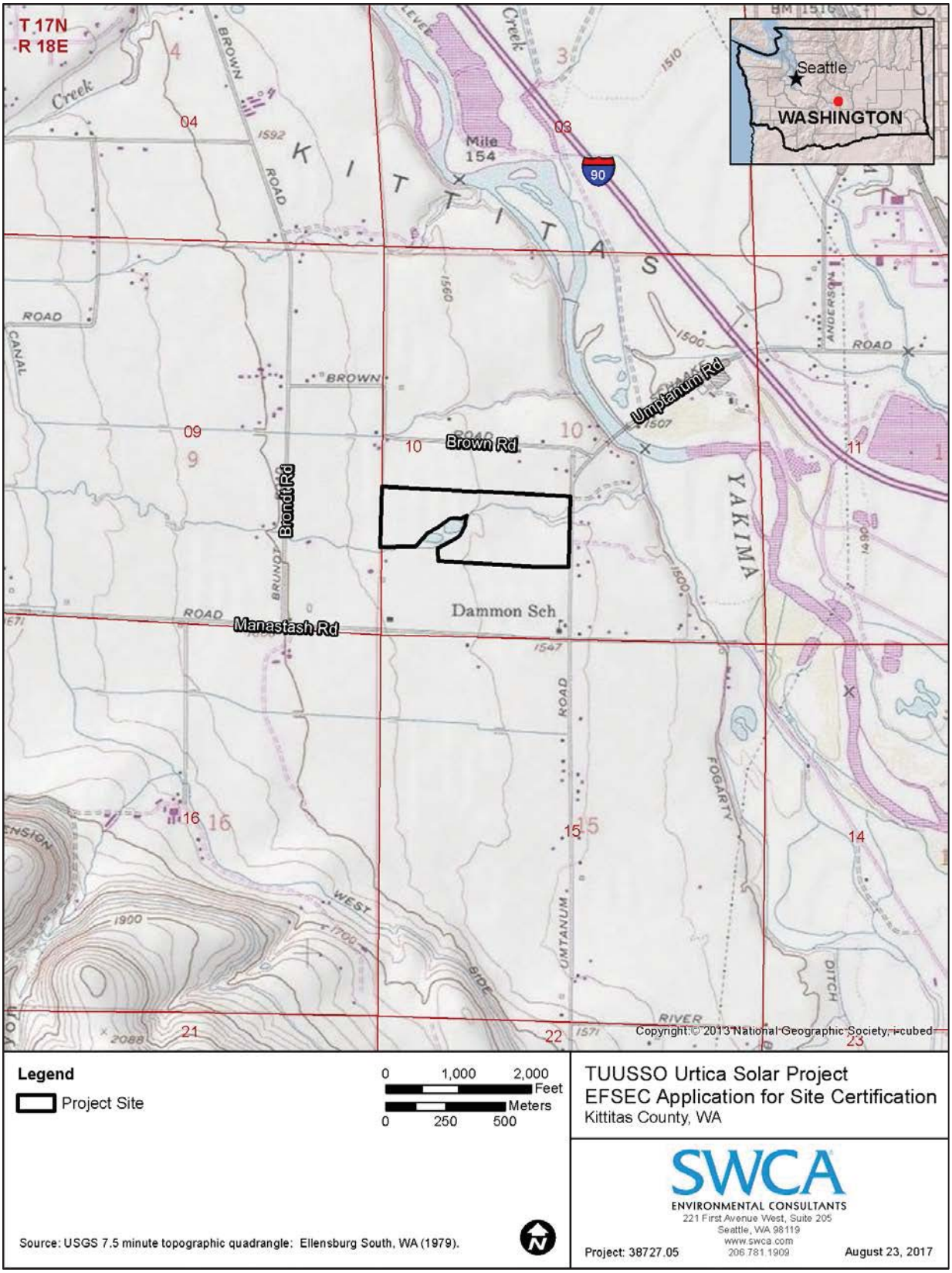


Figure 2.1-6. Urtica Solar Project site location.

2.2 Legal Descriptions and Ownership Interests 463-60-135

(1) Principal facility. The application shall contain a legal description of the site to be certified and shall identify the applicants and all nonprivate ownership interests in such land.

TUUSSO has established site control of all five of the proposed Columbia Solar Project sites via lease agreements executed with the landowners of record. All project sites are located in Kittitas County, Washington.

2.2.1 Camas Solar Project Site

2.2.1.1 Legal Description

TRACT A:

THAT PORTION OF PARCEL 1D OF THAT CERTAIN SURVEY AS RECORDED JUNE 15, 1994 IN BOOK 20 OF SURVEYS AT PAGE 60, UNDER AUDITOR'S FILE NO. 571789, RECORDS OF KITTITAS COUNTY, WASHINGTON, WHICH LIES SOUTHWESTERLY OF THE BULL DITCH RIGHT OF WAY; BEING A PORTION OF PARCEL 1B OF THAT CERTAIN SURVEY AS RECORDED APRIL 29, 1993 IN BOOK 19 OF SURVEYS AT PAGE 74, UNDER AUDITOR'S FILE NO. 559059, RECORDS OF KITTITAS COUNTY, WASHINGTON; LOCATED IN THE SOUTHEAST QUARTER OF SECTION 18, TOWNSHIP 17 NORTH, RANGE 19 EAST, W.M., KITTITAS COUNTY, WASHINGTON.

AND

THAT PORTION OF PARCEL 1C OF THAT CERTAIN SURVEY AS RECORDED JUNE 15, 1994 IN BOOK 20 OF SURVEYS AT PAGE 60, UNDER AUDITOR'S FILE NO. 571789, RECORDS OF KITTITAS COUNTY, WASHINGTON, WHICH LIES SOUTHWESTERLY OF THE BULL DITCH RIGHT OF WAY; BEING A PORTION OF PARCEL 1B OF THAT CERTAIN SURVEY AS RECORDED APRIL 29, 1993 IN BOOK 19 OF SURVEYS AT PAGE 74, UNDER AUDITOR'S FILE NO. 559059, RECORDS OF KITTITAS COUNTY, WASHINGTON; LOCATED IN THE SOUTHEAST QUARTER OF SECTION 18, TOWNSHIP 17 NORTH, RANGE 19 EAST, W.M., KITTITAS COUNTY, WASHINGTON.

TRACT B:

THAT PORTION OF THE NORTH HALF OF THE NORTHEAST QUARTER OF SECTION 19, TOWNSHIP 17 NORTH, RANGE 19 EAST, W.M., IN THE COUNTY OF KITTITAS, STATE OF WASHINGTON, WHICH IS BOUNDED BY A LINE DESCRIBED AS FOLLOWS:

BEGINNING AT THE NORTHWEST CORNER OF PARCEL A OF THAT CERTAIN SURVEY RECORDED APRIL 22, 1993, IN BOOK 19 OF SURVEYS, PAGE 73, UNDER AUDITOR'S FILE NO. 558819. WHICH IS THE TRUE POINT OF BEGINNING FOR SAID DESCRIBED LINE;

THENCE SOUTHERLY, ALONG THE WEST BOUNDARY OF SAID PARCEL A, WHICH IS ALSO THE EAST RIGHT OF WAY BOUNDARY OF 1-82, TO THE SOUTH BOUNDARY OF SAID NORTH HALF OF THE NORTHEAST QUARTER; THENCE NORTH 87°58'34" EAST, ALONG SAID SOUTH BOUNDARY OF SAID NORTH HALF OF THE NORTHEAST QUARTER, 60.81 FEET TO THE CENTERLINE OF NANEUM CREEK; THENCE NORTHEASTERLY, ALONG SAID NANEUM CREEK CENTERLINE, TO THE NORTH BOUNDARY OF SAID NORTH HALF OF THE NORTHEAST QUARTER; THENCE SOUTH 87°42'10" WEST, ALONG SAID NORTH BOUNDARY, 763.52 FEET TO THE TRUE POINT OF BEGINNING FOR SAID DESCRIBED LINE.

(SAID TRACT BEING A PORTION OF PARCEL A OF THAT CERTAIN SURVEY RECORDED APRIL 22, 1993, IN BOOK 19 OF SURVEYS, PAGE 73, UNDER AUDITOR'S FILE NO. 558819 AND OF LOT 1, OF REDD SHORT PLAT, KITTITAS COUNTY

SHORT PLAT NO. SP-93-14, AS RECORDED JANUARY 19, 1994 IN BOOK D OF SHORT PLATS, PAGE 89 AND 90, UNDER AUDITOR'S FILE NO. 567251, RECORDS OF KITTITAS COUNTY, STATE OF WASHINGTON.)

TRACT C:

THAT PORTION OF PARCELS 1C AND 1D OF THAT CERTAIN SURVEY AS RECORDED JUNE 15, 1994 IN BOOK 20 OF SURVEYS AT PAGE 60, UNDER AUDITOR'S FILE NO. 571789, RECORDS OF KITTITAS COUNTY, WASHINGTON, WHICH LIES NORTHERLY OF THE BULL DITCH RIGHT OF WAY AND NORTHWESTERLY OF THE CENTERLINE OF THE BRANCH OF NANEUM CREEK WHICH FLOWS THROUGH SAID PARCEL 1C; BEING A PORTION OF PARCEL 1B OF THAT CERTAIN SURVEY AS RECORDED APRIL 29, 1993 IN BOOK 19 OF SURVEYS AT PAGE 74, UNDER AUDITOR'S FILE NO. 559059, RECORDS OF KITTITAS COUNTY, WASHINGTON; LOCATED IN THE SOUTHEAST QUARTER OF SECTION 18, TOWNSHIP 17 NORTH, RANGE 19 EAST, W.M., KITTITAS COUNTY, WASHINGTON.

CONTAINS 51.21 ACRES.

2.2.1.2 Applicants and All Non-private Ownership Interests

The Applicant is TUUSSO Energy, LLC, which has a leasehold interest in the Camas Solar Project site from:

Ownership: Valley Land Company, LLC
1585 Tjossem Road
Ellensburg, WA 98926

TUUSSO is not aware of any non-private ownership interest in the project site.

2.2.2 Fumaria Solar Project Site

2.2.2.1 Legal Description

A TRACT OF LAND SITUATED IN THE SOUTHEAST QUARTER OF SECTION 9, TOWNSHIP 18 NORTH, RANGE 18 EAST, W.M., KITTITAS COUNTY, STATE OF WASHINGTON, BEING A PORTION OF PARCEL E OF THAT CERTAIN SURVEY AS RECORDED DECEMBER 22, 1998 IN BOOK 23 OF SURVEYS, AT PAGES 249 THROUGH 251, UNDER AUDITOR'S FILE NO. 199912220015, RECORDS OF SAID COUNTY, WHICH IS BOUNDED BY A LINE DESCRIBED AS FOLLOWS:

COMMENCING AT THE NORTHEAST CORNER OF SAID SOUTHEAST QUARTER OF SAID SECTION 9;

THENCE SOUTH 00°06'44" EAST ALONG THE EAST BOUNDARY LINE OF SAID SOUTHEAST QUARTER OF SAID SECTION 9, 60.76 FEET TO THE TRUE POINT OF BEGINNING OF SAID LINE;

THENCE CONTINUING SOUTH 00°06'44" EAST, ALONG SAID EAST BOUNDARY LINE OF SAID SOUTHEAST QUARTER, 2384.88 FEET;

THENCE SOUTH 89°36'01" WEST, 41.02 FEET;
THENCE SOUTH 71°56'57" WEST, 18.75 FEET;
THENCE SOUTH 68°28'25" WEST, 25.60 FEET;
THENCE SOUTH 59°52'18" WEST, 21.39 FEET;
THENCE SOUTH 55°35'54" WEST, 165.95 FEET;
THENCE NORTH 16°08'33" WEST, 159.35 FEET;
THENCE NORTH 04°55'17" WEST, 37.25 FEET;
THENCE SOUTH 86°43'54" WEST, 105.98 FEET;
THENCE NORTH 77°47'27" WEST, 339.61 FEET;

THENCE NORTH 88°06’56” WEST, 37.07 FEET;
THENCE SOUTH 69°10’09” WEST, 24.70 FEET;
THENCE NORTH 17°18’53” WEST, 22.35 FEET;
THENCE NORTH 02°14’53” WEST, 143.64 FEET;
THENCE NORTH 02°27’39” WEST, 389.33 FEET;
THENCE NORTH 19°22’16” EAST, 1646.02 FEET

THENCE SOUTH 89°13’18” EAST, 298.08 FEET TO THE TRUE POINT OF BEGINNING AND THE TERMINUS OF SAID LINE.

CONTAINS 35.24 ACRES.

2.2.2.2 Applicants and All Non-private Ownership Interests

The Applicant is TUUSSO Energy, LLC, which has a leasehold interest in the Fumaria Solar Project site from:

Ownership: Reecer Creek Solar LLC
6616 - 223rd Ave. NE
Redmond, WA 98053

TUUSSO is not aware of any non-private ownership interest in the project site.

2.2.3 Penstemon Solar Project Site

2.2.3.1 Legal Description

THE NORTHEAST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 17, TOWNSHIP 17 NORTH, RANGE 19 EAST, W.M., IN THE COUNTY OF KITTITAS, STATE OF WASHINGTON;

EXCEPT:

RIGHT OF WAY OF TJOSSEM AND MOE COUNTY ROADS.

CONTAINS 39.38 ACRES.

2.2.3.2 Applicants and All Non-private Ownership Interests

The Applicant is TUUSSO Energy, LLC, which has a leasehold interest in the Penstemon Solar Project site from:

Ownership: Valley Land Company LLC
1585 Tjossem Road
Ellensburg, WA 98926

TUUSSO is not aware of any non-private ownership interest in the project site.

2.2.4 Typha Solar Project Site

2.2.4.1 Legal Description

A TRACT OF LAND SITUATED IN THE EAST HALF OF THE NORTHEAST QUARTER OF SECTION 30, TOWNSHIP 18 NORTH, RANGE 18 EAST, W.M., KITTITAS COUNTY, STATE OF WASHINGTON, WHICH IS BOUNDED BY A LINE DESCRIBED AS FOLLOWS:

COMMENCING AT THE NORTHWEST CORNER OF SAID NORTHEAST QUARTER; THENCE SOUTH 89°16'48" EAST ALONG THE NORTH BOUNDARY LINE OF SAID NORTHEAST QUARTER, 1314.14 FEET TO THE TRUE POINT OF BEGINNING OF SAID LINE;

THENCE CONTINUING SOUTH 89°16'48" EAST ALONG SAID NORTH BOUNDARY LINE, 1134.53 FEET;
THENCE SOUTH 05°04'50" EAST, 98.92 FEET;
THENCE SOUTH 14°06'00" EAST, 80.70 FEET;
THENCE SOUTH 08°58'08" EAST, 174.50 FEET;
THENCE SOUTH 19°32'43" EAST, 160.93 FEET;
THENCE SOUTH 15°40'01" EAST, 143.68 FEET;
THENCE SOUTH 20°06'14" EAST, 124.44 FEET TO A POINT ON THE EAST BOUNDARY LINE OF SAID NORTHEAST QUARTER;
THENCE SOUTH 00°52'11" EAST, ALONG THE EAST BOUNDARY LINE OF SAID NORTHEAST QUARTER, 1262.44 FEET;
THENCE SOUTH 63°35'36" WEST, 47.38 FEET;
THENCE SOUTH 69°41'30" WEST, 117.32 FEET;
THENCE SOUTH 69°54'58" WEST, 101.62 FEET;
THENCE SOUTH 83°42'43" WEST, 36.85 FEET;
THENCE NORTH 15°17'56" WEST, 24.03 FEET;
THENCE SOUTH 74°30'43" WEST, 56.36 FEET;
THENCE NORTH 74°37'20" WEST, 75.56 FEET;
THENCE NORTH 69°50'05" WEST, 53.25 FEET;
THENCE NORTH 60°06'51" WEST, 195.24 FEET;
THENCE NORTH 60°42'51" WEST, 100.56 FEET;
THENCE NORTH 55°37'02" WEST, 226.49 FEET;
THENCE NORTH 40°07'35" WEST, 65.17 FEET;
THENCE NORTH 36°07'05" WEST, 135.85 FEET;
THENCE NORTH 22°37'59" WEST, 58.56 FEET;
THENCE NORTH 51°24'40" WEST, 47.40 FEET;
THENCE NORTH 36°10'00" WEST, 75.75 FEET;
THENCE NORTH 34°20'25" WEST, 72.58 FEET;
THENCE NORTH 26°34'08" WEST, 60.13 FEET;
THENCE NORTH 04°10'07" WEST, 55.08 FEET;
THENCE NORTH 81°36'17" EAST, 30.19 FEET;
THENCE NORTH 04°17'30" EAST, 33.02 FEET;
THENCE NORTH 38°49'40" WEST, 25.43 FEET;
THENCE SOUTH 66°22'39" WEST, 53.58 FEET;
THENCE NORTH 30°46'47" WEST, 93.84 FEET;
THENCE NORTH 21°54'36" WEST, 39.86 FEET;
THENCE NORTH 14°45'26" EAST, 20.96 FEET;

THENCE SOUTH 89°23'14" WEST, 31.77 FEET TO A POINT ON THE WEST BOUNDARY LINE OF SAID EAST HALF OF SAID NORTHEAST QUARTER;

THENCE NORTH 00°36’46” WEST ALONG SAID WEST BOUNDARY LINE OF SAID EAST HALF OF SAID NORTHEAST QUARTER, TO A POINT ON THE NORTH LINE OF SAID NORTHEAST QUARTER, 1166.28 FEET TO THE TRUE POINT OF BEGINNING AND TERMINUS OF SAID LINE.

CONTAINS 54.29 ACRES.

2.2.4.2 Applicants and All Non-private Ownership Interests

The Applicant is TUUSSO Energy, LLC, which has a leasehold interest in the Typha Solar Project site from:

Ownership: Douglas Dicken
P.O. Box 1201
Ellensburg, WA 98926

TUUSSO is not aware of any non-private ownership interest in the project site.

2.2.5 Urtica Solar Project Site

2.2.5.1 Legal Description

A TRACT OF LAND SITUATED IN THE SOUTHWEST QUARTER OF SECTION 10, TOWNSHIP 17 NORTH, RANGE 18 EAST, W.M., KITTITAS COUNTY, STATE OF WASHINGTON, BEING A PORTION OF LOTS 1, 2, 3 AND 4, AND ALL OF LOTS 7, 8, 9, 10, 11, AND 12 OF THAT CERTAIN SURVEY, AS RECORDED IN BOOK 32 OF SURVEYS, PAGE 71, UNDER AUDITOR’S FILE NO. 200602280020, RECORDS OF SAID COUNTY, WHICH IS BOUNDED BY A LINE DESCRIBED AS FOLLOWS:

COMMENCING AT THE SOUTHEAST CORNER OF SAID SOUTHWEST QUARTER; THENCE NORTH 01°15’25” EAST ALONG THE EAST BOUNDARY LINE OF SAID SOUTHWEST QUARTER, 1023.64 FEET; THENCE NORTH 88°44’35” WEST, 29.10 FEET TO THE TRUE POINT OF BEGINNING OF SAID LINE;

THENCE NORTH 89°14’26” WEST, 453.87 FEET;
THENCE NORTH 87°05’29” WEST, 1325.35 FEET;
THENCE NORTH 04°10’29” WEST, 211.33 FEET;
THENCE NORTH 61°45’24” EAST, 261.93 FEET;
THENCE NORTH 42°39’06” EAST, 113.46 FEET;
THENCE NORTH 31°25’35” EAST, 123.63 FEET;
THENCE NORTH 40°11’01” WEST, 121.12 FEET;
THENCE NORTH 87°43’34” WEST, 128.38 FEET;
THENCE SOUTH 56°41’46” WEST, 155.23 FEET;
THENCE SOUTH 28°15’58” WEST, 100.76 FEET;
THENCE NORTH 87°36’58” WEST, 96.74 FEET;
THENCE SOUTH 63°15’03” WEST, 170.80 FEET;
THENCE SOUTH 33°19’00” WEST, 161.55 FEET;
THENCE SOUTH 88°58’40” WEST, 447.52 FEET TO A POINT ON THE WEST BOUNDARY LINE OF SAID SOUTHWEST QUARTER;
THENCE NORTH 01°17’45” EAST ALONG SAID WEST BOUNDARY LINE OF SAID SOUTHWEST QUARTER, 801.99 FEET;
THENCE SOUTH 86°51’18” EAST, 1320.00 FEET;
THENCE NORTH 01°17’45” EAST, 7.60 FEET;
THENCE SOUTH 86°50’25” EAST, 1277.79 FEET TO A POINT ON THE EAST BOUNDARY LINE OF SAID SOUTHWEST QUARTER;

THENCE SOUTH 01°18’25” WEST ALONG SAID EAST BOUNDARY LINE OF SAID SOUTHWEST QUARTER, 971.53 FEET TO THE TRUE POINT OF BEGINNING AND TERMINUS OF SAID LINE.

CONTAINS 51.94 ACRES.

2.2.5.2 Applicants and All Non-private Ownership Interests

The Applicant is TUUSSO Energy, LLC, which has a leasehold interest in the Urtica Solar Project site from:

Ownership: Herbert and Shirley Snowden
751 Manastash Road
Ellensburg, WA 98926

TUUSSO is not aware of any non-private ownership interest in the project site.

(2) Associated and transmission facilities. For those facilities described in RCW 80.50.020 (6) and (7) the application shall contain the legal metes and bounds description of the preferred centerline of the corridor necessary to construct and operate the facility contained therein, the width of the corridor, or variations in width between survey stations if appropriate, and shall identify the applicant's and others' ownership interests in lands over which the preferred centerline is described and of those lands lying equidistant for 1/4 mile either side of such center line.

Pursuant to Revised Code of Washington (RCW) 80.50.020 (7), all on-site improvements to the five proposed Columbia Solar Project sites are described in Section 2.3 of this application.

With respect to off-site improvements, of the five proposed TUUSSO Columbia Solar Project sites, only two would have off-site generation tie lines of significant length that tie into PSE’s distribution transmission line network, namely the Fumaria and Typha Solar Project sites. Applicable additional information is provided below.

Camas Solar Project Site: the point of interconnection would be adjacent the Camas Solar Project site (Figure 2.2-1), and TUUSSO would not construct any associated or transmission facilities off-site.

Fumaria Solar Project Site: the generation tie line would originate from the southwestern corner of the Fumaria Solar Project site and would connect to the existing Puget Sound Energy’s distribution transmission lines (or the Puget Sound Energy substation) approximately 2.6 miles away to the southwest. The Fumaria Solar Project site, alternative access routes, and generation tie line path are illustrated in Figures 2.2-2 through 2.2-6. Up to 0.9 miles of the generation tie line would require new wooden poles or undergrounded conductor (as shown in the figures). The remaining length of the new generation tie line would be installed along existing distribution/transmission ROWs, and would either be mounted on the existing wooden poles, or those existing poles would be replaced with new poles to which the new generation tie line would be mounted. The generation tie line corridor ROWs would be 20 to 60 feet wide.



Figure 2.2-1. Camas Solar Project site.

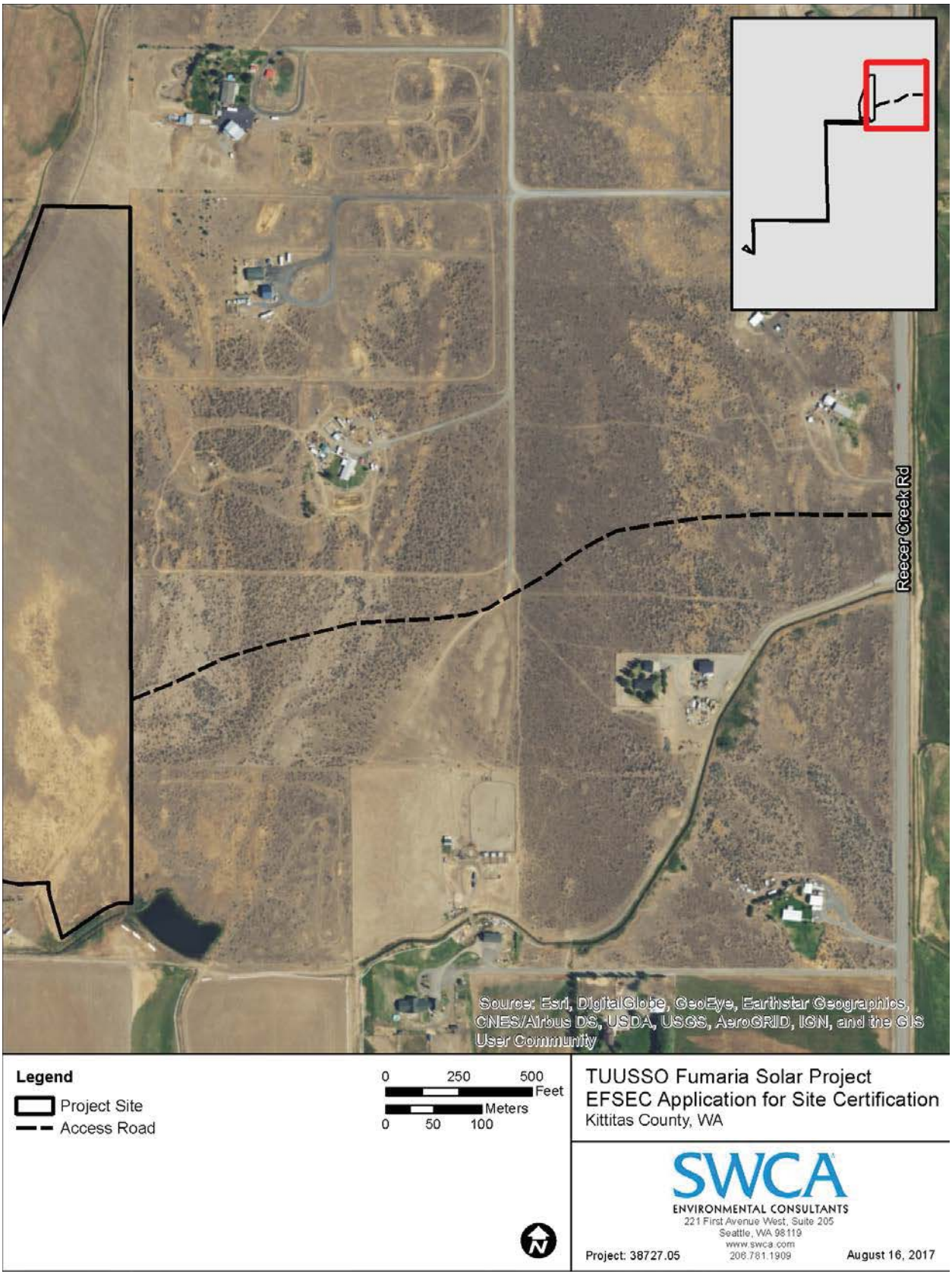


Figure 2.2-2. Fumaria Solar Project site, Map 1 of 5.

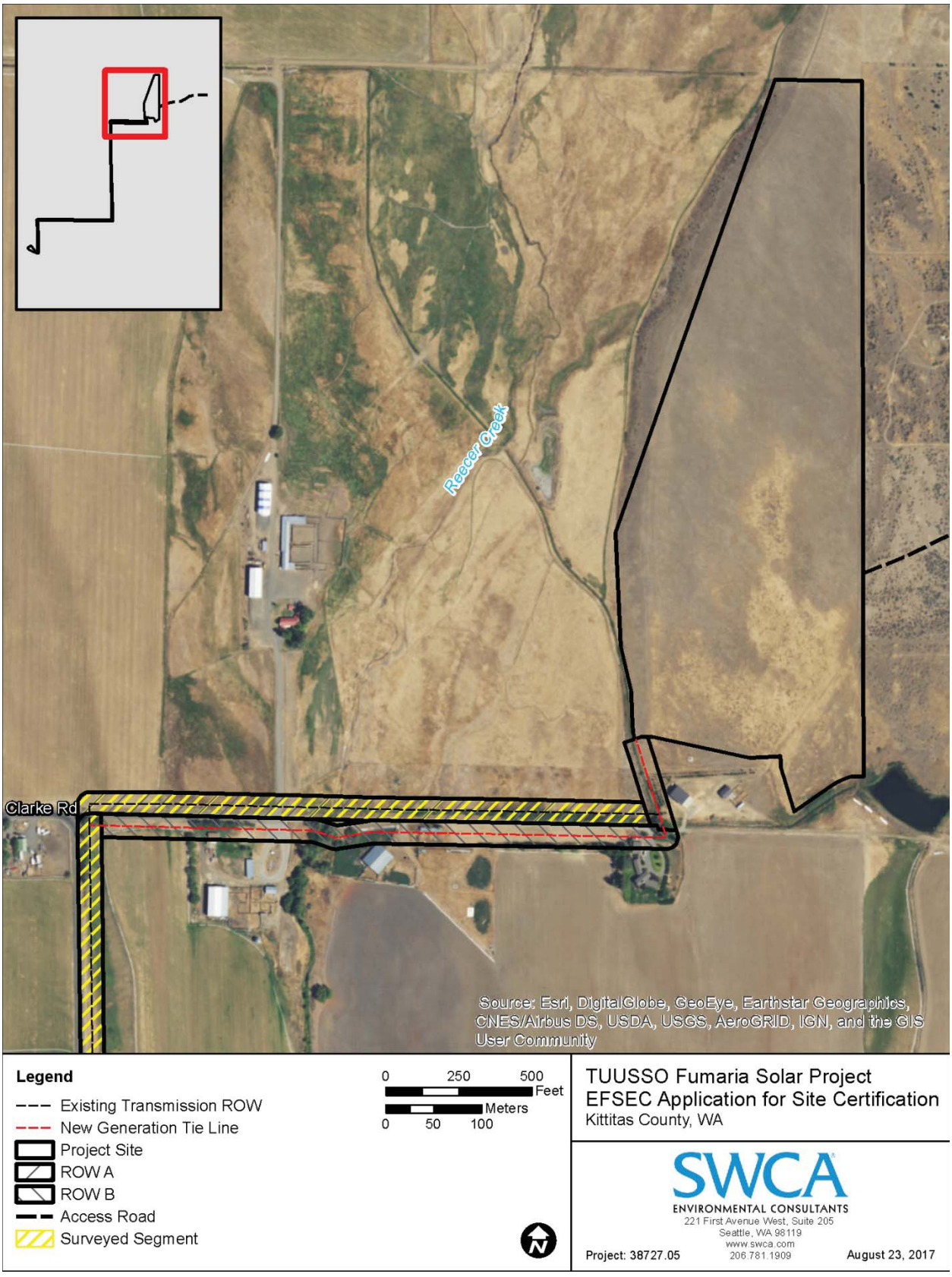


Figure 2.2-3. Fumaria Solar Project site, Map 2 of 5.

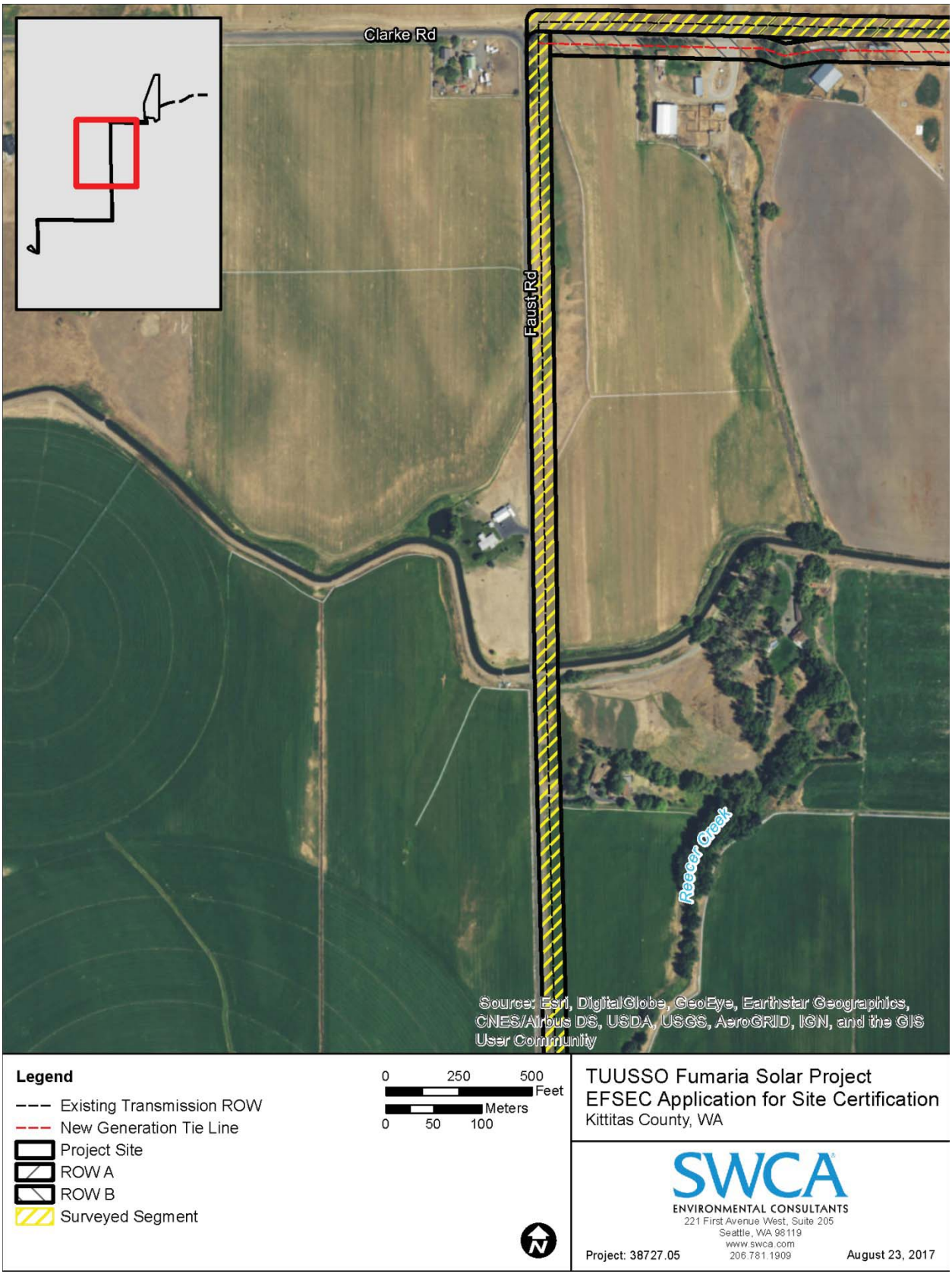


Figure 2.2-4. Fumaria Solar Project site, Map 3 of 5.

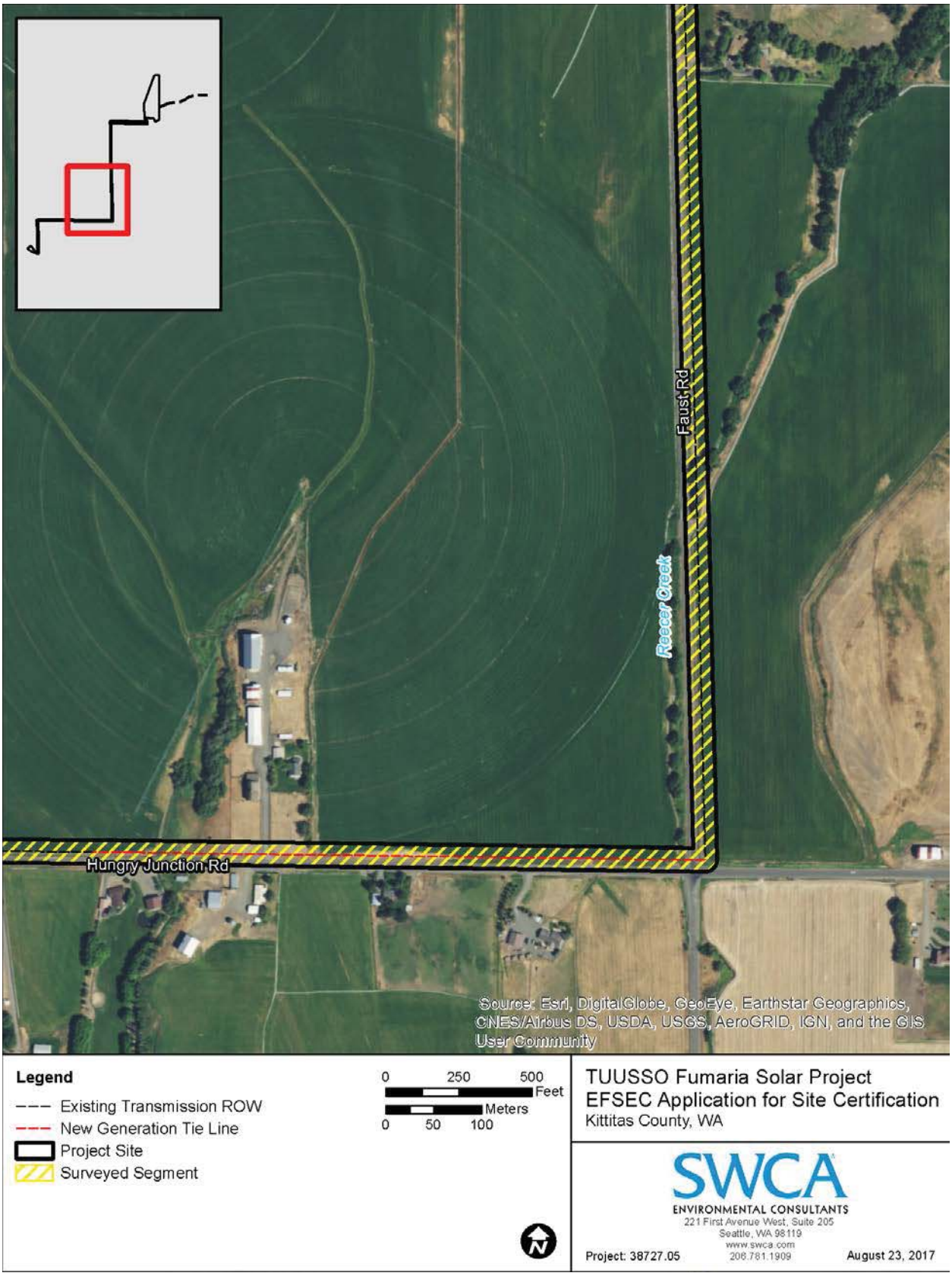


Figure 2.2-5. Fumaria Solar Project site, Map 4 of 5.

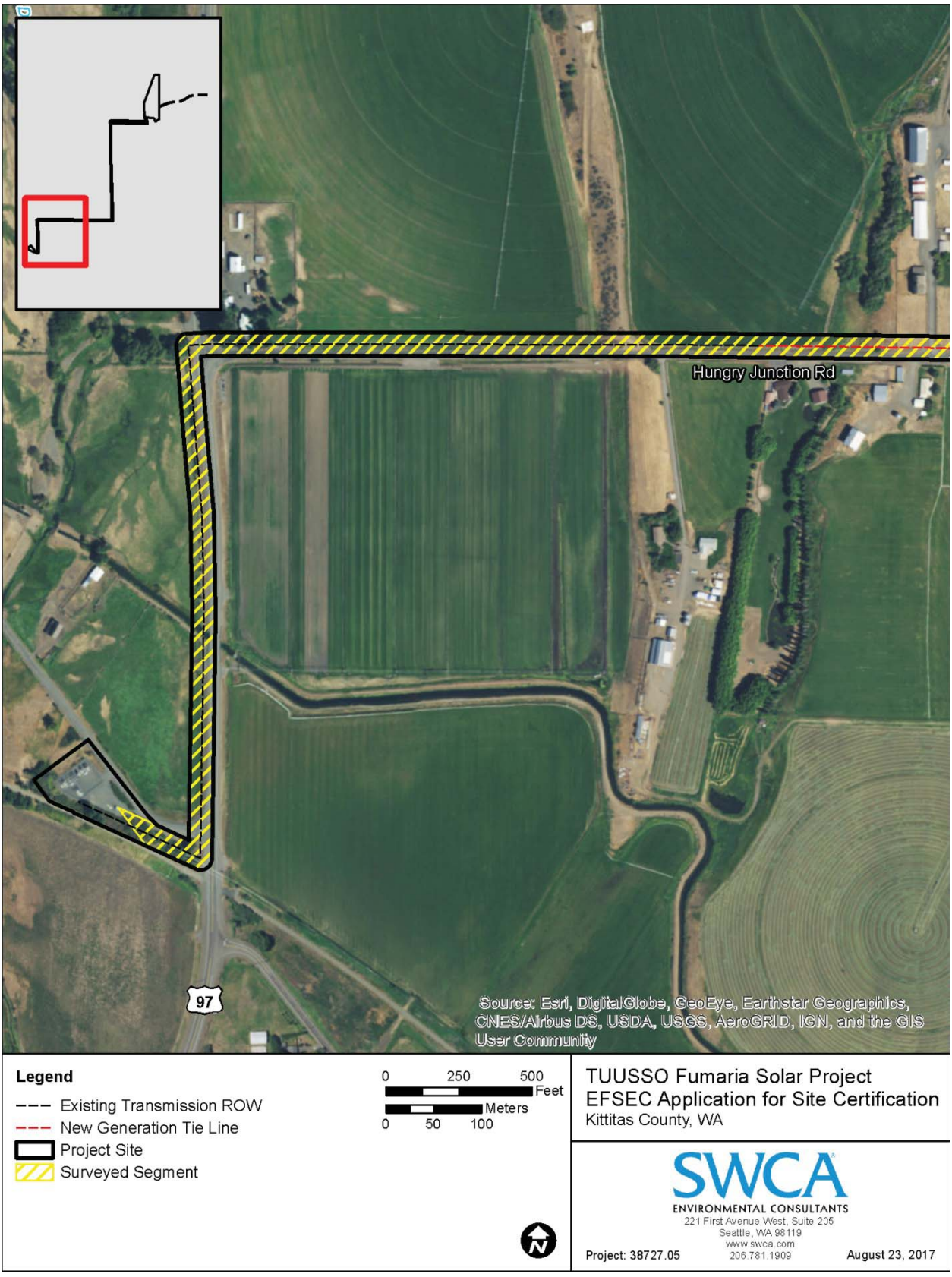


Figure 2.2-6. Fumaria Solar Project site, Map 5 of 5.

Penstemon Solar Project Site: the point of interconnection would be adjacent to the Penstemon Solar Project site (Figure 2.2-7) and TUUSSO would not construct any associated or transmission facilities off-site.

Typha Solar Project Site: the generation tie line would originate from the southwestern corner of the Typha Solar Project site and share wooden poles with existing distribution transmission lines that cross south along an existing access road, crossing the EP Canal three times, passing through the Ellensburg Golf and Country Club, to connect to the existing PSE distribution line along Thorp Highway South. The approximately 0.5-mile path is illustrated in Figure 2.2-8, of which less than 0.1 mile would require new wooden poles and conductor (as shown in Figure 2.2-8). The remaining length of the new generation tie line would be installed along existing electrical ROWs, and would either be mounted to the existing wooden poles, or those existing poles would be replaced with new poles to which the new generation tie line would be mounted. The generation tie line corridor ROWs would be 20 to 60 feet wide.

Urtica Solar Project Site: the point of interconnection would be adjacent to the Urtica Solar Project site (Figure 2.2-9), and TUUSSO would not construct any associated or transmission facilities off-site.



Figure 2.2-7. Penstemon Solar Project site.



Figure 2.2-8. Typha Solar Project site.



Figure 2.2-9. Urtica Solar Project site.

2.3 Construction on Site 463-60-145

The applicant shall describe the characteristics of the construction to occur at the proposed site including the type, size, and cost of the facility; description of major components and such information as will acquaint the council with the significant features of the proposed project.

2.3.1 Overview of TUUSSO'S Columbia Solar Projects

The Applicant, TUUSSO, a Seattle-based developer of ground-mounted solar power projects with a proven history of successful low-impact development of over 100 MW of solar projects, proposes to develop, own, and operate five PV projects, the Camas, Fumaria, Penstemon, Typha, and Urtica Solar Projects, collectively the Columbia Solar Projects. Each of these projects would be located in Kittitas County, outside of the city of Ellensburg on agricultural land, where major alternative energy facilities are a permitted conditional use under county code. The project sites would be converted to solar power generating facilities with associated grid interconnection equipment. The projects would operate year-round, producing up to 25 MW of renewable electric power in aggregate during daytime hours. The proposed schedule for construction of the facilities is to begin grading and construction of the facilities in April 2018 and complete construction by November 2018. The total cost of each facility is estimated to be $8 to 10 million, for a total of $40 to 50 million for all five solar projects.

TUUSSO has established site control of the Columbia Solar Project sites via lease agreements and has executed 15-year power purchase agreements with PSE to supply electricity generated by the projects to the utility under PSE's Schedule 91 program. Each of the projects is currently in advanced stages of the interconnection process with PSE, who have determined that the interconnection and proposed timelines are feasible, and may be made with limited impact to the local distribution and transmission system.

TUUSSO is proposing to construct each of the five Columbia Solar Projects to meet the following objectives:

- provide PSE and the State of Washington with clean, renewably generated electricity;
- stimulate the local economy through construction and operations job creation;
- support Washington's efforts to reduce greenhouse gas emissions and meet Renewable Portfolio Standard (RPS) mandates; and
- develop economically feasible and commercially financeable projects.

2.3.2 Columbia Solar Projects Facilities and Infrastructure

Each of the five Columbia Solar Project facilities would consist of:

- a solar field of north-south-oriented rows of crystalline silicon PV panels, such as QCells Q.Antum Solar Modules Q.Plus L-G4.2 between 325 and 345Wp, mounted on single-axis tracking systems, such as NEXTracker's NX Horizon^{TM}, on galvanized steel support structures;
- an electrical collection and inverter system that aggregates the output from the PV panels and converts the electricity from direct current (DC) to alternating current (AC), including inverters such as Solectria's SGI 750/500 XTM inverters;

- interconnection equipment where the facility output is transformed to a voltage of 12.47 kV, including a padmount-style transformer manufactured by ABB or similar;
- for the Typha and Fumaria Solar Projects, a 12.47-kV generation tie line connecting each solar project site to nearby existing distribution lines;
- Remote Supervisory Control and Data Acquisition (SCADA) monitoring incorporated into the process control system to allow unmanned operations;
- communications and grid-protection equipment;
- a meteorological data collection system configured to collect meteorological information roughly at the height of the PV panels;
- civil infrastructure including access gates, internal access roads, and secure fencing; and
- where appropriate, native trees, shrubs, and/or plants in selected locations to provide visual screening.

The design, including the selection of the primary components of each of the five Columbia Solar Project facilities, is subject to change based on the final engineering and market conditions at the time of construction.

Figures 2.3-1 through 2.3-5 show preliminary plans for each of the five Columbia Solar Project sites. These plans include the scale of the drawing and north point; locations of all existing and proposed uses, structures, fences, and improvements; distances between structures and property lines; and locations of all driveways, internal access roads, and points of ingress and egress. Typical racking details depict the array with portrait racking, with one row of modules positioned vertically on each rack. An elevation sketch is also provided to show a proposed inverter pad, including inverter and transformer structures on a concrete pad, showing dimensions and heights above the ground (Appendix L).

2.3.2.1 Photovoltaic Panels

The solar field would consist of PV panels mounted on steel support structures. The PV panels would consist of polycrystalline panels arranged in rows aligned north to south. The assembled PV panels would have a minimum leading edge height (bottom edge of the modules) of approximately 1 foot from grade, and a maximum top edge height of approximately 8 feet from grade, depending on the angle of the tracking system as it changes over the course of each day.

The supports would be configured with a pivoting, single-axis tracking system, such as NEXTracker's NX Horizon™ system. Throughout the day, the PV panels would pivot up to 120 degrees around a north-south axis, tracking the sun from east to west.

Depending on the final racking vendor selection and design, the number of racks supporting the PV panels could vary. Subject to final design, the typical three string rows would consist of nine pile driven posts, each serving as the foundation. Each post would be an I-beam, 10 to 15 feet in length, and have a cross-section of approximately 6 by 4 inches. They would be driven to a depth of approximately 5 to 7 feet below grade. The solar arrays would be designed to withstand snow loads of 25 pounds per square foot (psf) and winds of 120 miles per hour (mph).

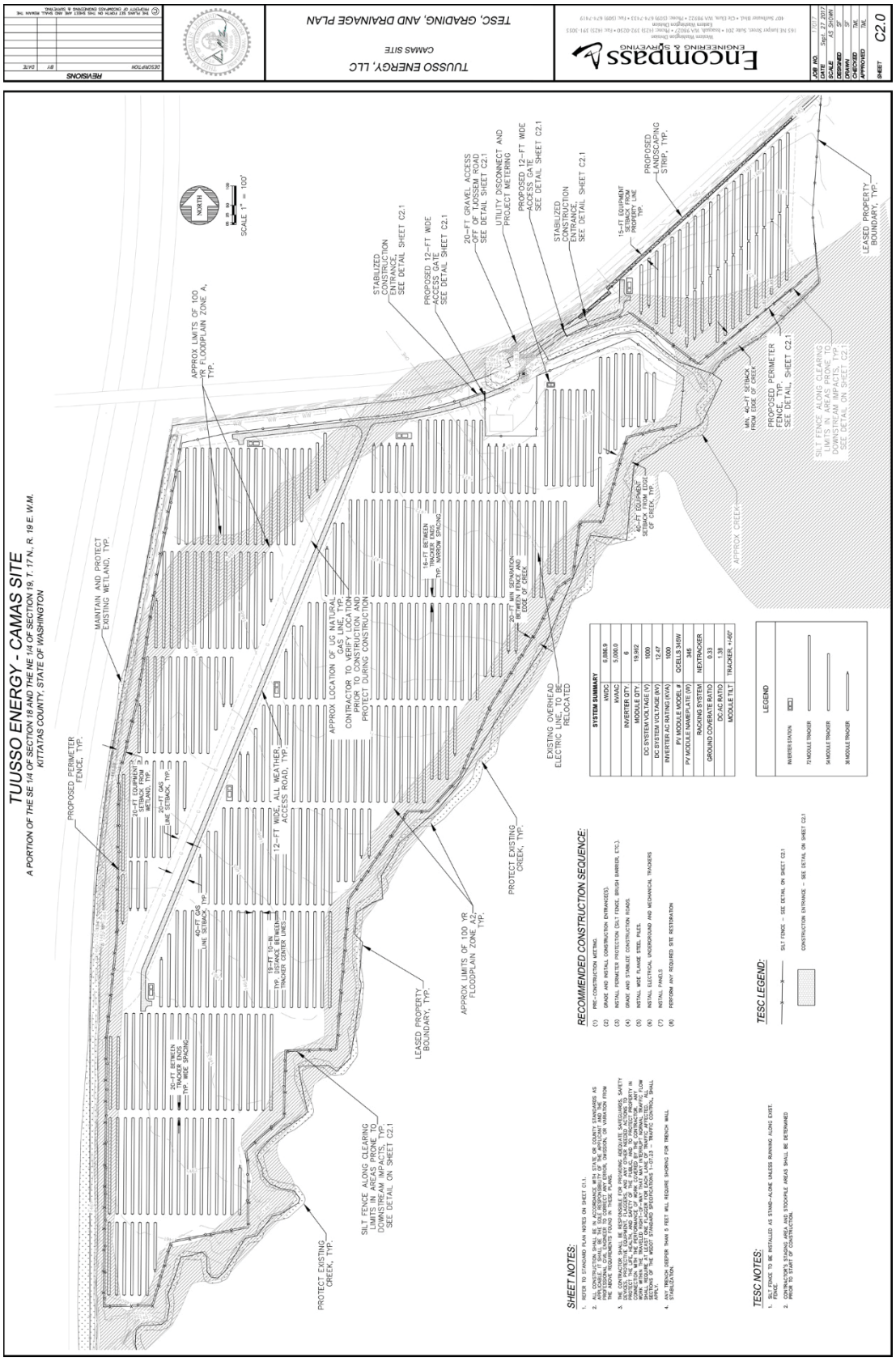


Figure 2.3-1. Camas Solar Project preliminary project plan.

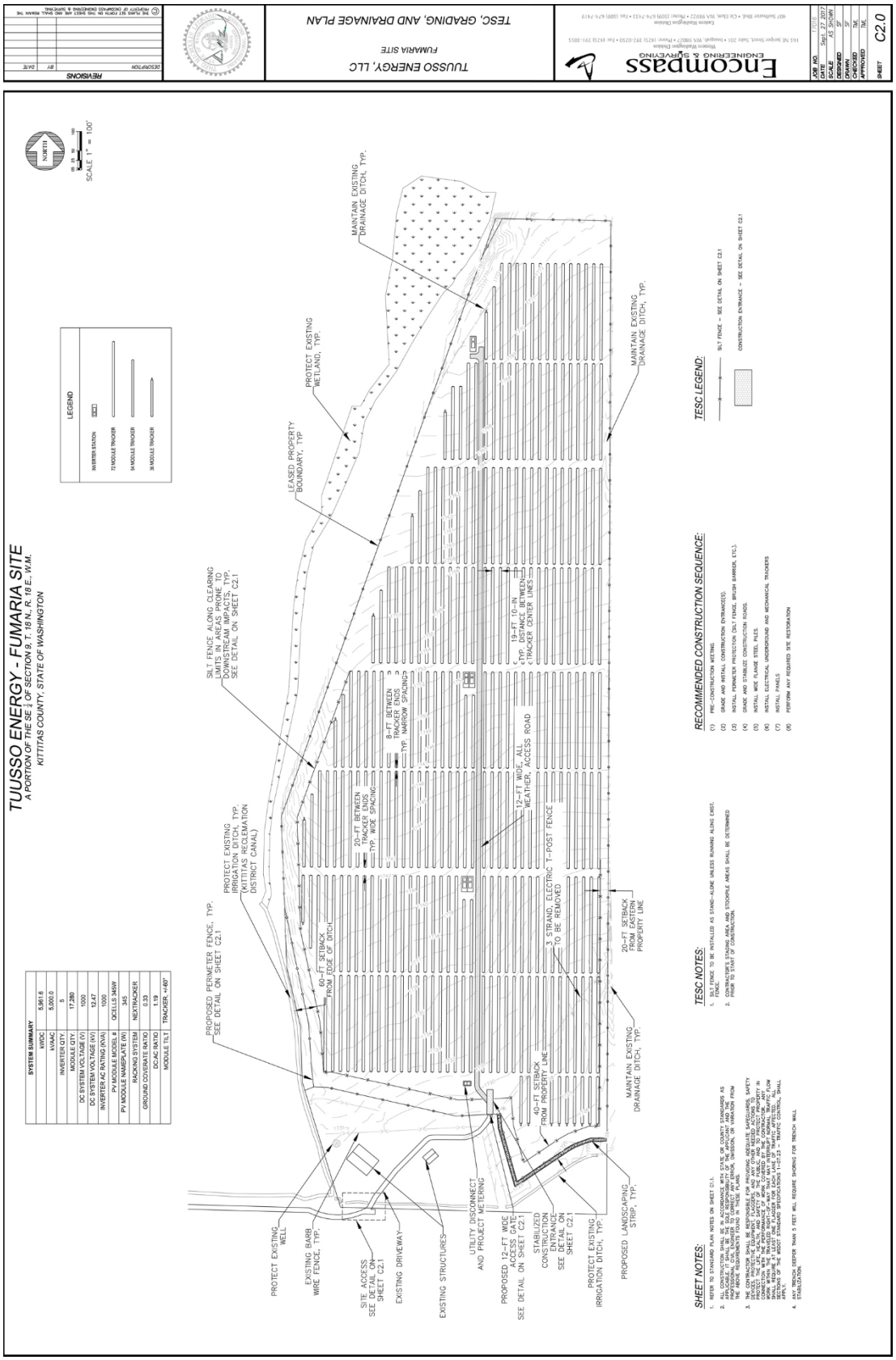


Figure 2.3-2. Fumaria Solar Project preliminary project plan.

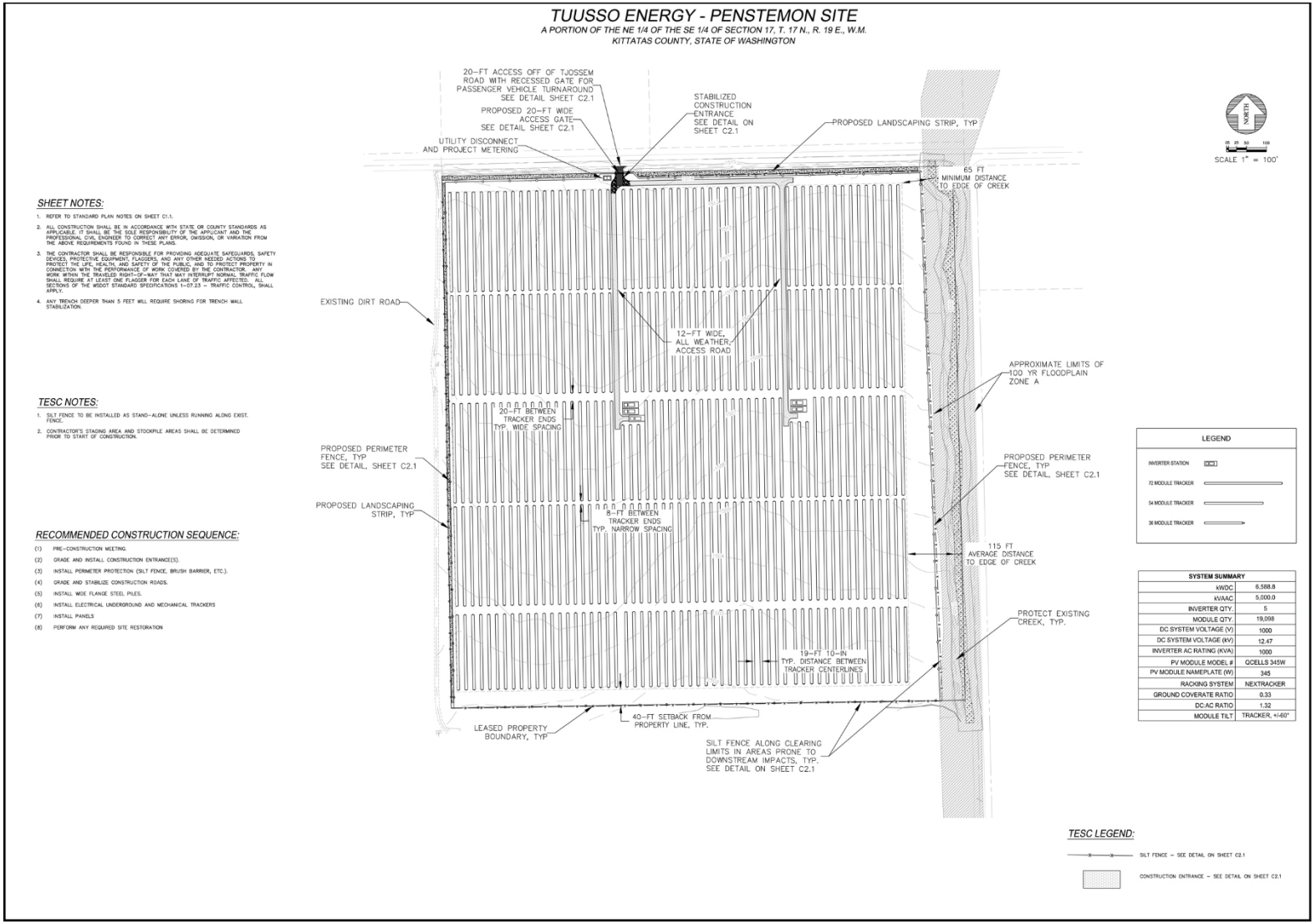


Figure 2.3-3. Penstemon Solar Project preliminary project plan.

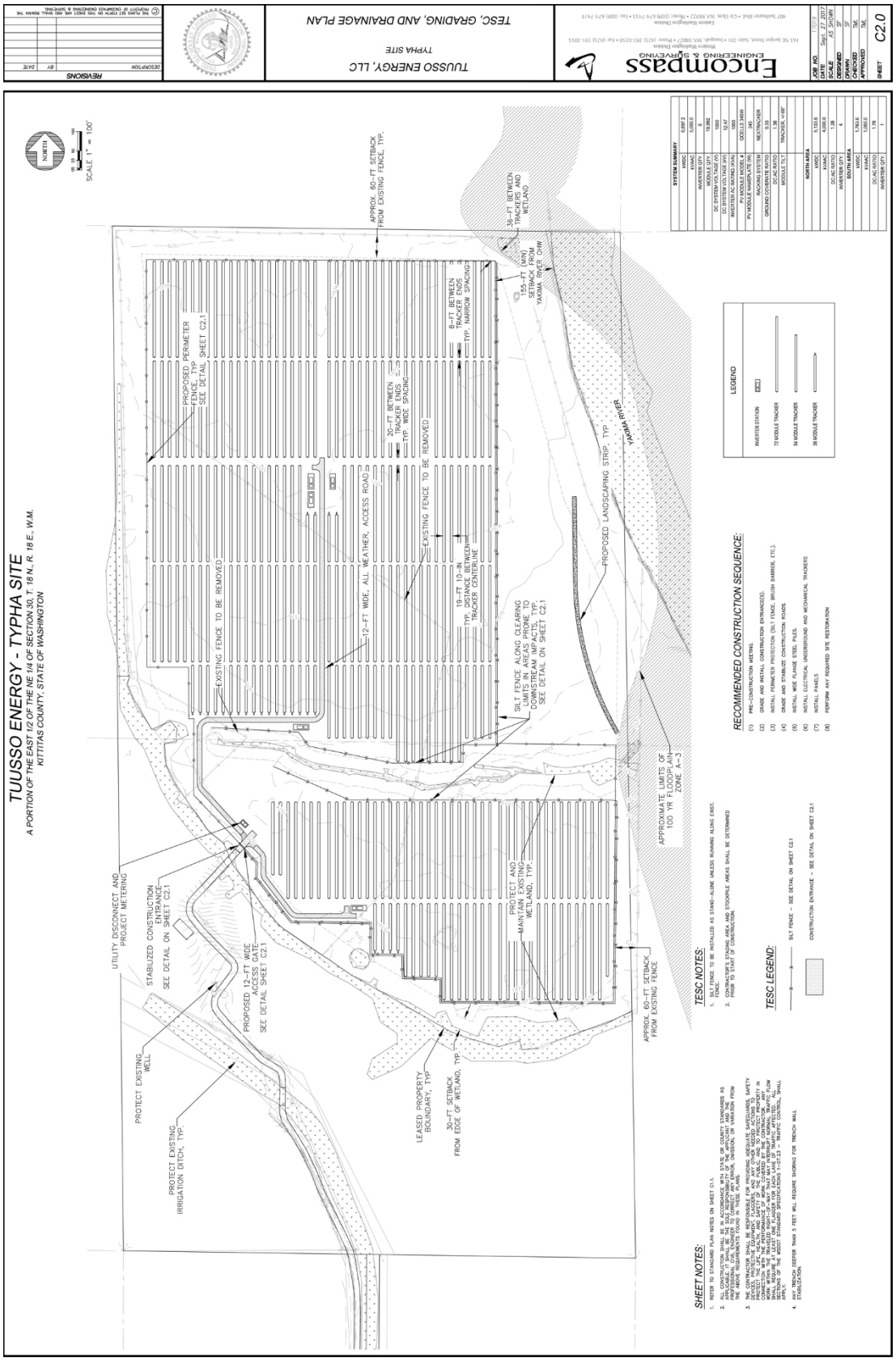


Figure 2.3-4. Typha Solar Project preliminary project plan.

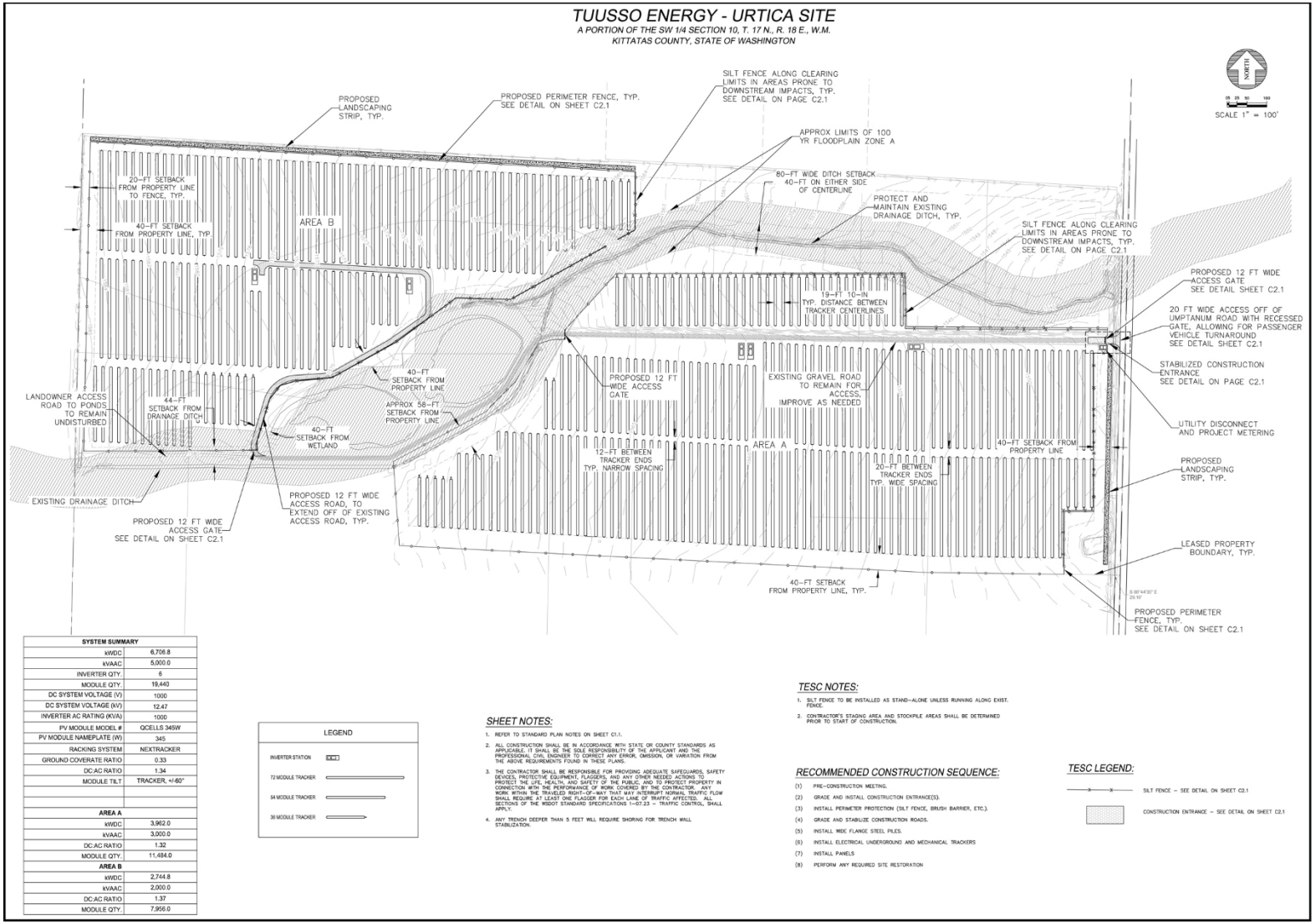


Figure 2.3-5. Urtica Solar Project preliminary project plan.

2.3.2.2 Electrical Collection System

The PV panels would be organized into electrical groups referred to as “blocks.” Each block would encompass approximately 7 acres of PV panels (capable of producing about 1.3 MW DC of power each) and would be connected to a central station inverter that would transform the DC power to AC power, which would then be transmitted by the grid and used by the utility’s customers. A typical block would measure approximately 600 by 500 feet. The size of each block would depend primarily on the inverter loading ratio (ILR; the ratio of DC power capacity to the AC output power of the inverter, and typically 1.3:1), and the ground cover ratio (GCR; i.e., the space that the PV panels occupy as a percentage of land area beneath them). The lower the GCR, the less space the PV panels occupy, thereby minimizing shading from row to row in the early morning and late afternoon hours.

Special weather and sunlight resistant conductors, attached under the PV panels, allow the connection of the panels with each other in parallel, to cumulatively form strings of higher voltage and power capacity. Each of these strings would consist of up to 20 panels in parallel and would terminate into above-ground special DC source circuit combiner boxes, with dimensions of approximately 36 × 36 × 10 inches that collect the power produced by multiple strings. From the combiner boxes, the cabling transitions to underground via buried trenches, feeding into the inverters and associated switchgear housed in each inverter skid. The cable sizes would vary based on the detailed electrical design, as would the size and depth of the trenches. However, the trenches would likely be about 36 to 48 inches deep, with cables installed in sand or similar material at the bottom of the trench and then 30 inches of compacted backfill placed over the bottom material. The trenches would be 6 to 24 inches wide. Actual cable width would be smaller, depending on whether direct burial or cable-in-conduit is used. In general, at least 3 inches of clearance is required from the bottom and sides of the trench to any cable or conduit.

Each inverter skid is anticipated to be a 15- by 30-foot, and 12- to 24-inch-deep prefabricated concrete pad with equipment mounted to it, including meteorological equipment up to 8 feet in height. The array and skid would be unoccupied except during inspection and maintenance. Each inverter skid would include an associated outdoor utility-grade transformer, roughly 6 × 6 × 6 feet, to step up the electricity voltage from the inverter output level (e.g., 480 V AC) to 12.47 kV AC.

From these transformers, electricity would be conveyed via an underground 12.47-kV AC collector circuit to a common 12.47-kV switchyard. The interconnection specifics for each of the five Columbia Solar Project sites would then vary, as described in greater detail below.

2.3.2.3 Energy Resource

TUUSSO modeled the design and associated energy output for each project using PVSyst v6.21. PVSyst is a PV solar project modeling software widely used in the solar power industry and is considered the state of the art standard for output simulation. The energy output simulated by PVSyst is based on the meteorological data at the project site, models of the system equipment such as the inverters and solar panels, and project design specifications. PVSyst v6.21 was used to simulate the predicted energy output from each of the five Columbia Solar Projects, with an estimate of approximately 11,500 megawatt hours (MWh) in the first full year of project operation.

2.3.2.4 Electrical Interconnection

Conceptual single-line diagrams illustrating the electrical collection system and interconnection for each of the five Columbia Solar Project sites are included in Appendix L. The switchyards would each include protection and communication equipment, including:

- 12.47-kV switchgear and circuit breaking devices;
- 12.47-kV capacitors;
- wood support structures up to 30 feet in height;
- grounding grid;
- prefabricated utility control enclosures;
- perimeter fence; and
- SCADA system, remotely monitored by TUUSSO's operations and maintenance (O&M) provider and PSE.

For the Typha and Fumaria Solar Projects, a generation tie line would be constructed from the on-site switchyard to the nearby distribution line infrastructure owned by PSE. The specifics of each generation tie line are described in greater detail below.

2.3.2.5 Meteorological Data Collection System

Each of the five Columbia Solar Project facilities would also include at least one meteorological data collection system, configured to collect the following meteorological data at the level of the solar panels, or approximately 6 to 8 feet above the ground:

- global horizontal irradiance;
- global irradiance/plane of array;
- ambient temperature;
- wind speed;
- wind direction;
- relative humidity;
- precipitation;
- barometric pressure; and
- visibility.

2.3.2.6 Infrastructure

Driveways and Access Roads

The points of access and associated construction methods vary for each project site and are described below in greater detail. Interior all-weather access roads within each site would be designed to provide access to the inverter pads from the site entrance. These all-weather access roads would be 12 feet wide, and would consist of compacted soils or gravel. These all-weather access roads would be compacted to 90%, and a soil binder would then be sprayed or aggregate would be laid down to protect them from wind and water erosion and allow for continuous access. The soil binder would be reapplied annually to ensure the integrity of the access roads.

The remainder of the access roads throughout each solar site would be unpaved vegetated drive roads, with slopes of less than 4%. All access roads have been placed to minimize grading, closely following the existing elevations.

Grading Design

Grading for each of the five Columbia Solar Projects would be minimal and would be isolated to the all-weather access roads (as needed), inverter pads, and switchyard pads to accommodate interconnection equipment. The all-weather access roads would be relatively flat and would be graded to match existing conditions in order to minimize earthwork. Inverter pads would be placed throughout each solar project site, each of which would be approximately 15 by 30 feet and 1 to 2 feet thick. Each of these pads would

be graded, but as with the switchyard pads, the proposed elevation would be set to minimize earthwork. The switchyard and inverter pads would require a minimum of 90% relative compaction.

No export of soil is anticipated for any of the five Columbia Solar Project sites. At the conclusion of construction, all disturbed areas surrounding graded areas would be remediated through reseeding with native, low-cover vegetation.

Landscaping

Per the recommendation of the Washington Department of Fish and Wildlife (WDFW), each of the five Columbia Solar Project sites, except for the Fumaria Solar Project site, would be revegetated with low-cover native plant species. These species would be planted from drought-tolerant seed mixes, adapted well to the Kittitas County climate. Each solar project has been designed to minimize disturbed areas by keeping grading to a minimum. The Fumaria Solar Project site has very limited water availability, and so TUUSSO plans to leave the existing established vegetation on-site.

To effectively establish the new native plant species, TUUSSO would likely undertake mowing, herbicide treatments, tilling, drilling seeds, and irrigation during the initial few years of operation. Subsequent broadleaf treatments during the first couple years after construction would be undertaken to prevent broadleaf weeds from competing against the newly planted native vegetation. Formal landscaping is not proposed for any of the solar projects, as the amount of proposed grading does not warrant a full landscape design. The plantings planned for each solar project site are set forth below in greater detail.

Fencing

The five proposed Columbia Solar Project sites would be secured using 6- to 8-foot-high, perimeter, chain-link fencing topped by razor wire surrounding the PV system and switchyard. The entrance gates for each of the solar sites would be about 8 feet high and 12 feet wide, to allow for fire department and maintenance access. All fencing would be placed at or above grade to ensure drainage flows are unobstructed.

“Warning High Voltage” signs would be placed on the fencing at about 100-foot intervals and at each gate.

Lighting

Lighting would be installed on metal poles, up to 20 feet tall, located around the periphery of each of the five Columbia Solar Project sites, as well as at the inverter pads, as required for nighttime security purposes. Lighting would consist of modern, low intensity, downward-shielded fixtures that are motion activated, and would be directed onto the immediate site. For each site, between five and 10 lights would be installed and fed by direct buried underground electrical supply lines.

Sewer and Water Facilities

None of the five Columbia Solar Project facilities would have on-site toilet and septic or sewer system connections. The projects would follow the applicable state and/or county guidelines with respect to relief stations for employees, when employees are on-site. Any on-site water for ongoing use would be provided by the landowners or would be trucked to the site from outside water sources.

Fire Suppression and Safety

Combustible vegetation on and around each of the five Columbia Solar Project boundaries would be maintained by TUUSSO and the landowner, and each solar project site would include fire breaks around the project boundary, in accordance with state and/or county standards, as applicable. TUUSSO would

also coordinate with the Kittitas County Fire Department to provide PV training to fire responders and construction, operational, and maintenance staff. The intent of this training would be to familiarize both responders and workers with the codes, regulations, associated hazards, and mitigation processes related to solar electricity. This training would include techniques for fire suppression of PV systems.

2.3.3 Solar Project Sites

The following sections describe any site-specific characteristics of the construction and/or major components that might occur at each proposed Columbia Solar Project site.

2.3.3.1 Camas Solar Project Site

The proposed Camas Solar Project, a preliminary plan for which is provided in Figure 2.3-1, is a 5-MWac solar energy generation facility that would be located at the intersection of Tjossem Road and I-82, within a development envelope of approximately 50.83 acres. The setbacks to the fencing and to the electrical generating equipment are depicted in Figure 2.3-1. As illustrated, the project would consist of two primary sections separated by Bull Ditch that are separately fenced but electrically connected. To clarify references to these different portions of the solar project, that larger portion of the project to the southwest of Bull Ditch is referred to as Camas A, and that smaller portion of the project to the northeast of Bull Ditch is referred to as Camas B.

A total of approximately 20,000 PV panels would be arranged in approximately 270 rows with center-to-center spacing of about 15 feet. The GCR is currently planned at approximately 33%. The final facility equipment numbers and locations would depend upon the results of technical studies (e.g., the Interconnection Facilities Study).

There would be approximately six inverter pads throughout the Camas Solar Project site, each of which would be approximately 15 by 30 feet and 1 to 2 feet thick, where the direct current from the arrays would be converted to alternating current and then transmitted by the electric grid. Each inverter pad would include one to two inverter enclosures and one AC transformer. The inverter located within Camas B would be electrically connected to Camas A via an overhead 12.47-kV conduit mounted to four to six wood monopoles passing over Bull Ditch. A typical wood monopole would be 30 to 45 feet tall, set 6 to 8 feet deep in the ground, and be 8 to 16 inches in diameter.

Aside from construction equipment traffic, there is little to no anticipated ground disturbance for the installation of the racking and solar modules. The Camas Solar Project site has an overall grade change of less than 2%, is relatively flat, and the piles can be installed on the existing grades. There would be 5% or less of impervious surfaces added to the site, less than 100,000 square feet. Impervious areas would be associated with all-weather access roads running to the inverter pads, the six inverter pads, piles for the solar panels and fencing, and a pad for the switchyard.

The only grading/earth moving expected on the Camas Solar Project site would be associated with a minor widening of the entrance road to Camas A; grading/leveling as required for the all-weather access roads; the small areas required for the concrete pads to support the inverters, transformers, and switch gear; and trenching for the DC and AC collection system. Other property improvements that would have only moderate impact/disturbance to in situ conditions would involve roadbed stabilization for the all-weather access roads.

In addition, TUUSSO is proposing to re-site an existing overhead distribution line owned by PSE that passes through the northeast quadrant of Camas A. TUUSSO would pursue one of three options for this distribution line: 1) direct burial of the line from the northern boundary of Camas A to the eastern

boundary of Camas A, staying within the current ROW, 2) modifying the ROW slightly to cause the path of the distribution line to travel more directly north-south through Camas A, or 3) modifying the ROW and path of the current overhead distribution line to instead closely follow Bull Ditch and Little Naneum Creek such that the line skirts the northeast boundary of Camas A. Option 1 would have minimal impact to the current site conditions, simply providing for the burial of the PSE distribution line where it passes through Camas A. Option 2 would comprise the construction of up to 4 additional monopoles (typically wood) to support the more north-south path through the project site. Option 3 would comprise the construction of up to around 10 monopoles (typically wood) to support the conduit along the northeast boundary of Camas A. A typical wood monopole would be 30 to 45 feet tall, set 6 to 8 feet deep in the ground, and be 8 to 16 inches in diameter.

Electrical Interconnection

The Camas Solar Project would be located in Puget Sound Energy's service territory, and would connect to the existing PSE distribution lines along Tjossem Road, on the northern boundary of the project site, where the switchyard is located (as illustrated in Figure 2.3-1). The interconnection would comprise a line tap on the existing electrical 12.47-kV distribution circuit Clymer-15, feeding into PSE's Clymer Substation. TUUSSO expects to finalize its Interconnection Agreement for the solar project with PSE by December 2017.

The major elements of the preliminary interconnection design required for the Camas Solar Project are likely to include:

- Install relay improvements or modifications, circuit breakers, and a new single phase line potential transformer within the Clymer Substation.
- Install one span of feeder conductor, gang operated switch, underground cable terminations, and underground cable from the existing feeder along Tjossem Road to the customer point of interconnection (POI).
- Install primary metering equipment at the project site.

The above described span of feeder conductor would connect from the Camas Solar Project switchyard to the existing 12.47-kV distribution circuit. Typically, such conduit would be strung with two to three new monopoles (typically wood). A typical wood monopole would be 30 to 45 feet tall, set 6 to 8 feet deep in the ground, and be 8 to 16 inches in diameter.

Site Access

There would be a single point of access to Camas A from Tjossem Road, and a separate point of access to Camas B from Tjossem Road. The point of access to Camas A would use the existing 20-foot gravel road running to the entry gate, which would be widened slightly from current conditions between Tjossem Road and the existing culvert, and would provide emergency access as well as access for maintenance and operation purposes. The point of access to Camas B would comprise a new, short span of 20-foot gravel road off of Tjossem Road leading to the entry gate for Camas B.

Fencing and Landscaping

The Camas Solar Project site would be secured using 6- to 8-foot-high, perimeter, chain-link fencing topped with razor wire surrounding the PV system and switchyard. The entrance gates for both Camas A and Camas B would be about 8 feet high, 12 feet wide, and set back from the edge of Tjossem Road to allow for fire department and maintenance access without disrupting traffic flows. All fencing would be placed at or above grade to ensure that drainage flows would be unobstructed.

Along the northern boundary of Camas A, the natural topography of the Camas Solar Project site and existing vegetation present a visual barrier for neighbors viewing the site from Tjossem Road. Along the northern boundary of Camas B, TUUSSO would plant a line of trees and/or shrubs up to 15 feet in height between Tjossem Road and the fence line, to provide neighbors a regionally appropriate visual barrier. Along the eastern boundary of the project site, the existing line of trees along Little Naneum Creek and Bull Ditch provides a visual barrier for other neighbors.

In the interior of the Camas Solar Project site, native plant species (e.g., bluegrass, fescue, and/or bentgrass) would be maintained beneath and around the arrays, mowed to a height of 12 inches or less. These plant species are indigenous to the area and have been recommended for use by BFI Native Seeds, to which TUUSSO was referred by WDFW. This seed mix would be carefully selected to provide low growth and low maintenance.

Drainage Design

Existing and proposed flows and volumes have been calculated for 2-, 10-, 25-, and 100-year storm events, and Standard Urban Stormwater Mitigation Plan (SUSMP) events to determine the quantity of stormwater to be retained on-site. Once constructed, the Camas Solar Project would not result in any significant change in surface hydrology on the site, nor runoff from the site. There would be less than 5% of impervious surface added, less than 100,000 square feet. Impervious areas would be associated with the limited all-weather access roads, the six inverter pads, piles for the solar panels and fencing, and a pad for the switchyard. Although the solar panels themselves are impermeable, they are small, disconnected from each other, and installed over the existing soil surface. Stormwater and snowmelt would drip from the panels and infiltrate the surface. Off-site flows have also been calculated and would bypass the site via the existing flow paths, which run throughout the site in poorly defined flow paths. The solar project has been laid out to minimize the area that would encroach into the flow paths.

In addition, as shown in Section 2.2.5.2, the Camas Solar Project has been laid out to avoid impacts to Little Naneum Creek, located along the eastern boundary of Camas A.

Current and Proposed Hydrology

Drainage on the Camas Solar Project site has been affected by development to the extent that natural watercourses no longer exist. Drainage in the area is subject to agricultural land and road infrastructure, with a network of canals, drains, and berms. Surface runoff on the solar site and vicinity drains locally northeast to the south on a gentle slope. An unnamed tributary makes up the southeastern boundary of the project site and appears to drain to the Yakima River via Wilson Creek. One other ditch crosses the project site's northeastern corner. Up-gradient drainage is largely controlled by agricultural development and channeled through other drains, canals, or creeks. Major roadways also border the project site and minimize or eliminate overland storm flows.

The Camas Solar Project site is located within the Upper Yakima subbasin of the Yakima groundwater basin. Basaltic rocks beneath most of the Yakima River basin are part of the larger Columbia River Basalt Group (CRBG). The CRBG comprises more than 300 individual basalt flows, and multiple aquifers reside within them (U.S. Bureau of Reclamation [Reclamation] 2012). Reported "depth to water" levels are as shallow as 10 feet near river valley bottoms, to more than 200 feet. Well yields are generally less than 100 gallons per minute. Groundwater flows in the basin converge toward the Yakima River, southwest of the project site.

Groundwater quality in the Yakima basin is generally good; most issues are related to the impacts of agricultural operations on drinking water wells (Reclamation 2012). Quality issues involve excess nitrate levels and bacterial contamination, particularly in the lower portions of the Yakima basin. There is a short

segment of the Yakima River mapped as impaired (U.S. Environmental Protection Agency [EPA] 2017). The impaired segment intersects with Wilson Creek, to which the Camas Solar Project's primary drainage is a tributary. There are also short impaired segments up-gradient of the project site, on Cooke Creek. These are located cross-gradient or up-gradient on different local drainage systems not connected to the site.

Well registry data (Washington State Department of Ecology [Ecology] 2017) identified no wells on the Camas Solar Project site. Two wells were located approximately 400 feet east of the project site. The wells had depths of 80 and 120 feet, but no depth to water or pump capacity was listed in the data files. Other wells in the vicinity had depths between 45 and 180 feet.

The layout for the Camas Solar Project has been designed to avoid impacts on Little Naneum Creek, and the facility incorporates a 40-foot setback from the edge of the creek for any electrical generation equipment. The layout has also been designed to avoid impacts to the existing drainage ditch and associated wetland along the western boundary of the project site, and the facility incorporates a 20-foot setback from the edge of the wetland to the electrical generation equipment. No inverters would be placed within the 100-year floodplain and very limited portions of the all-weather access road would cross the 100-year floodplain, resulting in minimal incremental impervious area within the flood zone.

2.3.3.2 Fumaria Solar Project Site

The proposed Fumaria Solar Project, a preliminary plan for which is provided in Figure 2.3-2, is a 4.99-MWac solar energy generation facility that would be located on Clarke Road, within a development envelope of approximately 35.24 acres. The setbacks to the fencing and to the electrical generating equipment follow Kittitas County guidelines and are depicted in Figure 2.3-2.

A total of approximately 18,000 PV panels would be arranged in approximately 250 rows, with center-to-center spacing of about 15 feet. The GCR is currently planned at approximately 33%. The final facility equipment numbers and locations would depend upon the results from technical studies (e.g., the Interconnection Facilities Study).

There would be approximately five inverter pads throughout the Fumaria Solar Project site, each of which would be approximately 15 by 30 feet and 1 to 2 feet thick, where the direct current from the arrays would be converted to alternating current and then transmitted by the electric grid. Each inverter pad would include one or two inverter enclosures and one AC transformer.

Aside from construction equipment traffic, there is little to no anticipated ground disturbance for the installation of the racking and solar modules on the Fumaria Solar Project site. The site has an overall grade change of less than 3% and is relatively flat, and the piles can be installed on the existing grades. There would be 5% or less of impervious surface added to the site, less than 100,000 square feet. Impervious areas would be associated with all-weather access roads running to the five inverter pads, piles for the solar panels and fencing, and a pad for the switchyard.

The only grading/earth moving expected on the Fumaria Solar Project site would be associated with grading/leveling required for the all-weather access roads; the small areas required for the concrete pads to support the inverters, transformers, and switch gear; and trenching for the DC and AC collection system. Other property improvements that would have only moderate impact/disturbance to in situ conditions would involve roadbed stabilization for the all-weather access roads.

Electrical Interconnection

The Fumaria Solar Project would be located in PSE's service territory, and would connect to the existing PSE distribution lines near PSE's Woldale Substation, located at the corner of McManamy Road and Interstate 97 (I-97). A roughly 2.6-mile generation tie line would run from the switchyard located near the southwestern corner of the project site to the adjacent PSE's Woldale Substation (see Section 2.2.5.2). The generation tie line would include up to 0.9 mile of new ROW, requiring new distribution poles and conductors or buried line (see Section 2.2.5.2). The remaining length would be installed along existing electric utility ROWs, and would include either mounting the new generation tie line on existing poles, or replacing the existing poles with new poles and placing the conductors on those new poles. The interconnection would comprise a line tap on the existing electrical 12.47-kV distribution circuit Woldale-15, feeding into PSE's Woldale Substation. TUUSSO expects to finalize its Interconnection Agreement for the solar project with PSE by December 2017.

The major elements of the preliminary interconnection design required for the Fumaria Solar Project are likely to include:

- Install relay improvements or modifications, circuit breakers, and a new single phase line potential transformer within the Woldale Substation.
- Install 2.6 miles of new generation tie line as described above, a gang operated switch, and cable terminations from the existing feeder adjacent to Woldale Substation to the customer POI.
- Install primary metering equipment at the project site.

Along those portions of the Fumaria Solar Project generation tie line within an existing utility ROW, sharing poles with that utility, the double-circuited poles would typically comprise pole classes H2 or H3, average spans of 250 feet between the poles, pole lengths of 60 to 65 feet (heights above ground of 50 to 55 feet), and groundline diameters of the poles between 16 and 24 inches. Along those portions of the generation tie line strung on new wood poles in a new ROW, the single-circuited poles would typically comprise pole classes 1 or 2, average spans of 300 to 350 feet between the poles, pole lengths of 40 to 45 feet (heights above ground of 30 to 40 feet), and groundline diameters of the poles between 16 and 20 inches.

Site Access

TUUSSO may incorporate one of two paths for accessing the Fumaria Solar Project site. The first potential site access would be provided from Clarke Road. This access route would use the existing 12-foot gravel and dirt road (up to the entry gates) to provide emergency access as well as access for maintenance and operation purposes. The second potential site access would be provided from Reecer Creek Road, as illustrated in Figure 2.3-2. This access route would utilize a new 12- to 20-foot-wide, approximately 0.5-mile-long gravel road up to entry gates on the east boundary of the project site, to provide emergency access as well as access for maintenance and operation purposes.

Fencing and Landscaping

The Fumaria Solar Project site would be secured using 6- to 8-foot-high, perimeter, chain-link fencing topped with razor wire surrounding the PV system and switchyard. The entrance gates for the project would be about 8 feet high and 12 feet wide to allow for fire department and maintenance access. All fencing would be placed at or above grade to ensure that drainage flows would be unobstructed.

The Fumaria Solar Project site is relatively isolated with few neighbors. Along the southern boundary of the project site, the existing line of trees provides a visual barrier for the project's neighbors located to the south, which would be further supplemented by an additional line of trees and/or shrubs up to 15 feet in

height along the eastern portion of the southern boundary (as shown in Figure 2.3-2), to provide neighbors a regionally appropriate visual barrier.

In the interior of the Fumaria Solar Project site, TUUSSO plans to leave the current vegetation cover in place, mowed to a height of 12 inches or less. Where ground is disturbed during construction, native plant species (e.g., bluegrass, fescue, and/or bentgrass) would be planted. These species are indigenous to the area and have been recommended for use by BFI Native Seeds, to which TUUSSO was referred by WDFW. This seed mix would be carefully selected to provide low growth and low maintenance.

Drainage Design

Existing and proposed flows and volumes on the Fumaria Solar Project site have been calculated for 2-, 10-, 25-, and 100-year storm events, and SUSMP events to determine the quantity of stormwater to be retained on-site. Once constructed, the project would not result in any significant change in surface hydrology on the site, nor runoff from the site. There would be less than 5% of impervious surface added to the site, less than 100,000 square feet. Impervious areas would be associated with the limited all-weather access roads, the five inverter pads, piles for the solar panels and fencing, and a pad for the switchyard. Although the solar panels themselves are impermeable, they are small, disconnected from each other, and would be installed over the existing soil surface. Stormwater and snowmelt would drip from the panels and infiltrate the surface. Off-site flows have also been calculated and would bypass the site via the existing flow paths, which run throughout the site in poorly defined flow paths. The solar project has been laid out to minimize the area that would encroach into the flow paths.

Current and Proposed Hydrology

Drainage on the Fumaria Solar Project site has been affected by agricultural use to the extent that there are no pre-development watercourses. Drainage in the local area is generally subject to agricultural land and road infrastructure, with a network of canals, drains, and berms. Surface runoff on the project site and vicinity drains locally southward on a gentle slope. Several ditches in the area appear to collect overland sheet flow. A network of ditches and canals drains water from and distributes water to agricultural fields. The nearest named natural drainage is Reecer Creek, which crosses Clarke Road from north to south; several other unnamed tributaries flow roughly parallel with Reecer Creek and most join Reecer Creek south of the project site. Up-gradient drainage is largely controlled by agricultural development and channeled through other drainages, canals, or local creeks.

The Fumaria Solar Project site is located within the Upper Yakima subbasin of the Yakima groundwater basin. Basaltic rocks beneath most of the Yakima River basin are part of the larger CRBG. The CRBG comprises more than 300 individual basalt flows, and multiple aquifers reside within them (Reclamation 2012). Reported “depth to water” levels are as shallow as 10 feet below ground surface (bgs) near river valley bottoms, to more than 200 feet bgs. Well yields are generally less than 100 gallons per minute. Groundwater flows in the basin converge toward the Yakima River, approximately 3 miles southwest of the project site.

Groundwater quality in the Yakima basin is generally good; most issues are related to the impacts of agricultural operations on drinking water wells (Reclamation 2012). Quality issues involve excess nitrate levels and bacterial contamination, particularly in the lower portions of the Yakima basin. There are no impaired reaches in, adjacent to, or up-gradient of the Fumaria Solar Project site (EPA 2017).

Well registry data (Ecology 2017) identified one well on the Fumaria Solar Project site (Well Log ID 339775), which had a recorded depth of 120 feet bgs. No depth to water or pump capacity data were available. Other wells within 1 mile of the project site had depths between 80 and 170 feet bgs.

The Fumaria Solar Project site layout has been designed to avoid impacts on Reecer Creek. The layout has also been designed to avoid impacts to the existing drainage ditch along the southwestern boundary of the project site, and the facility incorporates a 60-foot setback from the edge of the wetland passing along the western edge of the site to the electrical generation equipment.

2.3.3.3 Penstemon Solar Project Site

The proposed Penstemon Solar Project, a preliminary plan for which is provided in Figure 2.3-3, is a 4.99-MWac solar energy generation facility that would be located at the intersection of Moe and Tjossem Roads, within a development envelope of approximately 39.38 acres. As depicted in Figure 2.3-3, the proposed solar project array layout includes a 15-foot setback from the western site boundary to the electrical generation equipment, a 20-foot setback from the northern and southern boundaries to the electrical generation equipment, and a 60-plus-foot setback from the creek along the eastern boundary of the site to the electrical generation equipment.

A total of approximately 20,000 PV panels would be arranged in approximately 270 rows, with center-to-center spacing of about 15 feet. The GCR is currently planned at approximately 33%. The final facility equipment numbers and locations would depend upon the results from technical studies (e.g., the Interconnection Facilities Study).

There would be approximately five inverter pads throughout the Penstemon Solar Project site, each of which is approximately 15 by 30 feet and 1 to 2 feet thick, where the direct current from the arrays would be converted to alternating current and then transmitted by the electric grid. Each inverter pad would include one or two inverter enclosures and one AC transformer.

Aside from construction equipment traffic, there would be little to no anticipated ground disturbance for the installation of the racking and solar modules. The Penstemon Solar Project site has an overall grade change of less than 2% and is relatively flat, and the piles can be installed on the existing grades. There would be 5% or less of impervious surface added to the site, less than 100,000 square feet. Impervious areas would be associated with all-weather access roads running to the five inverter pads, piles for the solar panels and fencing, and a pad for the switchyard.

The only grading/earth moving expected on the Penstemon Solar Project site would be associated with grading/leveling as required for the all-weather access roads; the small areas required for the concrete pads to support the inverters, transformers, and switch gear; and trenching for the DC and AC collection system. Other property improvements that would have only moderate impact/disturbance to in situ conditions would involve roadbed stabilization for the all-weather access roads.

Electrical Interconnection

The Penstemon Solar Project would be located in PSE's service territory, and would connect to the existing PSE distribution transmission lines along Tjossem Road, on the northern boundary of the project site, where the switchyard would be located (as illustrated in Figure 2.3-3). The interconnection would comprise a line tap on the existing electrical 12.47-kV distribution circuit KIT-22, approximately 5.0 circuit miles from PSE's Kittitas Substation. TUUSSO expects to finalize its Interconnection Agreement for the solar project with PSE by December 2017.

The major elements of the preliminary interconnection design required for the Penstemon Solar Project include:

- Install relay improvements or modifications within the Kittitas Substation.
- Replace the 15-kV power circuit breaker within the Kittitas Substation with a new smart breaker.

- Install a new single phase line potential transformer (PT) within the Kittitas Substation.
- Install one span of feeder conductor, gang operated switch, underground cable terminations, and underground cable from the existing feeder along Tjossem Road to the customer POI.
- Install primary metering equipment at the project site.

The above described span of feeder conductor would connect the Penstemon Solar Project switchyard to the existing 12.47-kV distribution circuit. Typically, such conduit would be strung with two to three new monopoles (typically wood). A typical wood monopole would be 30 to 45 feet tall, set 6 to 8 feet deep in the ground, and be 8 to 16 inches in diameter.

Site Access

The single point of site access for the Penstemon Solar Project would be provided from Tjossem Road. The point of access would be a short paved or gravel driveway leading up to the entry gates from Tjossem Road, to provide emergency access as well as access for maintenance and operation purposes.

Fencing and Landscaping

The Penstemon Solar Project site would be secured using 6- to 8-foot-high, perimeter, chain-link fencing topped with razor wire surrounding the PV system and switchyard. The entrance gates for the project would be about 8 feet high, 12 feet wide, and would be set back from the edge of Tjossem Road, to allow for fire department and maintenance access without disrupting traffic flow. All fencing would be placed at or above grade to ensure that drainage flows would be unobstructed.

Along the northern boundary of the Penstemon Solar Project site, TUUSSO would plant a line of trees and/or shrubs up to 15 feet in height between Tjossem Road and the fence line, to provide neighbors a regionally appropriate visual barrier. Similarly, TUUSSO would plant a line of trees and/or shrubs up to 15 feet in height along the western boundary of the Penstemon Solar Project site. Along the eastern boundary of the project site, the existing line of trees along Coleman Creek provides a visual barrier for neighbors viewing the site from Moe Road.

In the interior of the Penstemon Solar Project site, native plant species (e.g., bluegrass, fescue, and/or bentgrass) would be maintained beneath and around the arrays, mowed to a height of 12 inches or less. These species are indigenous to the area and have been recommended for use by BFI Native Seeds, to which TUUSSO was referred by WDFW. This seed mix would be carefully selected to provide low growth and low maintenance.

Drainage Design

Existing and proposed flows and volumes for the Penstemon Solar Project have been calculated for 2-, 10-, 25-, and 100-year storm events, and SUSMP events to determine the quantity of stormwater to be retained on-site. Once constructed, the project would not result in any significant change in surface hydrology on the site, nor runoff from the site. There would be less than 5% of impervious surface added to the site, less than 100,000 square feet. Impervious areas would be associated with the limited all-weather access roads, the five inverter pads, piles for the solar panels and fencing, and a pad for the switchyard. Although the solar panels themselves are impermeable, they are small, disconnected from each other, and installed over the existing soil surface. Stormwater and snowmelt would drip from the panels and infiltrate the surface. Off-site flows have also been calculated and would bypass the site via the existing flow paths, which run throughout the site in poorly defined flow paths. The project has been laid out to minimize the area that would encroach into the flow paths.

In addition, as shown in Figure 2.3-3, the Penstemon Solar Project has been laid out to avoid impacts to Coleman Creek, located near the eastern boundary of the project, with an average distance of 115 feet from the electrical generating equipment to the edge of the creek.

Current and Proposed Hydrology

Drainage on the Penstemon Solar Project site has been affected by development, to the extent that natural watercourses no longer exist. Drainage in the area is subject to agricultural land and road infrastructure, with a network of canals, drains, and berms. Surface runoff on the project site travels toward the central drainage ditch, which flows south, then east to Coleman Creek. The greater vicinity appears to gently slope to the southwest. Coleman Creek connects with Wilson Creek and the Yakima River, within approximately 3 river miles of the project site. Up-gradient drainage is largely controlled by agricultural development and channeled through other drains, canals, or creeks. Roadways also border the project site and minimize or eliminate overland storm flows.

The Penstemon Solar Project would be located within the Upper Yakima sub-basin of the Yakima groundwater basin. Basaltic rocks beneath most of the Yakima River basin are part of the larger CRBG. The CRBG comprises more than 300 individual basalt flows, and multiple aquifers reside within them (Reclamation 2012). Reported “depth to water” levels are as shallow as 10 feet near river valley bottoms, to more than 200 feet. Well yields are generally less than 100 gallons per minute. Groundwater flows in the basin converge toward the Yakima River, southwest of the project site.

Groundwater quality in the Yakima basin is generally good; most issues are related to the impacts of agricultural operations on drinking water wells (Reclamation 2012). Quality issues involve excess nitrate levels and bacterial contamination, particularly in the lower portions of the Yakima basin. There is a short segment of the Yakima River mapped as impaired (EPA 2017). The impaired segment intersects with Wilson Creek, of which the Penstemon Solar Project’s primary drainage is a tributary. There are also short impaired segments up-gradient of the project site, on Cooke Creek. These are located cross-gradient or up-gradient on a different local drainage system not connected to the project site.

Well registry data (Ecology 2017) identified no wells on the Penstemon Solar Project site. Two wells were mapped approximately 700 feet east and north of the project site. The wells had depths of 125 to 150 feet bgs, but no depth to water or pump capacity was listed in the data files. Other wells within 1 mile of the project site had depths between 12 and 335 feet bgs.

The Penstemon Solar Project layout has been designed to avoid impacts on Coleman Creek, and the facility incorporates a greater than 100-foot average setback from the edge of the creek for any electrical generation equipment. No inverters would be placed within the 100-year floodplain and none of the all-weather access roads would be built within the 100-year floodplain, resulting in minimal incremental impervious area within the flood zone.

2.3.3.4 Typha Solar Project Site

The proposed Typha Solar Project, a preliminary plan for which is provided in Figure 2.3-4, is a 4.99-MWac solar energy generation facility that would be located off Thorp Highway South, within a development envelope of approximately 54.29 acres. The proposed array layout includes a greater than 100-foot setback from the Yakima River to any electrical generation equipment, a 30-foot setback from the wetlands located within the site to any electrical generation equipment, and other setbacks as shown in Figure 2.3-4.

A total of approximately 20,000 PV panels would be arranged in approximately 300 rows, with center-to-center spacing of about 15 feet. The GCR is currently planned at approximately 33%. The final facility

equipment numbers and locations would depend upon results from technical studies (e.g., the Interconnection Facilities Study).

There would be approximately five inverter pads throughout the Typha Solar Project site, each of which would be approximately 15 by 30 feet and 1 to 2 feet thick, where the direct current from the arrays would be converted to alternating current and then transmitted by the electric grid. Each inverter pad would include one or two inverter enclosures and one AC transformer.

Aside from construction equipment traffic, there would be little to no anticipated ground disturbance for the installation of the racking and solar modules. The Typha Solar Project site has an overall grade change of less than 1% and is relatively flat, and the piles can be installed on the existing grades. There would be 5% or less of impervious surface added to the site, less than 100,000 square feet. Impervious areas would be associated with all-weather access roads running to the five inverter pads, piles for the solar panels and fencing, and a pad for the switchyard.

The only grading/earth moving expected on the Typha Solar Project site would be associated with: 1) the improvement of the existing land bridge near the entrance to the site (e.g., by excavation of 8 to 12 inches of topsoil, placement of geotextile fabric in the excavation, and filling the excavation with quarry spalls) or construction of a small culvert at the location of the existing land bridge; 2) the filling of a small on-site watering pond; 3) grading/leveling as required for the all-weather access roads and the small areas required for the concrete pads to support the inverters, transformers, and switch gear; 4) trenching for the DC and AC collection system; and 5) improvement/widening of the existing gravel road leading from Thorp Highway South to the gated site entrance. Other property improvements that would have only moderate impact/disturbance to in situ conditions involve roadbed stabilization for the all-weather access road.

Electrical Interconnection

The Typha Solar Project would be located in PSE's service territory, and would connect to the existing PSE distribution transmission lines running along Thorp Highway South. A roughly 0.5-mile generation tie line would run from the switchyard located near the southwestern corner of the project site to Thorp Highway South (see Figure 2.3-4). The generation tie line would include a very short section of new ROW requiring new distribution wood poles and conductor, or buried line (see Figure 2.3-4). The remaining length would be installed along existing electric utility ROWs and would involve mounting the new generation tie line on existing wood poles, or replacing the existing poles with new poles and mounting the new generation tie line on those new poles. The interconnection would comprise a line tap on the existing electrical 12.47-kV distribution circuit Woldale-13, feeding into PSE's Woldale Substation. TUUSSO expects to finalize its Interconnection Agreement for the solar project with PSE by December 2017.

The major elements of the preliminary interconnection design required for the Typha Solar Project are likely to include:

- Install relay improvements or modifications, circuit breakers, and a new single phase line potential transformer within the Woldale Substation.
- Install 0.45 mile of new generation tie line, as described above, a gang operated switch, and cable terminations from the existing feeder along Thorp Highway South to the customer POI.
- Install primary metering equipment at the project site.

Along those portions of the Typha Solar Project generation tie line within an existing utility ROW, sharing poles with that utility, the double-circuited poles would typically comprise pole classes H2 or H3, average spans of 250 feet between the poles, pole lengths of 60 to 65 feet (heights above ground of 50 to 55 feet),

and groundline diameters of the poles between 16 and 24 inches. Along those portions of the generation tie line strung on new poles in a new ROW, the single-circuited poles would typically comprise pole classes 1 or 2, average spans of 300 to 350 feet between the poles, pole lengths of 40 or 45 feet (heights above ground of 30 to 40 feet), and groundline diameters of the poles between 16 and 20 inches.

Site Access

The single point of site access for the Typha Solar Project site would be provided from Thorp Highway South. This access route would use the existing 12-foot gravel and dirt road (up to the entry gates) to provide emergency access as well as access for maintenance and operations purposes. TUUSSO is in consultation with local fire authorities, and may widen the existing road to 20 feet based on the final requirements agreed upon in consultation with such authorities. An existing bridge along this road over the EP Canal would also need to be improved in one of three ways: 1) reinforce, improve, and/or replace existing bridge supports to accommodate the truck traffic to the project site; 2) completely remove and replace the existing bridge with a new bridge; or 3) install a temporary bridge over the existing bridge during the construction period to accommodate the heavy truck traffic.

Fencing and Landscaping

The Typha Solar Project site would be secured using 6- to 8-foot-high, perimeter, chain-link fencing topped with razor wire surrounding the PV system and switchyard. The entrance gates for the project would be about 8 feet high and 12 feet wide, to allow for fire department and maintenance access. All fencing would be placed at or above grade to ensure that drainage flows would be unobstructed.

The existing trees surrounding much of the Typha Solar Project site, as well as the topography of the site, provide a significant visual barrier for the project's neighbors. Along a portion of the eastern boundary of the project site closest to the nearby golf course, a line of trees and/or shrubs up to 15 feet in height would be planted to provide neighbors a regionally appropriate visual barrier.

In the interior of the Typha Solar Project site, native plant species (e.g., bluegrass, fescue, and/or bentgrass) would be maintained beneath and around the arrays, mowed to a height of 12 inches or less. These species are indigenous to the area and have been recommended for use by BFI Native Seeds, to which TUUSSO was referred by WDFW. This seed mix would be carefully selected to provide low growth and low maintenance.

Drainage Design

Existing and proposed flows and volumes on the Typha Solar Project site have been calculated for 2-, 10-, 25-, and 100-year storm events, and SUSMP events to determine the quantity of stormwater to be retained on-site. Once constructed, the project would not result in any significant change in surface hydrology on the site, nor runoff from the site. There would be less than 5% of impervious surface added to the site, less than 100,000 square feet. Impervious areas would be associated with the limited all-weather access roads, the five inverter pads, piles for the solar panels and fencing, and a pad for the switchyard. Although the solar panels themselves are impermeable, they are small, disconnected from each other, and installed over the existing soil surface. Stormwater and snowmelt would drip from the panels and infiltrate the surface. Off-site flows have also been calculated and would bypass the site via the existing flow paths, which run throughout the site in poorly defined flow paths. The project has been laid out to minimize the area that would encroach into the flow paths.

Current and Proposed Hydrology

Drainage on the Typha Solar Project site has been affected by agricultural use to the extent that pre-development watercourses do not exist. Drainage in the local area is generally subject to agricultural land

grading, with a network of canals, drains, and berms. Surface runoff on the project site and vicinity drains locally east and southeast along a gentle slope. The Yakima River abuts the project site's northeastern border. A ditch that wraps around the site's western and southern boundaries connects with other canals, which distribute or collect water to or from agricultural fields. This ditch later flows into the Yakima River. Up-gradient drainage is largely controlled by agricultural development and channeled through other drains, canals, or local creeks.

The Typha Solar Project site is located within the Upper Yakima subbasin of the Yakima groundwater basin. Basaltic rocks beneath most of the Yakima River basin are part of the larger CRBG. The CRBG comprises more than 300 individual basalt flows, and multiple aquifers reside within them (Reclamation 2012). Reported "depth to water" levels are as shallow as 10 feet near river valley bottoms, to more than 200 feet. Well yields are generally less than 100 gallons per minute. Groundwater flows in the basin converge toward the Yakima River, which directly abuts the project site.

Groundwater quality in the Yakima basin is generally good; most issues are related to the impacts of agricultural operations on drinking water wells (Reclamation 2012). Quality issues involve excess nitrate levels and bacterial contamination, particularly in the lower portions of the Yakima basin. There are no impaired reaches in, adjacent to, or up-gradient of the project site (EPA 2017).

Well registry data (Ecology 2017) identified one well on the Typha Solar Project site (Well Log ID 339775), which had a recorded depth of 120 feet bgs. No depth to water or pump capacity data were available. Other wells within 1 mile of the project site had recorded water depths between 80 and 170 feet bgs.

The Typha Solar Project layout has been designed to avoid impacts on the Yakima River, including a greater than 100-foot setback from the Yakima River to any electrical generation equipment, and a 30-foot setback from the wetlands located within the site to any electrical generation equipment. No inverters would be placed within the 100-year floodplain, and a limited portion of the all-weather access roads would be built within the 100-year floodplain, resulting in minimal incremental impervious area within the flood zone.

2.3.3.5 Urtica Solar Project Site

The proposed Urtica Solar Project, a preliminary plan for which is provided in Figure 2.3-5, is a 4.99-MWac solar energy generation facility that would be located near the intersection of Umptanum and Manastash Roads, within a development envelope of approximately 51.94 acres. The proposed array layout would include 40-foot setbacks from nearby wetlands to the electrical generation equipment, as depicted in Figure 2.3-5.

A total of approximately 20,000 PV panels would be arranged in approximately 320 rows on the Urtica Solar Project site, with center-to-center spacing of about 15 feet. The GCR is currently planned at approximately 33%. The final facility equipment locations would depend upon the results from the technical studies (e.g., the Interconnection Facilities Study).

There would be approximately five inverter pads throughout the Urtica Solar Project site, each of which would be approximately 15 by 30 feet and 1 to 2 feet thick, where the direct current from the arrays would be converted to alternating current and then transmitted by the electric grid. Each inverter pad would include one or two inverter enclosures and one AC transformer.

Aside from construction equipment traffic, there would be little to no anticipated ground disturbance for the installation of the racking and solar modules. The Urtica Solar Project site has an overall grade

change of less than 2% and is relatively flat, and the piles can be installed on the existing grades. There would be 5% or less of impervious surfaces added to the site, less than 100,000 square feet. Impervious areas would be associated with all-weather access roads running to the five inverter pads, piles for the solar panels and fencing, and a pad for the switchyard.

TUUSSO would use the existing 12-foot gravel/dirt road to access much of the Urtica Solar Project site. The only grading/earth moving expected would be associated with grading/leveling as required for new all-weather access roads running to the inverter pads; the small areas required for the concrete pads to support the inverters, transformers, and switch gear; and trenching for the DC and AC collection system. Other property improvements that would have only moderate impact/disturbance to in situ conditions would involve roadbed stabilization for the all-weather access roads.

Electrical Interconnection

The Urtica Solar Project would be located in PSE's service territory, and would connect to the existing PSE distribution transmission lines along Umptanum Road, on the eastern boundary of the project site, where the switchyard is located (as illustrated in Figure 2.3-5). The interconnection would comprise a line tap on the existing electrical 12.47-kV distribution circuit CLY-16, running from PSE's Clymer Substation. TUUSSO expects to finalize its Interconnection Agreement for the solar project with PSE by December 2017.

The major elements of the preliminary interconnection design required for the Urtica Solar Project include:

- Install relay improvements or modifications within the Clymer Substation.
- Replace the 15-kV power circuit breaker within the Clymer Substation with a new smart breaker.
- Install a new single phase line PT within the Clymer Substation.
- Install one span of feeder conductor, gang operated switch, underground cable terminations, and underground cable from the existing feeder along Umptanum Road to the customer POI.
- Install primary metering equipment at the project site.

The above described span of feeder conductor would connect from the Urtica Solar Project switchyard to the existing 12.47-kV distribution circuit. Typically, such conduit would be strung with two to three new monopoles (typically wood). A typical wood monopole would be 30 to 45 feet tall, set 6 to 8 feet deep in the ground, and be 8 to 16 inches in diameter.

Site Access

The single point of access to the Urtica Solar Project site would be provided from Umptanum Road. The point of access would be a short paved or gravel driveway leading up to the entry gates from Umptanum Road, to provide emergency access as well as access for maintenance and operation purposes.

Fencing and Landscaping

The Urtica Solar Project site would be secured using 6- to 8-foot-high, perimeter, chain-link fencing topped with razor wire surrounding the PV system and switchyard. The entrance gates for the project would be about 8 feet high, 12 feet wide, and would be set back from the edge of Umptanum Road, to allow for fire department and maintenance access without disrupting traffic flow. All fencing would be placed at or above grade to ensure that drainage flows would be unobstructed.

Along a portion of the eastern boundary of the Urtica Solar Project site, TUUSSO would plant a line of trees and/or shrubs up to 15 feet in height between Umptanum Road and the fence line, to provide neighbors a regionally appropriate visual barrier. Along a portion of the northern boundary of the project

site, TUUSSO would plant another line of trees and/or shrubs up to 15 feet in height outside of the fence line, to provide neighbors with another regionally appropriate visual barrier.

In the interior of the Urtica Solar Project site, native plant species (e.g., bluegrass, fescue, and/or bentgrass) would be maintained beneath and around the arrays, mowed to a height of 12 inches or less. These species are indigenous to the area and have been recommended for use by BFI Native Seeds, to which TUUSSO was referred by WDFW. This seed mix would be carefully selected to provide low growth and low maintenance.

Drainage Design

Existing and proposed flows and volumes on the Urtica Solar Project site have been calculated for 2-, 10-, 25-, and 100-year storm events, and SUSMP events to determine the quantity of stormwater to be retained on-site. Once constructed, the project would not result in any significant change in surface hydrology on the site, nor runoff from the site. There would be less than 5% of impervious surfaces added to the site, less than 100,000 square feet. Impervious areas would be associated with the limited all-weather access roads, the five inverter pads, piles for the solar panels and fencing, and a pad for the switchyard. Although the solar panels themselves are impermeable, they are small, disconnected from each other, and installed over the existing soil surface. Stormwater and snowmelt would drip from the panels and infiltrate the surface. Off-site flows have also been calculated and would bypass the site via the existing flow paths, which run throughout the site in poorly defined flow paths. The solar project has been laid out to minimize the area that would encroach into the flow paths.

In addition, as shown in Figure 2.3-5, the Urtica Solar Project has been laid out to avoid impacting the nearby ponds or the on-site ditch which flows through the northeastern portion of the property.

Current and Proposed Hydrology

Drainage on the Urtica Solar Project site has been affected by agricultural use to the extent that pre-development watercourses remain, but do not exist in their natural state. Drainage in the local area is generally subject to agricultural land grading, with a network of canals, drains, and berms. Surface runoff on the project site and vicinity drains locally east along a gentle slope to Fogarty Ditch and the Yakima River, which is located approximately 0.25 mile from the project site. Up-gradient drainage is also largely controlled by agricultural development and channeled through other drains, canals, or local creeks.

The Urtica Solar Project site would be located within the Upper Yakima subbasin of the Yakima groundwater basin. Basaltic rocks beneath most of the Yakima River basin are part of the larger CRBG. The CRBG comprises more than 300 individual basalt flows, and multiple aquifers reside within them (Reclamation 2012). Reported “depth to water” levels are as shallow as 10 feet near river valley bottoms, varying to more than 200 feet. Well yields are generally less than 100 gallons per minute. Groundwater flows in the basin converge toward the Yakima River, which directly abuts the project site.

Groundwater quality in the Yakima basin is generally good; most issues are related to the impacts of agricultural operations on drinking water wells (Reclamation 2012). Quality issues involve excess nitrate levels and bacterial contamination, particularly in the lower portions of the Yakima basin. There are no impaired reaches in, adjacent to, or up-gradient of the project site (EPA 2017).

Well registry data (Ecology 2017) identified one well on the project site (Well Log ID 339775), which had a recorded depth of 172 feet below bgs. No depth to water or pump capacity data were available. Other wells within 1 mile of the project site had depths between 15 and 290 feet bgs.

No inverters would be placed within the Urtica Solar Project site 100-year floodplain and limited portions of the all-weather access roads would be built within the 100-year floodplain, resulting in minimal incremental impervious area within the flood zone.

2.4 Energy Transmission Systems 463-60-155

The application shall identify the federal, state, and industry criteria used in the conceptual design, route selection, and construction for all facilities identified in RCW 80.50.020 (6) and (7), and shall indicate how such criteria are met.

Pursuant to RCW 80.50.020 (7), all on-site improvements to the five Columbia Solar Project sites are described in Section 2.3.

With respect to off-site improvements, of the five proposed TUUSSO Columbia Solar Project sites, only two would have off-site generation tie lines of significant length that tie into the PSE's distribution transmission line network, namely the Fumaria and Typha Solar Project sites, as described in Section 2.2.5.2. The design, route selection and construction of the generation tie lines have been selected to meet the following criteria: 1) safety; 2) minimal environmental impact by locating such lines, where possible, within existing distribution line corridors; 3) shortest possible route to proposed POI; 4) available access across landowners' properties; and 5) overall construction impacts.

2.5 Electrical Transmission Facilities 463-60-160

(1) Prior to submitting an application for site certification for an electric transmission facility under RCW 80.50.060(3) an applicant shall follow the procedure as set in chapter 463-61 WAC.

TUUSSO is not submitting an ASC for an electric transmission facility, and therefore this section is not applicable.

(2) An application for an electric transmission facility shall include the information required by this chapter unless the requirement may not be applicable to such a facility.

TUUSSO is not submitting an ASC for an electric transmission facility, and therefore this section is not applicable.

(3) An application for an electrical transmission facility shall include the results of any pre-application negotiations including any agreements between the applicant and cities, towns, or counties where the electrical transmission facility is proposed to be located.

TUUSSO is not submitting an ASC for an electric transmission facility, and therefore this section is not applicable.

2.6 Water Supply 463-60-165

(1) Water intake and conveyance facilities. The application shall describe the location and type of water intakes, water lines, pipelines and water conveyance systems, and other associated facilities required for providing water to the energy facility for which certification is being requested.

None of the five Columbia Solar Projects would require or use water intake or conveyance structures. If the projects use existing on-site water resources, they would be conveyed using existing piping systems or would be trucked from such systems.

(2) Water supply and usage alternatives.

(a) The applicant shall consider water supply alternatives, including use of reclaimed water, water reuse projects, and conservation methods. The application shall describe all supply alternatives considered, including the associated cost of implementing such alternatives, and the resulting benefits and penalties that would be incurred.

2.6.1 Construction Water Use

During construction, water would be used to suppress fugitive dust during grubbing, clearing, grading, trenching, and soil compaction. In addition, non-toxic soil binding agents may be employed to help with soil stabilization during construction.

Construction activities for the five proposed Columbia Solar Projects are conservatively estimated to generate an average water demand of 100,000 gallons per day. The daily water demand estimate assumes that on an average construction day, 20 acres of the solar project sites are in active construction, requiring 10 continuous hours of water using five water trucks, assuming 4,000-gallon-capacity trucks. Construction time for the Columbia Solar Projects would require approximately 6 months, or 156 work days (Monday to Saturday), to complete. Based upon these parameters, the construction water demand for the proposed Columbia Solar Projects is very conservatively estimated to total 15.6 million gallons, or 47.87 acre-feet (1 acre-foot is equal to 325,851 gallons), or approximately 10 acre-feet per project.

TUUSSO has considered a number of water supply alternatives for construction purposes. Each of the solar project sites, except for the Fumaria Solar Project site, has on-site existing water allocations that TUUSSO may be able to use during construction. TUUSSO has also explored the use of greywater sources (including those in the Kittitas Valley) for construction, as water for construction activities can be of non-potable quality. However, greywater availability is limited in Kittitas County. Finally, TUUSSO has discussed with the City of Ellensburg the availability of municipal water for construction purposes. Based on this array of possible water sources, TUUSSO intends to use either on-site water or trucked in water from municipal water sources for all projects except the Fumaria Solar Project, and intends to truck in water for the Fumaria Solar Project from a municipal water source.

TUUSSO would also incorporate water conservation methods wherever possible. For example, water would not be used for concrete hydration on-site because the concrete is expected to be delivered to the site already hydrated. Less water-intensive methods of dust suppression are also under review, including use of soil stabilizers, tightly phasing construction activities, staging grading and other dust-creating activities, and/or compressing the entire construction schedule to reduce the time period over which dust-suppression measures would be required.

2.6.2 Operational Water Use

On an ongoing basis, water would be used for cleaning PV panels and controlling dust (less than 1 acre-foot per year per project site). Water would also be necessary to establish the tree/shrub visual buffers along portions of the Columbia Solar Project sites, as described above, as well as the native plant species throughout the solar project sites. Project landscaping would consist of native and drought-

tolerant species. Once established, the species would not require ongoing irrigation. The irrigation needs for landscaping establishment are assumed to last for 3 consecutive years following installation.

Based on feedback from farmers familiar with growing conditions in Kittitas Valley (including landowners familiar with the conditions on the five Columbia Solar Project sites), assuming periodic irrigation for establishment purposes over a 3-year period, it is estimated that approximately 400 acre-feet of water per acre per year would be needed at a maximum over this period to ensure plant establishment on the solar project sites. These water needs are the same as the current water needs on the actively farmed project sites.

With respect to operational water supply, as with the construction water supply, TUUSSO has considered a number of alternatives. Each of the Columbia Solar Project sites, except for the Fumaria Solar Project site, has on-site existing water allocations that TUUSSO may be able to use during operation for irrigation purposes. Given the costs of trucking water from an external source to each of the sites, TUUSSO would likely only pursue such a water source for irrigation needs for the Fumaria Solar Project site. Given the limited water needed for cleaning PV panels, TUUSSO will likely truck in water from municipal water sources for all of the project sites for this purpose.

TUUSSO has incorporated water conservation methods into its operational water plan as well. Where feasible, TUUSSO would work with the current landowners to incorporate more efficient irrigation systems, such as drip lines, to water the trees and shrubs forming the visual buffers. TUUSSO has used native and drought-tolerant species to ensure that the landscaping can be established quickly with water needs similar to or below current water usage, and once established, would not require any further watering except in extreme drought conditions. TUUSSO would also investigate using sprinkler systems on the Columbia Solar Project sites to irrigate the native ground cover (instead of the current flood irrigation methods used on the solar project sites).

(b) The application shall include detailed information regarding using air cooling as an alternative to consumptive water use, including associated costs.

The five Columbia Solar Projects do not, by design, require consumptive water cooling. Thus, air cooling versus water cooling is not an issue for these facilities.

(c) The application shall describe water conservation methods that will be used during construction and operation of the facility.

During construction, TUUSSO would incorporate water conservation methods wherever possible. For example, water would not be used for concrete hydration on-site because the concrete is expected to be delivered to the site already hydrated. Less water-intensive methods of dust suppression are also under review, including use of soil stabilizers, tightly phasing construction activities, staging grading and other dust-creating activities, and/or compressing the entire construction schedule to reduce the time period over which dust-suppression measures would be required.

TUUSSO has incorporated water conservation methods into its operational water plan as well. Where feasible, TUUSSO would work with the current landowners to incorporate more efficient irrigation systems to water the trees and shrubs forming the visual buffers. TUUSSO has used native and drought tolerant species to ensure that the landscaping can be established quickly with minimal water needs, and once established, would not require any further watering except in extreme drought conditions. TUUSSO would also investigate using sprinkler systems on the Columbia Solar Project sites to irrigate the native ground cover (instead of the current flood irrigation methods used on the solar project sites).

(3) Water rights and authorizations. An applicant proposing to use surface or groundwater for the facility shall describe the source and the amount of water required during construction and operation of the energy facility and shall do one or more of the following:

As described above, TUUSSO is proposing to use water supplied under existing water allocations or from municipal water sources for all but the Fumaria Solar Project site (which is limited to water supplied from municipal water sources). For each of these sites, TUUSSO is conservatively estimating approximately 10 acre-feet would be needed for construction, and (with the exception of the Fumaria Solar Project site) based on very conservative water estimates, 20,000 acre-feet would be needed per site per year during the first 3 years of operation. After the initial 3 years of operation, TUUSSO would require less than 1 acre-foot of water per site per year.

(a) Submit a water use authorization or a contractual right to use water supplied by a municipal corporation or other water purveyor; or

TUUSSO is in the process of making a final determination between on-site existing water allocations and municipal water sources, and has not yet submitted any requests to municipal water sources.

(b) Submit a water right permit or water right certificate issued by the department of ecology for the proposed facility in an amount sufficient to meet the need of the facility. If the permit and/or certificate has been issued five years prior to the submittal date, the applicant shall provide evidence that the water right permit is in good standing, or that the certificate has not relinquished through nonuse; or

Not applicable.

(c) For applications for new surface or groundwater withdrawals, or applications for water right changes or transfers of existing rights or certificates for withdrawal, the applicant shall submit appropriate application(s) for such rights, certificates or changes in rights and certificates, to the department of ecology prior to submittal of the application for site certification to the council. The application for site certification shall include report(s) of examination, identifying the water rights, or water right changes, submitted to and under review by the department of ecology, the quantities of water in gallons per minute and acre feet per year that are eligible for change, together with any limitations on use, including time of year. The report(s) of examination shall also include comments by the Washington state department of fish and wildlife with respect to the proposed water right applications under review by the department of ecology.

Not applicable.

(d) Mitigation. The application shall contain a description of mitigation proposed for water supply, and shall include any and all mitigation required by the department of ecology pursuant to the review of water rights or certificates, or changes to water rights or certificates required in (c) of this subsection.

Not applicable.

2.7 System of Heat Dissipation 463-60-175

The application shall describe both the proposed and alternative systems for heat dissipation from the proposed facilities.

The five Columbia Solar Projects do not, by design, require cooling or heat dissipation. Thus, air cooling versus water cooling is not an issue for these facilities.

2.8 Characteristics of Aquatic Discharge Systems 463-60-185

(1) Where discharges into a watercourse are involved, the applicant shall identify outfall configurations including:

(a) Location(s) of water discharge pipeline or conveyance system, the outfall, and any associated dilution systems;

The five Columbia Solar Projects do not, by design, require aquatic discharge systems. Thus, this section does not apply to them.

(b) Average and maximum discharge rate;

The five Columbia Solar Projects do not, by design, require aquatic discharge systems. Thus, this section does not apply to them.

(c) Extent of the dilution zone if necessary;

The five Columbia Solar Projects do not, by design, require aquatic discharge systems. Thus, this section does not apply to them.

(d) Width of the receiving water body at the outfall location;

The five Columbia Solar Projects do not, by design, require aquatic discharge systems. Thus, this section does not apply to them.

(e) Dimension(s), and rated and maximum carrying capacity of the water discharge pipeline or conveyance system, the outfall structure and any associated dilution systems;

The five Columbia Solar Projects do not, by design, require aquatic discharge systems. Thus, this section does not apply to them.

(f) Depth and width of the receiving water body at the discharge point;

The five Columbia Solar Projects do not, by design, require aquatic discharge systems. Thus, this section does not apply to them.

(g) Average, minimum and maximum water velocity of the receiving water body at the discharge point, and the times when the maximum and minimum flows occur.

The five Columbia Solar Projects do not, by design, require aquatic discharge systems. Thus, this section does not apply to them.

(2) Where discharges are into a water-course via an existing discharge system for which certification is not being sought, the applicant shall also provide the following information:

(a) Ownership of the discharge conveyance system;

The five Columbia Solar Projects do not, by design, require aquatic discharge systems. Thus, this section does not apply to them.

(b) A description of, and the terms and duration contained in, the use agreement that allows the applicant to use the discharge conveyance system;

The five Columbia Solar Projects do not, by design, require aquatic discharge systems. Thus, this section does not apply to them.

(c) Identification of the party responsible for operation and maintenance of the discharge conveyance system;

The five Columbia Solar Projects do not, by design, require aquatic discharge systems. Thus, this section does not apply to them.

(d) NPDES or state wastewater discharge permit number for the existing system discharge;

The five Columbia Solar Projects do not, by design, require aquatic discharge systems. Thus, this section does not apply to them.

(e) Location of connection point into the existing discharge system;

The five Columbia Solar Projects do not, by design, require aquatic discharge systems. Thus, this section does not apply to them.

(f) Diameter and rated and maximum volume capacity of the wastewater line or conveyance system into which discharge is being proposed;

The five Columbia Solar Projects do not, by design, require aquatic discharge systems. Thus, this section does not apply to them.

(g) Existing, rated and maximum flow levels in the wastewater line or conveyance system into which the discharge is being proposed;

The five Columbia Solar Projects do not, by design, require aquatic discharge systems. Thus, this section does not apply to them.

(h) Where a discharge is proposed to a publicly owned treatment works, in addition to the items provided in subsections (1) and (2) of this section, the applicant shall provide an engineering analysis showing that the proposed discharge will not cause the waste treatment facility to exceed capacities or to violate its authorized discharge limits, including both the quality of the discharge and the volume of the discharge, or to violate the permits governing its operation.

The five Columbia Solar Projects do not, by design, require aquatic discharge systems. Thus, this section does not apply to them.

2.9 Wastewater Treatment 463-60-195

(1) The application shall describe each wastewater source associated with the facility and for each source, the applicability of all known, available, and reasonable methods of wastewater control and treatment to ensure it meets current waste discharge and water quality regulations.

The five Columbia Solar Projects do not, by design, require wastewater treatment systems. Thus, this section does not apply to them.

(2) Where wastewater control involves collection and retention for recycling and/or resource recovery, the applicant shall show in detail the methods selected, including at least the following information:

(a) Waste source(s);

The five Columbia Solar Projects do not, by design, require wastewater treatment systems. Thus, this section does not apply to them.

(b) Average and maximum daily amounts and composition of wastes;

The five Columbia Solar Projects do not, by design, require wastewater treatment systems. Thus, this section does not apply to them.

(c) The type of storage vessel and the storage capacity and duration; and

The five Columbia Solar Projects do not, by design, require wastewater treatment systems. Thus, this section does not apply to them.

(d) Any bypass or overflow facilities to the wastewater treatment system(s) or the receiving waters.

The five Columbia Solar Projects do not, by design, require wastewater treatment systems. Thus, this section does not apply to them.

(3) Where wastewaters are discharged into receiving waters, the applicant shall provide a detailed description of the proposed treatment system(s), including:

(a) Appropriate flow diagrams and tables showing the sources of all tributary waste streams:

The five Columbia Solar Projects do not, by design, require wastewater treatment systems. Thus, this section does not apply to them.

(b) Their average and maximum daily amounts and composition;

The five Columbia Solar Projects do not, by design, require wastewater treatment systems. Thus, this section does not apply to them.

(c) Individual treatment units and their design criteria;

The five Columbia Solar Projects do not, by design, require wastewater treatment systems. Thus, this section does not apply to them.

(d) Major piping (including all bypasses); and

The five Columbia Solar Projects do not, by design, require wastewater treatment systems. Thus, this section does not apply to them.

(e) Average and maximum daily amounts and composition of effluent(s).

The five Columbia Solar Projects do not, by design, require wastewater treatment systems. Thus, this section does not apply to them.

2.10 Spillage Prevention and Control 463-60-205

The application shall describe all spillage prevention and control measures to be employed regarding accidental and/or unauthorized discharges or emissions, relating such information to specific facilities, including but not limited to locations, amounts, storage duration, mode of handling, and transport. The application shall describe in general detail the content of a Construction Phase and an Operational Phase Spill Prevention, Control and Countermeasure Plan (chapter 40 C.F.R. Part 112 and Hazardous Waste Management Plan) that will be required prior to commencement of construction.

2.10.1 Construction Phase Spill Prevention, Control, and Countermeasure Plan

This section describes measures that would be taken to prevent and mitigate any accidental spills or discharges. A detailed construction Spill Prevention, Control, and Countermeasure (SPCC) Plan would be developed by TUUSSO's engineering, procurement, and construction (EPC) contractor and submitted to EFSEC for review prior to construction. EFSEC, as well as pertinent local emergency response organizations, where appropriate, would review and approve all plans before they are implemented. The plan would address prevention and clean-up of any potential spills from construction activities.

Petroleum fuels are the only potentially hazardous materials that would be used in any significant quantity during construction of the Columbia Solar Projects. Construction of the projects would require the use of diesel fuel for operating construction equipment and vehicles. Measures to prevent and contain any accidental spills resulting from this fuel storage and use are described in detail below in Construction Spill Prevention, below. Construction of the projects would not result in the generation of any hazardous wastes in quantities regulated by state or federal law.

2.10.1.1 Construction Spill Prevention

Fuel and lubricating oils from construction vehicles and equipment and, if the transformers used are not dry-type, then the mineral oil used to fill the transformers are the only potential sources for a spill. The EPC contractor would be responsible for training its personnel in spill prevention and control and, if an incident occurs, would be responsible for containment and cleanup.

2.10.1.2 Fuel Spill Prevention

During construction, the EPC contractor would utilize fuel trucks for refueling of construction vehicles, fuel storage tanks and equipment on site. The fuel trucks would be properly licensed and would incorporate

features in equipment and operation, such as automatic shut-off devices, to prevent accidental spills. Some construction vehicles, such as pickup trucks, would be fueled in town at gas stations. Any spills would be addressed in accordance with the Construction Spill Prevention Plan that would be developed by the EPC contractor and would be submitted to EFSEC for review and approval prior to construction.

Potential risks would be additionally mitigated by using dedicated fuel-delivery trucks driven by professional, appropriately licensed drivers and by ensuring adherence to site speed limits. No other equipment fueling plan is anticipated. A fuel tanker accident would trigger activation of the SPCC Plan. The SPCC Plan would include a description of procedures that would be followed in the event of a fuel tanker spill and would contain a list of equipment that would be on-site for spill response emergencies.

2.10.1.3 Lubricating Oils

Lubricating oils used during construction would mostly be contained in the vehicles and equipment for which they are used. Small quantities of lubricating oils may also be stored in appropriate containers at the construction staging area. The details of storage and containment of lubricating oils and other materials at the construction staging area would be addressed in the construction-phase SPCC Plan, which would be developed by the EPC contractor and submitted to EFSEC prior to construction for review and approval. Appropriate measures would be taken to ensure these materials are not spilled and that if a spill does occur, it is promptly cleaned up and reported to the proper agencies.

2.10.1.4 Transformer Mineral Oil

The pad-mounted transformers found throughout each of the five Columbia Solar Project sites would likely be filled with mineral oil at the factory and not at the site during construction. Appropriate measures would be taken to ensure these materials are not spilled and that if a spill does occur, it is promptly cleaned up and reported to the proper agencies.

2.10.2 Operational Phase Spill Prevention, Control, and Countermeasure Plan

An operational-phase SPCC Plan would be developed and submitted to EFSEC prior to the commencement of Columbia Solar Project operations. Operation of the projects would not require the storage or use of significant quantities of fuel or other materials that could cause a spill or other accidental release.

Columbia Solar Project operations would not require the use of a permanent fuel storage tank, as fuel use during operations is limited to maintenance vehicle fueling, which would be done at existing licensed gas stations in nearby communities. The potential for accidental spills during operations is minimal, as the sole source of potential spills on-site would be the small amounts of mineral oil contained within the pad-mounted transformers. The transformers are designed to meet stringent electrical industry standards, including containment tank welding and corrosion protection specifications.

2.11 Surface-Water Runoff 463-60-215

The application shall describe how surface-water runoff and erosion are to be controlled during construction and operation to assure compliance with state water quality standards. The application shall describe in general detail the content of the construction and operational storm water pollution prevention plans that will be prepared prior to commencement of construction and/or operation of the facility.

2.11.1 Short-term Construction

Construction of the five Columbia Solar Projects has the potential to generate water pollutants during the construction phase unless best management practices (BMPs) are implemented. Stormwater runoff from the solar project sites could contain pollutants such as soils and sediments that are released during grading activities, as well as chemical and petroleum-related pollutants due to spills or leaks from heavy equipment and machinery. Other common pollutants that may result from construction activities include solid or liquid chemical spills; concrete and related cutting or curing residues; wastes from paints, sealants, solvents, detergents, glues, acids, lime, plaster, and cleaning agents; and heavy metals from equipment.

Hazardous materials (such as fuels, solvents, and coatings, among others) associated with the Columbia Solar Project construction activities would be stored and used in accordance with the manufacturer's specifications and applicable hazardous material regulations. In addition, spill kits would be required for all construction equipment in order to immediately manage any spills from fueling or equipment breakdown. However, soil disturbances (from construction activities associated with the limited site grading, mounting of the solar panels, equipment installation, electrical conduit trenching, and scraping for the all-weather access roads) could cause soil erosion and the eventual release of sediment into stormwater runoff.

The National Pollutant Discharge Elimination System (NPDES) permit program was established to control water pollution by regulating point sources that discharge pollutants into "Waters of the U.S." Pursuant to Clean Water Act (CWA) Section 402(p), which requires regulations for permitting of certain stormwater discharges, Ecology has issued the statewide NPDES General Permit for Stormwater Discharges Associated with the Construction and Land Disturbance Activities.

Under this Construction General Permit, individual NPDES permits or Construction General Permit coverage must be obtained for discharges of stormwater from construction sites with a disturbed area of 1 or more acres, and those undertaking construction are required to either obtain individual NPDES permits for stormwater discharges or be covered by the Construction General Permit.

Coverage under the Construction General Permit is accomplished by completing and filing a Permit Registration Document (PRD) with Ecology prior to commencement of construction activities. The PRD consists of a Notice of Intent (NOI); a Risk Assessment; a site map; a Stormwater Pollution Prevention Plan (SWPPP); an annual fee; and a signed certification statement. The primary objective of the SWPPP is to identify, construct, implement, and maintain BMPs to reduce or eliminate pollutants in stormwater discharges and authorized non-stormwater discharges from the construction site during construction. Encompass Engineering & Surveying has prepared a preliminary SWPPP for the Columbia Solar Projects, but this has not yet been approved by Ecology. A copy of the preliminary SWPPP is included in the materials submitted with this ASC.

The preliminary SWPPP describes a number of BMPs to assure compliance with state water quality standards, including the following:

- Preserving natural vegetation.
- Establishing buffer zones to protect existing wetlands and to relieve potential downstream impacts.
- Providing a single, stabilized construction entrance to prevent soil and sediment from tracking off the site.
- Controlling flow rates leaving the site via full on-site dispersion.

- Installing a silt fence at all areas downslope of disturbed areas, and upslope of existing waterbodies.
- Stabilizing soils when necessary, including the use of plastic covering to protect soil stockpiles.
- If necessary, utilizing a wheel wash at the site exit if sediment may be tracked off-site.

The installed BMPs would be visually monitored at least once per week, and within 24 hours of any stormwater or non-stormwater discharge from the site. Turbidity sampling would also be required at least once per week as applicable to ensure that the Columbia Solar Projects do not exceed 25 nephelometric turbidity units and a transparency of less than 33 cm.

Obtaining coverage under, and ensuring compliance with, the Construction General Permit requirements (including implementation of appropriate BMPs and consistent record keeping of the SWPPP) would ensure that temporary water quality impacts associated with construction activities would not cause any significant downstream or off-site impacts.

2.11.2 Long-term Operation

Operation of the five proposed Columbia Solar Projects would include infrequent site visits for inspection and maintenance. Maintenance activities would include washing the PV panels to remove accumulated airborne dust and debris using a truck with a water tank and sprayer, and mowing or otherwise managing the native vegetation to maintain buffers around the site and vegetation height within the site. Panel washing would occur between one and four times per year, depending on the accumulation of dust on the surfaces of the panels, and vegetation management would occur at a similar frequency based on rainfall and yearly plant growth.

Table 2.11-1 presents a summary of typical pollutants associated with commercial developments and their likelihood of being generated at the project site. As shown, due to annual maintenance activities, pollutants such as pesticides, trash, and oil/grease are anticipated to be generated from project implementation. However, because the project site would be an unmanned site and would only be subject to maintenance a couple of times per year, the potential for pollutants would be greatly reduced when compared to a typical commercial or industrial land use.

As shown in Table 2.11-1, no Columbia Solar Projects–generated pollutants are expected to impact downstream receiving waters, and project flows would not discharge to any receiving waterbody that is listed for water quality impairment.

As the five Columbia Solar Projects would not generate any pollutants of concern, impacts would be less than significant. However, BMPs are incorporated into the project to address water quality impacts on site and at downstream receiving waters. The five proposed solar projects would include vegetation throughout the sites such that full dispersion and infiltration would treat and control the runoff for the area within the panel arrays.

Other water quality BMPs include: 1) protecting slopes and channels through the preservation of existing site drainage patterns; 2) the absence of chemical storage and pollution generating surfaces on-site; 3) maintaining BMPs regularly, including annual inspections of the entire site and maintenance of inspection records; 4) regular maintenance of any bare soil or gravel surfaces, such as the all-weather access roads, to ensure that they are properly stabilized; and 5) training for Columbia Solar Projects operators and contractors, and the provision of educational materials for project personnel, regarding housekeeping practices that prevent pollutant loading in on-site runoff and BMP maintenance.

Table 2.11-1. Potential Columbia Solar Project Pollutants

Associated Project Pollutants			Is a Pollutant?	
Pollutants	**Status**	**Notes**	**303(d) listed***	**Total Maximum Daily Load**
Sediment/Turbidity	Potential	Open areas	No	No
Nutrients	Potential	Open areas	No	No
Organic Compounds	Expected	Pesticides and hydrocarbons	No	No
Trash and Debris	Potential	Windblown litter	No	No
Oxygen Demanding Substances	Potential	Open areas	No	No
Bacteria and Viruses	No	No paved parking areas	No	No
Oil and Grease	Potential	Petroleum hydrocarbons	No	No
Pesticides	Potential	Open areas	No	No
Metals	No	Materials at the site are designed to be exposed to the elements	No	No

*Under Section 303(d) of the Clean Water Act, states are required to develop lists of impaired waters. These are waters that are too polluted or otherwise degraded to meet the water quality standards set by states, territories, or authorized Tribes. The law requires that states establish priority rankings for waters on the lists and calculate the Total Maximum Daily Load (TMDL) for these waters. A TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still safely meet water quality standards.

Further, any cleaning agents or additives used to clean the PV panels would be biodegradable, non-toxic, and non-hazardous to plants, animals, and groundwater. Therefore, the use of water to clean the PV panels would have a less than significant impact on surface water and groundwater quality.

2.12 Emission Control 463-60-225

(1) The application shall describe and quantify all construction and operational air emissions subject to regulation by local, state or federal agencies.

Construction emissions for each of the proposed Solar Projects have been quantified and shown in Section 3.2.6.1 of this application. The proposed Columbia Solar Projects are PV facilities and would not be a source of any air emissions during operation.

(2) The application shall identify all construction and operational air emissions that are exempt from local, state and federal regulation, and the regulatory basis for the exemption.

Per WAC 173-400-110 a notice of construction application must be submitted for new and stationary sources of air emissions. WAC 173-400-110(4) exempts certain emission units and activities from new source review and the filing of a notice of construction application. Construction activities that do not result in new or modified stationary sources or portable stationary sources are one of the exemptions (WAC 173-400-110[4][x]). The five proposed Columbia Solar Projects would only have minimal dust and vehicular air emissions during construction, and no air emissions during operation. Thus, the Columbia Solar Projects would not result in new sources of air emissions. Per WAC 173-400-110(4)(x), the

Columbia Solar Projects are exempt from new source review and filing a notice of construction application.

Once operational, the five proposed Columbia Solar Projects would not be a source of air emissions. Therefore, the projects would not be subject to air emission regulations. There would not be any applicable air emission regulations to be exempted from.

(3) The applicant shall demonstrate that the highest and best practicable treatment for control of emissions will be utilized in facility construction and operation.

Once operational, the five proposed Columbia Solar Projects would not be a source of air emissions. Construction emissions would be temporary and transient in nature. Dust from access roads would be controlled by applying gravel or watering, as necessary.

(4) The application shall identify all state and federal air emission permits that would be required after approval of the site certification agreement by the governor, and the timeline for submittal of the appropriate applications for such permits.

The five proposed Columbia Solar Projects would be PV facilities and would not be a source of air emissions. No further air emission permits would be required for the Columbia Solar Projects after approval of the site certification agreement.

(5) In the case of fossil-fuel fired energy plants, the application shall describe and quantify all emissions of greenhouse gases.

Because TUUSSO is proposing the five Columbia Solar Projects, and not a fossil-fueled plant, this requirement does not apply.

(6) In the case of a nuclear-fueled plant, the applicant shall address optional plant designs as these may relate to gaseous emissions.

Because TUUSSO is proposing the five Columbia Solar Projects, and not a nuclear-fueled plant, this requirement does not apply.

2.13 Carbon Dioxide Mitigation 463-60-230

For thermal electric energy facilities, the application shall include a carbon dioxide mitigation plan and information required by chapter 463-80 WAC.

Because TUUSSO is proposing the five Columbia Solar Projects, which are PV facilities without carbon dioxide emissions, not thermal electric energy facilities, WAC 463-80 does not apply to the proposed projects. The Columbia Solar Projects would not be a source of carbon dioxide (CO_2) emissions and thus would not have any CO_2 emissions to mitigate.

2.14 Greenhouse Gases Emissions Performance Standards 463-60-232

For baseload electric generating facilities, the application shall provide information required by, and describe how the requirements of chapter 463-85 WAC will be met.

As these five Columbia Solar Projects are PV facilities, not baseload electric generating facilities, WAC 463-85 is not applicable to the projects. The operation of Columbia Solar Projects would not emit any

greenhouse gases. However, it is notable that the implementation of the projects would result in a net regional and global reduction of greenhouse gas (GHG) emissions compared with the existing conditions.

2.15 Construction and Operation Activities 463-60-235

The application shall: Provide the proposed construction schedule, identify the major milestones, and describe activity levels versus time in terms of craft and noncraft employment; and describe the proposed operational employment levels.

2.15.1 *Project Phases and Schedule*

Construction of the five Columbia Solar Projects is anticipated to commence in second quarter 2018 and would require approximately 6 to 9 months to complete. For each project, approximately 3 months of actual construction time would be needed. However, when possible, specialized work crews would be moved from site to site to efficiently move through and manage the phases of construction on each project. Table 2.15-1 provides the proposed schedule for the projects' construction. While the schedule may be modified due to the date of EFSEC's approval as well as other approvals/permits, this table illustrates the approximate duration of major project activities. Construction activities would occur between the hours of 7:00 a.m. and 10:00 p.m., Monday through Saturday.

Table 2.15-1. Columbia Solar Projects Construction Schedule

Project Activity	Schedule
Approval of all other required non-discretionary permits	1st quarter 2018
Approval of all administrative permits	1st quarter 2018
Approved Site Certification Agreements	March 2018
Construction begins	2nd quarter 2018
Completion of construction	4th quarter 2018
Projects operational	4th quarter 2018

Project construction would include several phases occurring simultaneously across the five Columbia Solar Project sites, including:

1. the grading and construction of a temporary gravel construction entrance/exit at the entry gates of each site;
2. the installation of silt fencing;
3. the pile driving of piers or posts, and the placement of trackers on support piers;
4. the trenching and installation of the DC and AC collection system, including the installation of the inverter enclosures;
5. the installation of the PV panels;
6. the construction of electrical interconnection facilities, including the construction of the interconnection and generation tie lines;
7. the mowing, application of herbicide treatment, discing/tilling, and planting of native plant species on the sites, as well as the planting of landscaping species (e.g., trees and bushes along certain boundaries of the sites); and

8. the grading, compaction, and placement of gravel (as necessary) for all-weather access roads.

2.15.2 *Construction Workforce and Workspace*

Construction of the five Columbia Solar Projects would employ up to 100 workers per day during the peak construction period, with roughly 80% non-craft laborers and 20% craft mix laborers. Based on prior experience, approximately 80% of the workers would be local hires. For each site, the projects would host up to 50 workers per day during the peak construction period.

Vehicular trip generation for employees and delivery trucks would vary depending on the phase of construction. It is estimated that a total of approximately 1,500 trips would be made to each site during the 3-month construction period, with conservatively 25% of those trips made by heavy trucks. Thus, on average, approximately 25 trips per site per day would be generated during construction. During the peak of construction, a typical day would include the transportation of workers, movement of heavy equipment, and transportation of materials.

Construction staging and material lay-down areas would be set up for each section of each Columbia Solar Project site, to allow for efficient distribution of components to different parts of each project site. These lay-down areas would be temporarily fenced and would cover approximately 1.5 acres each within the project boundaries.

2.15.3 *Site Preparation and Grading Activities*

Construction of the five Columbia Solar Projects would involve:

- limited clearing and grubbing of the existing vegetation for construction;
- limited grading, if necessary, for the construction of all-weather access roads and the installation and operation of the PV system;
- trenching for the electrical DC and AC collection system, including the telecommunication lines;
- installation of the inverter enclosures and associated transformers;
- construction of an underground 12.47-kV line for each collection system leading to each project switchyard;
- installation of the interconnection equipment; and
- for the Typha and Fumaria Solar Projects, installation of the generation tie lines.

It is anticipated that there would be no import or export of soils for the projects. To prepare each of the five Columbia Solar Project sites, temporary gravel construction entrance/exits at the entry gates of each site would be constructed, and silt fencing would be installed (as illustrated in the respective site layouts).

During construction, water would be used to suppress fugitive dust during grubbing, clearing, grading, trenching, and soil compaction. In addition, non-toxic soil binding agents may be employed to help with soil stabilization during construction. Water may be trucked in from municipal water sources or may be supplied on-site based on existing water allocations.

2.15.4 Ongoing Operations and Maintenance

2.15.4.1 Operations Workforce

The workforce performing ongoing O&M would be relatively small and would typically be off-site. The workforce would consist of general labor for cleaning purposes, skilled electricians for visual inspections and performance testing, and skilled mechanics to inspect and maintain the mechanical portions of the

tracking system. Because the facilities would be monitored remotely in real time, as described in detail below, it is anticipated that four to five O&M personnel would make roughly two to three visits per year to each of the five Columbia Solar Project sites to conduct the on-site O&M functions.

Other than O&M, general landscape labor would perform vegetation maintenance based on the weather and vegetation growth, to maintain ground cover and remove unwanted vegetation.

Skilled O&M personnel would review the information provided by the SCADA system. In addition, if a fault or an error occurs, an automatically generated email would be sent to monitoring personnel to alert them. The monitoring personnel would assess the fault or error information to determine what corrective actions would be needed. In most cases with PV systems, the fault is auto-correctable and does not require reactive repair at the site.

2.15.4.2 Facility Maintenance

PV facilities contain very few moving parts and have limited ongoing maintenance requirements. Maintenance activities would consist of checking electrical performance parameters via remote monitoring, performing periodic inspections and maintenance of transformers and inverters, responding to any problems detected by remote monitoring, conducting weed abatement, mowing vegetation cover, performing dust control activities, cleaning PV panels, and maintaining all-weather access roads. Water would be used for cleaning PV panels and controlling dust as well as to establish landscaping (both for the trees and shrubs, forming a visual buffer along the boundaries of some of the sites, and the native vegetation cover) during the first 3 years, but no water would be used by the facility for the production of electricity. No major equipment is anticipated to be required for maintenance of the facility except as necessary for maintenance of the all-weather access roads.

2.15.4.3 Site Security

Site security could be provided by fencing, monitoring cameras, and security staff, who may periodically drive along the site perimeter security fence. As mentioned above, lighting would also be installed around the perimeter of each of the five Columbia Solar Project sites to deter criminal activities.

2.15.4.4 Dust Control

The facilities would be constructed within the existing contours and topography of the land. For those limited areas that are cleared and grubbed, water trucks would be employed to keep dust to a minimum. As the roads are compacted for construction, soil binding agents and/or aggregate would be laid down to control the dust. After construction is complete, interior roads other than the all-weather access roads would be plowed and re-seeded with a native, low-lying seed mix that requires little maintenance and would help control dust.

2.16 Construction Management 463-60-245

The application shall describe the organizational structure including the management of project quality and environmental functions.

For the construction of the five proposed Columbia Solar Projects TUUSSO plans to utilize a standard turnkey EPC contract structure, which would cover construction of all generating facilities and any necessary civil infrastructure and interconnection such as the all-weather access roads, project switchyards, etc. TUUSSO or the primary financial sponsor would act as the owner in the EPC contract, with construction oversight responsibilities. As part of the EPC contract, the contractor would be required

to design and implement a safety plan, a quality assurance/quality control (QA/QC) plan, and an environmental protection plan, including a SWPPP and any erosion control measures.

2.16.1 Construction Management and Organizational Structure

The detailed Columbia Solar Projects management organizational structure would be decided by the final EPC contractor, but would typically include three primary management structures on the contractor side: management of engineering and design, management of supply chain and logistics, and construction project management (Figure 2.16.-1).

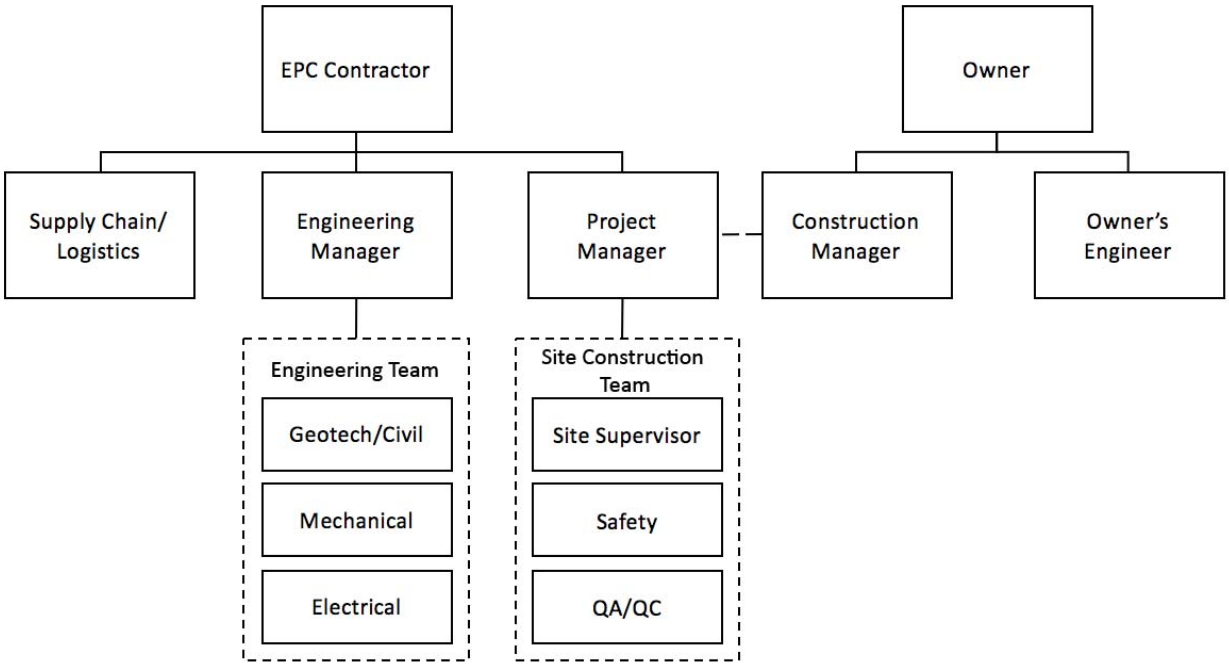


Figure 2.16-1. Columbia Solar Projects management structures.

The engineering and design team is responsible for selecting the generating equipment, the detailed plant design, and construction specifications for QA/QC of the various portions of the Columbia Solar Projects. The engineering team, in conjunction with the supply chain team, would review proposals from multiple suppliers for key equipment such as panels, trackers, and inverters to ensure that the equipment selected is best suited for the site and project performance goals. The engineering team also would ensure that the detailed design would meet the required codes and standards applicable to each project.

The supply chain team would ensure that the procurement and delivery of key generating equipment and construction equipment to each project site are on time and within the project budget.

Finally, the project manager would be responsible for planning and executing all aspects of field activities, including scheduling and staffing of site work, safety, and field QA/QC. The project manager would also be responsible for specification and procurement of any construction equipment required on-site. As part of their overall responsibilities, the project manager would manage any required construction subcontractors including civil subcontractors involved in site preparation, interior roads, and post installation; any mechanical subcontractors working on trackers and other moving parts; and any

electrical subcontractors required for the DC/AC installation and commissioning. The project manager would be assisted by a site supervisor or foreman, a safety manager, and a QA/QC team that would work together to ensure that the work is performed safely to the design specifications and conforms to best industry practices.

On the owner's side, the construction manager would act as the primary liaison with the EPC project manager to ensure schedule and other performance metrics meet targets. The construction manager would be assisted by the owner's engineer, who would provide independent verification in conjunction with the Columbia Solar Projects' field QA/QC team.

While this organizational structure represents a typical structure for solar power plant construction, the exact organization may change after award of the EPC contract and other subcontracts.

2.16.2 Quality Assurance/Quality Control

A QA/QC Plan would be implemented and maintained during the duration of the five Columbia Solar Projects, to ensure that the construction and commissioning of each plant is completed as specified. QA/QC inspections would typically include, but not be limited to, the following checks and review:

Supplier QA/QC

- Review and inspection of third party test verification reports for panels and inverters
- Review and inspection of manufacturer's QA/QC procedures for International Organization for Standardization (ISO) compliance
- Review of logistics procedures and handling

Field QA/QC

- Review of equipment and material delivery acceptance inspection procedures
- Inspection of post galvanization finishing and protection
- Overall visual inspection (including assembly, fastening systems, and any welding)
- Field verification of road locations compared to site plan and survey markings
- Review of clearing and grubbing and compaction process
- Verification of road materials and compaction
- Field verification of concrete pouring and concrete testing
- Field verification of post locations and heights compared to site plan and relative to survey markings
- Verification of all mechanical assembly work for trackers and racking
- Verification of field wiring and tagging
- Inspection of cables and trenches prior to burial and backfilling
- Witness of proper backfilling procedures
- Inspection of terminations and termination hardware
- Verification of polarity, cable marking, grounding system tests
- Witness and/or review of all electrical tests

Safety QA/QC

- Review of safety procedures
- Observation and attendance of safety training for supervisors and field staff including daily safety debriefings
- Review of construction safety techniques and implementation

The owner's engineer would work directly with the QA/QC team on site to ensure that the QA/QC plan is implemented and maintained satisfactorily.

2.16.3 Environmental Protection

An Environmental Protection and Compliance Program would be developed by the EPC contractors to ensure that all construction activities meet the conditions, limits, and specifications set in environmental standards established in the Site Certification Agreement and all other federal, state and local environmental regulations. The Environmental Protection and Compliance Program would cover avoidance of wetlands, and any other sensitive areas during construction, waste handling and storage, stormwater management, spill prevention and control, and other components required by state and county regulation. Copies of the plan and all applicable construction permits would be kept on-site. The project manager would be responsible for ensuring that all the requirements in the Environmental Protection and Compliance Plan and the construction permits are adhered to, and that any deficiencies are promptly corrected.

2.17 Construction Methodology 463-60-255

The application shall describe in detail the construction procedures, including major equipment, proposed for any construction activity within watercourses, wetlands and other sensitive areas.

Table 2.17-1 lists the typical construction equipment commonly associated with the construction of solar facilities.

Table 2.17-1. Construction Equipment

Type of Equipment	Construction Use
Heavy Vehicles	
Boom Truck/Truck Mounted Crane	Moving materials
Bore/Drill Rigs	Drilling holes into the ground
Concrete Mixing Trucks	Delivering concrete used for any slabs and foundations
Dump Trucks	Delivering and spreading aggregates
Excavators	Trenching and foundations
Graders	Access road and driveway leveling
Paving Equipment	Paving, if required
Pile/Vibratory Drivers	Driving structure posts
Rollers	Compacting access roads and driveways
Semi-Tractor Trailers	Moving materials and equipment
Non-heavy Vehicles	
Forklifts	Moving materials, loading and unloading of trucks
Personnel transport vehicles	Transporting workers
Other Material Handling Equipment	Moving materials
Service Trucks	Maintaining heavy equipment
Skid Steer Loaders	Light soil work for slabs and foundations
Sweepers/Scrubbers	Dust control on paved areas
Tractors/Loaders/Backhoes	Clearing and grubbing and moving soil
Trenchers	Light trench work
Water Trucks	Dust control

Type of Equipment	Construction Use
Other Equipment	
Disposal Containers	Disposing of and removing construction debris
Other General Industrial Equipment	Assembling structures
Plate Compactors/Jumping Jacks	Compacting soil under concrete slabs and foundations
Pressure Washers	Cleaning
Storage Containers	Storing on-site materials
Welders	Assembling structures

Construction of each project would be undertaken in accordance with all state and local authority having jurisdiction (AHJ) requirements and civil, electrical, mechanical codes and standards as applicable. Construction procedures would utilize industry best practices for low-impact construction and would be carried out in conjunction with a safety plan, a QA/QC plan, and a comprehensive environmental protection plan, as described in Section 2.16.3. The major steps in construction and associated procedures are outlined in the following sections.

2.17.1 Pre-construction and Site Preparation Including Revegetation Activities

Prior to start of construction, pre-construction activities would be undertaken, including detailed project management and scheduling, crew sizing, and recruitment plans, construction equipment procurement, in parallel with administrative permitting. Following administrative permits, preliminary site preparation activities would also be completed at that time. This would include any utility locates, demarcation of staging areas, local temporary construction office installation, and commencement of site revegetation activities in accordance with the Revegetation Plan. The site would be mowed, grubbed as necessary, and any weed control measures would be started at that time.

2.17.2 Grade and Install Construction Entrance and Fencing

The sites for the five Columbia Solar Projects are relatively flat, and there are no grades within the design areas that exceed solar racking longitudinal or cross-slope mechanical tolerances. In addition, the existing hydrological flows on-site would not be altered for any drainage or stormwater management, and as a result, overall grading would be restricted to that which may be required for the site entrance and all-weather access roads. Motor graders with typical blade lengths of 12 feet would be used to level the entrance area off the roadway, as per the design, and maintain the slope within design parameters. The entrance area soil would be stabilized, including potential use of binders, geotextiles, and mats, overlaid with aggregate and compacted using equipment such as vibratory rollers and soil compactors. Native soils would be utilized for the minimal fill that may be required, and no export of topsoil is anticipated. Fencing would be installed around the perimeter of the sites, as per the design for each project.

At that time, the temporary laydown area would also be demarcated, grubbed, and stabilized with erosion control measures as necessary.

2.17.3 Install SWPPP Measures Including Perimeter Protection

Interior perimeter protection (including silt fencing, sandbags, straw bales or other BMPs) would then be installed as per the SWPPP and Temporary Erosion and Sediment Control (TESC) Plan. Any existing storm drains and culverts would be inspected for clear flows and brought up to maintenance standards.

2.17.4 Install Interior All-weather Access Roads

Interior all-weather access roads would be located and demarcated, as per the design, utilizing standard surveying equipment. The road areas would be graded using a motor grader or similar, then stabilized and compacted using vibratory rollers and plate compactors. If necessary, these all-weather access roads might be overlaid with aggregate and then compacted. No export of topsoil is anticipated, as per the design.

2.17.5 Layout Arrays, Combiner Box, Trenching, and Inverter Locations

Pier locations would be identified and demarcated using string lines, as per the array design, using standard laser surveying equipment and site boundary survey reference points. Pier locations are further identified as corners, motor mounts, and interior piers as per the design, as these are structurally distinct from each other. At this time, the detailed DC collection system path, combiner box locations, inverter pad locations, AC collection system routing, and interconnection point would be established and demarcated. Inverter locations include the appropriate clearances and setbacks that provide for safety as per code and provide for adequate inverter pad access during installation and maintenance.

2.17.6 Install Piles

Using flatbed trucks, boom trucks, and forklifts, the wide-channel, galvanized-steel piles for the arrays would be transported to the pier locations and laid out for the civil crew who would drive them into the ground to support the trackers. Using laser beacons and global positioning system (GPS)-enabled vibratory pile drivers in conjunction with previously demarcated pier locations, piles would be driven into the ground within mechanical tolerance requirements. The pile drivers are specifically designed for solar array construction and consist of a high frequency vibratory hammer that operates at around 1,500 beats per minute, with plumb line and pile height controls. Typically, a crew of two to three people operate a single pile driver, driving in a post every 1 to 2 minutes with 3- to 5-minute transitions between locations. Grounding of panels is achieved through the piles via the tracking mechanism.

2.17.7 Install Trackers

The parts for the tracker cross-beams, which support the panels and are also referred to as the torque tubes, would be transported to the array locations by flatbed trucks, boom trucks, and forklifts. These torque tube sub-assemblies would be lifted onto the installed supporting piles and connected to the piles using bracket-mounted bearings, torsional limiters, and tracking actuators, which consist of DC motors with slew gear assemblies. Trackers would typically then be field assembled by three- to five-person crews utilizing specialty tools, allowing for rapid installation. The wireless mesh tracker control systems would then be installed at the center drive posts, with an ability to measure inclination and use that to control position in accordance with tracking algorithms.

2.17.8 Install Panels and Complete Racking

Galvanized steel and aluminum tubes and purlins are used for attaching the modules to trackers. These components would be transported to the assembled trackers, and attached using bolts and specifically designed brackets. Modules would then be transported to the trackers for installation on the purlins and mounting rails. Modules are attached to the rails and purlins using specialized fasteners and clamps, such as pressure mounting clips, that also provide ability for grounding. The modules typically have junction boxes with multi-contact connectors for the DC collection system.

2.17.9 Trenching for AC and DC Cabling

Trenches for the DC cabling would be dug from the array combiner box locations to the inverter pads using excavators and trenchers. Trenches for the AC collection system would also be dug from the inverter pad locations to the plant switchgear and POI. Trench sizes are typically determined by electrical code requirements for the type and size of cabling to be buried. Trenches may contain circuits of different systems as long as proper separation is maintained. Trenching would be performed in a manner that minimizes impact to the surrounding area, and the area surrounding open trenches during the installation would be identified and protected as required for safety.

Cables would be installed in the finished trenches. Cabling would be supplied to the site in spools, either as cable in conduit or base cable. Spools are typically transported to the trenches using special mounting structures on trucks or tractors and cables are pulled into trenches by the electrical crew. All buried cables would be in metal sheath, polyvinyl chloride (PVC), or similar conduit, or are direct buried, with appropriate rating and environmental protection as per code and best practices. Minimum AC and DC collector system cover depth throughout the entire project site would be in accordance with acceptable solar energy standards, the National Electrical Code (NEC), and the state and local AHJ requirements.

Completed cabling would then be tested and carefully identified and marked during all phases of construction. The area of the trench and surrounding area would be cleaned up and restored to its prior condition as soon as cable installation and trenching were completed.

2.17.10 Install Medium Voltage DC Collection System

Electrical crews would install the combiner boxes and the medium voltage DC collection system cables from the combiners to the inverter pad. Combiner boxes include DC disconnectors that are left open to enable safe connection of the modules. The electrical crews would then complete string assembly of the panels in series using ultraviolet (UV)-rated wiring and connectors, and combine the strings in parallel at the combiner boxes to complete the medium voltage DC system.

2.17.11 Install Inverters

Inverters are typically either fully assembled with the transformers and skid-mounted off-site for delivery via flatbed or assembled on-site onto poured concrete slab foundations. If the latter method is used, then slabs, often steel reinforced, would be designed, taking into account inverter mounting and cabling conduit requirements, appropriate load bearing capacity, and plant lifetime. Areas around the slab foundation would be stabilized and compacted. Excavators and graders would be used to create the appropriate foundation trench with cabling entry and exit points. Concrete mixers would be driven to the inverter locations, and the concrete pads would be poured and cured over the required time.

The inverters and transformers would then be delivered to the pad locations on pallets using flatbed trucks. Various lifting methods would be used to move the equipment onto the mounting structures on the pads, including forklifts, truck-mounted cranes, and crane forks. Electrical crews would then terminate the MV DC collection system at the inverters, and connect the inverters and transformer sub-assemblies.

2.17.12 Install AC Collection System

The AC cabling, typically aluminum cable, would be installed, with transformers from multiple inverter pads connected in series and terminating at the pad-mounted circuit breaker and pad-mounted recloser of the interconnection switchyard. Cabling would be tested again for continuity and conformance to design parameters. This would complete the installation of the AC collection system.

2.17.13 Construction of Interconnection Facilities

A small area at the POI would be used for the interconnection facilities. This area would be graded using excavators and graders, and foundation trenches dug, with cabling entry and exit points for any pad-mounted equipment. The pad-mounted equipment, such as circuit breakers, reclosers, relays, etc., would be brought to the location using flatbeds and lifted into place using boom trucks, truck-mounted cranes, or similar equipment. The AC collection system termination would then complete the customer side of the interconnection. The wood monopole(s) required for connection to the utility lines would be transported to the POI using a flatbed truck and installed using auger drills, boom trucks, and truck-mounted cranes.

2.17.14 Site Restoration

At the completion of construction, following successful testing and before final plant commissioning, areas requiring any intensive restoration and remediation would be identified. These might include areas such as the laydown area that have experienced unexpected erosion from traffic or vegetation that has been disturbed by construction equipment or on-site stored generating equipment pallets. Any such areas would be restored to pre-construction levels using any fill or revegetation as may be required.

2.18 Protection from Natural Hazards 463-60-265

The application shall describe the means to be employed for protection of the facility from earthquakes, volcanic eruption, flood, tsunami, storms, avalanche or landslides, and other major natural disruptive occurrences.

The five Columbia Solar Project sites are not subject to any significant risk of avalanche, tsunami, landslides, or flood. The size, mounting depth, and other characteristics of the mounting structures would meet the American Society of Civil Engineers (ASCE) requirements for general structural design for wind, snow, rain, atmospheric ice, and earthquake loads, as well as combinations thereof. The requirements are based on site-specific conditions and would be adhered to in the final detailed design of the mounting structures.

2.18.1 Earthquakes

The 2015 International Building Code recognizes the ASCE for seismic site class definitions. In accordance with Table 20.3-1 of the *ASCE Minimum Design Loads for Building and Other Structures manual*, Site Class D would be used by TUUSSO for the design of the five Columbia Solar Projects.

Based on the soil conditions discovered during geotechnical analyses, the five Columbia Solar Project sites have very low susceptibility to liquefaction.

2.18.2 Volcanic Eruption, Tsunami, Avalanches, or Landslides

TUUSSO has not taken any special precautions to protect the facilities from these potential disasters. However, the facilities would be built to meet building codes and would be appropriately insured.

2.18.3 Floods/Storm Events

Portions of the Camas, Typha, and Urtica Solar Project sites would be located within 100-year flood hazard areas, as determined by the Federal Emergency Management Agency (FEMA). The FEMA flood hazard is categorized as a Zone “A,” meaning this area is subject to a 1% annual chance flood, also

known as a 100-year storm event. The flood hazard areas are shown in the site layouts for each of these projects (Appendix L).

To protect the five Columbia Solar Projects from flood impacts, TUUSSO would not locate any of the inverter pads within these flood zones, and would raise the perimeter fence 6 to 12 inches above grade to prevent a build-up of debris along the fence lines during a flooding event.

2.19 Security Concerns 463-60-275

The application shall describe the means employed for protection of the facility from sabotage, terrorism, vandalism and other security threats.

2.19.1 Fencing

The five proposed Columbia Solar Project sites would be secured using 6- to 8-foot-high, perimeter, chain-link fencing topped by razor wire surrounding the PV system and switchyard. The entrance gates for each of the solar sites would be about 8 feet high and 12 feet wide, to allow for fire department and maintenance access. “Warning High Voltage” signs would be placed on the fencing at about 100-foot intervals and at each gate.

2.19.2 Lighting/Cameras

Lighting would be installed on metal poles, up to 20 feet tall, located around the periphery of each of the five Columbia Solar Project sites, as well as at the inverter pads, as required for nighttime security purposes. Lighting would consist of modern, low-intensity, downward-shielded fixtures that are motion activated, and would be directed onto the immediate site. For each site, between five and 10 lights would be installed and fed by direct buried underground electrical supply lines. Security cameras may also be installed by TUUSSO on those same lighting poles.

2.20 Study Schedules 463-60-285

The application shall furnish a brief description of all present or projected schedules for additional environmental studies. The studies descriptions should outline their scope and indicate projected completion dates.

2.20.1 Natural Resources Site Visits with the Washington Department of Fish and Wildlife (April 12, 2017)

On April 12, 2017, SWCA Environmental Consultants (SWCA) conducted site visits of all five proposed Columbia Solar Project sites with Scott Downes and Brent Renfrow, WDFW staff, to review the natural resources on each site and to obtain their input about potential site impacts, buffers, and mitigation. These site visits provided the bases for subsequent email exchanges with WDFW (see Section 1.12 for a summary of those exchanges).

2.20.2 Natural Resource Surveys (April 3–12, 2017)

Natural resources field surveys were conducted from April 3 to 12, 2017, to document flora and fauna in the vicinity of each of the five solar project sites, as well as different vegetation communities and habitat. Visual observations were recorded within 200 feet of each project site, and included wildlife and habitat data. A Trimble Geo XT GPS unit was used by the biological field team to assist in identifying the site

boundaries and to record site spatial data. This device was capable of submeter accuracy. The full extent of each solar project site was covered by the biological field team. Photographs were taken and wildlife observations and vegetation characteristics were documented. The spatial locations of some features observed outside of the solar project sites were approximated using field observations and aerial imagery to determine their extent. Geographic information system (GIS) software was used to analyze data and to produce habitat map figures.

2.20.3 Wetland Delineations (April 3–12, 2017)

Each solar project site was surveyed for wetlands from April 3 to 12, 2017, in accordance with the current methodology of the U.S. Army Corps of Engineers' (USACE's) *2008 Arid West Regional Supplement (Version 2)* and the *Wetlands Delineation Manual* (Environmental Laboratory 1987). Wetlands and streams located outside of a project site and any associated generation tie line (for the Fumaria and Typha Solar Project sites) but that occurred within 200 feet of their boundaries and had the potential to have buffers extend into the project were included in a "study area." Wetlands and streams outside of the project site and within the study area were visually inspected but not formally delineated. Detailed descriptions of the field methods used in these studies are provided in Appendices G through K.

A Trimble Geo XT GPS unit was used by the field team to assist in identifying the project site boundaries and to record site spatial data. This device was capable of submeter accuracy.

The full extent of each project site was covered by the team of biologists. Photographs were collected and vegetation, soil, and hydrology characteristics were documented. The boundaries for wetlands located outside of the project site but within the study area were approximated using field observations and aerial imagery to determine the extent of on-site wetland buffers.

GIS software was used to analyze data and to produce the report figures. Per Washington Administrative Code (WAC) 463-60-333 and KCC Chapter 17A, wetlands were rated using Ecology's wetland rating criteria in the *Washington State Wetland Rating System for Eastern Washington, 2014 Update*. Kittitas County's definition of a wetland is based on RCW 36.70A.030. Per KCC 17A.04.020, the resulting wetland ratings were used to determine the Kittitas County–prescribed range of wetland buffers for each wetland.

A detailed analysis of wetland functions was not conducted; however, a brief description of wetland functions is provided as part of the general description for each wetland.

2.20.4 Archaeological Surveys (April 4–17, 2012)

Archaeological fieldwork was conducted on each of the five proposed Columbia Solar Project sites from April 4 to 17, 2017, by a team of 11 SWCA archaeologists. The parcels were surveyed with pedestrian transects spaced at approximately 20-meter intervals. The survey was supplemented by about 900 shovel probes (SPs) measuring between 35 and 40 cm in diameter (Appendices G–K). The SPs were excavated in arbitrary 20-cm levels, and the sediments from each level were passed through a ¼-inch mesh screen. Shovel probes were terminated at 100 cm, when native alluvial cobbles or gravels were encountered, or when other obstructions prevented further excavation. If a probe was positive for the present of cultural material, a minimum of two 20-cm negative levels were excavated beyond the lowest positive level, unless an obstruction or depth of 100 cm was reached first. Any cultural material identified during the pedestrian survey and SP survey was recorded and photographed. Subsurface artifacts were bagged in plastic bags, labeled, and reburied where they were found.

The findings of each SP were recorded on standard shovel/auger probe forms that included information about soil color, texture, composition, and observed cultural materials. A Trimble handheld GPS unit was used to collect the Universal Transverse Mercator (UTM) coordinates of shovel probes. Digital photographs were taken of each project area and a sample of the excavated SPs, and information about the photographs was recorded on a standard photograph log. SP photographs included cardinal direction overview photographs and at least one photograph of the soil stratigraphy. Project field records and files are on file at SWCA's office in Seattle.

Information about any identified archaeological sites or isolates was recorded on State of Washington Archaeological Site Inventory Forms, which were entered into the Washington State Department of Archaeology and Historical Preservation's Washington Information System for Architectural and Archaeological Records Data (WISAARD) database.

For the generation tie lines for the Fumaria and Typha Solar Project sites, SWCA also conducted a pedestrian survey, but no shovel probing, for portions of the generation tie line ROW associated with each solar facility. The generation tie line pedestrian survey was conducted by four SWCA archaeologists on April 17, 2017. Within the generation tie line ROW, SWCA did not survey any private property outside of the ROW of public roads, except where landownership was the same as the project site and landowner permission had therefore been given. In addition, though TUUSSO is considering two alternative generation tie line alignments for the Fumaria Solar Project (ROWs A and B), only the one located on the north side of Clarke Road (ROW A) was surveyed for the present inventory, and the area around the substation at the terminus of the transmission line also was not surveyed. Photographs were taken from the center of the generation tie line ROW in cardinal directions, and toward any places of interest within the generation tie line ROW.

2.20.5 Built Environment Surveys (April 5–6, 2017)

A SWCA architectural historian conducted site visits on April 5 and 6, 2017, to conduct a field survey of built environment resources over 50 years old. These resources included buildings such as houses, barns, and sheds, and structures such as bridges and irrigation ditches. Resources were photographed and described on field forms, these data were then entered into the WISAARD database, and an inventory form was generated for each resource (Appendices G–K).

2.21 Potential for Future Activities at Site 463-60-295

The application shall describe the potential for any future additions, expansions, or further activities which might be undertaken by the applicant on or contiguous to the proposed site.

TUUSSO does not plan for any further additions, expansions, or further activities upon or contiguous to the sites used for the Columbia Solar Projects.

2.22 Analysis of Alternatives 463-60-296

The application shall include an analysis of alternatives for site, route, and other major elements of the proposal.

Within Washington State, Kittitas County represents a unique overlap of: 1) available land parcels large enough to support a utility-scale solar project; 2) high solar insolation; and 3) PSE's service territory (one of the only utilities in Washington with tariffs that support utility-scale solar production). In early 2016,

TUUSSO identified Kittitas County as the best area for utility-scale solar development in Washington State.

As part of the initial conceptual development and siting of the five Columbia Solar Projects, TUUSSO applied solar facility siting criteria to identify potential sites in Kittitas County. These criteria included the following:

- High solar insolation
- Available land of sufficient size for the solar facility
- Proximity to PSEs distribution lines and/or substations
- Proximity to existing roads
- Cost-effective land value
- Land currently zoned for utility-scale solar development in accordance with Kittitas County's permitting requirements
- Agricultural, or otherwise previously disturbed land
- Land that is sufficiently flat for efficient solar installation with minimal grading

TUUSSO identified more than 100 sites in Kittitas County based on these criteria, and approached the landowners for these sites. Sites were then dropped based on one of the following screens: 1) landowner not interested in a lease or sale of the property; 2) distribution lines near the project site were not owned by PSE; 3) landowner's lease rates were not economical for solar development; 4) distribution lines near the site were electrically connected to other lines upon which TUUSSO or another solar developer was already proposing a project (only one utility-scale solar project could be connected to each distribution line, and only two utility-scale solar projects could be connected to each PSE substation); or 5) idiosyncratic site risks made the site too risky (e.g., high risk of flooding, protected flora or fauna on site, etc.).

In the process of culling through more than 100 sites, TUUSSO identified the proposed five Columbia Solar Project sites as the best opportunities for solar development in Kittitas County.

2.23 Pertinent Federal, State, and Local Requirements 463-60-297 (Compliance Evaluation)

(1) Each application shall include a list of all applicable federal, state, and local statutes, ordinances, rules, permits, and required use authorizations (i.e., leases, easements, rights of way, or similar authorizations) that would apply to the project if it were not under council jurisdiction. For each federal, state, or local requirement, the applicant shall describe how the project would comply or fail to comply. If the proposed project does not comply with a specific requirement, the applicant shall discuss why such compliance should be excused.

(2) Inadvertent failure by the applicant to discover and list a pertinent requirement shall not invalidate the application, but may delay the council's processing of the application.

Table 2.23-1 lists the pertinent federal, state, and local permits and related requirements pursuant to WAC 463-42-685 that would apply to construction and operation of the five Columbia Solar Projects. The table lists the permits or requirements, identifies the permitting agency, and cites the authorizing statute or regulation. The table also identifies the sections in the ASC relating to each permit or requirement.

Table 2.23-1. Pertinent Federal, State and Local Codes, Ordinances, Statutes, Rules, Regulations, and Permits

Permit or Requirement	Agency Code, Ordinance, Statute, Rule, Regulation, or Permit	Application Section
Federal		
Threatened or Endangered Species	U.S. Fish and Wildlife Service Endangered Species Act of 1973 (16 USC, Section 1531, et seq.) and implementing regulations. Designates and provides for protection of threatened and endangered plants and animals and their critical habitat.	Sections 3.4.2 and 3.4.4
Migratory Birds	U.S. Fish and Wildlife Service Migratory Bird Treaty Act (16 USC 703-711)	Sections 3.4.1, 3.4.5, 3.4.6.1
Bald Eagles	U.S. Fish and Wildlife Service Bald and Golden Eagle Protection Act (16 CFR 668-668c) Eagle permit regulations (50 CFR 22)	Sections 3.4.2 and 3.4.4
Waters of the United States	U.S. Army Corps of Engineers, Seattle District Clean Water Act of 1972 (Waters of the U.S. 1986/1988 regulatory definition in 40 CFR 230.3) Joint Aquatic Resource Permit Application (JARPA) for Section 404 fill in Waters of the U.S.	Sections 3.3.1, 3.3.2, 3.5.1, 3.5.2, 3.5.3, 3.5.4; Appendix J-3
State		
Electrical Construction Permit	Washington Department of Labor and Industries WAC 296-746A, Washington Department of Labor and Industries Safety Standards – Installing Electrical Wires and Equipment – Administration Rules.	
Noise Control	Washington Department of Ecology RCW 70.107, Noise Control; WAC 173-58, Sound Level Measurement Procedures WAC 173-60, Maximum Environmental Noise Levels; WAC 463-62-030, Noise Standards	Sections 4.1.4, 4.1.6, 4.1.7

Permit or Requirement	Agency Code, Ordinance, Statute, Rule, Regulation, or Permit	Application Section
Water Quality Storm Water Discharge: Construction Activities	Washington Department of Ecology RCW 90.48, Water Pollution Control Act, establishes general stormwater permits for the Washington Department of Ecology National Pollutant Discharge Elimination System Permit Program WAC 173-201A, Washington Department of Ecology Water Quality Standards for Surface Waters of the State of Washington, which regulates water quality of surface waters Federal statute(s) and regulations implemented by the above state statute(s) and regulations include: Federal Clean Water Act, 42 USC 1251; 15 CFR 923-930 KCC 12.70	Sections 2.3.3, 2.10, 2.11, 3.3.4, 3.3.5, 3.3.6, 3.3.7, 3.3.8; Appendices G-3, H-3, I-3, J-3, K-3
Shorelines of the State	Washington Department of Ecology WAC 173-18, Shoreline Management Act, Streams and Rivers Constituting Shorelines of the State (Note EFSEC energy facility exemption from Shoreline Act permitting requirements, RCW 90.58.140[9]). WAC 173-22, Adoption of Designations of Shorelands and Wetlands Associated with Shorelines of the State JARPA and shoreline conditional use permit (CUP) for fill in wetlands associated with Shorelines of the State	Sections 3.3.1, 3.3.2, 3.5.1, 3.5.2, 3.5.3, 3.5.4; Appendix J-3
Fish and Wildlife	Washington Department of Fish and Wildlife WAC 220-610, defines State species status and protections WAC 232-12, Washington Department of Fish and Wildlife Permanent Regulations, provides information on classification of wildlife species, including “Priority Habitats and Species” RCW 77, Hydraulic Code for in-water work	Section 3.4

Permit or Requirement	Agency Code, Ordinance, Statute, Rule, Regulation, or Permit	Application Section
State Environmental Policy Act (SEPA)	RCW 43.21C, Washington Environmental Policy Act WAC 197-11, Washington Department of Ecology SEPA Rules, which establishes uniform requirements for compliance with SEPA KCC 15.04	A SEPA Environmental Checklist is attached as Appendix A. Also, this entire Application for Site Certification describes the affected environment, potential construction and operational impacts, and mitigation measures.
Archaeology and Historic Preservation	Washington State Department of Archaeology and Historic Preservation RCW 27.53, Archaeological Sites and Resources	Sections 4.2.10 and 4.10.11
County		
Comprehensive Plan	Kittitas County Comprehensive Plan, 2000–2020	Sections 4.2.1 and 4.2.2
Zoning Ordinance, including Critical Areas Ordinance	KCC 17, including 17A	Sections 2.1.1, 2.18.2, 3.1.1, 3.1.2, 3.1.3, 3.1.10, 3.1.11, 3.3.1, 3.3.2, 3.3.3, 3.3.9, 3.3.10, 3.5.1, 3.5.2, 3.5.3, 3.5.4, 3.5.5; Appendices G-1, H-1, I-1, J-1, K-1
Access Permit	KCC 12.05	Appendices G-3, H-3, I-3, J-3, K-3
Grading Permit (if necessary)	KCC 14.05	Section 2.15.3

2.23.1 Pertinent Federal Statutes, Regulations, Rules, and Permits

2.23.1.1 Threatened or Endangered Species

The Endangered Species Act (ESA) of 1973 (16 United States Code [USC] 1531, et seq.) and implementing regulations designates and provides for protection of threatened and endangered plants and animals and their critical habitat. It requires a determination of whether a protected species is present in the area affected by a project. Section 7 of the ESA requires that federal agencies consult with the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) for their determination in authorizing a project that may affect listed species or designated critical habitats that may be found in the vicinity of a project. In cases where a project does not require the approval, funding, or conduct of a federal agency, Section 10 of the ESA provides a parallel process whereby non-federal entities may consult with the USFWS or NMFS and acquire a take statement for incidental adverse effects or take of listed species by the project.

Statement of Compliance

TUUSSO has carried out studies and field surveys for the Columbia Solar Projects. Bald eagles (*Haliaeetus leucocephalus*), a Federal Species of Concern, are present near the Fumaria and Penstemon Solar Project sites, and are likely present throughout the project-scale analysis areas. If nests are present in the project vicinity, they have the potential to be affected by noise and visual disturbances during construction. No bald eagle nests have been identified near the solar project sites; if nests are identified near the sites, construction outside of the critical use period (January 1–May 31) is recommended. If

construction near active bald eagle nests might occur during the critical use period, local USFWS biologists would be consulted.

There are no threatened, endangered, proposed, or candidate species, or designated critical habitat, present at the project sites. Because the Columbia Solar Projects do not have a federal nexus and also would not affect any federally-listed threatened or endangered species, ESA Section 7 and Section 10 consultation were not conducted for the proposed projects.

2.23.1.2 Migratory Bird Species

The U.S. Fish and Wildlife Service administers and enforces the Migratory Bird Treaty Act (MBTA) (16 USC 703-711). The MBTA prohibits the taking, killing, or possession of migratory birds, except as allowed by the Secretary of the Interior. The list of migratory birds is found in 50 CFR 10, and permit regulations are found in 50 CFR 21.

Statement of Compliance

To ensure compliance with MBTA, vegetation clearing for the Columbia Solar Projects would ideally be undertaken from August 1 through the end of February. If construction or vegetation clearing is required between March 1 and August 1, nest surveys would be required in the proposed areas of disturbance. If active migratory bird nests are encountered during the surveys, land-disturbing construction activities should be avoided while the birds are allowed to fledge. An appropriate species avoidance buffer, as determined in conjunction with WDFW and local agencies, would apply to all active nests for migratory bird species. Implementing these measures would result in the Columbia Solar Projects being in compliance with the MBTA.

2.23.1.3 Bald Eagles

The federal Bald and Golden Eagle Protection Act (BGEPA) (16 CFR 668-668c) prohibits the taking, possession, purchase, sale, barter, transport, export, or import of any bald or golden eagle or any part, nest, or egg of a bald or golden eagle, except for certain scientific, exhibition, and religious purposes. Eagle permit regulations are found in 50 CFR 22.

Statement of Compliance

The Columbia Solar Project project-scale analysis areas have the potential to provide nesting habitat to bald and golden eagles. All raptor species are protected under the MBTA, and bald and golden eagles are additionally protected under the BGEPA. If active raptor nests occur within 0.25 mile of the solar project construction activities, noise and construction activities could disturb nesting and fledgling raptors, potentially causing nest abandonment. Based on WDFW guidance (Appendix C), a nest survey within 0.25 mile of construction activities would be conducted within the same year that construction is scheduled, to determine whether nests could be occupied during construction. The nesting seasons vary by species, as shown in Section 3.4.6.1. WDFW's 0.25-mile buffer is inclusive of the distance recommended by the National Bald Eagle Management Guidelines (USFWS 2007), which specifies a 660-foot (0.125-mile) buffer from active eagle nests. If active raptor nests are observed, then TUUSSO would coordinate with WDFW to determine approaches to minimize disturbance to the nesting raptors. Buffer distances and timing restrictions would collaboratively be developed by WDFW and TUUSSO, dependent upon the sound levels produced by the construction equipment and the sensitivity of the nesting raptors. Implementing these measures would result in the Columbia Solar Projects being in compliance with the BGEPA.

2.23.1.4 Waters of the United States

The Clean Water Act of 1972 establishes the basic structure for regulating discharges of pollutants into the waters of the United States, which are defined in subsequent regulations in 1986 and 1988 (40 CFR 230.3), and regulating quality standards for surface waters. The fill or excavation of waters of the United States, which includes associated wetlands, is regulated by the USACE.

Statement of Compliance

The Columbia Solar Projects would avoid all impacts to waters of the United States through avoidance measures in the project design, except for the Typha Solar Project site. A minor wetland fill is currently proposed on the Typha Solar Project site at the southern site entrance where a culvert replacement would be necessary. A Joint Aquatic Resource Permit Application (JARPA) would be submitted to the Seattle District USACE and Ecology to meet both federal and state regulations. The wetland fill activities during construction and operation of the Typha Solar Project site would be in compliance with CWA regulations.

2.23.2 Pertinent State Statutes, Regulations, Rules, and Permits

2.23.2.1 Electrical Construction Permit

The Washington Department of Labor and Industries permits, inspects, and enforces regulations regarding electrical installations pursuant to WAC 296-746A, Washington Department of Labor and Industries Safety Standards – Installing Electrical Wires and Equipment – Administration Rules.

Statement of Compliance

The Washington Department of Labor and Industries would administer and enforce all electrical permitting, inspecting, design, and enforcement regulations regarding electrical installations either directly or pursuant to a contract with EFSEC. The Columbia Solar Projects would be designed and constructed in conformance with WAC 296-746A.

2.23.2.2 Noise Control

Ecology has the authority regarding noise standards and control pursuant to RCW 70.107, Noise Control; WAC 173-58, Sound Level Measurement Procedures; and WAC 173-60, Maximum Environmental Noise Levels.

Statement of Compliance

The Columbia Solar Projects would be designed, constructed and operated to meet the Ecology's noise regulations and standards.

2.23.2.3 Water Quality Storm Water Discharge: Construction Activities and Operation

The Columbia Solar Projects would require a Stormwater General Permit for construction activities because construction of the facilities would disturb more than 5 acres of land. EFSEC has jurisdiction regarding the NPDES Permit for the Columbia Solar Projects pursuant to WAC 463-38. Ecology would have had jurisdiction in the absence of EFSEC. The applicable statutes and regulations are as follows:

- RCW 90.48, Water Pollution Control Act;

- WAC 173-226, Waste Water General Permit Program establishes general stormwater permits for the Washington Department of Ecology National Pollutant Discharge Elimination System Permit Program (NPDES); and
- WAC 173-201A Washington Department of Ecology Water Quality Standards for Surface Waters of the State of Washington, which regulates water quality of surface waters.

Federal statute(s) and regulations implemented by the above state statute(s) and regulations include: 42 USC 1251, Federal Clean Water Act; and 15 Code of Federal Regulations [CFR] 923-930. A NPDES Permit would be required for construction activities and may be required for operation.

Statement of Compliance

TUUSSO would obtain the necessary NPDES Permit(s) from EFSEC pursuant to WAC 463-39 that would conform and be in compliance with all the requirements set forth above. An NPDES Permit for stormwater would be obtained, and its associated SWPPP(s) would be implemented, for construction of the Columbia Solar Projects. The above measures also meet the Kittitas County Storm Water Management Plan guidelines (KCC 12.70).

2.23.2.4 Shorelines of the State

EFSEC jurisdictional energy facilities (including those opting in to EFSEC) are exempt from the requirements of the Shoreline Management Act (RCW 90.58.140[9]). KCC 17B.07.0030(I) provides that "any project with a certification from the governor pursuant to RCW Chapter 80.50" is exempt from shoreline permit requirements. The Typha Solar Project site would nevertheless be consistent with all of the policies specified in RCW 90.58.020 and the Kittitas County SMP, but is subject to EFSEC jurisdiction and authorization. A Shoreline CUP application and JARPA meeting state regulations are included in Appendix J-3.

In non-EFSEC settings, Ecology, pursuant to the Shoreline Management Act (WAC 173-18), regulates waters designated as Shorelines of the State and wetlands associated with them as defined in WAC 173-22. Any impacts that would occur in designated Shorelines of the State would need to be addressed in a JARPA that would be submitted to Ecology. In addition, if the project is considered a "substantial development" by the definition stated in RCW 90.58.030(3)(e), then a substantial development permit (SDP) would be required for any work that impacts designated Shorelines of the State and would be submitted to Ecology in conjunction with the JARPA. In addition, a shoreline conditional use permit (CUP) would be required for utility generation facilities in areas with a Shoreline Environment Designation (SED) of Rural Conservancy, based on the Kittitas County Shoreline Master Program (SMP). Under WAC 173-27-150, SDPs and CUPs cannot be approved unless they are consistent with policies and procedures of the Shoreline Management Act, Ecology rules, and the local master program.

Statement of Compliance

Designated Shorelines of the State are not located near any of the Columbia Solar Projects, except for the Typha Solar Project site. The nearest Shoreline of the State is located along the Yakima River within 200 feet of the eastern site boundary for the Typha Solar Project site. The western edge of the Yakima River ordinary high water mark (OHWM) is between 35 feet and 200 feet from the eastern edge of the site boundary. All portions of the site within 200 feet of the OHWM of the Yakima River, and within the National Wetland Inventory (NWI)-mapped emergent wetland that extends into the southern portion of the site, have a SED of Rural Conservancy. This SED area partially overlaps wetlands TW01 and TW02, which would be avoided through project design, as well as areas delineated as uplands that would be within the Typha Solar Project site.

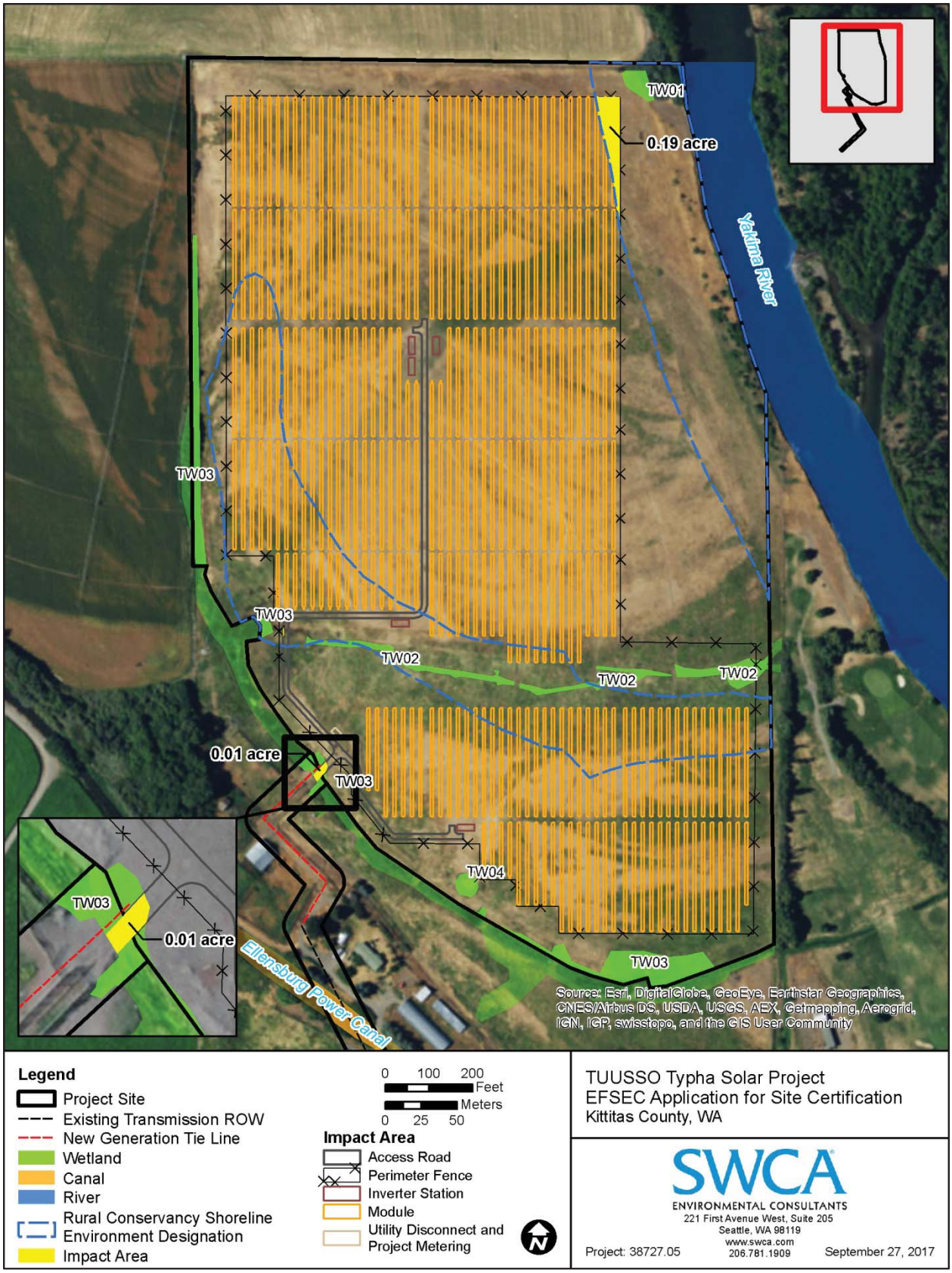


Figure 2.23-1. Shoreline of the State encroachment areas for the Typha Solar Project.

The Typha Solar Project would overlap areas within the Shoreline of the State jurisdiction in two areas. The nearest project impact occurring within 200 feet of the Yakima River shoreline would overlap this shoreline area by only 0.19 acre and would consist of fence installations located at least 144 feet from the OHWM of the Yakima River and solar arrays located at least 154 feet from the OHWM of the Yakima River. The second area of overlap would be located at an existing access road crossing of wetland TW03, an associated wetland of the Yakima River that would be considered within Shoreline of the State jurisdiction, where a culvert replacement would result in approximately 0.01 acre of wetland fill. The Kittitas County SMP designates an area that overlaps approximately 6.61 acres of the proposed project area as part of the Shoreline of the State based on NWI mapping; however, SWCA performed a professional wetland delineation throughout the entire site and found that wetlands associated with the Yakima River shoreline only occur in areas delineated as wetlands TW01, TW02, and TW03. Refer to Figure 2.23-1 for exact locations. Both wetlands TW01 and TW02 would be avoided through project design, and impacts to wetland TW03 would be limited to only 0.01 acre for the proposed culvert replacement for site access. In addition, the vegetation adjacent to the Yakima River would not be altered, and all of the areas of the project within 200 feet of the Yakima River shoreline would be planted with low-growing native plant species. Therefore, the proposed project would have minimal adverse effects on the shoreline of the Yakima River and would preserve the natural character of the shoreline. In addition, any adverse effects associated with the proposed project would be minimal and would not substantially affect the ecology and resources of the Yakima River shoreline (meets RCW 90.58.020[2–4]).

The proposed Typha Solar Project would add less than 3% impervious surfaces to the property, including less than 10 square feet (based on approximately 16 solar array footings of 6- by 8-inch cross-section) for solar array footings and less than 700 square feet for the access road fill within wetland TW03 in areas within Shoreline of the State jurisdiction. These areas and the overall project would not result in a substantial increase in runoff. No shoreline protection work is proposed nor would be necessary to stabilize the shoreline for project purposes (meets Kittitas County SMP 6.19.A.1). The location of the proposed Typha Solar Project is on private land located west of a segment of the Yakima River that is not visible from properties immediately to the west of the site. The solar arrays on the proposed site would not exceed 8 feet in height and would not block any views of the Yakima River from adjoining properties. In addition, the associated generation tie line would be predominately located along existing power lines and would not substantially alter the current views nearby (meets Kittitas County SMP 6.19.A.2).

Solar generation facilities are an allowed conditional use on lands zoned Commercial Agriculture. As described in Section 1.16 of the ASC, the Typha Solar Project would be consistent with the Kittitas County Comprehensive Plan. The proposed project would limit grading activities as much as possible, utilizing existing site contours with limited ground disturbance. The project would operate under a maximum 41-year lease with the current landowner, after which the site may return to its current agricultural land use. In addition, the generation tie line would be located predominantly along existing power lines and would not affect any existing land uses along its route (meets Kittitas County SMP 6.19.A.3). The proposed Typha Solar Project is located on private land that currently does not allow public access to the Yakima River shoreline. Therefore, public access to the shoreline of the Yakima River and public recreational opportunities would not be affected by the proposed project (meets RCW 90.58.020[5–6]).

Finally, based on the project design and impacts described above, the proposed Typha Solar Project would not destroy or obstruct scenic views of the Yakima River shoreline because of the private location of the property and topography of the surrounding landscape. In addition, the project would meet the no-net-loss standards of the Kittitas County SMP because the small areas of impact are either below the threshold for mitigation, in the case of the 0.01 acre of wetland fill, or would have a negligible impact with

an improvement in vegetation quality, in the case of the 0.19 acre at least 144 feet from the OHWM of the Yakima River. Therefore, the proposed project meets the Kittitas County SMP 6.19.B.12 requirement.

The Typha Solar Project would be a conditionally permitted use for areas within the SED of Rural Conservation under the Kittitas County SMP. The wetland fill activities during construction of the Typha Solar Project site would be in compliance with regulations under the Shoreline Management Act (WAC 173-18) and the Kittitas County SMP.

2.23.2.5 Fish and Wildlife

The WDFW, pursuant to WAC 232-12, provides information on the classification of wildlife species. Additionally the WDFW, pursuant to WAC 232-12, designates certain Priority Habitats and Species. The State of Washington regulates fish and wildlife with RCW 77 and WAC 220. State and protected species regulations are defined in WAC 220-610, which includes provisions for endangered, threatened, and sensitive wildlife species, ESA-listed fish, and bald eagle protection rules. Fish and aquatic habitats are protected under RCW 77.55, commonly referred to as the Hydraulic Code. Any environmental impacts that could occur in waters of the state below the OHWM would need to be addressed in a Hydraulic Project Approval process.

Statement of Compliance

TUUSSO would comply with the substantive requirements of the WDFW regarding the appropriate minimization and mitigation of impacts to Priority Habitats and Species. Sections 3.4.3, 3.4.4, and 3.4.5 evaluate the potential for construction and operation impacts on habitats, fish, and wildlife. No significant impacts would occur from the proposed Columbia Solar Projects, therefore these projects would comply with State habitat, fish, and wildlife guidelines.

2.23.2.6 State Environmental Policy Act (SEPA)

A Development Permit would have been required from Kittitas County, which would have made it the lead agency for SEPA, absent EFSEC jurisdiction. The applicable statutes and regulations are as follows: RCW 43.21C, Washington Environmental Policy Act; and WAC 197-11, Washington Department of Ecology SEPA Rules, which establishes uniform requirements for compliance with SEPA and Kittitas County SEPA regulations set out in KCC 15.04.

Statement of Compliance

A SEPA Environmental Checklist has been prepared meeting the above statutes and regulations, and is attached as Appendix A to this application. A SEPA Determination would be issued by EFSEC that would comply with the statutes and regulations set out above. The substantive requirements set out in KCC 15.04 are the same and would be used by EFSEC in its SEPA process.

2.23.2.7 Archaeological Sites

The Washington State Department of Archaeology and Historic Preservation (DAHP) regulates and protects the cultural and historic resources on private and public lands in the State of Washington. The applicable statute is as follows: RCW 27.53, Archaeological Sites and Resources.

Statement of Compliance

The Columbia Solar Projects would comply with RCW 27.53. TUUSSO has researched state and federal registries along with all archaeological and historical files and maps located at DAHP in Olympia. TUUSSO conducted a comprehensive pedestrian field survey of the project area. This archaeological

survey project covered the entire areas within the Columbia Solar Projects where ground-disturbing activities are proposed. Thirteen isolates, one historic debris scatter, and two small lithic scatter sites were identified, and SWCA recommends these resources are not eligible for listing on the NRHP. These sites would be avoided during construction and operation of the Columbia Solar Projects. A qualified archaeologist would monitor all ground-disturbing activities during the construction process. The Yakama Nation has been consulted during the planning process, beginning in March of 2017. The Yakama Nation would be notified prior to commencement of construction and would be invited to have representatives present during all ground-disturbing activities. It is anticipated that a stipulation would be made with the Yakama Nation establishing procedures to be followed in the event of any finds during construction.

2.23.3 Pertinent Local Ordinances and Permits

2.23.3.1 Comprehensive Plan, Zoning Ordinances, Critical Areas

The five Columbia Solar Projects and two associated generation tie lines are located in unincorporated portions of Kittitas County and are consistent and compliant with the Kittitas County Code, including KCC 17, Zoning, or the December 2016 Kittitas County Comprehensive Plan.

Since Kittitas County is a full-planning Growth Management Act county, the Kittitas County Code, including its zoning code, must be consistent with the county's comprehensive plan. As a result, compliance with the Kittitas County Code also serves as compliance with the comprehensive plan.

Under the Kittitas County Code, each of the Columbia Solar Projects is a "major alternative energy facility" because each is a solar farm that is not a "minor alternative energy facility" (see KCC 17.61.010[9, 11]). As major alternative energy facilities, the solar projects can be authorized as conditional uses in the A-20 and Commercial Agriculture zones (see KCC 17.61.020). In designating solar PV generation facilities as permitted conditional uses, Kittitas County has made the legislative decision (based on its comprehensive plan policies) that these solar projects are allowable within the A-20 and Commercial Agricultural zones, subject to site-specific review and conditions to address potential *localized impacts* to the agricultural land uses in the vicinity. The Camas, Penstemon, and Typha Solar Projects would be located on land zoned as Commercial Agriculture. The Fumaria and Urtica Solar Projects would be located on land zoned as Rural Working – Agriculture 20. As a result, the Columbia Solar Projects are consistent and compliant with siting and zoning pursuant to the Kittitas County Code and Comprehensive Plan.[2]

The Columbia Solar Projects can be authorized as conditional uses in A-20 and Commercial Agriculture zones because the solar projects meet the Kittitas County Code review criteria for conditional uses. In accordance with RCW 80.50.110, and WAC 463-60-117 and 463-28, EFSEC can permit and authorize a conditional use, with appropriate consideration accorded to the following county code requirements:

Kittitas County Code Title 17.61.020, Permitted and Conditional Uses

A) The proposed use is essential or desirable to the public convenience and not detrimental or injurious to the public health, peace, or safety or the character of the surrounding neighborhood (KCC 17.60A.015[1]).

[2] On July 18, 2017, the Kittitas County Board of Commissioners extended until January 9, 2018, a moratorium on accepting applications for major alternative energy facilities in the form of solar farms. Ordinance 2017-004 (July 18, 2017). The moratorium temporarily precludes accepting applications but does not preclude approving facilities. In addition, it does not alter the Kittitas County Comprehensive Plan or Kittitas County Code which allow (via CUP) solar facilities on Commercial Agriculture and Agriculture-20 zoned lands. Therefore, the moratorium does not alter findings that the Columbia Solar Projects are consistent and compliant with the Comprehensive Plan and Kittitas County Code.

The Columbia Solar Projects are essential or desirable to the public convenience because the projects would help the state meet Washington's Renewable Portfolio Standard mandates for 9% of Washington's electricity to be generated from renewable sources by 2016, increasing to 15% by 2020. The solar projects would also provide clean, locally produced power that would be delivered directly to the PSE electricity grid. The Columbia Solar Projects would deliver their 25 MW of output to the PSE electric grid through its existing electrical distribution transmission line system.

Washington has a policy to increase the use of renewable energy facilities through focusing on local sources such as solar (RCW 82.16.110 and 82.16.110). The legislature also found it in the public interest to encourage private investment in renewable energy resources, to stimulate the state's economic growth and to enhance the continued diversification of energy resources used in the state (RCW 80.60.005). The Columbia Solar Projects meet this policy because they would be funded by private money, with an estimated total cost of $40 to $50 million, which should stimulate economic growth and would diversify energy resources further through additional solar facilities.

Finally, the Columbia Solar Projects would not be detrimental or injurious to the public health, peace, safety, or character of the surrounding neighborhood. As discussed in this application, the solar projects would have minimal impacts to the environment and available agricultural land. The Columbia Solar Projects would be the largest individual and collective solar projects in Washington and would fortify Kittitas County's electric grid with clean, local power. Each of the five Columbia Solar Projects would generate an estimated 11,500 MWh of electricity in the first full year of project operation, for a total of 57,500 MWh.

B) The proposed use at the proposed locations will not be unreasonably detrimental to the economic welfare of the county, and that it will not create excessive public cost for facilities and services by finding that

a. The proposed use will be adequately serviced by existing facilities such as highways, roads, police and fire protection, irrigation and drainage structures, refuse disposal, water and sewers, and schools; or

b. The applicant shall provide such facilities; or

c. The proposed use will be of sufficient benefit to offset additional public costs or economic detriment (KCC 17.60A.015[2]).

The Columbia Solar Projects would not be unreasonably detrimental to the economic welfare of Kittitas County or create excessive public cost. The solar projects would not have a detrimental impact on the county's economic welfare but rather a positive impact. During peak construction, the solar projects would employ up to 100 workers per day, hired locally when possible, and should increase local spending. The projects would also provide an estimated $4,880,000 in property tax revenues for Kittitas County over the approximate 30-year project life, as well as consistent revenue to the landowners through lease payments. The electricity generated by the five Columbia Solar Projects would likely be absorbed into PSE's service area in Ellensburg and Kittitas County. Capital investments for each of the five projects is estimated to be $8 to $10 million, for a total investment of $40 to $50 million. In addition to generating a source of renewable electricity, the solar projects would create additional economic benefits through direct capital investments in the local and regional economy.

In addition, as described in Sections 4.3 and 4.4, existing services would adequately serve the Columbia Solar Projects, with no anticipated significant impacts to police, fire, school, irrigation, refuse, water or septic systems, or health care services. Any additional facilities required by the solar projects would be

provided by TUUSSO. These facilities may include appropriate access improvements coordinated with the Kittitas County Department of Public Works and the Washington State Department of Transportation, and additional fire response and safety training for the local fire departments. Finally, the solar projects should generate a positive tax-related impact for the area that could help expand services.

C) The proposed use complies with relevant development standards and criteria for approval set forth in this title or other applicable provisions of Kittitas County Code (KCC 17.60A.015[3]).

TUUSSO and the Columbia Solar Projects would comply with all relevant development standards and criteria in the Kittitas County Code, including low impact construction and operation, and BMPs, as well as:

KCC Title 8 Health, Welfare, and Sanitation,
KCC Title 9 Public Peace, Safety and Morals
KCC Title 10 Vehicles and Traffic
KCC Title 12 Roads and Bridges
KCC Title 13 Water and Sewers
KCC Title 14 Buildings and Construction
KCC Title 15 Environmental Policy
KCC Title 17 Zoning
KCC Title 17A Critical Areas
KCC Title 20 Fire and Life Safety

TUUSSO is dedicated to using BMPs during all phases of development, construction, and operation/maintenance of the Columbia Solar Projects. The five solar projects would comply with any and all relevant development standards required by the Kittitas County Code.

D) The proposed use will mitigate material impacts of the development, whether environmental or otherwise (KCC 17.60A.015[4]).

As discussed in the SEPA Environmental Checklist and this ASC's Section 1.10 and Chapter 3, the Columbia Solar Projects would mitigate potential impacts through mitigation plans and other measures. TUUSSO is committed to developing well-sited, well-constructed solar projects. TUUSSO employed a rigorous site selection process to first avoid and then to mitigate, to the greatest extent feasible, potential negative natural and built environmental impacts, while partnering with landowners and local residents to generate positive community impacts and economic development in Kittitas County.

The development process for the five Columbia Solar Projects began in early 2016 when TUUSSO originally identified more than 100 potential solar project sites in Kittitas County. TUUSSO has been systematically collecting and evaluating information for each of those sites, to identify those that best avoid having impacts and then subsequently those with the least potential impacts, while also achieving successful financing and operations. TUUSSO would continue to work to mitigate potential impacts. TUUSSO is committed to developing well-sited solar projects that avoid sensitive habitats and engaging agencies early and often, as shown in Section 1.12, with discussions and correspondence with the EFSEC, Ecology, WDFW, DAHP, the Yakama Nation, and various representatives of Kittitas County.

E) The proposed use will ensure compatibility with existing neighboring land uses (KCC 17.60A.015[5]).

The five proposed Columbia Solar Projects would be compatible with the existing neighboring land uses as they would create very limited visual and auditory impacts and generate almost no traffic during operations, as discussed in Chapters 3 and 4. The solar projects are an allowed use, considered to be compatible with the Kittitas County Comprehensive Plan, and an accepted rural land use. Solar PV facilities are, therefore, compatible with the rural nature of Kittitas County.

F) The proposed use is consistent with the intent and character of the zoning district in which it is located (KCC 17.60A.015[6]).

Kittitas County Code allows major alternative energy facilities as conditional uses in the A-20 and Commercial Agriculture zones. A major alternative energy facility can be a solar farm that is not a minor alternative energy facility (KCC 17.61.010[9]). As a result, the Columbia Solar Projects would be major alternative energy facilities that can be allowed as conditional uses in A-20 and Commercial Agriculture zones. The solar projects are consistent with the intent and character of the zoning districts, as they are expressly allowed and satisfy the Growth Management Act's intent that the county allow a range of land uses in rural areas, discouraging residential sprawl, to meet local economic needs.

The zoning for the five Columbia Solar Project sites is as follows:

- Camas Solar Project Site: the site would be located on land zoned as Commercial Agriculture.
- Fumaria Solar Project Site: the site would be located on land zoned as Rural Working – Agriculture 20.
- Penstemon Solar Project Site: the site would be located on land zoned as Commercial Agriculture.
- Typha Solar Project Site: the site would be located on land zoned as Commercial Agriculture.
- Urtica Solar Project Site: the site would be located on land zoned as Rural Working – Agriculture 20.

G) For conditional uses outside of Urban Growth Areas the use:

1. Is consistent with the intent, goals, policies, and objectives of the Kittitas County Comprehensive Plan, including the policies of Chapter 8, Rural and Resource Lands;

Kittitas County has established goals, policies, and objectives (GPOs) to provide its intent toward county-wide land use planning. The county created these GPOs in response to identified needs within the county and to guide legislative actions in adopting zoning. Tables 2.23-2 and 2.23-3 provide an overview of the GPOs related to the lands where the Columbia Solar Projects would be located, and are intended to direct the county in the adoption of specific zoning ordinances:

Table 2.23-2. Kittitas County Comprehensive Plan GPO General Policy Statements

GPO Number	General Policy Statements
2.15	The development of resource based industries and processing should be encouraged in all areas of Kittitas County. When such uses are located in rural and resource lands, criteria shall be developed to ensure the protection of these lands to ensure compatibility with rural character. Consider adding a definition for "resource based industry" to the definitions in Title 17, Zoning.
6.18	Decisions made regarding utility facilities should be consistent with and complementary to regional demand and resources and should reinforce an interconnected regional distribution network.

GPO Number	General Policy Statements
6.36	Develop a study area encompassing the entire county to establish criteria and design standards for the siting of solar farms.
8.1	Rural lands are characterized by a lower level of services; mixed residential, agricultural and open space uses; broad visual landscapes and parcels of varying sizes, a variety of housing types and small unincorporated communities.
8.3	The County shall promote the retention of its overall character by establishing zoning classifications that preserve rural character identified to Kittitas County.
8.4	Development in rural areas is subject to agricultural and forestry activities that may take place as a right on adjacent properties.
8.8	A certain level of mixed uses in rural areas and rural service centers is acceptable and may include limited commercial, service, and rural industrial uses
8.11	Policies will reflect a “right to farm” in agricultural lands.
8.13	Encourage development activities and establish development standards which enhance or result in the preservation of rural lands.
8.14C	Development shall be located distances from streams, rivers, lakes, wetlands, critical areas determined necessary and as outlined within existing Shorelines Management Program, the Critical Areas Ordinance and other adopted resource ordinances in order to protect ground and surface waters.
8.15	Uses common in rural areas of Kittitas County enhancing rural character, such as agriculture uses in Lower Kittitas and rural residential uses and recreation uses in Upper Kittitas shall be protected from activities which encumber them.
8.17	Land use development within the Rural area that is not compatible with Kittitas County rural character or agricultural activities as defined in RCW 90.58.065(2)(a) will not be allowed.
8.44	Growth and development in Rural lands will be planned to minimize impacts upon adjacent natural resource lands.
8.129	Encourage development projects whose outcome will be the significant conservation of farmlands.
8.16	Give preference to land uses in Rural designated areas that are related to agriculture, rural residential development, tourism, outdoor recreation, and other open space activities.
8.21	Kittitas County will provide criteria within its zoning code to determine what uses will be permitted within rural zone classifications in order to preserve rural character.

Table 2.23-2 Kittitas County Comprehensive Plan GPO Zoning Implementation Statements

GPO Number	General Policy Statements
6.7	Decisions made by Kittitas County regarding utility facilities will be made in a manner consistent with and complementary to regional demands and resources.
6.9	Process permits and approvals for all utility facilities in a fair and timely manner, and in accordance with development regulations that ensure predictability and project concurrency.
6.10	Community input should be solicited prior to county approval of utility facilities, which may significantly impact the surrounding community.
6.23	Kittitas County reserves the right to review all applications for utilities placed within or through the County for consistency with local policies, laws, custom and culture.
8.5	In order to protect and preserve Resource Lands, non-resource development and activities on adjacent Rural lands shall require preservation of adjacent vegetation, existing landforms (e.g. ravines) or use of other methods that provide functional separation from the resource land use.

GPO Number	General Policy Statements
8.9	Protecting and preserving resource lands shall be given priority. Proposed development allowed and adjacent to resource lands shall be conditioned to protect resource lands from negative impacts from that development.
8.21B	Functional separation and setbacks found necessary for the protection of water resources, rural character and/or visual compatibility with surrounding rural areas shall be required where development is proposed. The first sentence of this policy shall not apply to agricultural activities as defined in RCW 90.58.065(2(a). When required by the county shoreline master program or critical area regulations, buffers shall be provided.

The above GPOs are directed at the legislative effort to adopt zoning codes that implement the intent and policy direction of Kittitas County and these GPOs; therefore, they have little to no direct application to the Columbia Solar Projects. Given this, while the zoning code references the comprehensive plan, the plan itself is not a regulatory mandate, does not include regulatory criteria capable of reliable and predictable implementation, and is not directly applicable or enforceable as such.

However, the Columbia Solar Projects are consistent with the above listed GPOs from the Kittitas County Comprehensive Plan, including policies in Chapters 2 (Land Use), 6 (Utilities), and 8 (Rural and Resource Lands). The solar projects implement the intent under the Growth Management Act for land uses that are compatible with agricultural uses, provide economic opportunity to rural area residents and landowners, minimize and mitigate impacts to rural and resource lands, and recognize the emphasis the GPOs place on the character and use of these lands. The solar projects are consistent particularly with GPO 6.36, which focuses on developing and studying the county for siting solar farms, showing an intent to address solar facilities as allowed uses.

2. Preserves “rural character” as defined in the Growth Management Act (RCW 36.70A.030[15]);

The Columbia Solar Projects preserve the area’s rural character, as defined in the Growth Management Act, by being compatible with the county’s rural patterns of land use and development. The solar projects maintain natural areas, open space, and the visual landscape. The low-lying panels used in the projects are quiet, unobtrusive structures with very few moving parts and minimal maintenance requirements that would not significantly impact viewsheds or alter the county’s rural character during operations. The panels would have native vegetation planted under them and would be surrounded by native habitat. The solar projects would also be compatible with current rural uses of the land. The projects would not impact traditional rural lifestyles, rural-based economies, or opportunities to live and work in rural areas. Local farming practices can (and TUUSSO anticipates would) continue on the properties adjacent to the projects, particularly where the projects would operate on portions of larger parcels. The solar projects would not in any way interfere with existing surrounding agricultural practices and would not force or compel any conversions to non-agricultural land uses.

The Columbia Solar Projects would also not cause inappropriate conversion of undeveloped land into sprawling, low-density residential development. The projects would be temporary and provide an opportunity for diversified farming income that disincentivizes sprawling, low-density development. Finally, as discussed below, the solar projects would not require the extension of urban governmental services.

The Columbia Solar Projects would also maintain the rural character of the wildlife habitat and protection of natural surface water and groundwater flows, recharge, and discharge. The projects would also be compatible with local wildlife. TUUSSO would continue to work with WDFW to manage existing wildlife habitat. In addition, the solar projects would maintain current patterns of surface water and groundwater

flow and recharge and discharge areas, as well as surface water and groundwater uses. The projects are anticipated to have no stormwater discharges and would use water under existing water allocations or water that is trucked in.

3. Requires only rural government services; and

The Columbia Solar Projects would require only rural government services, such as police and fire services. The projects would have on-site fire prevention and protection measures. In addition, with minor improvements, the surrounding roads and infrastructure would be sufficient to serve the projects' construction and operation. As mitigated, the solar projects would not increase the need for police, fire, school, irrigation, refuse, water or septic systems, or health care services. As mitigated, there should be no costs or detriments to offset.

4. Does not compromise the long term viability of designated resource lands (KCC 17.60A.015[7]).

The Columbia Solar Projects would not compromise the long-term viability of the surrounding agricultural land. The solar projects would temporarily remove approximately 232 acres of land from its current agricultural use or fallow status. Throughout the solar projects' life, they would not compromise agricultural and rural use on the surrounding land. Moreover, after the removal of all solar equipment after the lease terms, the land would be returned to its original state and can be returned to agricultural production.

Kittitas County Code Title 17A, Critical Areas

The Columbia Solar Projects would meet applicable requirements of KCC 17A, Critical Areas Ordinance (CAO), as indicated below.

The KCC CAO applies to lands within unincorporated Kittitas County, including both Washington state-owned lands and privately owned lands. The Columbia Solar Projects would follow the general guidance of the Kittitas County critical areas policy document, coupled with the more specific provisions of the critical areas development ordinance, pursuant to the requirements of RCW 36.70A (Ord. 94-22 [part], 1994).

TUUSSO has adhered to all requirements outlined in the critical areas checklist and required information (KCC 17A.03.035) for project activities subject to this ordinance, which are outlined in the critical areas reports for each solar project site in Appendices G to K. The critical area reports and this application include the following information, meeting the required KCC CAO checklist (KCC 2017):

- Legal descriptions of the land, and assessor's parcel numbers.
- As defined herein, the location of the following, if applicable:
    - wetlands;
    - erosion hazard areas;
    - floodplains and floodways;
    - riparian habitats;
    - geologically hazardous areas;
    - landslide hazard areas;
    - mine hazard areas;
    - seismic hazard areas; and
    - streams and rivers.

- Any voluntary methods or activities anticipated by TUUSSO pertaining to critical areas, including incentives being offered by the local or state government.
- Duplicate plans drawn to scale showing the nature, location, dimensions, and elevations of the areas in question, including existing or proposed structures, estimated amounts of fill materials, drainage facilities, significant natural features, and the location of the above items, if applicable.
- The requirement for delineating the location of possible critical areas would be waived if field investigations by county staff indicate the following:
    - sufficient information exists for staff to estimate the boundaries of any critical areas without a delineation by the applicant; or
    - no structures and uses, except for exempt activities, are proposed to be located within any possible critical area.
- Subject to field investigations by county staff, or other reliable and relevant information, the information submitted by the applicant shall be presumed valid for all purposes under this chapter (Ord. 94-22 [part], 1994).

The Columbia Solar Projects would comply with all Kittitas County critical areas ordinances.

2.23.3.2 Access Permit

Under KCC 12.05, an access permit is required for any activity within Kittitas ROWs and for driveways or access roads that connect to county ROWs.

Statement of Compliance

TUUSSO has prepared access permits for each of the Columbia Solar Project sites and would be in compliance with this requirement.

2.23.3.3 Grading Permit

Under KCC 14.05, grading or filling on a site involving more than 100 cubic yards requires a grading permit from Kittitas County.

Statement of Compliance

Grading on the Columbia Solar Project sites would be minimized to the extent possible and be focused in access road and transformer locations. The Columbia Solar Projects would be permitted through EFSEC and would likely not require a grading permit through Kittitas County. If a grading permit is required, then TUUSSO would coordinate with the county to prepare and submit a grading permit for each project site, as necessary.

2.24 References – Chapter 2

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual*. Technical Report Y-87-1. Online edition. Vicksburg, Mississippi: U.S. Army Engineer Waterways Experiment Station. Available at: http://el.erdc.usace.army.mil/wetlands/pdfs/wlman87.pdf.

Kittitas County. 2016. Kittitas County Comprehensive Plan, December 2016. Adopted by Ordinance No. 2016-023. Available at: https://www.co.kittitas.wa.us/uploads/documents/cds/comp-plan/2016/2016%201206%20Comp%20Plan%20per%20Kittitas%20Co%20Ord%202016-023.pdf.

Kittitas County Code (KCC). 2017. Kittitas County, Washington, Ordinances and Resolutions. Available at: http://co.kittitas.wa.us/boc/countycode/. Accessed March 13, 2017.

U.S. Bureau of Reclamation (Reclamation). 2012. *Yakima River Basin Integrated Water Resource Management Plan, Final Programmatic Environmental Impact Statement*. March 2012. U.S. Bureau of Reclamation, Pacific Northwest Region. Available at: https://www.usbr.gov/pn/programs/yrbwep/reports/FPEIS/fpeis.pdf.

U.S. Environmental Protection Agency (EPA). 2017. MyWATERS Data Mapper Google Earth kmz file. Available at: https://www.epa.gov/waterdata/viewing-waters-data-using-google-earth. Accessed March 7, 2017.

Washington State Department of Ecology (Ecology). 2017. Wells GIS Data. Available at: http://www.ecy.wa.gov/services/gis/data/data.htm#w. Accessed March 7, 2017.

3 NATURAL ENVIRONMENT AFFECTED ENVIRONMENT AND IMPACTS

3.1 Earth 463-60-302

(1) The applicant shall provide detailed descriptions of the existing environment, project impacts, and mitigation measures for the following:

(a) Geology. The application shall include the results of a comprehensive geologic survey showing conditions at the site, the nature of foundation materials, and potential seismic activities.

3.1.1 Affected Environment for Geology

3.1.1.1 General County

Kittitas Valley is at the eastern margin of the Yakima River Valley in a structural basin between the Cascade Mountains and the Columbia Plateau (Alt and Hyndman 1995; McKee 1972). In April 2017 TUUSSO Energy, LLC (TUUSSO), conducted a comprehensive geologic survey showing conditions at the Columbia Solar Project sites, the nature of foundation materials, and potential seismic activities. The reports summarizing this study are included in Appendices G through K (Swiftwater Environmental & Geotechnical [Swiftwater] 2017a, 2017b, 2017c, 2017d, 2017e). Two test borings were drilled at each project site to a maximum depth of 16.5 feet below existing grade. The boring locations were selected to attempt to be representative of each project site. A general description of soils and groundwater conditions is included below in Sections 3.1.4 and 3.3.11, respectively.

According to Waitt (1979), the Columbia Solar Project sites and surrounding area are underlain by Qs (Quaternary Alluvium, Sidestream Facies) soil which is characterized as downstream aggradation deposits with their source being upstream glacial moraines located in the west and northwest areas of the Kittitas Valley. These deposits consist primarily of basaltic gravels and sands with varying amounts of silt and clay minerals. The gravel varies from fine to coarse. These undifferentiated sandy gravel deposits are overlain by varying thicknesses of topsoil, weathered sandy gravel horizons, and loessal (wind) deposits that comprise silty sand and sandy silt units observed from the surface down to the relatively un-weathered, partially cemented gravel. The gravel deposits consistently displayed some level of cementation that is most likely caused by breakdown of the basaltic rock to silt and clay minerals and then subsequent relithification under normal loading. The soils observed in the borings at the sites were consistent with this mapping.

In the second borings at each project site, Swiftwater encountered a fine-grained, reddish brown to tan silty clay to clayey silt unit underlying the sandy gravel deposits. Swiftwater contacted Dr. Nick Zentner, Professor of Geological Sciences at Central Washington University about this unit. Dr. Zentner indicated that this layer is probably an alluvial deposit that develops in slow-water areas and ox-bows proximate to streams and to the Yakima River. He stated that these deposits are horizontally discontinuous and are found throughout the valley. The deposit on each project site is thus likely limited in lateral extent, especially given that it was not encountered in the first borings at any of the sites.

3.1.1.2 Solar Project Sites

Camas Solar Project Site

Surface geology in the Camas Solar Project site vicinity consists of Holocene river and creek alluvium and windblown loess of the Palouse Formation overlying Pleistocene Thorp Gravels. Recent alluvium deposited by Naneum and Wilson Creeks covers most of the project area, except the northeast corner where an older alluvial terrace of the ancestral Yakima River is present.

Fumaria Solar Project Site

The Fumaria Solar Project site is within the Kittitas Valley on the east side of the river on a Pliocene epoch gravel deposit called the Thorp Gravels.

Fumaria Solar Project Generation Tie Line

The Fumaria Solar Project generation tie line crosses several adjacent landforms, including ridges of Pleistocene epoch alpine glacial sediment of the Kittitas Drift (Swauk Prairie and Indian John subdrifts) and the Lakedale Drift (Bullfrog subdrift). Quaternary creek alluvium is mapped in the swales between the glacial ridges and at the point of intersection of the generation tie line with the existing grid (Baker et al. 1991).

Penstemon Solar Project Site

Surface geology in the Penstemon Solar Project site vicinity consists of Holocene creek alluvium and wind-blown loess of the Palouse Formation overlying Pleistocene Thorp Gravels. Alluvium deposited by Coleman Creek covers most of the project site.

Typha Solar Project Site

Surface geology in the Typha Solar Project site vicinity consists of Holocene river alluvium and wind-blown loess overlying older Pleistocene gravels. Recent alluvium deposited by the Yakima River and its major local tributary Robinson Creek covers most of the project site, and Thorp Highway South follows an older alluvial terrace southwest of the project.

Urtica Solar Project Site

Surface geology in the Urtica Solar Project site vicinity consists of Pleistocene-aged wind-blown loess and ash on top of Holocene-aged, water-lain alluvium, both overlying older glacial and pre-glacial gravels (Baker et al. 1991). Quaternary terraced sediments that include glacial sediment, older alluvium, and uplifted, partially lithified coastal marine and estuarine deposits form the substrate of the project site. Flows of the Middle Miocene Grande Ronde Basalt make up the hills just south of the project site and younger alluvium is in the valley floor to the north.

3.1.2 Impacts to Geology

3.1.2.1 General County

Detailed plans and specifications for the Columbia Solar Projects were not available prior to completion of the geologic survey, nor was a grading plan. However, based on Swiftwater's review of similar projects, they believed that very little grading would be required to construct the solar panel racks (Swiftwater 2017). Standard H-beam penetration for this type of installation is 6 to 8 feet below grade, and based on their survey, Swiftwater determined that from a geotechnical standpoint construction of the proposed solar projects would be feasible provided that strong enough vertical H-beam supports are installed. Once the loading for the piles has been determined, final bearing capacities and embedment lengths would be

computed. The density of the soil matrix combined with the weight of the hammer might possibly damage the pile, leading to less than satisfactory bearing capacity values. In this case, it would be prudent to complete several test borings to determine whether the piles could be placed without damage. The purpose of this testing is two-fold: 1) it is necessary to determine that the piles can be driven into the bearing soils to the required embedment depth without damaging the pile and 2) it is required to load test the resulting piles to determine that adequate bearing capacity is being developed.

Wind Loading

The Kittitas Valley, particularly the Ellensburg area, is known for year-round windy conditions. This analysis assumed that solar panels that would be used for the Columbia Solar Projects would be 8 feet long by 4 feet wide, i.e., 32-square-foot panels. Ultimately, the panels would be 6.5 feet long by 3.5 feet wide, i.e., approximately 23-square-foot panels. The wind pressure loads in Table 3.1-1 were calculated using maximum wind speeds on vertically-oriented panels (Swiftwater 2017a).

Table 3.1-1. Estimated Wind Pressure Loads on Solar Panels Calculated Using Maximum Wind Speeds

Site-specific Wind Speed Value	Wind Speed (miles per hour)	Wind Pressure (lbs)
American Society of Civil Engineers (ASCE) 7-93 Wind speed (fastest mile)	70	593
ASCE 7-05 Wind speed (3-second peak gust)	85	878
ASCE 7-10 100-year Mean Recurrence Interval	91	1006
ASCE 7-10 Risk Category II	110	1470

Because the panels' current design is smaller than the dimensions used in the analysis, and the panels typically would not be oriented vertically and could be shifted horizontally before or during a high-wind event, the pressure on the panels (and therefore the H-beams) is likely to be less than these estimates. As a result, potential impacts to geology would be permanent, but minimal.

Seismic Activities

No seismic activities are planned as part of the Columbia Solar Projects.

3.1.2.2 Solar Project Sites

Camas Solar Project Site

The zone of appropriate embedment depth for the H-beams on the Camas Solar Project site is about 3 to 4 feet below grade to 16 feet below grade (Swiftwater 2017a).

Fumaria Solar Project Site

From the surface, drilling was difficult in both of the Fumaria Solar Project borings, indicating that embedment soils were present from grade down to 16 feet (Swiftwater 2017b).

Penstemon Solar Project Site

In both of the Penstemon Solar Project borings, drilling became more difficult with depth, indicating increasing density, increasing cementation, or both. Embedment depths were present from 3 feet below grade (Swiftwater 2017c).

Typha Solar Project Site

In both of the Typha Solar Project borings, drilling was difficult beginning at about 1.5 to 2 feet below grade, indicating that adequate embedment soils were present from about 2 feet below grade (Swiftwater 2017d).

Urtica Solar Project Site

In both of the Urtica Solar Project borings, drilling was difficult beginning at about 3.5 to 4 feet below grade, indicating that adequate embedment soils were present from about 3 to 4 feet below grade (Swiftwater 2017e).

3.1.3 Mitigation Measures for Geology

Complete several test borings to determine if the piles can be placed without damage. The purpose of this testing is two-fold: 1) it is necessary to determine that the piles can be driven into the bearing soils to the required embedment depth without damaging the pile, and 2) it is required in order to load test the resulting piles to determine that adequate bearing capacity is being developed.

(b) Soils. The application shall describe all procedures to be utilized to minimize erosion and other adverse consequences during the removal of vegetation, excavation of borrow pits, foundations and trenches, disposal of surplus materials, and construction of earth fills. The location of such activities shall be described and the quantities of material shall be indicated.

3.1.4 Affected Environment for Soils

3.1.4.1 General County

Most soils in the vicinity of the Columbia Solar Project sites have a cemented zone at depth, commonly called caliche, and a blanket of loess and volcanic ash across the surface (Gentry 2010). In April 2017 TUUSSO conducted a comprehensive geologic survey showing conditions at the solar project sites. The reports summarizing this study are included in Appendices G through K (Swiftwater 2017a, 2017b, 2017c, 2017d, 2017e). Two test borings were drilled at each project site to a maximum depth of 16.5 feet below existing grade. The boring locations were selected to be representative of each project site as possible. The soil profiles in all of the borings were very consistent and based on the depositional environment in available mapping and also on the locally flat topography, the soil profile across each site is likely similar to those observed in the boring profiles. The boring logs contain detailed descriptions of soils at each project site (Swiftwater 2017a, 2017b, 2017c, 2017d, 2017e).

3.1.4.2 Solar Project Sites

Camas Solar Project Site

Soils mapped on the Camas Solar Project site include Mitta ashy silt loam, Nosal ashy silt loam, and Opnish ashy loam that form on floodplains and alluvial fan landforms within alluvium mixed with volcanic ash (Gentry 2010). Hydrologic Soil Group D was used in the hydrologic modeling because Nosal ashy silt loam is classified as Group D for undrained areas (detailed in Section 3.3.5).

Boring C-1 was completed in the north-northwest quadrant of the Camas Solar Project site, immediately to the south and west of the barn and staging area and Boring C-2 was located in the southeast quadrant of the site west of Little Naneum Creek (Figure 3.1.-1) (Swiftwater 2017a).

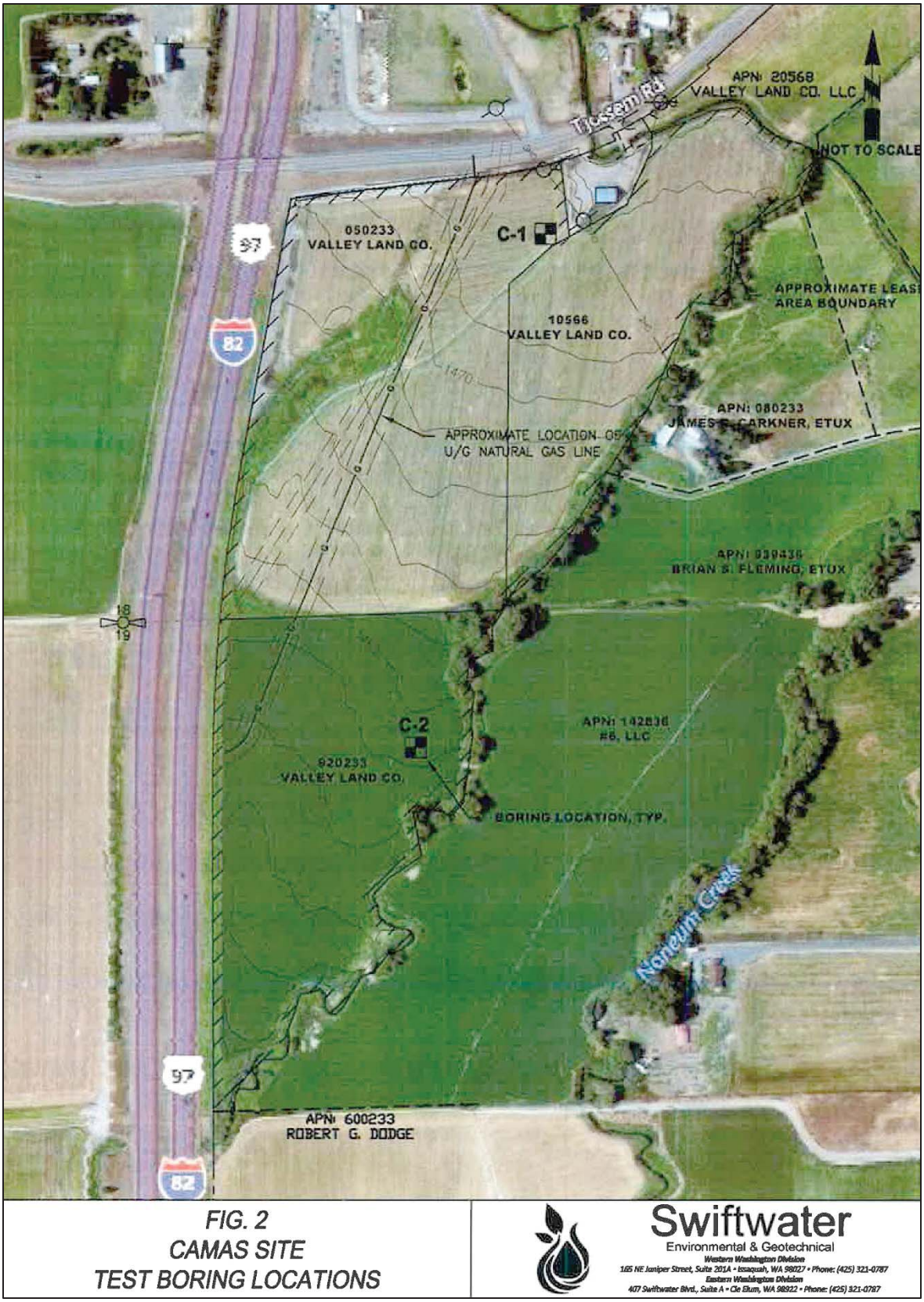


Figure 3.1-1. Boring locations at the Camas Solar Project site.

In Boring C-1, Swiftwater observed less than 6 inches of very dark brown highly organic sod underlain by a brown, moist medium dense topsoil-like loam soil with varying amounts of fine gravel. Swiftwater encountered this material to a depth of about 4 feet below grade. Drilling became very hard at about 4.5 to 5 feet below grade and the Standard Penetration Test (SPT) sample at 5.0 feet revealed a gray to dark gray, silty, sandy, partially cemented gravel with thin (<1-inch) fine sand seams that contained perched groundwater. N-values in this material was in excess of 40 and remained above that until termination of the hole. In Boring C-2, Swiftwater observed a soil profile that was nearly identical to that found in Boring C-1. A 6-inch-thick, wet sand seam was observed at 10.0 to 11.0 feet below grade. The entire soil profile of the site is moisture sensitive.

In both borings, Swiftwater observed that drilling grew difficult with depth beginning at about 3.5 to 4 feet below grade, indicating that adequate embedment soils are present from about 3 to 4 feet below grade down to the depth of the test borings.

Fumaria Solar Project Site

Soils mapped on the Fumaria Solar Project site include the Reeser-Reelow-Sketter complex, which form in alluvium and glacial drift with an influence of loess and volcanic ash on remnant alluvial fan landforms and typically extend to 1.8 feet below the surface. Hydrologic Soil Group D was used in the hydrologic modeling (detailed in Section 3.3.5).

Boring F-1 was completed in the north-northwestern quadrant of the Fumaria Solar Project site and Boring F-2 was located in the southeastern quadrant of the solar project site (Figure 3.1.-2) (Swiftwater 2017b). From the surface, drilling was difficult in both borings, indicating that embedment soils are present from the start of installation of the piles.

In Boring F-1, less than 6 inches to 1 to 1.5 feet of dark brown topsoil-like material was observed. It was a moist, very loose to loose, silty sand to sandy silt with varying amounts of gravel. Immediately underlying the very thin topsoil unit with a SPT (N-value) of 88, a dark gray to light gray, slightly moist to moist, very dense and partially cemented sandy gravel with varying amounts of silt was observed. N-values observed below 13 feet were about 28. This is on the high end of dense, but should not cause problems for pile installation because of the depth of the material.

In Boring F-2, a soil profile nearly identical to that found in F-1 was observed; the only differences being a thin (2- to 3-inch) unit of poorly developed topsoil and a slight reduction in density below 13 feet. Minor seepage was observed in Boring F-2 at 6.0 to 7.0 in a reddish sand seam. The entire soil profile of the site is moisture sensitive. Similar to F-1, there should not be any problems for pile installation because the dense material depth is below that of the planned pile installation depth.

Fumaria Solar Project Generation Tie Line

Soils mapped along the proposed Fumaria Solar Project generation tie line include Nanum, Manastash, Durtash, Metmill, and Brysill soils that form in alluvium mixed with ash on remnant alluvial fan and old terrace landforms. Soils mapped at the Reecer and Dry Creek crossings include Ackna, Brickmill, Manastash, Metmill, Nanum, Nosal, and Reeser soils that form in alluvium mixed with loess and ash on alluvial fan and terrace landforms, as well as soils of the Weirman-Kayak-Zillhah complex that form in alluvium on floodplains. The alluvial soils extend from 1.3 to 3.7 feet below the modern surface.

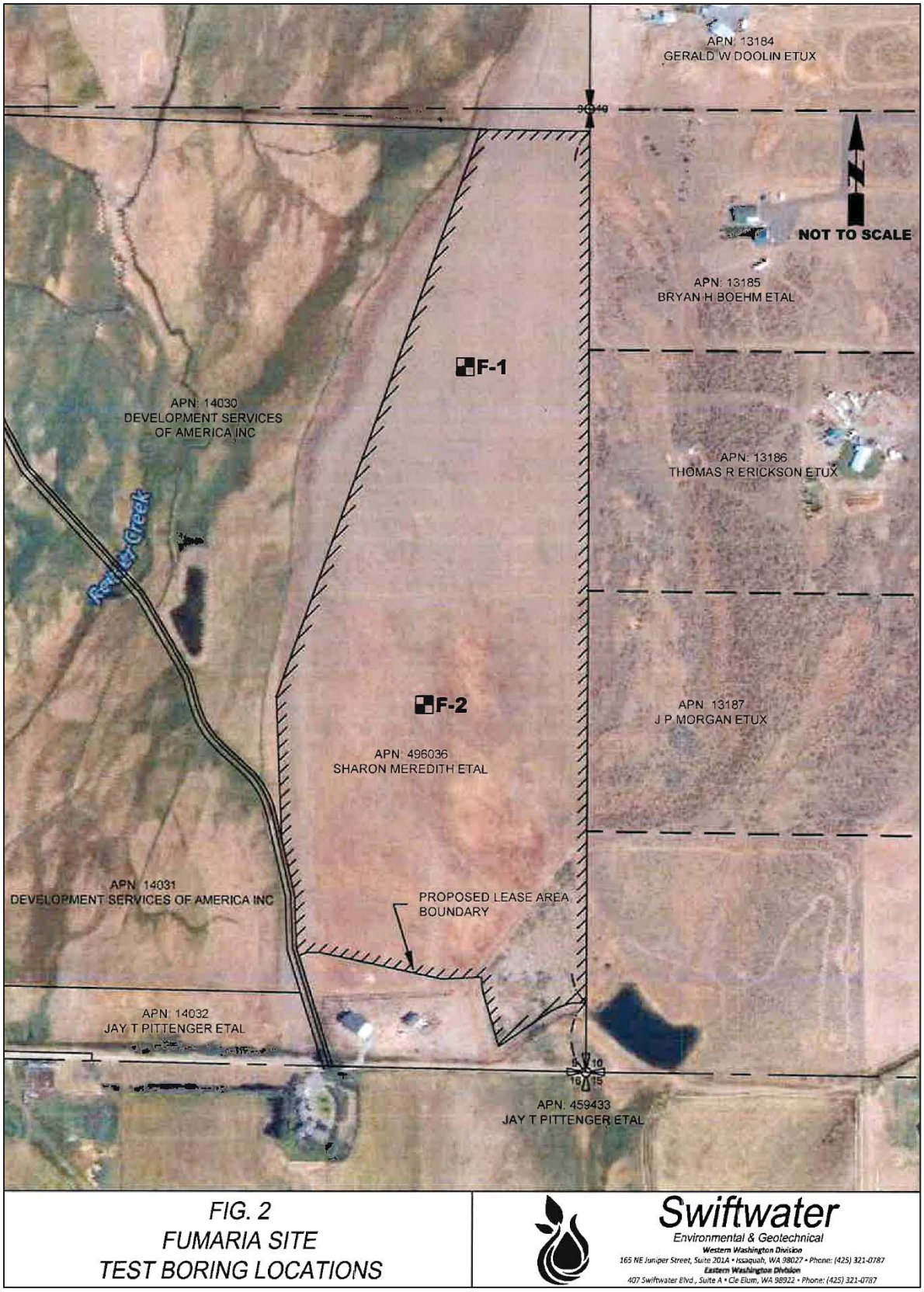


Figure 3.1-2. Boring locations at the Fumaria Solar Project site.

Penstemon Solar Project Site

Soils in the west third of the Penstemon Solar Project site is mapped as the Nack-Brickmill complex. Soil in the middle of project area is mapped as Mitta ashy silt loam. Soil in the east third of project area is mapped as Deedale clay loam. These soils form in alluvium mixed with volcanic ash on alluvial fan landforms and floodplain landforms (Gentry 2010). Hydrologic Soil Group D was used in the hydrologic modeling because some of these soils are either classified as Group D or are Group D when undrained (detailed in Section 3.3.5).

Boring P-1 was completed in the northwestern quadrant of the Penstemon Solar Project site and Boring P-2 was located in the southeastern quadrant of the site (Figure 3.1-3) (Swiftwater 2017c).

In Boring P-1, 1.5 feet of dark brown topsoil-like material consisting of a moist, very loose to loose silty sand to sandy silt with varying amounts of gravel was observed. Immediately underlying the topsoil unit a dark gray to light gray, slightly moist to moist, very dense and partially cemented sandy gravel with varying amounts of silt was observed. Below about 10 feet, thin (less than 6 inches) reddish-brown fine sand seams with minor amounts of perched groundwater were observed. This boring was terminated in the sandy gravel unit. The soil profile in P-1 was nearly identical to that found in P-2, the only difference being a reddish-brown, stiff to very stiff, silty clay to clayey silt unit below about 12.5 feet.

In both borings, drilling became more difficult with depth indicating increasing density, increasing cementation, or both. The upper topsoil unit is moisture sensitive.

Typha Solar Project Site

Soils mapped on the Typha Solar Project site include Nosal ashy silt loam, Weirman gravelly sandy loam, and soils of the Weirman-Kayak-Zillah complex that form in alluvium on flood plain landforms (Gentry 2010). Hydrologic Soil Group D was used in the hydrologic modeling because some of these soils are classified as Group D when undrained (detailed in Section 3.3.5).

Boring T-1 was completed in the south-central area of the Typha Solar Project site, and Boring T-2 was located in the northeast quadrant of the site, west of the Yakima River (Figure 3.1-4) (Swiftwater 2017d).

In Boring T-1, less than 6 inches of very dark brown, highly organic sod underlain by a brown, moist medium dense gravelly sand to sandy gravel with a trace to some silt and scattered fine organics (e.g., fine roots) was observed. Drilling was very hard below about 1.5 feet with a color change to gray. The surficial SPT N-value was 40. There was cementation in the sandy gravel to gravelly sand, and the same material was observed to the final depth of the boring. All N-values equaled or exceeded 50. At 6.5 feet below grade, there was a 6-inch silty sand seam with perched groundwater seepage. The seepage was not continuous.

A soil profile that was nearly identical to that found in T-1 was observed in Boring T-2, including the 6-inch silty sand seam with perched groundwater seepage. T-2 was terminated in the gray to dark gray silty sand to sandy silt unit. SPT N-values were consistent at 50.

In both borings, drilling was difficult beginning at about 1.5 to 2 feet below grade indicating that adequate embedment soils are present from about 2 feet below grade.



Figure 3.1-3. Boring locations at the Penstemon Solar Project site.

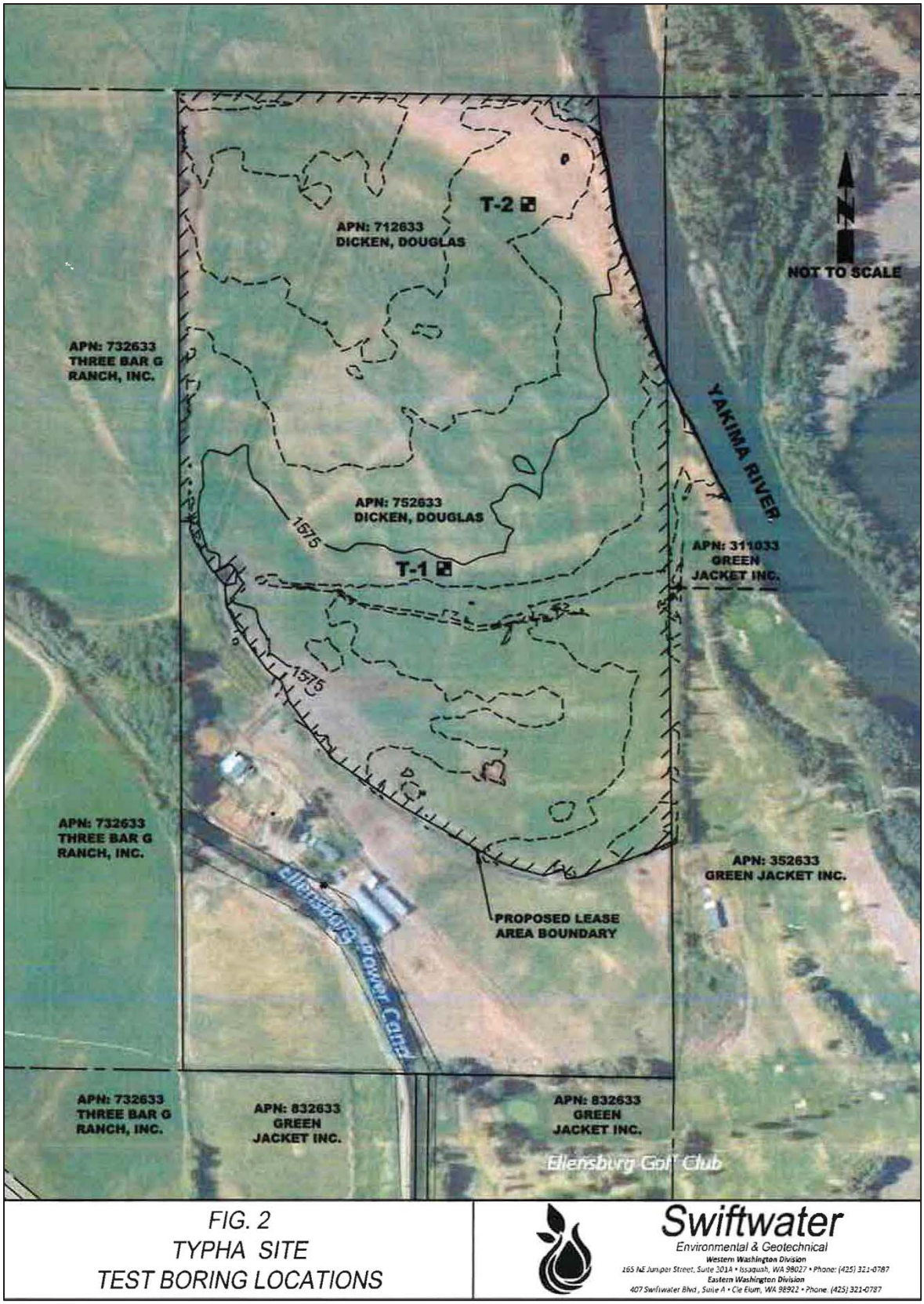


Figure 3.1-4. Boring locations at the Typha Solar Project site.

Urtica Solar Project Site

The Urtica Solar Project site is composed of Nanum ashy loam, Brickmill gravelly ashy loam, Ackna Ashy loam, and Brysill cobbly ashy loam (Natural Resources Conservation Service [NRCS] 2017a). Hydrologic Soil Group D was used in the hydrologic modeling because Nanum ashy loam is classified as Group D for undrained areas (detailed in Section 3.3.5)

Boring U-1 was completed in the northwest quadrant of the Urtica Solar Project site, northwest of the ponds and Boring U-2 was located in the south central quadrant of the site (Figure 3.1-5) (Swiftwater 2017e).

In each boring, there was a thin topsoil layer consisting of a brown silty fine sand with scattered organics that extended to a depth of about 1.5 to 4 feet below grade and consisted of a topsoil-like loamy material. This material would not be suitable for embedment or for lateral force. At about 4.5 to 5 feet below grade drilling became very hard and the SPT sample at 5 feet revealed a gray to dark gray silty sandy, partially cemented gravel. N-values in this material were in excess of 40 and remained there until termination of the hole. The soil profile in Boring U-2 was nearly identical to that found in U-1.

In both borings, drilling was difficult beginning at about 3.5 to 4 feet below grade indicating that adequate embedment soils are present from about 3 to 4 feet below grade.

3.1.5 Impacts to Soils

The following sections describe all procedures to be utilized to minimize erosion and other adverse consequences during the removal of vegetation, excavation of foundations and trenches (no borrow pits are planned), disposal of surplus materials, and construction of earth fills. The Columbia Solar Project would result in temporary minor impacts to soils. For each Columbia Solar Project site, the location of such activities is described in detail and shown in map figures in Appendix L.

3.1.5.1 Infiltration and Temporary Erosion and Sedimentation Control

TUUSSO would implement applicable stormwater guidelines and best management practices (BMPs) for eastern Washington to reduce or eliminate concentrated stormwater runoff and erosion on the Columbia Solar Projects. These BMPs would also help limit the introduction of pollutants/contamination into the arid-land and rangeland soils present at the solar project sites. Additional details regarding BMPs can be found in Section 3.1.6 and would be part of the SWPPP.

Construction of the Columbia Solar Project arrays could create a minor increase in the total and effective impervious area of each site that would be equivalent to the area of the solar panel footings and associated infrastructure. There would also be an increase in less pervious area because of the proposed gravel access roads on each solar project site.



Figure 3.1-5. Boring locations at the Urtica Solar Project site.

Based on the results of the geotechnical studies, infiltration into the upper, topsoil-like silty sand/sandy silt soils at the Columbia Solar Project sites is feasible and ongoing (Swiftwater 2017a, 2017b, 2017c, 2017d, 2017e). The solar project sites have been cultivated using flood irrigation methods, and the irrigation water percolates into the soil and is stored above the underlying relatively impervious layer found throughout the valley. The soils are capable of allowing stormwater to infiltrate during an average year (Swiftwater 2017a, 2017b, 2017c, 2017d, 2017e). The solar project sites are located in Climate Region 2 – Central Basin and receive an average of about 8 inches of precipitation per year, some of it in the form of snow. Given the relatively low precipitation in the area, combined with the natural permeability of the upper soil horizon, infiltration of normal stormwater amounts would occur, and normal levels of stormwater would not be concentrated to a significant extent on the solar project sites (Swiftwater 2017a, 2017b, 2017c, 2017d, 2017e). As a result, there would be permanent minor impacts to soils.

3.1.5.2 Stripping

No well-developed sod or heavily organic topsoil layers were observed at the Columbia Solar Project sites because of ongoing cultivation, thus stripping should not be required (Swiftwater 2017a, 2017b, 2017c, 2017d, 2017e). If a topsoil horizon is observed in areas where maintenance roads are proposed, the topsoil would be removed down to mineral soil and replaced with crushed rock or structural fill. Topsoil strippings could be stockpiled for use in non-structural areas, as desired, but would not be allowed to mix with soils that would be used for structural fill.

3.1.5.3 Native Soils and Imported Soils

At least the upper units of the soil profile at each Columbia Solar Project site, and for some sites the entire soil profile, are moisture-sensitive and those soils would be difficult to use as structural fill during the rainy winter and spring months. The underlying partially cemented sandy gravel soils would be less moisture sensitive, but natural variability of the fine-grained fraction (e.g., silts and clay minerals) might cause these soils to be moisture sensitive as well (Swiftwater 2017a, 2017b, 2017c, 2017d, 2017e). However, if moisture content is near optimum, the soil could be used as compacted structural fill. Excavated site soils would be stockpiled and covered immediately if they are to be saved and used as structural fill. If the soils are above optimum moisture content, it may be possible to aerate them to reduce moisture content. This is possible during the warmer summer months, but it is difficult to achieve uniform moisture content. It may also be possible to use Portland cement as an admixture to reduce moisture content. If the site soils cannot be adequately compacted, it may be necessary to use imported soil for structural fill. Imported soil would be a well-graded granular mineral soil with fines content below 5% and should be at or slightly above the optimum moisture content. If construction of the Columbia Solar Projects is scheduled to occur during periods where precipitation is expected, a contingency would be built into the solar projects for imported soil/crushed rock base (CRB) or other imported structural fill.

3.1.5.4 Subgrade Preparation

Disturbed native soil would not be used in structural areas (e.g., maintenance road prism or inverter foundations). The fill would be compacted in accordance with the structural fill specifications to reach design grade. CRB can also be placed and compacted. If necessary, a local materials testing firm would sample soils to be used as structural fill, collect samples for Proctor testing, and provide compaction testing as structural fill is placed.

3.1.5.5 Structural Fill

Structural fill on the Columbia Solar Projects would be placed in thin lifts and compacted to design specifications, to support overlying structures with little or no post-construction movement. It is typically

used under foundations, slabs, and roads; in utility trenches; behind retaining walls; and in constructed slopes. Compaction specifications may vary, especially in utility trenches under public or private roads, as specified by the local jurisdiction. Moisture content is critical to achieving adequate densification (compaction) and the upper units of all the Columbia Solar Project sites' soils is very moisture sensitive, i.e., a small change in moisture content can make them unusable as structural fill. If the soils are stockpiled and not covered, precipitation would make them difficult or impossible to use as structural fill (Swiftwater 2017a, 2017b, 2017c, 2017d, 2017e).

3.1.5.6 Foundations

The Columbia Solar Project inverter foundations would be supported on undisturbed, competent, native sandy gravel soils found below the upper topsoil-like horizon, on re-compacted native soils, structural fill, or CRB (Swiftwater 2017a, 2017b, 2017c, 2017d, 2017e). Where loose or unsuitable soils are encountered at design subgrade, it would be necessary to re-compact the native soils to structural fill specifications, or to over-excavate down to competent native soils and then place structural fill or CRB up to design subgrade. The following parameters may be used for solar project design:

- Allowable soil bearing capacity: 1,500 pounds per square foot (psf)
- Passive earth pressure: 300 pound force per cubic foot (pcf) (equivalent fluid)
- Coefficient of friction: 0.35

A one-third increase in the allowable soil bearing capacity would be assumed for short-term wind and seismic loading conditions. The passive pressure and friction values above include a factor of safety of at least 1.5. With anticipated structural loads, total settlement of 1 inch and differential settlement of 0.5 inch would be anticipated. Most settlement would occur during construction, as dead loads are applied.

3.1.5.7 Seismic Design

The groundwater and native soil conditions (upper native silty sand soils and the underlying partially cemented sandy gravels) at the Columbia Solar Project sites have very low susceptibility to liquefaction (Swiftwater 2017a, 2017b, 2017c, 2017d, 2017e). Liquefaction is a phenomenon wherein loose, saturated soils suddenly lose shear strength and begin to behave as a fluid. Liquefaction typically occurs under seismic loading conditions and if structures are supported on soils that liquefy, structural damage can occur.

3.1.5.8 Excavations/Slopes

Soils observed in the upper 1.5 to 2 feet of the test borings at all of the Columbia Solar Project sites would be classified as Occupational Safety and Health Administration/Washington Industrial Safety and Health Act (OSHA/WISHA) Type C. Temporary excavations like utility excavations and foundation excavations with heights in excess of 4 feet would be sloped to no steeper than 1.5H:1V. If seepage is observed in these excavations, they may need to be sloped at 2H:1V to prevent sloughing due to seepage pressure. The dense native sandy gravel soil observed below about 2 feet would be considered OSHA/WISHA Type B soils and would be laid back at 1H:1V.

3.1.5.9 Utility Support, Trenches, and Trench Backfill

Columbia Solar Project site soils would be suitable for support of solar panel infrastructure and utilities (Swiftwater 2017a, 2017b, 2017c, 2017d, 2017e). In shallower trenches, particularly shallower than about 2 feet, it may be necessary to over-excavate loose or wet soil down to suitable, stable soils, and then replace it with compacted structural fill or CRB. Groundwater seepage may be encountered in trench

walls, particularly if deeper than 2 to 3 feet. Seepage may cause caving of the trench walls and temporary shoring may be required. Dewatering measures may also be needed to control seepage.

Site soils may be suitable for use as backfill, provided the moisture content is optimal (Swiftwater 2017a, 2017b, 2017c, 2017d, 2017e), as determined in the laboratory. Trench backfill would be placed and compacted in accordance with the structural fill specifications (described above). CRB would be placed in 6- to 8-inch lifts and compacted with a plate compactor or other compaction device.

3.1.6 Mitigation Measures for Soils

The following mitigation measures would be used:

- Planned BMPs include those from stormwater management guidelines applicable to eastern Washington.
- If excavated site soils are to be used as structural fill, they would be protected from moisture while stockpiled.
- Stockpiled topsoil would not be mixed with structural fill, if it is planned for use in non-structural areas.
- Temporary excavations like utility excavations and foundation excavations with heights in excess of 4 feet would be sloped no steeper than 1.5H:1V. If seepage is observed in these excavations, they may need to be sloped at 2H:1V to prevent sloughing due to seepage pressure. Dewatering measures may also be needed to control seepage.
- Temporary construction ingress and egress would be completed prior to the start of ongoing construction traffic at the solar project sites. A temporary construction entrance would be constructed of 8 to 12 inches of quarry spalls. If the soils in the entrance locations are soft, a layer of geotextile fabric would be laid down as a barrier prior to placement of quarry spalls. The quarry spalls would provide a stable entrance/exit to the sites and would limit tracking of mud onto the existing public and private roads during and after wet weather. Infiltration and Temporary Erosion and Sedimentation Control (TESC) measures would consist of installation of silt fencing as needed around the site entrances, around the perimeter of the low side of the sites, and at discharge points where sediment-laden surface water might enter off-site drainage features. Because the solar project sites are flat and slope very gently to the south, silt fencing would probably not be necessary at the southern perimeters.

(c) Topography. The application shall include contour maps showing the original topography and any changes likely to occur as a result of energy facility construction and related activities. Contour maps showing proposed shoreline or channel changes shall also be furnished.

3.1.7 Affected Environment for Topography

The Columbia Solar Project sites are all relatively flat (see figures in Section 3.3.4.2).

3.1.7.1 Camas Solar Project Site

The Camas Solar Project site is sloped gently from north to south with an overall inclination of about 0.5%.

3.1.7.2 Fumaria Solar Project Site

The Fumaria Solar Project site is sloped gently north to south with an overall inclination of about 2%.

3.1.7.3 Fumaria Solar Project Generation Tie Line

The Fumaria Solar Project generation tie line would originate from the southwestern corner of the Fumaria Solar Project site and would connect to the existing Puget Sound Energy (PSE) distribution transmission lines (or the PSE substation) approximately 2.6 miles away to the southwest. The path is illustrated in Appendix L, and up to 0.9 mile of it would require new wooden poles or undergrounded conductor. The remaining length of the new generation tie line would be installed along existing electrical rights-of-way (ROWs).

3.1.7.4 Penstemon Solar Project Site

The Penstemon Solar Project site is flat with a very slight inclination from north to south.

3.1.7.5 Typha Solar Project Site

The Typha Solar Project site is irregularly shaped with the north and east site boundaries defined by the Yakima River. The site surface is irregular with an overall topography change of about 10 feet. This area appears to be ancient floodplain and old meanders and oxbows are visible across the project site.

3.1.7.6 Typha Solar Project Generation Tie Line

The generation tie line would originate from the southwestern corner of the Typha Solar Project site and share wooden poles with existing electric distribution lines that cross south along an existing access road, crossing the EP Canal three times, passing through the Ellensburg Golf and Country Club, to connect to the existing PSE distribution line along Thorp Highway South. The approximately 0.5-mile path is illustrated in Appendix L, and less than 0.1 mile would require new wooden poles and conductors. The remaining length of the new generation tie line would be installed along existing electrical ROWs.

3.1.7.7 Urtica Solar Project Site

The Urtica Solar Project site slopes gently from north to south.

3.1.8 Impacts to Topography

Minor topographical changes would occur as a result of Columbia Solar Project construction and operation activities; these include the proposed internal 12-foot access roads and inverter foundations (Appendix L). No other topographical changes are proposed. No changes would occur to shorelines or channels from the proposed solar project sites and their associated generation tie lines. As a result, potential impacts to topography would be permanent, but minimal.

(d) Unique physical features. The application shall list any unusual or unique geologic or physical features in the project area or areas potentially affected by the project.

3.1.9 Unique Physical Features

The Yakima River, located east of the Typha Solar Project site, is the only unusual or unique geologic or physical feature in the vicinity of the Columbia Solar Project sites and their associated generation tie lines. The river would not be affected by the proposed Typha Solar Project site because, at the closest, the project site boundary fence would be set back 146 feet from the river, and the solar panel arrays would be 158 feet from the river. As a result, there would be no potential impacts to unique physical features.

(e) Erosion/enlargement of land area (accretion). The application shall identify any potential for erosion, deposition, or change of any land surface, shoreline, beach, or submarine area due to construction activities, placement of permanent or temporary structures, or changes in drainage resulting from construction or placement of facilities associated with construction or operation of the proposed energy project.

3.1.10 Erosion/Enlargement of Land Area (Accretion)

As described in Section 3.1.7, the Columbia Solar Project sites are all relatively flat, and there is no potential for accretion impacts through erosion, deposition, or change of any land surface, shoreline, beach, or submarine area due to construction or operation of the proposed solar projects. Additional details regarding erosion control and drainage are included in Section 3.3.6.

(2) The application shall show that the proposed energy facility will comply with the state building code provisions for seismic hazards applicable at the proposed location.

3.1.11 Seismic Hazards

The Columbia Solar Project sites would be designed to seismic Site Class D in accordance with Table 20.3-1 of the American Society of Civil Engineers (ASCE) *Minimum Design Loads for Buildings and Other Structures* manual, as recognized by the 2015 International Building Code (Swiftwater 2017a). As a result, there would be minimal potential for seismic impacts to occur.

3.2 Air 463-60-312

The application shall provide detailed descriptions of the affected environment, project impacts, and mitigation measures for the following:

(1) Air quality. The application shall identify all pertinent air pollution control standards. The application shall contain adequate data showing air quality and meteorological conditions at the site. Meteorological data shall include, at least, adequate information about wind direction patterns, air stability, wind velocity patterns, precipitation, humidity, and temperature. The applicant shall describe the means to be utilized to assure compliance with applicable local, state, and federal air quality and emission standards.

3.2.1 Affected Environment for Air Quality

3.2.1.1 Local Climate

Localized meteorology can influence air pollutant mixing and dispersion. The climate of the Columbia Solar Projects area has both continental and marine characteristics. The climate is mild for its latitude due to the terrain, the Pacific Ocean, and semipermanent high and low pressure regions over the North Pacific Ocean. The proposed Columbia Solar Projects area is in the Ellensburg Valley, just east of the Cascade Range. As air descends along the eastern slopes of the mountains, it warms and dries, creating a nearly desert climate. The proposed solar project area experiences a mean annual maximum temperature around 60°F. In the warmest month, July, the average maximum temperature is in the mid-80s°F and minimum temperatures average around 54°F. January is the coolest month with a maximum temperature of 32°F and minimum temperatures average around 16°F. In the winter, the average snowfall ranges from 5 to 13 inches. Snow tends to remain on the ground for periods varying from a few days to

two months between mid-December and the end of February (Western Regional Climate Center [WRCC] 2017a).

Annual precipitation averages around 9 inches. It is common for 4 to 6 weeks to pass during July and August without rainfall. Representative, historical data from Ellensburg Bowers Field National Weather Service Co-op Station 452508 is summarized in Table 3.2-1.

Table 3.2-1. Representative Meteorological Conditions in the Proposed Action Area

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (°F)	32.2	40.9	49.9	60.7	69.4	74.2	84.0	82.7	75.3	60.9	44.2	35.9	59.2
Average Min. Temperature (°F)	15.8	22.5	27.7	34.3	42.6	48.6	54.2	53.2	45.4	36.1	26.6	21.9	35.8
Average Total Precipitation (inches)	1.31	0.85	0.84	0.52	0.72	0.70	0.20	0.28	0.48	0.78	1.26	1.19	9.12
Average Total Snowfall (inches)	13.0	6.2	2.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	5.5	8.2	35.2

Note: Historical weather data for Ellensburg Bowers Field, Washington, National Weather Service Co-op Station 452508 (46.96917, -120.54) from 5/4/1940 to 6/7/2016. Annual averages are presented for minimum and maximum temperatures and annual totals for precipitation and snowfall.
max. = maximum
min. = minimum
Source: WRCC (2017b).

Wind conditions near the proposed solar project area can be characterized by Remote Automated Weather Stations (RAWS), which collect data used in numerous applications, including: fire weather, climatology, resource management, flood warning, noxious weed control, all-risk management, and air quality management (National Interagency Fire Center 2003). The RAWS closest to the proposed solar project sites is in Peoh Point, Washington. During the period from July 1, 2000, to July 5, 2017, the prevailing winds most frequently blew from the southwest (approximately 26% of the time). The average wind speed for the period was approximately 5.8 miles per hour (2.6 meters per second) (WRCC 2017c).

3.2.1.2 National Ambient Air Quality Standards

The U.S. Environmental Protection Agency (EPA) has promulgated primary and secondary National Ambient Air Quality Standards (NAAQS) for six criteria pollutants: carbon monoxide (CO), nitrogen dioxide (NO_2), two size categories of particulate matter (PM_{10} and $PM_{2.5}$), ozone (O_3), sulfur dioxide (SO_2), and lead. The primary standards are concentration levels of pollutants in ambient air, averaged over a specific time interval, designed to protect public health with an adequate margin of safety. The secondary standards are concentration levels judged necessary to protect public welfare and other resources from known or anticipated adverse effects of air pollution. Although states may promulgate more stringent ambient standards, the State of Washington has adopted standards identical to the federal levels (see Washington Administrative Code (WAC) 173-476, Ambient Air Quality Standards).

Table 3.2-2 presents the NAAQS for six “criteria” pollutants, including both primary standards (pertaining to human health) and secondary standards (pertaining to human welfare, such as visibility, socioeconomics, and effects on flora and fauna). Lead is not measured, as it generally does not pose a problem since the removal of lead from gasoline.

Table 3.2-2. National Ambient Air Quality Standards

Pollutant	Averaging Period	Primary	Secondary
Nitrogen Dioxide (NO_2)	1-hour	100 ppb	–
	Annual	53 ppb	53 ppb
Sulfur Dioxide (SO_2)	1-hour	75 ppb	–
	3-hour	–	0.5 ppm
	24-hour*	0.14 ppm	–
	Annual*	0.02 ppm	–
Carbon Monoxide (CO)	1-hour	35 ppm	–
	8-hour	9 ppm	–
Ozone (O_3)	8-hour	0.07 ppm	0.07 ppm
Lead (Pb)	3-month Average	0.15 µg/m^3	0.15 µg/m^3
Particulates			
• $PM_{2.5}$	24-hour	35 µg/m^3	35 µg/m^3
	Annual	12 µg/m^3	15 µg/m^3
• PM_{10}	24-hour	150 µg/m^3	150 µg/m^3

*State standard only. SO_2 24-hour and Annual NAAQS were revoked in 2010.
Note: µg/m^3 = micrograms per cubic meter; ppm = parts per million; ppb = parts per billion.
Source: EPA (2017a), WAC 173-476-900.

3.2.1.3 General Conformity

The General Conformity Rule was established under the Clean Air Act (CAA) Section 176(c)(4) and serves to ensure that federal actions do not inhibit state's attainment plans for areas designated as non-attainment or maintenance. The term conformity (as it pertains to the rule), means "conformity to a SIP's [State Implementation Plan's] purpose of eliminating or reducing the severity and number of violations of the NAAQS and achieving expeditious attainment of such standards." The rule effectively applies to all federal actions that take place in areas designated as non-attainment or maintenance, except for actions covered under the transportation conformity rule, actions with associated emissions below specified de minimis levels, and other actions that are exempt or presumed to conform (EPA 2010).

De minimis levels for criteria pollutants are established under the General Conformity Rule. De minimis levels are based on the severity of an area's air quality problem and establish a threshold for determining if a general conformity determination must be performed. Activities below this threshold level are assumed to have no significant impact on air quality. De minimis levels for hazardous air pollutants (HAPs) and greenhouse gases (GHGs) are not yet defined.

Because the five proposed Columbia Solar Project sites would be located within an attainment area, the General Conformity Rule does not apply.

3.2.2 Impacts to Air Quality

The five proposed Columbia Solar Projects would only have minimal dust and vehicular air emissions during construction, and no air emissions during operation. In addition, no air permit authorizations are anticipated to be required for the proposed solar projects.

(2) Odor. The application shall describe for the area affected all odors caused by construction or operation of the facility, and shall describe how these are to be minimized or eliminated.

3.2.3 Affected Environment for Odor

Kittitas County consists substantially of rural agricultural, native rural lands, and forests. Thus, typical sources of odors include crops and associated operating agricultural machinery, cattle and other farm animals, and various species of trees and native shrubs and grasses.

3.2.4 Impacts to Odor

3.2.4.1 Construction Impacts

Typical odor nuisances include hydrogen sulfide, ammonia, chlorine, and other sulfide-related emissions. No significant sources of these pollutants would be used during construction of the five Columbia Solar Projects. An additional potential source of project-related odor is diesel engine emissions. The five proposed solar projects may generate odors from the construction equipment exhaust. Any odors from construction would be periodic and temporary in nature, since construction equipment would not be located in any one area for longer than 3 months.

3.2.4.2 Operation Impacts

Operation and maintenance activities for the five proposed Columbia Solar Projects would not cause detectable odors. Vehicles used for occasional maintenance might generate exhaust odors in the immediate vicinity, but this would be temporary and would not affect a substantial number of people.

(3) Climate. The application shall describe the extent to which facility operations may cause visible plumes, fogging, misting, icing, or impairment of visibility, and changes in ambient levels caused by all emitted pollutants.

3.2.5 Affected Environment for Climate

Emission inventories are useful in comparing emission source categories to determine which industries or practices are contributing to the general level of pollution in an area. Emission inventories provide an overview of the types of pollution sources in an area, as well as the amount of pollution being emitted on an annual basis by said sources. For the purposes of this assessment, the most recent National Emissions Inventory conducted in 2014 was used. The emission inventory data is summarized in Table 3.2-3.

Table 3.2-3. Emissions Inventory in Tons per Year for Kittitas County, Washington

Source	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOC	HAPs
Agriculture	0	0	208	42	0	0	0
Biogenics [1]	5,079	269	0	0	0	21,967	3,376
Dust	0	0	708	130	0	0	0
Fires	36,866	442	3,701	3,138	257	8,675	2,072
Fuel Combustion	909	61	122	120	8	153	28
Industrial Processes	0	0	106	13	0	3	0
Miscellaneous [2]	46	1	30	28	0	706	76
Mobile	13,852	3,811	162	125	12	1,434	419
Waste Disposal	688	32	139	121	7	54	16
Total	**57,441**	**4,616**	**5,176**	**3,717**	**285**	**32,993**	**5,988**

Note: Due to an incomplete data set, GHG emissions are not presented. Totals may not sum exactly due to rounding.
VOC = Volatile Organic Compound, HAPs = Hazardous Air Pollutants, NO_X = Nitrogen oxides, including nitrogen dioxide (NO_2).
1. Biogenic emissions are those emissions derived from natural processes (such as vegetation and soil).
2. Miscellaneous categories include bulk gasoline terminals, commercial cooking, gas stations, miscellaneous non-industrial (not elsewhere classified), and solvent use.
Source: EPA (2014).

3.2.6 Impacts to Climate

3.2.6.1 Construction Impacts

As shown in Table 3.2-4, the most abundant pollutants produced during the construction phase of the Columbia Solar Projects, in total tons, are CO_2e, NO_X, CO, and PM_{10}. The greatest contributors to these pollutants are the operation of off-road construction equipment (CO_2e, NO_X, and CO) and on-road vehicles commuting and deliveries (PM_{10}).

Table 3.2-4. Construction-Related Emissions in Tons Resulting from the Proposed Solar Project (Per Project Site)

Source	CO	NO_X	SO_X [1]	PM_{10}	$PM_{2.5}$	VOCs	HAPs	CO_2e [2]
Off-Road Construction Equipment	3.42	5.53	0.01	0.25	0.23	0.76	0.08	744
Commuting/On-Road Equipment/Material Delivery	0.39	0.11	0.00	1.20	0.14	0.05	0.00	84
Fugitive Dust From Construction Operations	–	–	–	0.03	0.00	–	–	–
Total	**3.81**	**5.63**	**0.01**	**1.48**	**0.37**	**0.81**	**0.08**	**828**
Percent of Total Kittitas County Emissions	***0.01%***	***0.12%***	***< 0.01%***	***0.03%***	***0.01%***	***< 0.01%***	***< 0.01%***	***N/A*** [3]

Note: CO_2e = Carbon dioxide equivalent.
1. All oxides of sulfur (including SO_2). For purposes of comparison, SO_2 emissions reported in the county inventory are assumed to be equal to SO_X.
2. CO_2e emissions are reported in metric tons.
3. CO_2e emissions are not reported for all sources in the county inventory. Therefore, CO_2e emissions are not compared to the county inventory.

Each pollutant is at most 0.12% of Kittitas County's emissions inventory. These construction emissions would be temporary and transient in nature. Therefore, significant impacts to air resources are not likely to occur from the construction of the Columbia Solar Projects.

3.2.6.2 Operation Impacts

Climate concerns, similar to air quality concerns, would be very minimal once the five proposed Columbia Solar Projects are in operation. Operational-related emissions for the proposed solar projects would consist of a monthly maintenance inspections by workers in a single pick-up truck. Thus, the operational emissions would be minimal. There would be no impacts on climate from the operation of the five proposed solar projects.

(4) Climate change. The application shall describe impacts caused by greenhouse gases emissions and the mitigation measures proposed.

3.2.7 Affected Environment for Climate Change

Gases that trap heat in the atmosphere are called GHGs. Adverse health effects and other impacts caused by elevated atmospheric concentrations of GHGs occur via climate change. Climate impacts are not attributable to any single action but are exacerbated by diverse individual sources of emissions that each make relatively small additions to GHG concentrations.

GHGs absorb heat and slow the rate at which energy escapes to space. Some GHGs are more effective at absorbing energy and stay in the atmosphere longer than others. Equivalent carbon dioxide (CO_2e) is the amount of carbon dioxide (CO_2) that would cause the same level of warming as a unit of one of the other GHGs. The principal GHGs that enter the atmosphere because of oil and gas exploration and production include CO_2, methane (CH_4), and nitrous oxide (N_2O) (EPA 2015). For example, 1 ton of CH_4 has a CO_2e of 25 tons; therefore, 25 tons of CO_2 would cause the same level of warming as 1 ton of CH_4. N_2O has a CO_2e value of 298 (40 Code of Federal Regulations [CFR] 98).

The 2013 Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report states that the atmospheric concentrations of well-mixed, long-lived GHGs, including CO_2, CH_4, and N_2O, have increased to levels unprecedented in at least the last 800,000 years. Further human influence has been detected in warming of the atmosphere and the ocean, changes in the global water cycle, reductions in snow and ice, global mean sea-level rise, and changes in some climate extremes. It is extremely likely (95%–100% probability) that human influence has been the dominant cause of the observed warming since the mid-twentieth century (IPCC 2013).

Global mean surface temperatures have already increased 1.5°F (from 1880 to 2012). Additional near-term warming is inevitable due to the thermal inertia of the oceans and ongoing GHG emissions. However, climate change would impact regions differently and warming would not be equally distributed. Both observations and computer model predictions indicate that increases in temperature are likely to be greater at higher latitudes, where the temperature increase may be more than double the global average. Models also predict increases in duration, intensity, and extent of extreme weather events. Warming of surface air temperature over land would very likely be greater than over oceans (IPCC 2013).

3.2.8 Impacts to Climate Change

The five proposed Columbia Solar Projects would produce energy with minimal air emissions due to construction and maintenance equipment exhaust. Because no fuel is burned, no air emissions are produced in the process of generating electricity from photovoltaic sources. Furthermore, this fossil fuel–less project means there are also no GHG emissions due to the extraction of fossil fuel. In addition, equipment (e.g., switches and reclosers) containing sulfur hexafluoride (SF_6) are not planned for the solar projects.

The "total fuel cycle" of the Columbia Solar Projects includes the emissions from manufacturing processes, transporting parts and equipment, construction, operation, and maintenance of the solar projects. According to the IPCC, the total fuel cycle CO_2e emissions of solar power are 90% less than the total fuel cycle CO_2e emissions of natural gas and 94% less than the total fuel cycle CO_2e emissions of coal per unit of electricity generated (IPCC 2014).

(5) Dust. The application shall describe for any area affected all dust sources created by construction or operation of the facility, and shall describe how these are to be minimized or eliminated.

3.2.9 Affected Environment for Dust

Typical existing sources of dust in the Columbia Solar Project areas include agricultural activities (e.g., from plowing, planting, and harvesting fields) and from travel along gravel and dirt roads. Current emissions of particulate matter for Kittitas County are shown in Table 3.2-3.

3.2.10 Impacts to Dust

Dust generated by excavation and grading on the five Columbia Solar Projects would be short term. Dust from access roads would be controlled by applying gravel or watering, as necessary.

Once operational, the only source of dust emissions from the five Columbia Solar Projects would be due to occasional maintenance vehicle traffic on the access roads.

3.3 Water 463-60-322

(1) The application shall provide detailed descriptions of the affected natural water environment, project impacts and proposed mitigation measures, and shall demonstrate that facility construction and/or operational discharges will be compatible with and meet state water quality standards.

3.3.1 Affected Environment for Water Resources

3.3.1.1 General County

Streams identified within the five Columbia Solar Project sites were classified according to the WAC water typing system (WAC 222-16-030). Criteria for this typing system are described in Table 3.3-1. The streams were categorized based on the stream reaches within each of the five solar project sites; reaches downstream of the solar project sites may be rated higher.

Table 3.3-1. Summary of the WAC Water Typing System

Stream Type	Definition[1]
S	All waters, within their bankfull width, as inventoried as "shorelines of the state" under RCW 90.58 and the rules promulgated pursuant to RCW 90.58 including periodically inundated areas of their associated wetlands.
F	All segments of natural waters that are not Type S waters, and that contain fish or fish habitat, including: 1) waters diverted for domestic use by more than 10 residential or camping units or by a public accommodation facility; 2) waters diverted for use by a federal, state, or Tribal fish hatchery from the point of diversion for 1,500 feet or the entire tributary if the tributary is highly significant for protection of downstream water quality; 3) waters that are within a federal, state, local, or private campground having more than 10 camping units; or 4) riverine ponds, wall-based channels, and other channel features that are used by fish for off-channel habitat.
Np	All segments of natural waters within the bankfull width of defined channels that are perennial non–fish habitat streams. Perennial streams are flowing waters that do not go dry any time of a year of normal rainfall and include the intermittent dry portions of the perennial channel below the uppermost point of perennial flow.
Ns	All segments of natural waters within the bankfull width of the defined channels that are not Type S, F, or Np waters. These are seasonal, non–fish habitat streams in which surface flow is not present for at least some portion of a year of normal rainfall and the stream is not located downstream from any stream reach that is a Type Np water. Ns waters must be physically connected by an above-ground channel system to Type S, F, or Np waters.

1. Definitions are summarized from WAC 222-16-030.

Each of the five Columbia Solar Project sites was investigated for the presence of non-wetland waters and used a global positioning system (GPS) device capable of submeter accuracy to delineate the ordinary high water marks (OHWMs) of streams per the definitions in WAC 173-22-030 (Figures 3.3-1 to 3.3-15). The OHWMs of streams and rivers outside of each of the five project sites, but that occur within 200 feet of the project site boundary, were approximated using field observations and aerial imagery to determine the extent of potential on-site stream buffers. Water features delineated within and adjacent to each of the solar project sites included rivers, streams, canals, and ditches.

A total of one river, the Yakima River (Typha Solar Project site); five streams, including Little Naneum Creek (Camas Solar Project site), Reecer Creek (Fumaria Solar Project generation tie line), an unnamed stream (Fumaria Solar Project generation tie line), Coleman Creek (Penstemon Solar Project site), and McCarl Creek (Urtica Solar Project site); four canals, including Bull Ditch (Camas Solar Project site), the Cascade Irrigation District Canal (Fumaria Solar Project generation tie line), Town Ditch (Fumaria Solar Project generation tie line), and the Ellensburg Power (EP) Canal (Typha Solar Project generation tie line); one pond (Urtica Solar Project site); and various ditches were delineated throughout all of the five project sites.

Table 3.3-2 summarizes the water type, average width, and size within each of the five Columbia Solar Project sites. Most delineated waters would fall under the jurisdiction of the U.S. Army Corps of Engineers (USACE), Washington State Department of Ecology (Ecology), and Kittitas County. Some ditches and canals may not be considered jurisdictional based on their connectivity to jurisdictional features; however, this is determined on a case-by-case basis and can only be determined by the applicable regulatory agency. Detailed descriptions of each water feature within the solar project sites are provided in the Critical Areas Wetland and Waters Delineation Reports for each site (Appendices G–K), which also include a list of vegetation observed along each water feature and ground-level site photographs.

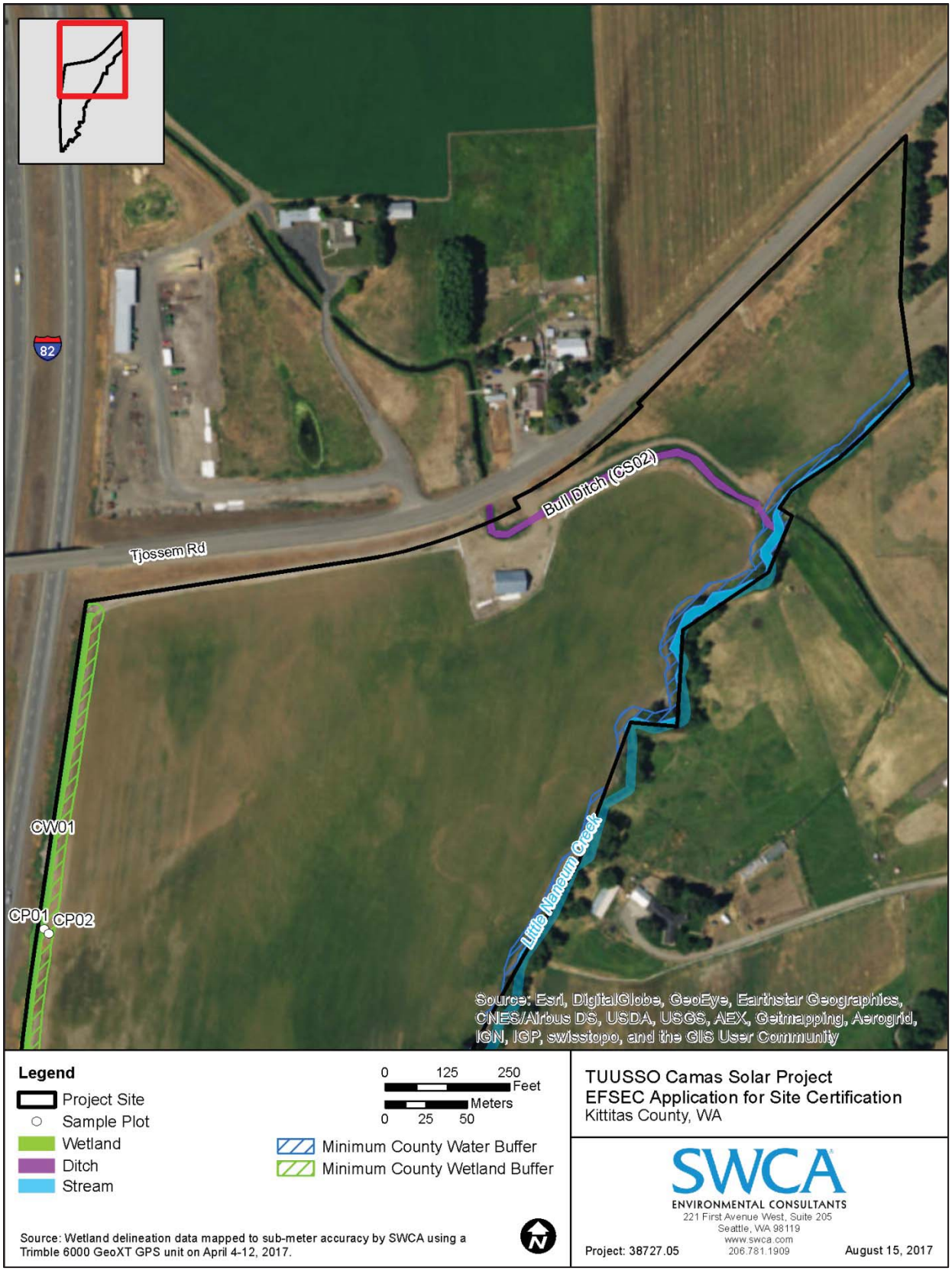


Figure 3.3-1. Camas Solar Project site map showing water resources, north portion.

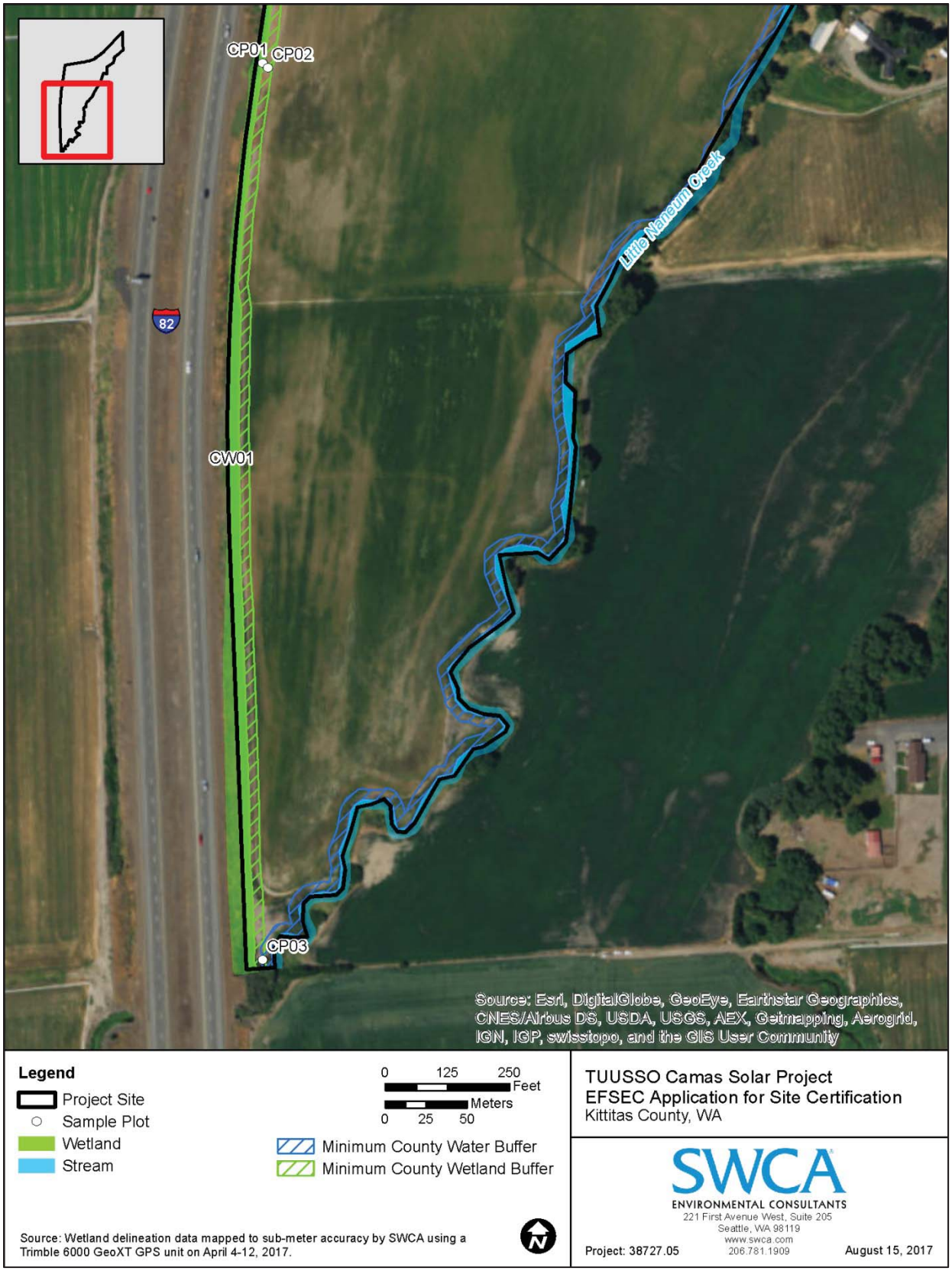


Figure 3.3-2. Camas Solar Project site map showing water resources, south portion.



Figure 3.3-3. Fumaria Solar Project site map showing water resources, Map 1 of 8.

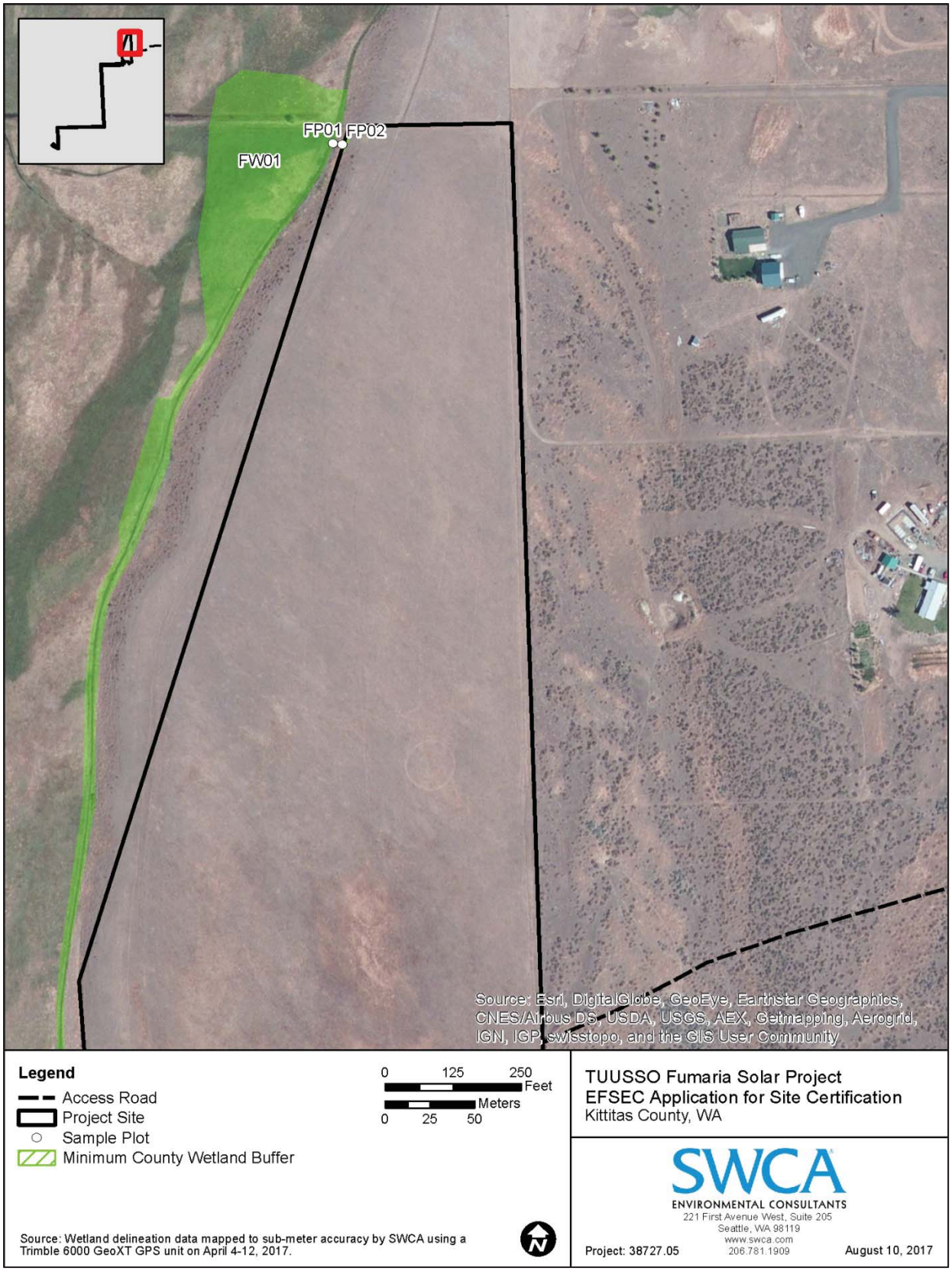


Figure 3.3-4. Fumaria Solar Project site map showing water resources, Map 2 of 8.

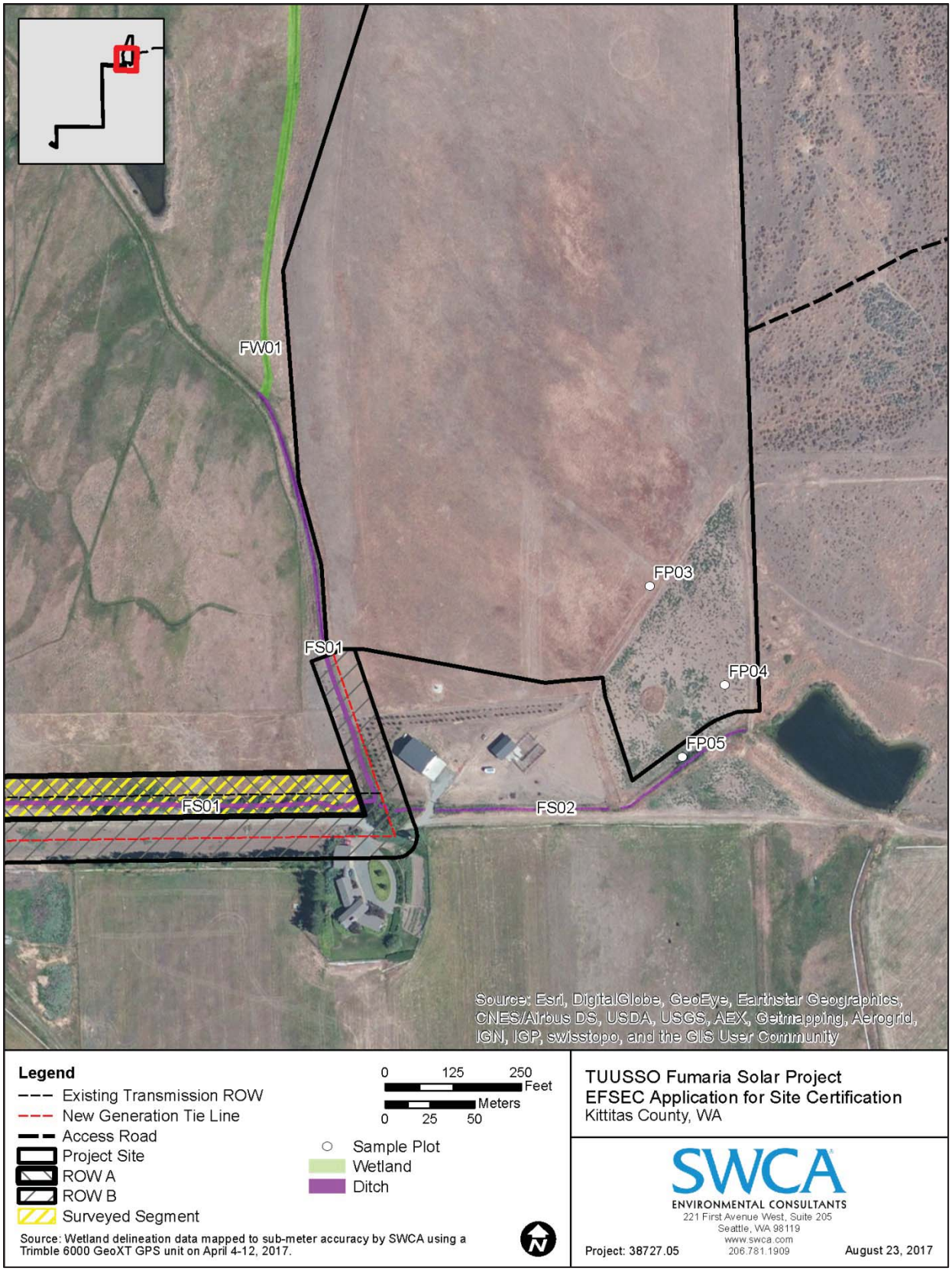


Figure 3.3-5. Fumaria Solar Project site map showing water resources, Map 3 of 8.

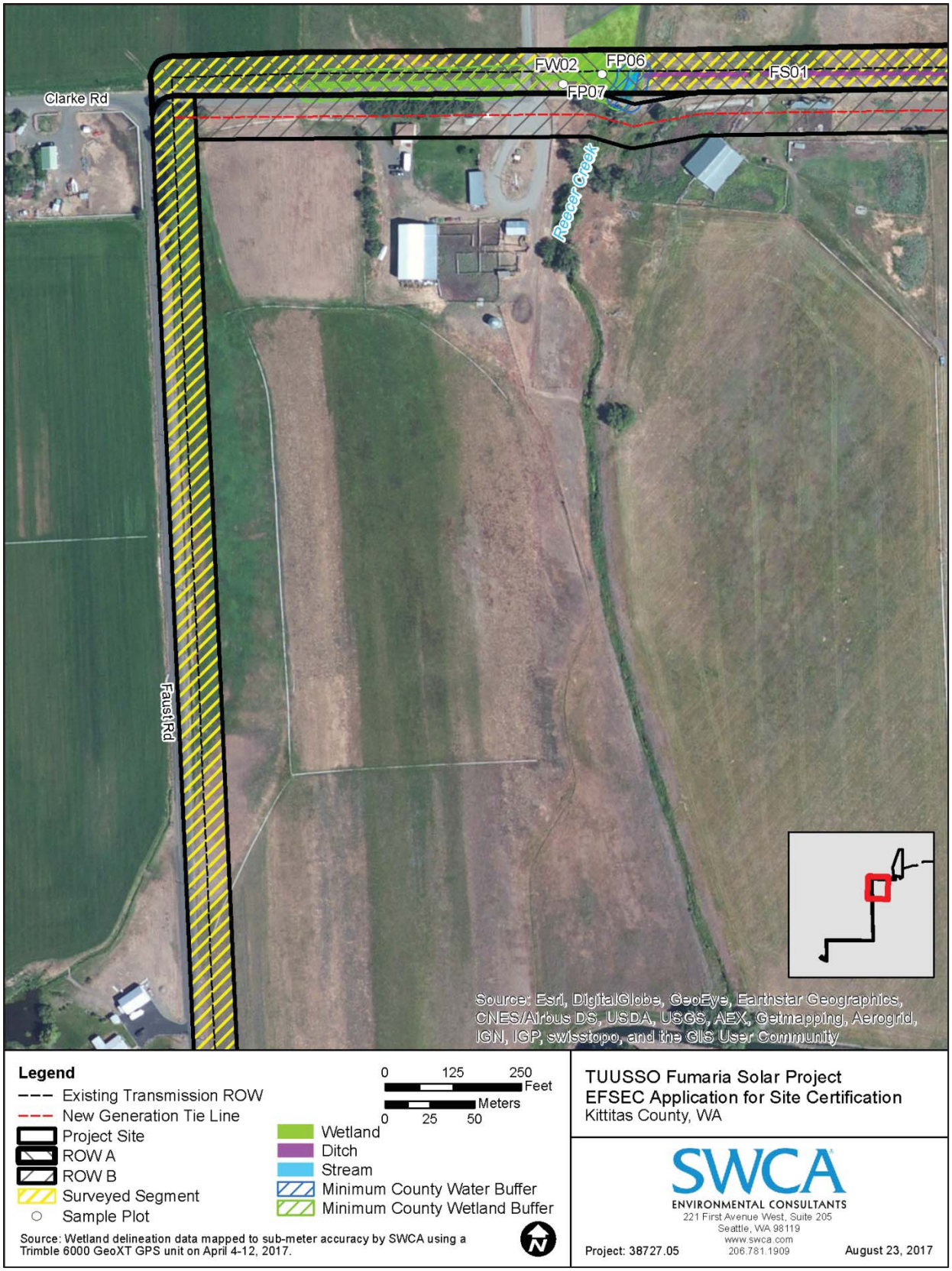


Figure 3.3-6. Fumaria Solar Project site map showing water resources, Map 4 of 8.

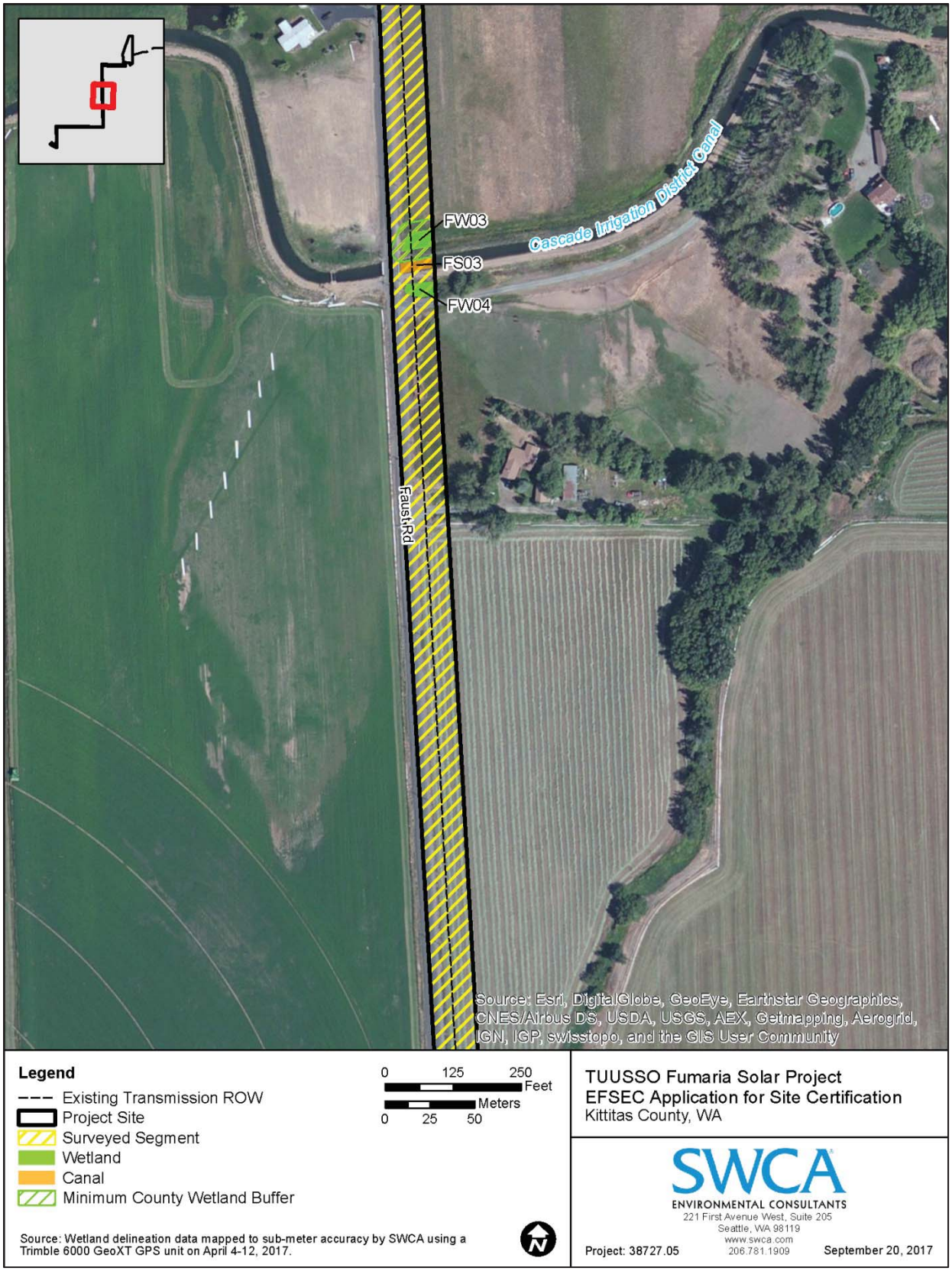


Figure 3.3-7. Fumaria Solar Project site map showing water resources, Map 5 of 8.

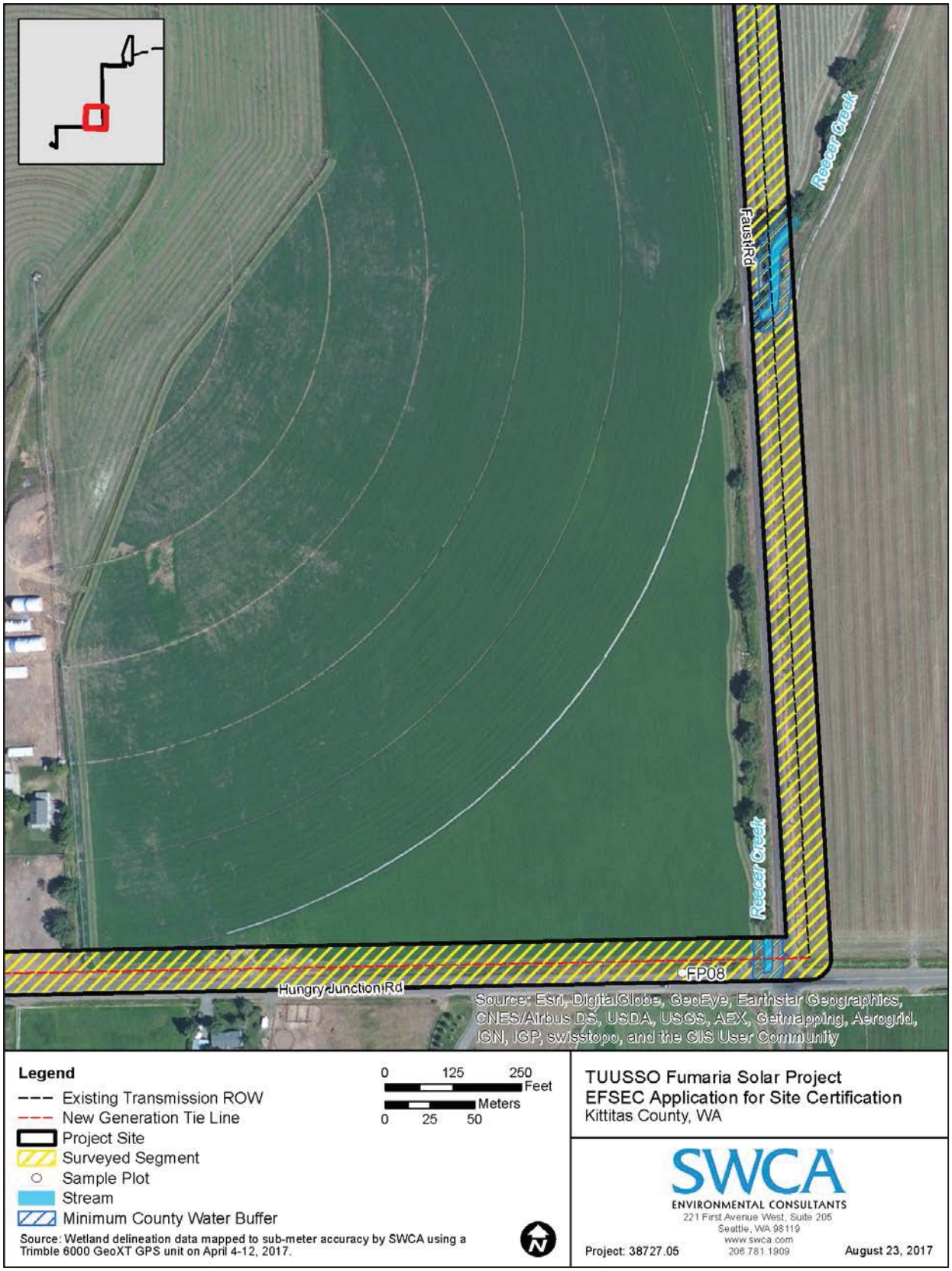


Figure 3.3-8. Fumaria Solar Project site map showing water resources, Map 6 of 8.

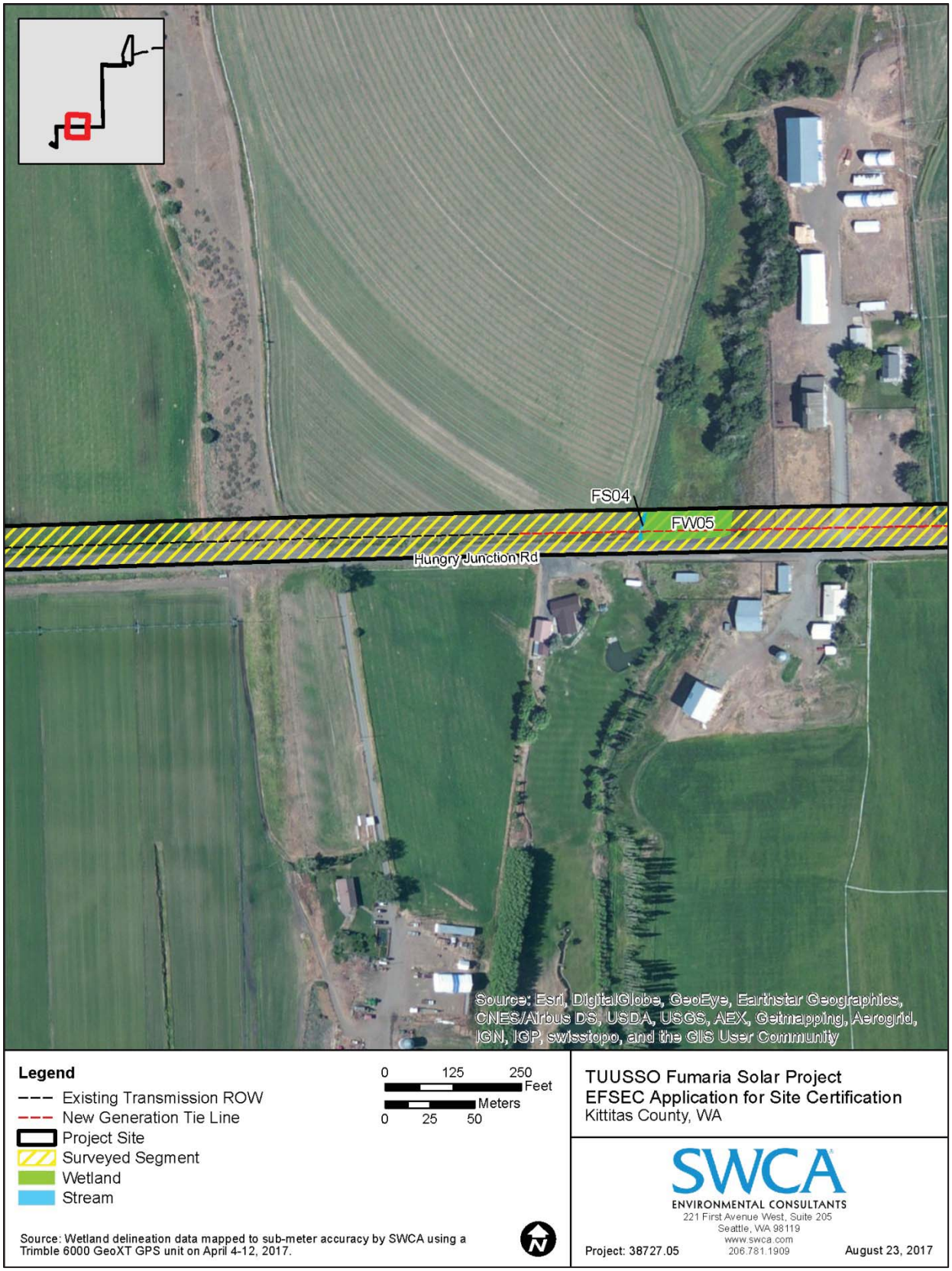


Figure 3.3-9. Fumaria Solar Project site map showing water resources, Map 7 of 8.

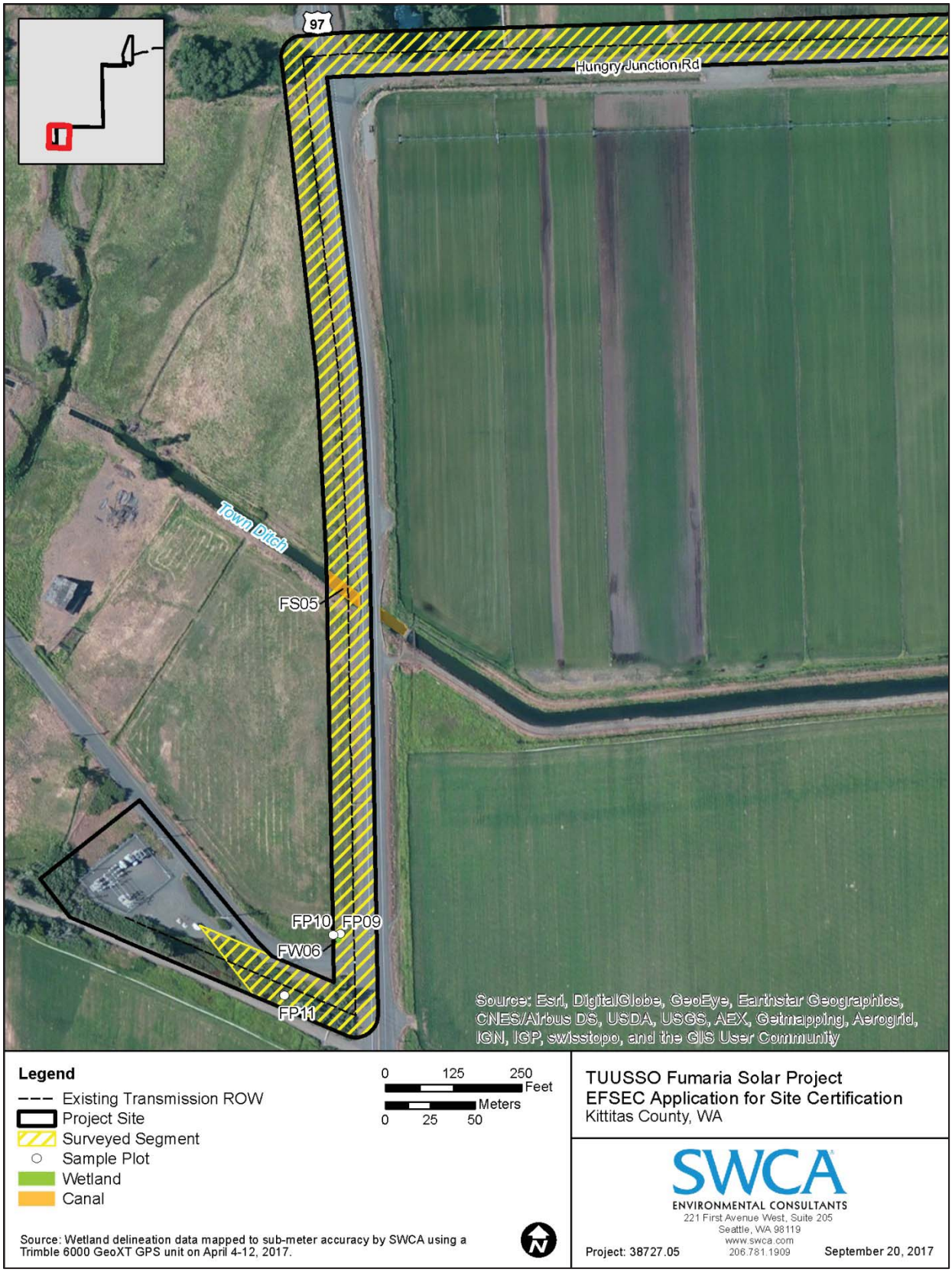


Figure 3.3-10. Fumaria Solar Project site map showing water resources, Map 8 of 8.

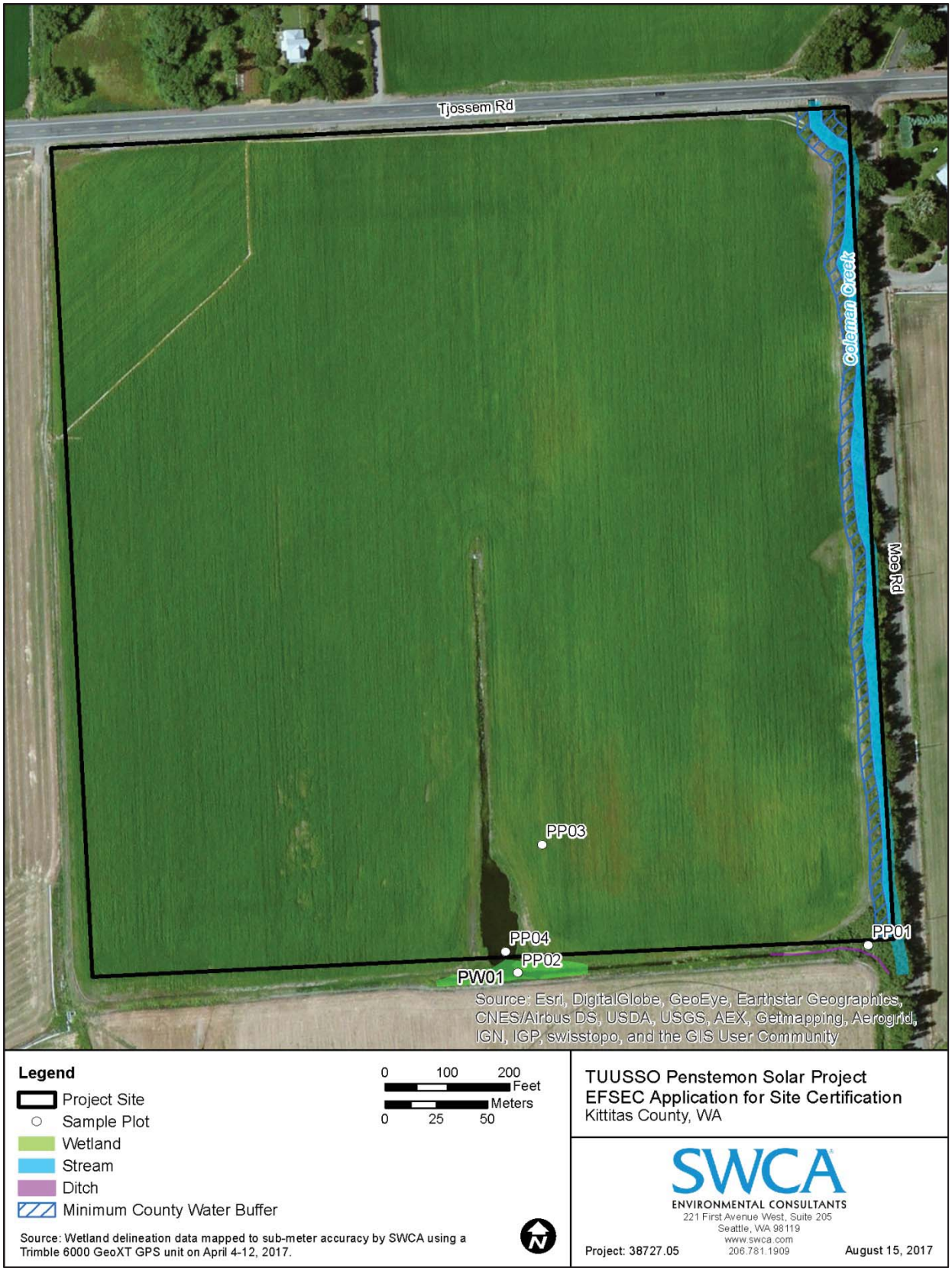


Figure 3.3-11. Penstemon Solar Project site map showing water resources.

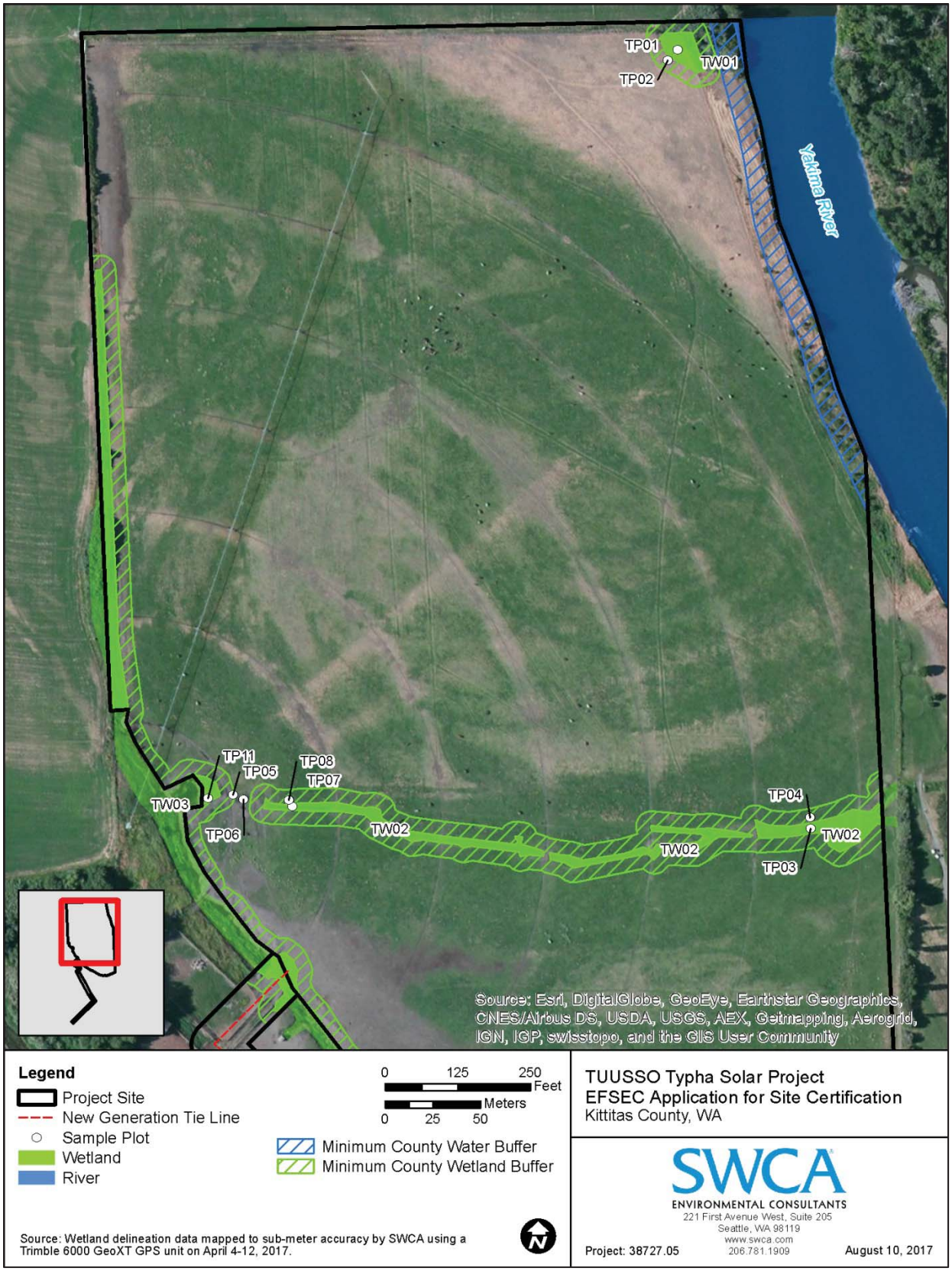


Figure 3.3-12. Typha Solar Project site map showing water resources, north portion.

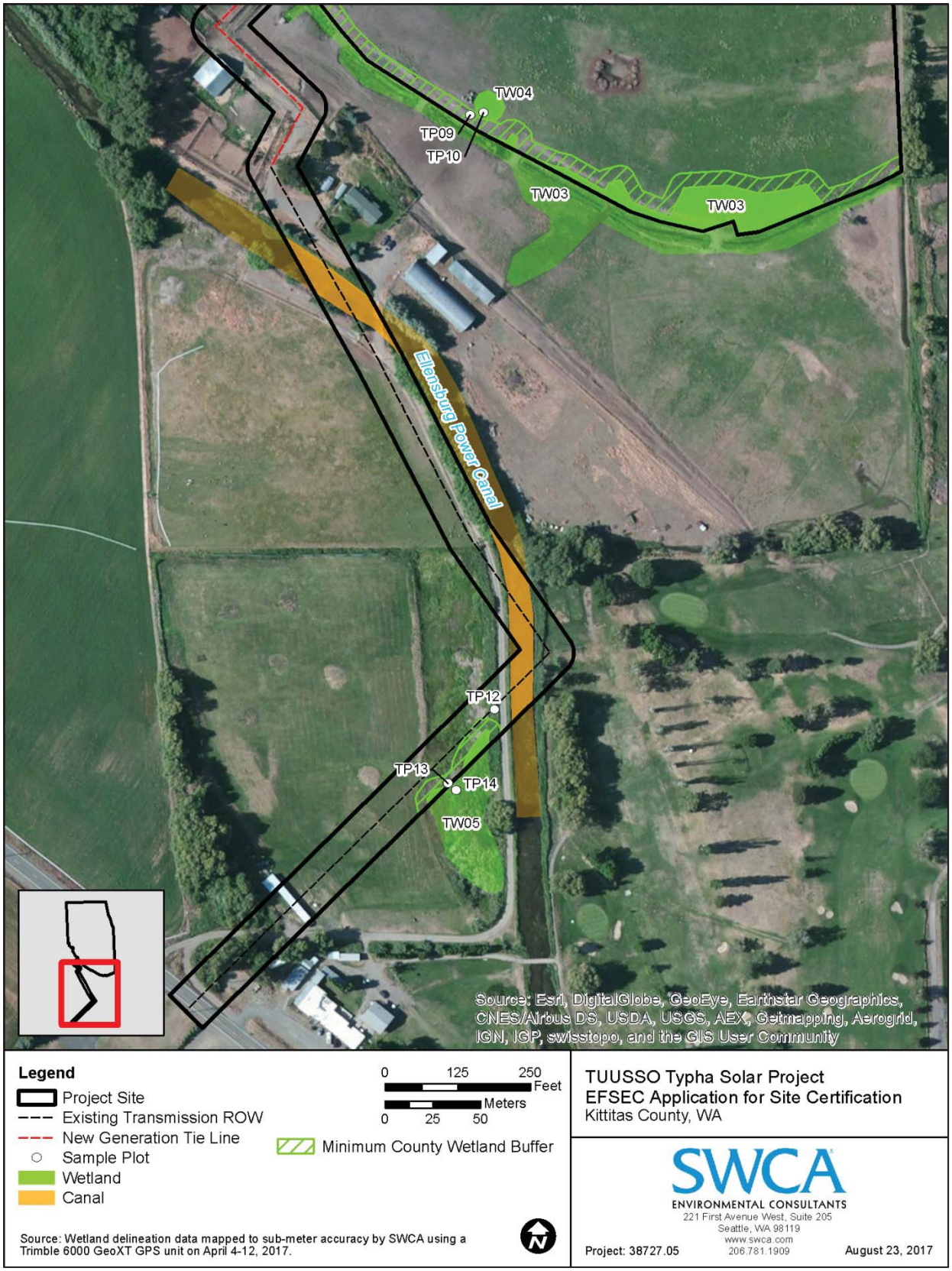


Figure 3.3-13. Typha Solar Project site map showing water resources, south portion.

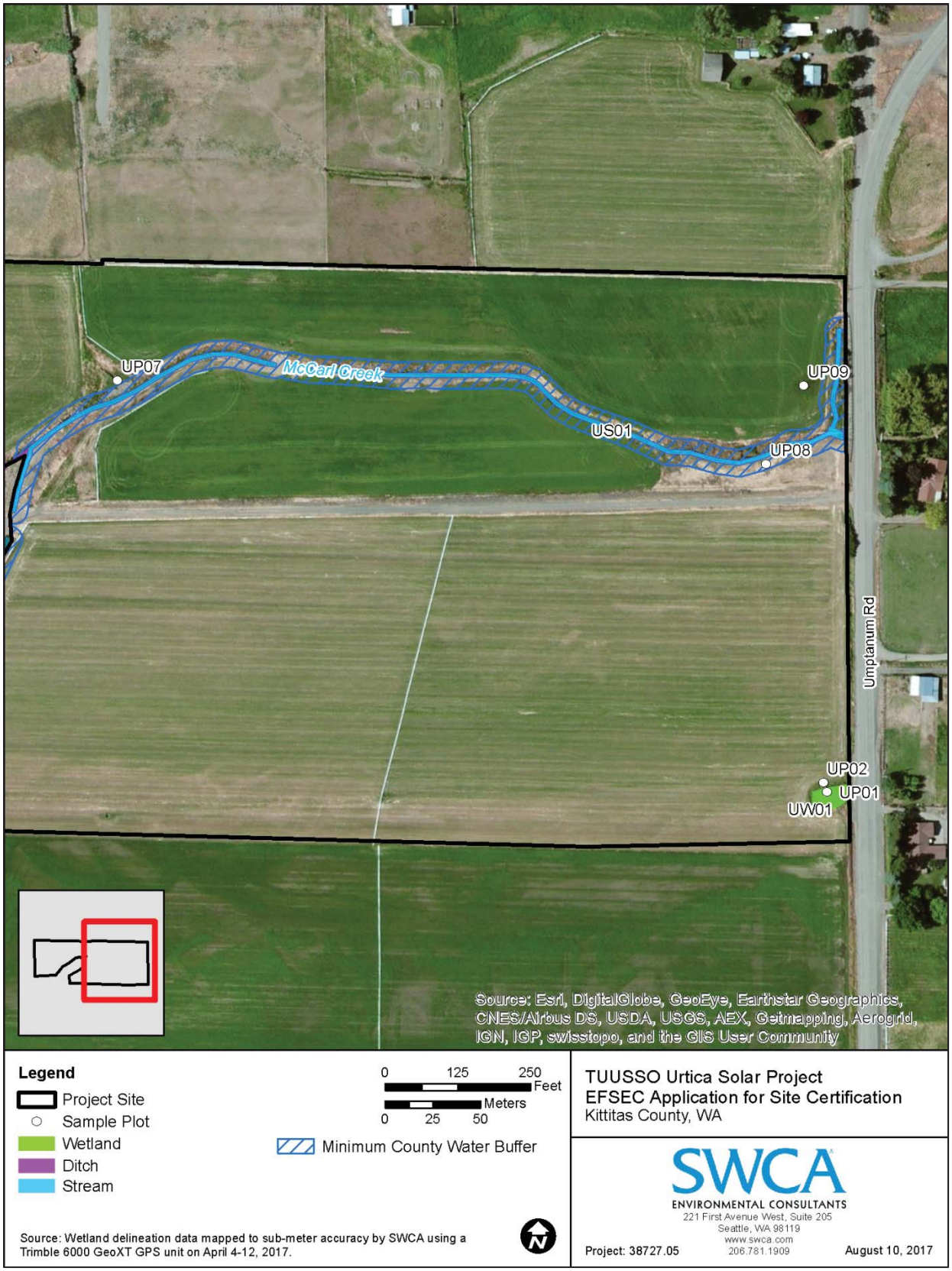


Figure 3.3-14. Urtica Solar Project site map showing water resources, east portion.

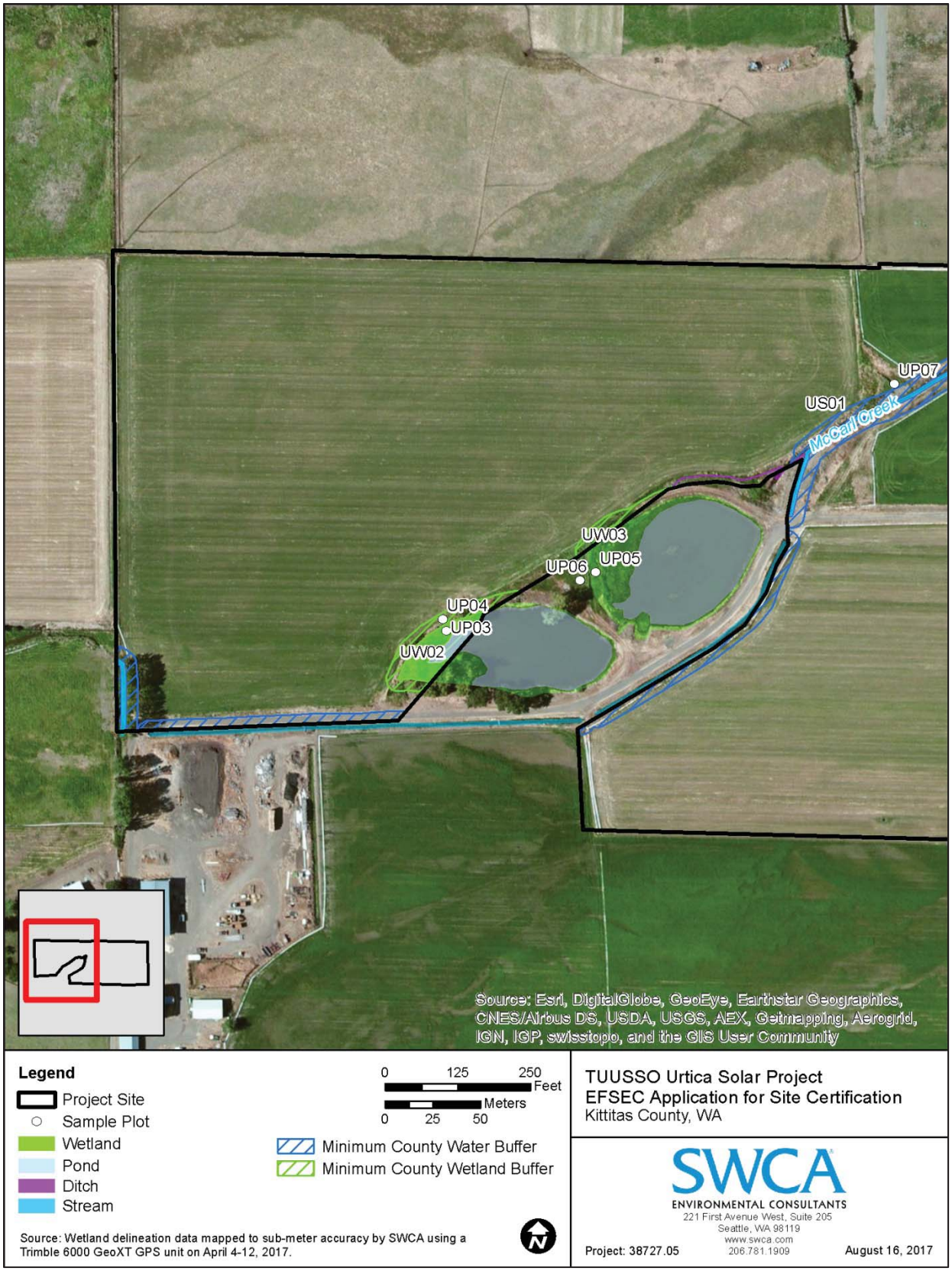


Figure 3.3-15. Urtica Solar Project site map showing water resources, west portion.

Table 3.3-2. Summary of Water Features within and near the Columbia Solar Project Sites

Stream Name	Tributary to	Stream Type[1]	USACE Jurisdiction[2]	Average Width in Project Site (feet)[3]	Approximate Length in Project Site (feet)[3]
Camas Solar Project Site					
Little Naneum Creek	Naneum Creek	F	RPW	19	2,050
Bull Ditch (CS02)	N/A	N/A	N/A	14	690
Fumaria Solar Project Site					
Ephemeral ditch (FS01)	Reecer Creek	N/A	N/A	8	710
Ephemeral ditch (FS02)	FS01	N/A	N/A	5	680
Fumaria Solar Project Generation Tie Line					
Reecer Creek	Yakima River	F	RPW	14	290
Ephemeral ditch (FS01)	Reecer Creek	N/A	N/A	8	1,087
Cascade Irrigation District Canal (FS03)	Yakima River	N/A	N/A	15	63
Unnamed stream (FS04)	Town Ditch	Ns	NRPW	6	57
Town Ditch (FS05)	Yakima River	N/A	N/A	16	74
Roadside ditches	Varies	N/A	N/A	3	1,920
Penstemon Solar Project Site					
Coleman Creek	Naneum Creek	F	RPW	19	1,005
Unnamed Ephemeral Ditch	Coleman Creek	N/A	NRPW	3	0
Typha Solar Project Site					
Yakima River	Columbia River	S	RPW	158	0
Typha Solar Project Generation Tie Line					
EP Canal (TS01)	Naneum Creek	F	RPW	19	2,050
Unnamed Ephemeral Ditch 1	Yakima River	N/A	RPW	45	540
Unnamed Ephemeral Ditch 2	EP Canal	N/A	NRPW	4	115
Urtica Solar Project Site					
McCarl Creek (US01)	Yakima River	F	RPW	7	2,108
UOW01 (western pond)	McCarl Creek	F	RPW	20	100
Unnamed Ephemeral Ditch	McCarl Creek	N/A	NRPW	3	269

1. S = shoreline of the state (WAC 222-16-030), F = fish-bearing stream (WAC 222-16-030), Ns = non-fish-bearing (WAC 222-16-030), N/A = not applicable, due to ditches and canals being excluded from the WAC typing system.

2. RPW = relatively permanent water, NRPW = non-relatively permanent water, N/A = not applicable, due to exclusion from jurisdiction.

3. Average widths and approximate lengths were determined based on SWCA survey data and field observations.

A summary of all non-wetland waters and their buffers documented within the Columbia Solar Project sites is provided in Table 3.3-3. Kittitas County Code (KCC) guidance (Chapter 17A.07.010) defines minimum protection buffers of 40 feet for Type S waters and 20 feet for Type F waters. KCC guidance does not define protection buffers for irrigation canals and ditches, because they do not qualify as streams. In addition, KCC guidance specifies that no protection buffer is needed for Type Ns waters.

Table 3.3-3. Water Typing and Minimum Buffer Distance Summary for each Columbia Solar Project Site

Water Features	Water Typing[1]	Kittitas County Minimum Buffer Distance (feet)[2]	Total Size of Water Feature Within the Project Site (acres)[3]
Camas Solar Project Site			
Little Naneum Creek	F	20	0.69
Bull Ditch (CS02)	N/A	None	0.22
Fumaria Solar Project Site			
Ephemeral ditch (FS01)	N/A	None	0.00
Ephemeral ditch (FS02)	N/A	None	0.00
Fumaria Solar Project Generation Tie Line			
Reecer Creek	F	20	0.12
Ephemeral ditch (FS01)	N/A	None	0.25
Ephemeral ditch (FS02)	N/A	None	0.01
Cascade Irrigation District Canal (FS03)	N/A	None	0.03
Unnamed stream (FS04)	Ns	None	0.01
Town Ditch (FS05)	N/A	None	0.04
Roadside ditches	N/A	None	0.18
Penstemon Solar Project Site			
Coleman Creek	F	20	0.47
Ditch	N/A	None	0.00
Typha Solar Project Site			
Yakima River	S	40	0.05
Typha Solar Project Generation Tie Line			
EP Canal (TS01)	N/A	None	0.44
Ditches	N/A	None	0.02
Urtica Solar Project Site			
McCarl Creek (US01)	F	20	0.27
UOW01 (western pond)	N/A	None	0.05
Ditch	N/A	None	0.02

1. F = fish-bearing water (WAC 22-16-030); N/A = not applicable, due to exclusion from water typing system.
2. Only minimum buffer distances are depicted on maps.
3. Does not include buffer areas.

3.3.1.2 Solar Project Sites

See Figures 3.3-1 through 3.3-15 for the locations of delineated water features throughout each of the five Columbia Solar Project sites. Detailed descriptions of each non-wetland water within the solar project sites are provided in the Critical Areas Wetland and Waters Delineation Reports for each site (Appendices G–K).

3.3.2 Impacts to Water Resources

3.3.2.1 General County

TUUSSO has made every effort to avoid impacts to water resources throughout all of the Columbia Solar Project sites, which would be achieved through avoidance measures in project design and utilization of BMPs. Table 3.3-4 shows the project impacts to each of the water resources delineated within each of the solar project sites.

Table 3.3-4. Proposed Water Resources Impact Summary for each Columbia Solar Project Site

Water Name	Total Size of Water Resources Within the Project (acres)[1]	Total Impacts to Water Resources Within the Project (acres)
Camas Solar Project Site		
Little Naneum Creek	0.69	0.00
Bull Ditch (CS02)	0.22	0.00
Fumaria Solar Project Site		
Ephemeral ditch (FS01)	0.00	0.00
Ephemeral ditch (FS02)	0.00	0.00
Fumaria Solar Project Generation Tie Line		
Reecer Creek	0.12	0.00[2]
Ephemeral ditch (FS01)	0.25	0.00
Ephemeral ditch (FS02)	0.01	0.00
Cascade Irrigation District Canal (FS03)	0.03	0.00
Unnamed stream (FS04)	0.01	0.00
Town Ditch (FS05)	0.04	0.00
Roadside ditches	0.18	0.00
Penstemon Solar Project Site		
Coleman Creek	0.47	0.00
Ditch	0.00	0.00
Typha Solar Project Site		
Yakima River	0.05	0.00
Typha Solar Project Generation Tie Line		
EP Canal (TS01)	0.44	0.00[2]
Ditches	0.02	0.00
Urtica Solar Project Site		
McCarl Creek (US01)	0.27	0.00
UOW01 (western pond)	0.05	0.00
Ditch	0.02	0.00

1. Does not include buffer areas.
2. TUUSSO plans to span this water resource, which would result in no impacts by the project.

In addition, the Columbia Solar Projects do not propose to discharge any water or contaminants into water resources on-site or downstream of the solar project sites, during or after construction. This would be achieved through avoidance measures in the project designs and through utilization of BMPs. No ditches or outfall pipes would be installed as part of the proposed projects. Therefore, all water in the solar project sites would either be absorbed on-site through infiltration or runoff through overland flow at very low velocities that are unlikely to cause excessive erosion.

Impacts to water resources at each solar project site and along each generation tie line are described below.

3.3.2.2 Solar Project Sites

Camas Solar Project Site

No impacts are proposed to any water resources within the Camas Solar Project site. The access road crossing of Bull Ditch depicted on the proposed site plan would utilize the existing road crossing and would not modify or impact this crossing of Bull Ditch. No impacts are proposed to Little Naneum Creek. Therefore, all impacts to water resources would be avoided through project design.

Fumaria Solar Project Site

No impacts are proposed to any water resources within the Fumaria Solar Project site. Internal access roads and site access would be located in upland areas or on existing access roads. All impacts to water resources would be avoided through project design.

For Western site access: Proposed site access would be from the west via Clarke Road and would cross Reecer Creek. The current road edge is eroding on the southern side of the road. TUUSSO would either install spanning structures to avoid impacts to the Reecer Creek crossing (such as using road plates and gravel) or improve and reinforce the current bridge infrastructure, which could result in minor impacts to Reecer Creek. If impacts to Reecer Creek are proposed, then TUUSSO would prepare and submit a Joint Aquatic Resource Permit Application (JARPA) for review by USACE and Ecology.

Fumaria Solar Project Generation Tie Line

No impacts are proposed to any water resources along the Fumaria Solar Project generation tie line. All water resources would be spanned by power poles, and existing roads adjacent to the proposed line would be utilized for installation of new lines or power poles. All impacts to water resources would be avoided through project design.

Penstemon Solar Project Site

No impacts are proposed to any water resources within the Penstemon Solar Project site. Internal access roads and site access would be located in upland areas or on existing access roads. All impacts to water resources would be avoided through project design.

Typha Solar Project Site

No impacts are proposed to any water resources within the Typha Solar Project site. Internal access roads would be located in upland areas or on existing access roads. For site access, existing roads would be utilized as much as possible; however, the existing bridge crossing of the Ellensburg Power Canal would need to be improved in one of three ways: 1) reinforce, improve, and/or replace existing bridge supports to accommodate the truck traffic to the project site; 2) completely remove and replace the existing bridge with a new bridge; or 3) install a temporary bridge over the existing bridge during the construction period to accommodate the truck traffic. Based on the current project design, all impacts to

jurisdictional water resources would be avoided through project design. If TUUSSO alters the project design to where the EP Canal would be impacted, then TUUSSO would coordinate with EFSEC, USACE, Ecology, and Kittitas County to comply with all new permitting requirements.

Typha Solar Project Generation Tie Line

No impacts are proposed to any water resources along the Typha Solar Project generation tie line. All water resources would be spanned by power poles, and existing roads adjacent to the proposed line would be utilized for installation of new lines or power poles. All impacts to water resources would be avoided through project design.

Urtica Solar Project Site

No impacts are proposed to any water resources within the Urtica Solar Project site. Internal access roads and site access would be located in upland areas or on existing access roads. All impacts to water resources would be avoided through project design.

3.3.3 Mitigation Measures for Water Resources

3.3.3.1 General County

A total of one river, five streams, four canals, and various ditches were delineated throughout all of the five Columbia Solar Project sites and their associated generation tie lines. These waters were rated using the WAC water typing system (WAC 222-16-030), defined in Table 3.3-1, and minimum protection buffers were defined using KCC guidance (Chapter 17A.07.010). Of the delineated water resources, only five of them require protection buffers under KCC guidance: Little Naneum Creek (Camas Solar Project site), Reecer Creek (Fumaria Solar Project generation tie line), Coleman Creek (Penstemon Solar Project site), Yakima River (Typha Solar Project site), and McCarl Creek (Urtica Solar Project site). TUUSSO utilized avoidance measures during the project design to avoid, reduce, or eliminate impacts to water resources.

No water resources would be impacted by the proposed Columbia Solar Projects; however, minor encroachment into the minimum protection buffers would be unavoidable based on the current project designs and would occur over a total of 0.39 acre across all five of the solar project sites. Refer to Table 3.3-5 for the water type, minimum protection buffer distances, total area of buffers within the solar project sites, average distance from the edge of the minimum buffer to the nearest project disturbance, and total buffer area encroachment for water resources within each of the solar project sites.

See Figures 3.3-1 through 3.3-15 for the locations of delineated water resources and their buffers for each of the five Columbia Solar Project sites. See Appendix L for site plans for each of the Columbia Solar Project sites.

Table 3.3-5. Water Protection Buffers and Project Encroachment within Each Columbia Solar Project Site

Water Name	Water Type[1]	Kittitas County Minimum Buffer Distance (feet)[2]	Total Area of Buffer within Project (acres)	Average Distance from Buffer Edge to Project Disturbance (feet)	Total Buffer Encroachment (square feet)
Camas Solar Project Site					
Little Naneum Creek	F	20	1.80	20	0
Fumaria Solar Project Generation Tie Line					
Reecer Creek	F	20	0.35	No power poles would be replaced within the water protection buffer	
Penstemon Solar Project Site					
Coleman Creek	F	20	0.68	36	7
Typha Solar Project Site					
Yakima River	S	40	0.77	205	0
Urtica Solar Project Site					
McCarl Creek (US01)	F	20	2.06	0	16,796

1. S = shoreline of the state (WAC 222-16-030), F = fish-bearing stream (WAC 222-16-030); all other water resources were excluded from this table because no protection buffers were defined by KCC guidance for those features.
2. Minimum buffer distances are depicted on maps.

3.3.3.2 Solar Project Sites

Camas Solar Project Site

No impacts are proposed to the KCC-defined minimum protection buffer around Little Naneum Creek within the Camas Solar Project site. The nearest project impact area (the planned perimeter fence) would be 1 to 100 feet from the edge of the minimum protection buffer for Little Naneum Creek. No KCC-defined minimum protection buffer is defined for Bull Ditch because ditches and canals are excluded from the WAC water typing system. All impacts to water protection buffers would be avoided through project design.

Fumaria Solar Project Site

No KCC-defined protection buffers are defined for the two on-site ditches because ditches are excluded from the WAC water typing system. Therefore, no impacts are proposed to any KCC-defined minimum water protection buffers within the Fumaria Solar Project site. All impacts to water protection buffers would be avoided through project design.

Fumaria Solar Project Generation Tie Line

No impacts are proposed to the KCC-defined minimum protection buffers around Reecer Creek along the Fumaria Solar Project generation tie line. Power poles near Reecer Creek that are within its minimum protection buffer would not be replaced. No KCC-defined minimum water protection buffer is defined for unnamed stream FS04 because KCC guidance specifies that no protection buffer is needed for Type Ns water resources, and no KCC-defined minimum water protection buffers are defined for Cascade Irrigation District Canal, Town Ditch, and the ditches along the Fumaria Solar Project generation tie line because ditches and canals are excluded from the WAC water typing system. All impacts to water protection buffers would be avoided through project design.

If new power poles need to be installed, then TUUSSO would install them in upland areas outside of the KCC-defined minimum protection buffers for all water resources along the Fumaria Solar Project generation tie line.

Penstemon Solar Project Site

The Penstemon Solar Project would have very minor encroachment on the KCC-defined minimum protection buffer around Coleman Creek within the project site. The proposed perimeter fence would impact approximately 7 square feet along the western edge of Coleman Creek's minimum protection buffer (Figure 3.3-16). Along the remainder of the buffer, the project impact area would be 0 to 82 feet from the edge of the minimum protection buffer for Coleman Creek, with an average distance of 36 feet from the edge of the minimum protection buffer. No KCC-defined minimum protection buffer is defined for the on-site ditch because ditches and canals are excluded from the WAC water typing system. Impacts to water protection buffers on the Penstemon Solar Project site would be negligible and would not require mitigation.

Typha Solar Project Site

No impacts are proposed to the KCC-defined minimum protection buffer around the Yakima River within the Typha Solar Project site. The nearest project impact area would be 104 to 335 feet from the edge of the minimum protection buffer for the Yakima River, with an average distance of 205 feet. All impacts to water protection buffers would be avoided through project design.

Typha Solar Project Generation Tie Line

No KCC-defined protection buffers are defined for the EP Canal and on-site ditches because ditches and canals are excluded from the WAC water typing system. Therefore, no impacts are proposed to any KCC-defined minimum water protection buffers along the Typha Solar Project generation tie line. All impacts to water protection buffers would be avoided through project design.

Urtica Solar Project Site

The Urtica Solar Project would impact the KCC-defined minimum protection buffer around McCarl Creek within the project site (Figure 3.3-17). No impacts to McCarl Creek or its buffer would occur because the proposed fence posts would be installed within the existing access road prism. Although 16,796 square feet of encroachment into the KCC-defined minimum protection buffer for McCarl Creek is depicted in Figure 3.3-17, no activities are planned within this area, other than adding a fence outside of it. The existing road is not considered a part of the water protection buffer because it cannot act as a buffer for surrounding resources; therefore, its area was excluded from the buffer area calculation. Improvements to this road could extend outside of the existing road footprint; however, this is not proposed at this time. If plans are altered, then coordination with Kittitas County would occur for the buffer impacts associated with that design change. All impacts to water protection buffers would be avoided or would have negligible impacts on water protection buffers based on the current project design.

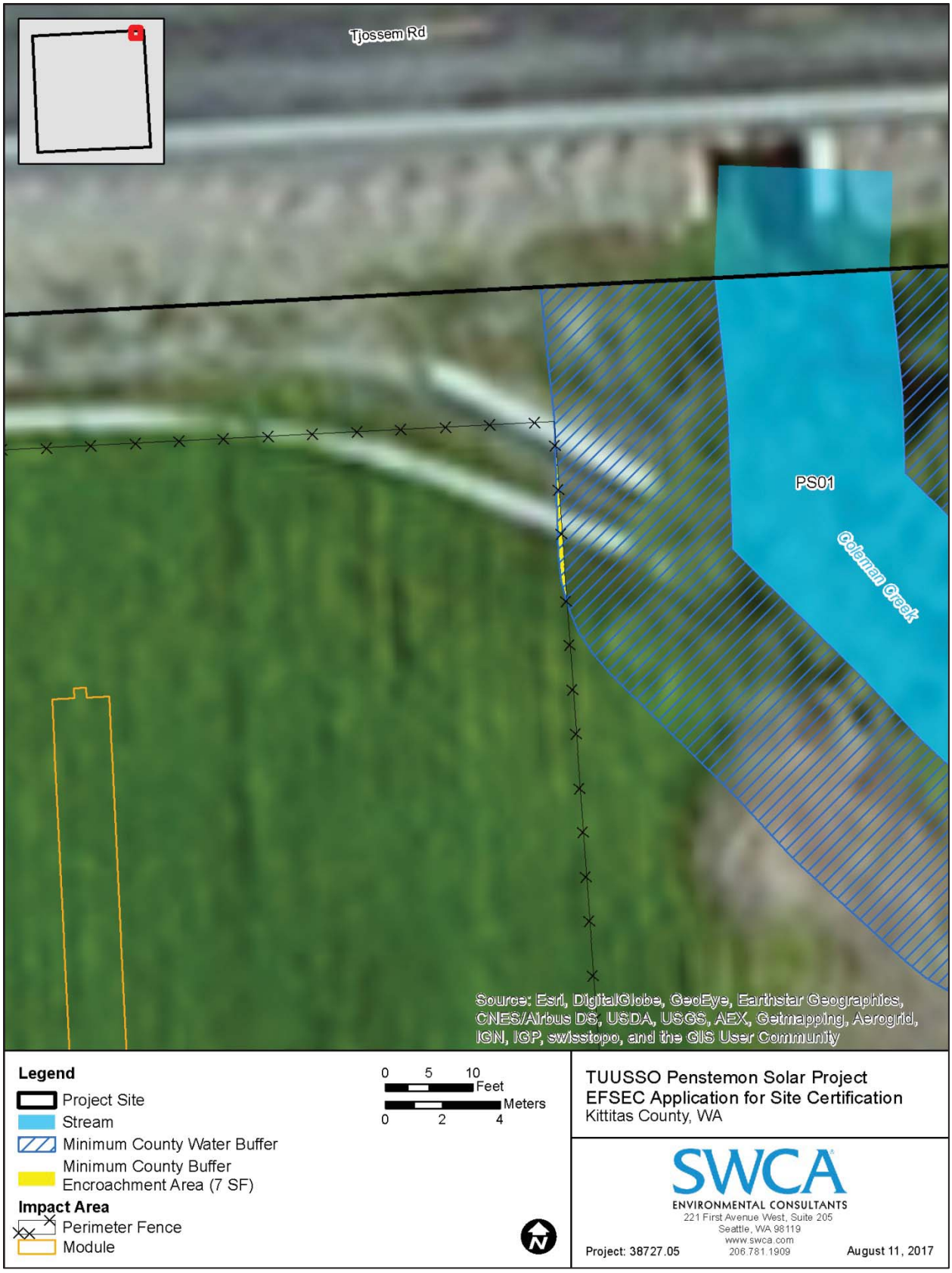


Figure 3.3-16. Penstemon Solar Project water buffer encroachment.

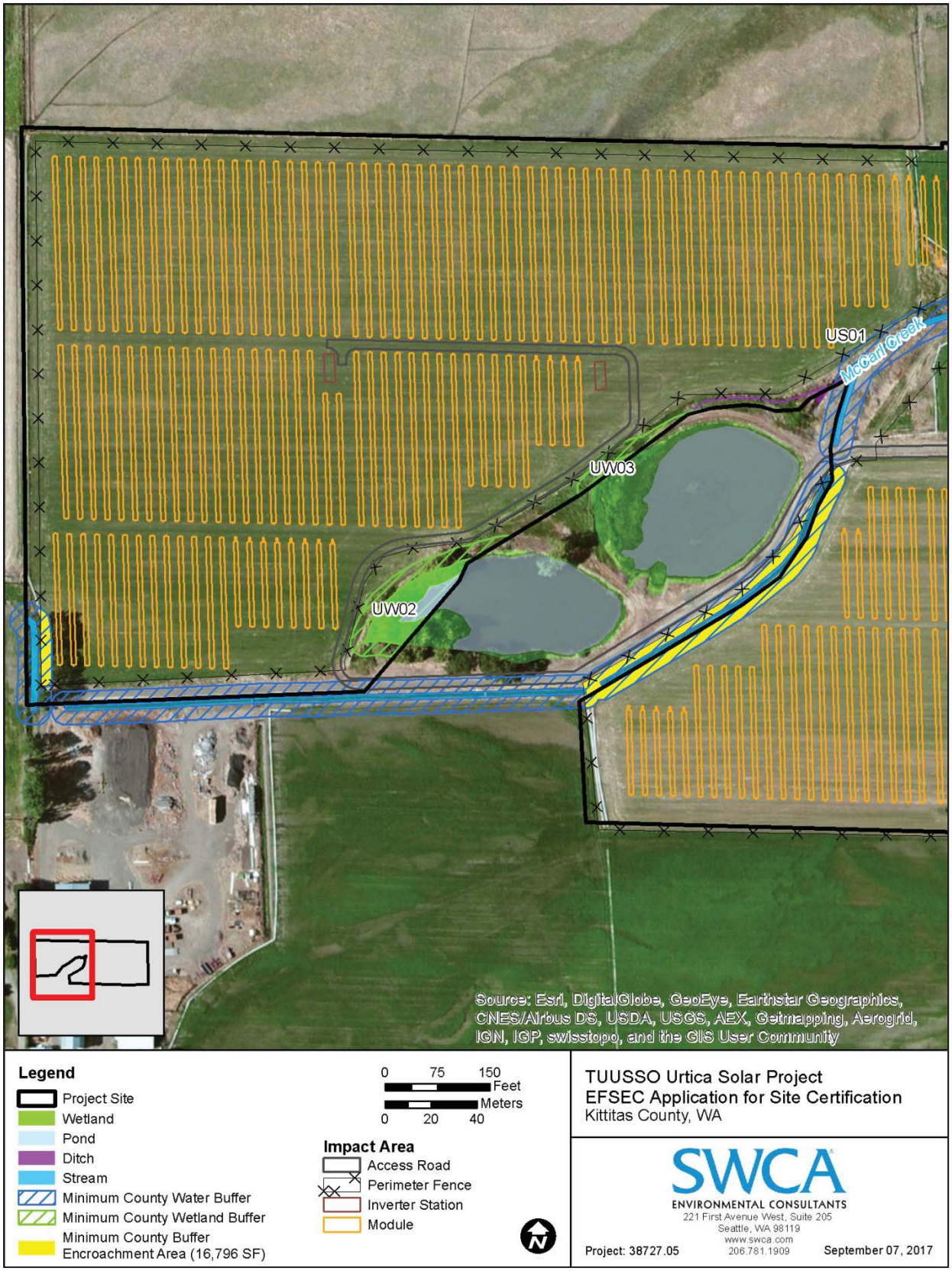


Figure 3.3-17. Urtica Solar Project wetland and water buffer encroachment.

(2) Surface water movement/quality/quantity. The application shall set forth all background water quality data pertinent to the site, and hydrographic study data and analysis of the receiving waters within one-half mile of any proposed discharge location with regard to: Bottom configuration; minimum, average, and maximum water depths and velocities; water temperature and salinity profiles; anticipated effluent distribution, dilution, and plume characteristics under all discharge conditions; and other relevant characteristics which could influence the impact of any wastes discharged thereto.

3.3.4 Affected Environment for Surface Water

3.3.4.1 General County

TUUSSO prepared drainage reports for the Columbia Solar Project sites (Encompass Engineering & Surveying [Encompass] 2017a, 2017b, 2017c, 2017d, 2017e). See also the Drainage Design and Current and Proposed Hydrology sections in Section 2.3.3.1. All of the sites are all relatively flat. All of the sites generally slope from north to south.

3.3.4.2 Solar Project Sites

Camas Solar Project Site

The Camas Solar Project site is currently an open field used to make hay using flood irrigation methods. The overall topography of the site gently slopes to the south (Figure 3.3-18). The surface water that does not infiltrate flows to the south. The western edge of the site is bordered by an irrigation ditch (CW01) flowing to the south, while Little Naneum Creek flows southwest along the southeastern edge of the site. These surface waters meet at the southwest corner of the site before crossing under Interstate 82 (I-82) in existing irrigation infrastructure. Bull Ditch runs southeast through the northern portion of the site. These ditches are maintained by the landowner.

Drainage Basins

As shown in Figure 3.3-18, the Camas Solar Project site is made up of two drainage basins (Encompass 2017a). Drainage Basin 1 captures the majority of the site, and it includes everything that is south and west. Drainage Basin 2 is the small, northeast portion of the site that is separated from the rest of the site by Bull Ditch. All of the runoff is either infiltrated on-site or flows to the south/southwest. The existing drainage currently has a barn on it which results in 0.06 acre of impervious area on the site, while the remaining 51.15 acres are pervious.

Downstream Analysis

As noted above, all runoff from the Camas Solar Project site flows into Little Naneum Creek that leaves the site at the southwest corner of the site and flows under I-82. Little Naneum Creek and Bull Ditch are part of a larger irrigation network that serves the rural areas south of Ellensburg. The flow rates are controlled as needed. Little Naneum Creek flows south from the site for approximately 0.5 mile before discharging into Naneum Creek and then Wilson Creek. No issues have been brought up in relation to the existing irrigation infrastructure downstream of the project site.

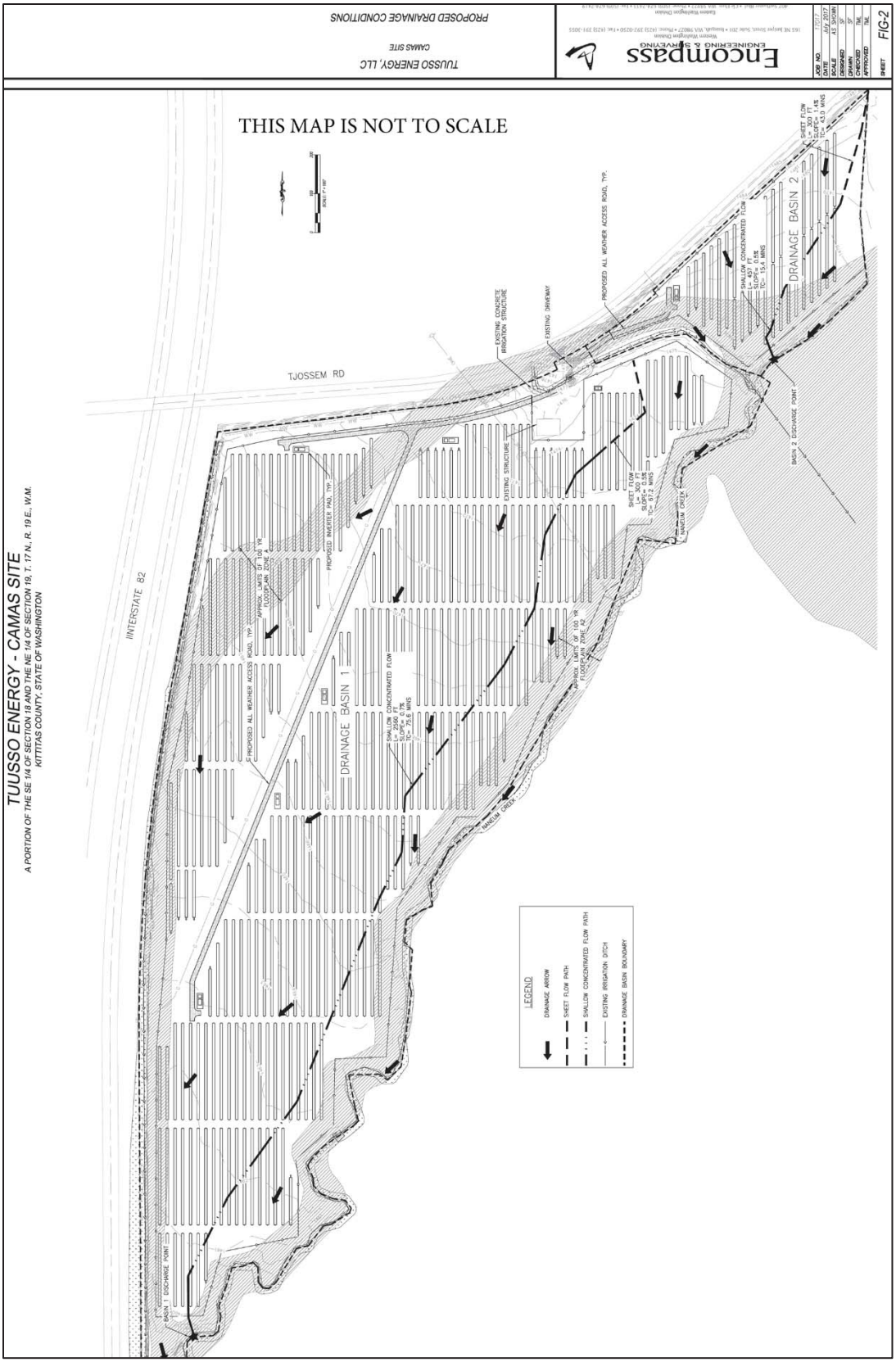


Figure 3.3-18. Proposed drainage conditions for the Camas Solar Project site.

Fumaria Solar Project Site

The overall topography of the Fumaria Solar Project site gently slopes to the south (Figure 3.3-19). The surface water that does not infiltrate flows to the south. Runoff to the west is captured by an existing irrigation ditch that flows south along the western border of the site (FS01). Runoff to the south is captured in the southern portion of the ditch where it discharges to an existing detention pond just off the southeast corner of the property.

Drainage Basins

As shown in Figure 3.3-19, since all runoff is either infiltrated on-site or captured in the existing irrigation pond, the Fumaria Solar Project site is a single drainage basin represented by two sub-basins: Basin 1A and Basin 1B (Encompass 2017b). Basin 1A makes up the majority of the site and flows generally to the south. Basin 1B makes up a small portion of the site that sheet flows off the site to the west. Runoff from Basins 1A and 1B meet in an existing irrigation ditch (FS01). The existing drainage basin contains no impervious surfaces, meaning the entire 35.24 acres is pervious.

Downstream Analysis

As noted above, all runoff from the Fumaria Solar Project site flows into the existing irrigation ditch at the southern end of the site. The ditch discharges into an existing irrigation pond immediately to the southeast of the project site. The ditch and pond are currently maintained by the landowner. The irrigation ditch, and ditches downstream of the project site, are part of a larger irrigation network that serves the rural areas north of Ellensburg. The pond outlets via a culvert to the south, where it then splits into two ditches, one to the south and one to the east. As these are irrigation facilities, the flow rates are controlled as needed. No issues have been brought up in relation to the existing irrigation infrastructure downstream of the project site.

Penstemon Solar Project Site

The overall topography of the Penstemon Solar Project site gently slopes to the south (Figure 3.3-20). The surface water that does not infiltrate flows to the south. This runoff is captured in an irrigation ditch along the southern property line. The ditch flows to the east and into Coleman Creek at the southeast corner of the site.

Drainage Basins

As shown in Figure 3.3-20, since all runoff is either infiltrated or captured in the existing irrigation ditch at the southern border of the Penstemon Solar Project site, the site is a single drainage basin (Encompass 2017c). The existing drainage basin contains no impervious surfaces, meaning the entire 39.38 acres is pervious.

Downstream Analysis

As noted above, all runoff from the Penstemon Solar Project site flows into the existing irrigation ditch at the southern end of the site. This ditch is currently maintained by the landowner. The irrigation ditch is part of a larger irrigation network that serves the rural areas south of Ellensburg, and the flow rates are controlled as needed. The ditch discharges into Coleman Creek, immediately to the southeast of the project site. Coleman Creek is well defined, with thick vegetation on its edges, and flows south along Moe Road for 0.5 mile. It then flows southeast, ultimately joining Wilson Creek, before discharging into the Yakima River. No issues have been brought up in relation to the existing irrigation infrastructure downstream of the solar project site.

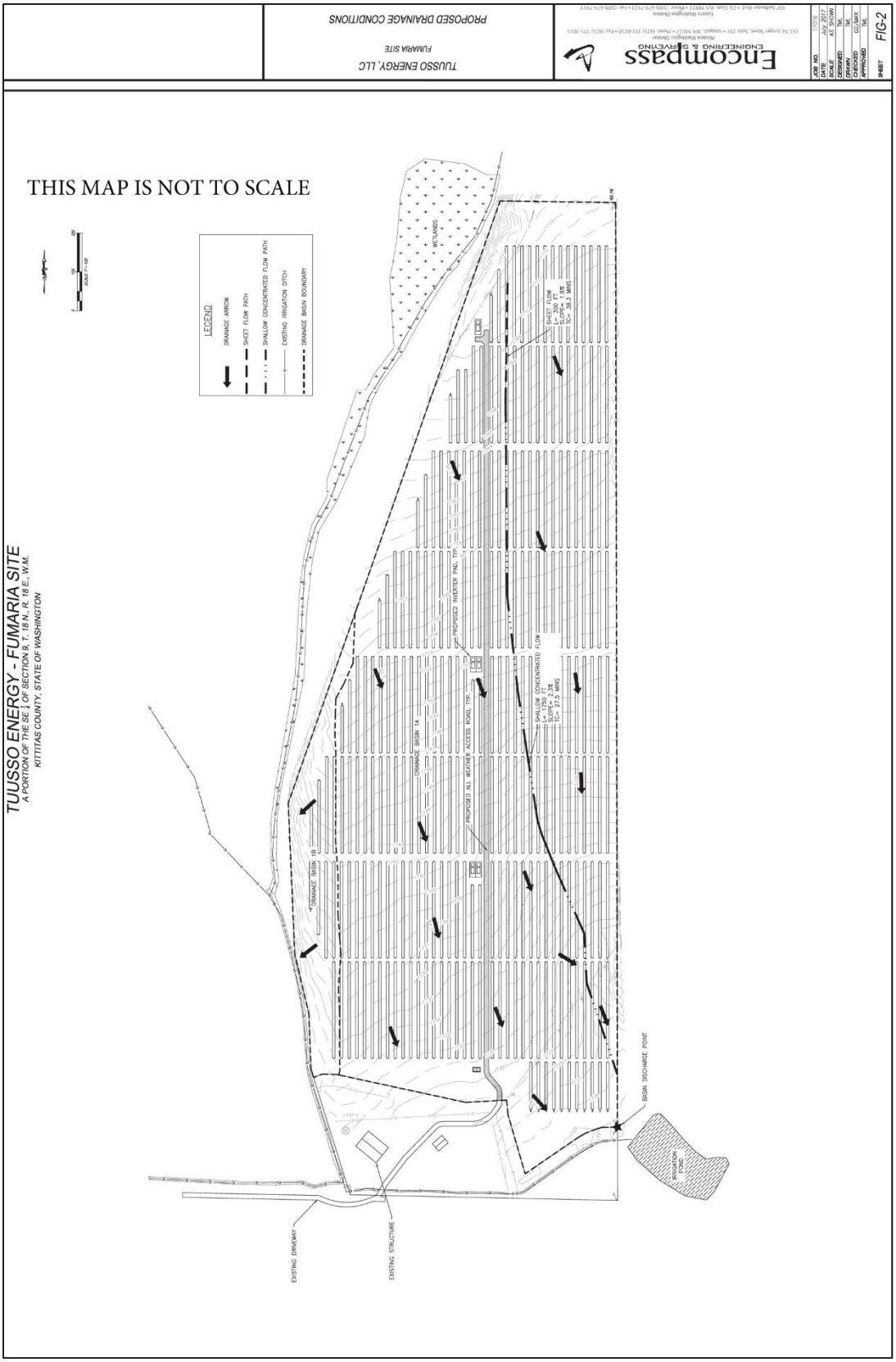


Figure 3.3-19. Proposed drainage conditions for the Fumaria Solar Project site.

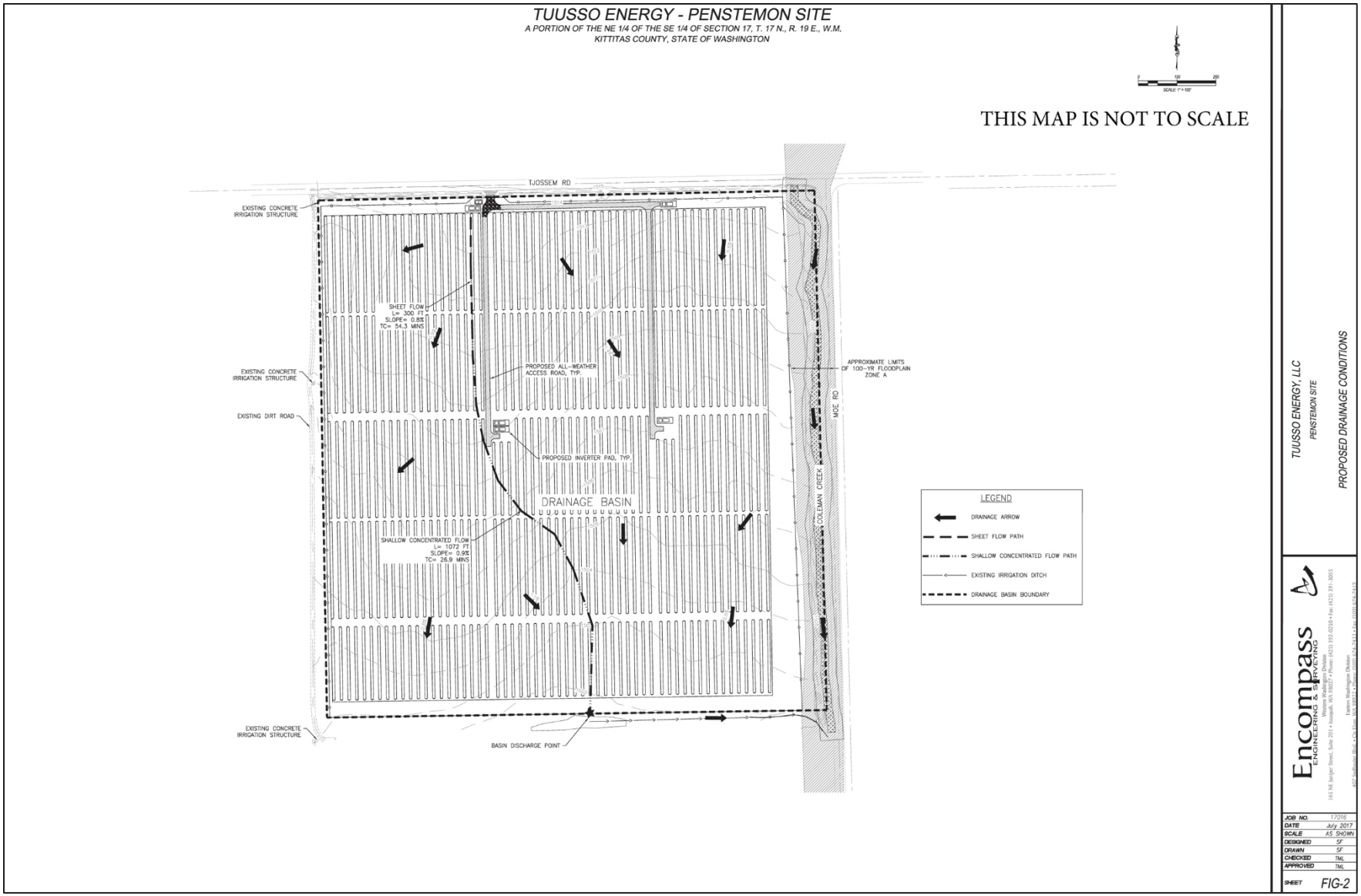


Figure 3.3-20. Proposed drainage conditions for the Penstemon Solar Project site.

Typha Solar Project Site

The overall topography of the Typha Solar Project site gently slopes to the south (Figure 3.3-21). The surface water that does not infiltrate flows to the south. There are two narrow wetlands that run west to east through the site and capture surface runoff and slowly discharge it to the east.

Drainage Basins

As shown in Figure 3.3-21, the Typha Solar Project site is made up of three drainage basins (Encompass 2017d). Drainage Basin 1 is made up of the northwest portion of the site. Drainage from this area flows south and into the northern wetland (TW01) on the site. Drainage Basin 2 is the largest drainage basin on the site and encompasses the northeast portion of the site. Drainage from Basin 2 flows south into the existing northern wetland (TW02), which then carries the flow to the east. Drainage from Basin 3 flows south into the wetland (TW03) which borders the southern portion of the site and is the more major wetland of the two on site. The runoff slowly flows to the east via the wetland. There are no impervious surfaces, meaning the entire 56.12 acres is pervious.

Downstream Analysis

The Typha Solar Project site drains into two wetlands (TW02 and TW03), both of which make their way to the east. The southern wetland becomes a more defined irrigation channel after leaving the site and continues to convey water to the east for approximately 0.75 mile before discharging into the Yakima River. This irrigation channel is currently maintained by the Kittitas Reclamation District (KRD). It is part of a larger irrigation network that serves the rural areas west of Ellensburg. As this channel is part of the irrigation facilities, the flow rate is controlled as needed. No issues have been brought up in relation to the existing irrigation infrastructure downstream of the project site.

Urtica Solar Project Site

The overall topography of the Urtica Solar Project site gently slopes to the east (Figure 3.3-22). The surface water that does not infiltrate flows to the east. Two ponds are located near the middle of the site and discharge into an existing irrigation ditch that runs west to east through the site.

Drainage Basins

As shown in Figure 3.3-22, the Urtica Solar Project site is made up of two drainage basins (Encompass 2017e). Drainage Basin 1 is the smaller of the two and encompasses the southern portion of the site. Drainage from this area flows east, to the southeast corner of the site, where it enters a culvert and crosses under Umptanum Road. Drainage Basin 2 is the larger drainage basin that encompasses the northern portion of the site. Drainage from Basin 2 flows into the existing irrigation pond and ditch (US01, McCarl Creek) that flows through the site to the east. There are no structures on the existing site, however there is an existing gravel road, which results in 0.33 acre of the site being impervious. The remaining 51.16 acres are pervious.

Downstream Analysis

The majority of the Urtica Solar Project site (Basin 2) drains to the east into the irrigation ponds and/or irrigation ditch (US01, McCarl Creek) that flows west to east through the site. The pond and ditch are currently maintained by the current landowner. The irrigation pond and ditch are part of a larger irrigation network that serves the rural areas southwest of Ellensburg. As this pond and ditch are irrigation facilities, the flow rates are controlled as needed. Both Basins drain into culverts that cross under Umptanum Road, and then continue on to the southeast as part of the larger existing irrigation network that serves the whole area. No issues have been brought up in relation to the existing irrigation infrastructure downstream of the project site.

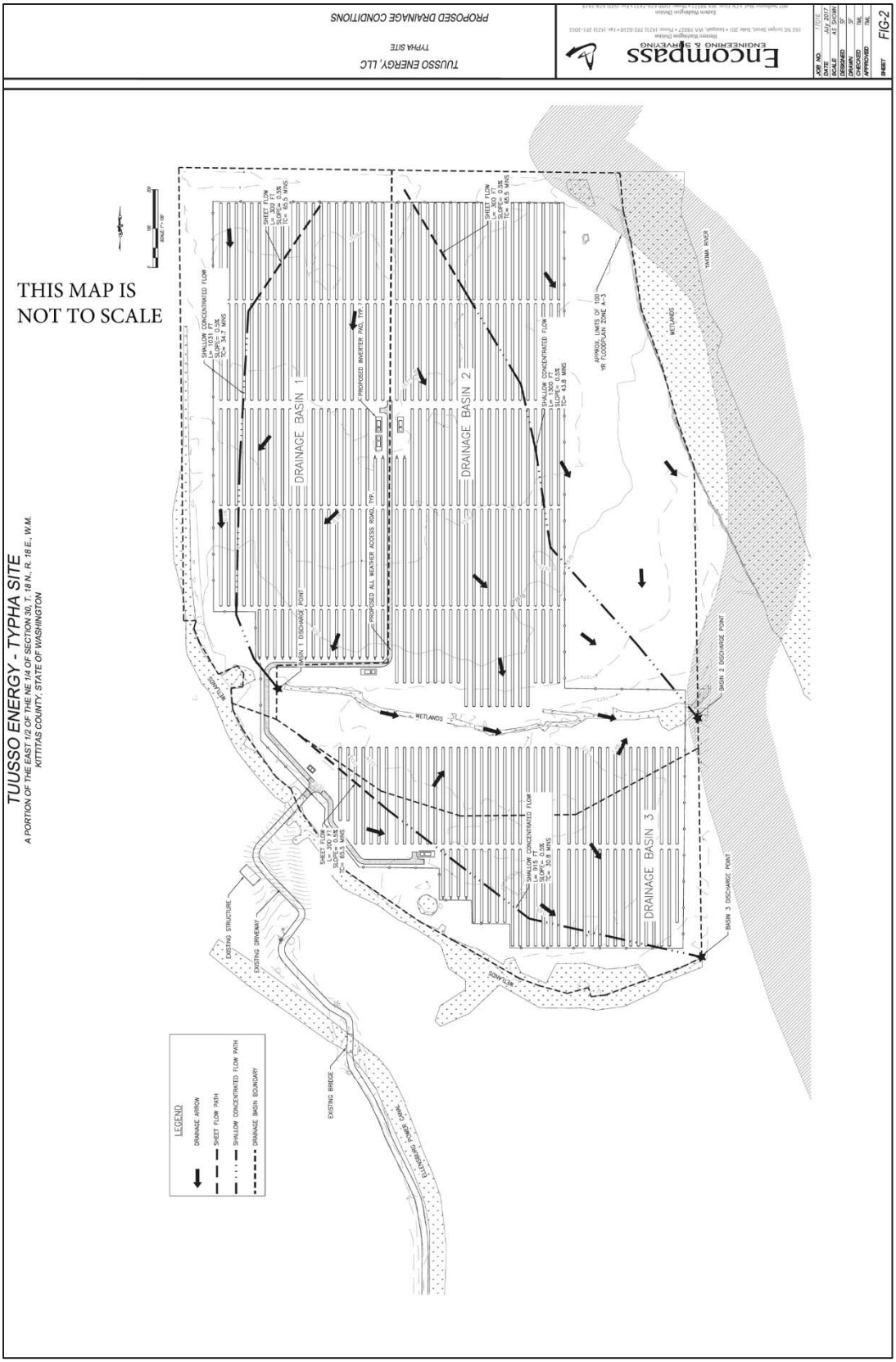


Figure 3.3-21. Proposed drainage conditions for the Typha Solar Project site.

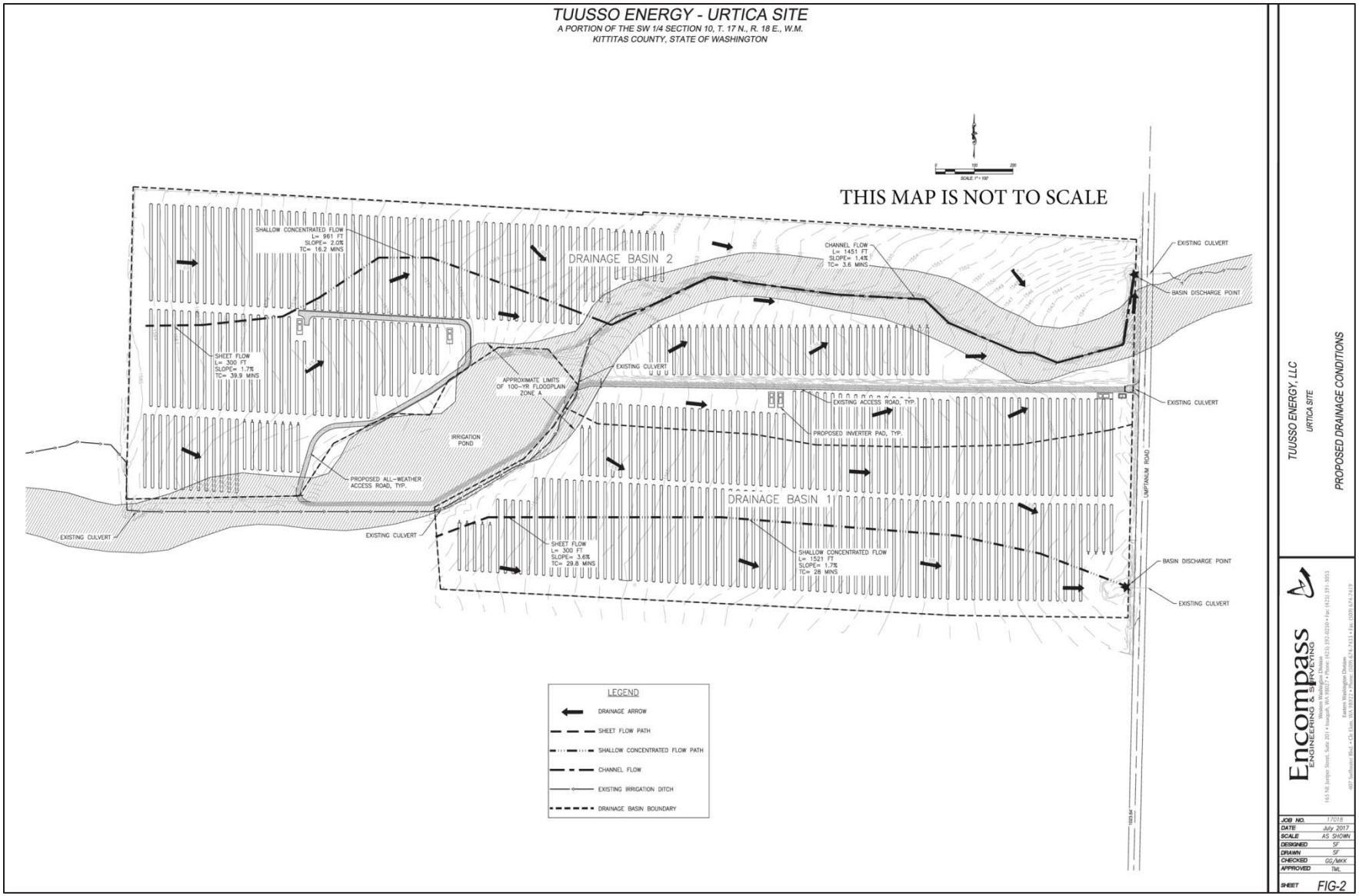


Figure 3.3-22. Proposed drainage conditions for the Urtica Solar Project site.

3.3.5 Impacts to Surface Water

3.3.5.1 General County

Minimal grading and ground disturbance would occur as part of the proposed Columbia Solar Projects. The proposed projects include at least 20-foot setbacks from wetlands, streams, and the Yakima River. Additionally, sediment and erosion control measures would be implemented to avoid water quality impacts to adjacent wetlands, streams, and the Yakima River. As a result, there would be no impacts to water quality. The access roads, concrete pads for the electrical infrastructure, and solar tracker posts are the only impervious surfaces proposed for the site. The portion of the solar panel array installations that actually disturb the ground is also very minimal. Because of this, existing topography and drainage patterns would remain relatively undisturbed, and the proposed drainage basins would encompass the same area as the existing drainage basins (see Figures 3.3-18 through 3.3-22).

See also Sections 2.11, 3.3.7, and 3.3.8. No discharge of water or contaminants is proposed for any of the five Columbia Solar Project sites; therefore, no hydrographic study data and analysis of the receiving waters within 0.5 mile of the solar project sites would be necessary. However, because impervious surfaces would be added to each project site, hydrologic modeling was conducted. All site and location factors were taken into account to perform the hydrologic modelling. These results are further summarized below for each site; the detailed analyses can be found in Appendices G through K (Encompass 2017a, 2017b, 2017c, 2017d, 2017e). The modeled increased runoff can be handled by full dispersion throughout each project site, as a majority of the existing vegetation at the sites would be protected. See detailed discussion of this in Appendices G through K (Encompass 2017a, 2017b, 2017c, 2017d, 2017e). The increased runoff is also considered negligible, due to the reduction of flood irrigation that would accompany each of the Columbia Solar Projects.

The Columbia Solar Projects would not impact the surface water quality and there would be minor permanent impacts to the surface water movement and quantity. However, no impacts are expected to occur in waters downstream of the solar project sites.

3.3.5.2 Solar Project Sites

Camas Solar Project Site

The Camas Solar Project would convert 2.00 acres into impervious surfaces. The modelling calculations showed that the runoff generated from a 2-year storm increased by 0.02 cubic feet per second (cfs) for Basin 1 while it did not increase for Basin 2. Runoff generated from a 25-year storm increased 0.07 cfs for Basin 1 and 0.01 cfs for Basin 2.

Fumaria Solar Project Site

Basin 1B would remain undisturbed throughout the Fumaria Solar Project, with no appreciable impervious surface added. The project would convert 1.71 acres into impervious surfaces in Basin 1A. The modelling calculations showed that the runoff generated from a 2-year storm increased 0.04 cfs. Runoff generated from a 25-year storm increased 0.11 cfs.

Penstemon Solar Project Site

The Penstemon Solar Project would convert 1.31 acres into impervious surfaces. The modelling calculations showed that the runoff generated from 2-year and 25-year storms would remain the same as under the existing condition.

Typha Solar Project Site

The Typha Solar Project would convert 1.40 acres into impervious surfaces. The modelling calculations showed that the runoff generated from a 2-year storm would increase 0.01 cfs for Basin 1 and remain the same as under the existing condition for Basins 2 and 3. Runoff generated from a 25-year storm increased 0.02 cfs for Basin 1 and 0.01 cfs for Basin 3, while Basin 2 remained unchanged.

Urtica Solar Project Site

The Urtica Solar Project would convert 1.65 acres into impervious surfaces. The modelling calculations showed that the runoff generated from a 2-year storm increased 0.02 cfs for Basin 1 while it did not increase for Basin 2. Runoff generated from the 25-year storm increased 0.01 cfs for Basin 1 and 0.02 cfs for Basin 2.

(3) Runoff/absorption. The application shall describe how surface water runoff and erosion are to be controlled during construction and operation, how runoff can be reintroduced to the ground for return to the groundwater supply, and to assure compliance with state water quality standards.

3.3.6 Affected Environment for Runoff/Absorption

The estimated infiltration rates for the Columbia Solar Project sites are 1.02 inches/hour for the upper, silty sand unit and 0.27 inch/hour for the underlying sandy gravel (Swiftwater 2017a, 2017b, 2017c, 2017d, 2017e). The rate for the sandy gravel unit is assumed to be low because of the presence of fine-grained silt and clay minerals in the interstitial spaces and fractures of this partially cemented unit.

Site-specific seepage and perched groundwater observations are included below in Section 3.3.11.

3.3.7 Impacts to Runoff/Absorption

3.3.7.1 General County

See also the Drainage Design and Current and Proposed Hydrology sections in Section 2.3.3.1, as well as Section 3.3.5.

No export of soil is anticipated for any of the five Columbia Solar Project sites. During site construction, open soil exposure would be minimized through minimization of grading activities, and erosion from runoff would be reduced or eliminated by the utilization of BMPs, including but not limited to installation of silt fences and tarps where appropriate. At the conclusion of construction, all disturbed areas surrounding graded areas would be remediated through reseeding with native low cover vegetation. No ditches or outfall pipes would be installed as part of the proposed solar projects. Therefore, all water in the project impact areas would either be absorbed through infiltration or runoff through overland flow at very low velocities that are unlikely to cause excessive erosion. No discharges to water resources are proposed for the construction and operation of the solar project sites. As a result, the temporary runoff/absorption impacts would be minor.

Infiltration and Temporary Erosion and Sedimentation Control

TUUSSO would implement BMPs based on applicable stormwater guidelines for eastern Washington to reduce or eliminate concentrated stormwater runoff and erosion. Additional details regarding BMPs can be found in Section 3.1.6.

Construction of the solar arrays at the Columbia Solar Project sites could create a minor increase in the total and effective impervious area of the sites that is equivalent to the area of the solar panel footings and associated infrastructure. There would also be an increase in less pervious areas because of the proposed gravel access roads.

Based on the results of the geotechnical study, infiltration into the upper, topsoil-like silty sand/sandy silt soils at the Columbia Solar Project sites is feasible and ongoing (Swiftwater 2017a, 2017b, 2017c, 2017d, 2017e). The solar project sites have been cultivated using flood irrigation methods, and the irrigation water percolates into the soil and is stored above the underlying relatively impervious layer found throughout the valley. The soils are capable of infiltrating stormwater during an average year (Swiftwater 2017). The solar project sites are located in Climate Region 2 – Central Basin and receive an average of about 8 inches of precipitation per year, some of it in the form of snow (Ecology 2013). Given the relatively low precipitation in the area, combined with the natural permeability of the upper soil horizon, infiltration of normal stormwater amounts would occur on the solar project sites and normal levels of stormwater would not be concentrated to a significant extent (Swiftwater 2017a, 2017b, 2017c, 2017d, 2017e). As a result, there would be permanent minor runoff/absorption impacts.

Drainage

Appreciable amounts of seepage are not anticipated during excavation of the Columbia Solar Project sites; however, during the rainy winter months, it is prudent to anticipate seepage in excavations and groundwater control measures would be on-site or readily available. These would include trash pumps, sumps, and discharge ditches. Seepage may create instability in the excavation walls. The solar project sites would be graded such that surface water would be directed away from structures and slopes and not allowed to pond near the tops or toes of slopes. Given the relatively low precipitation in the solar project areas, combined with the natural permeability of the upper soil horizon, infiltration of normal stormwater amounts would occur on the project sites and normal levels of stormwater would not be concentrated to a significant extent (Swiftwater 2017a, 2017b, 2017c, 2017d, 2017e). Stormwater discharge BMPs would be implemented on the project sites to control runoff from the sites and ensure that state water quality standards are achieved.

3.3.8 Mitigation for Runoff/Absorption

The following mitigation measures would be used:

- Off-site flows have been calculated for the Columbia Solar Project sites, and would bypass the sites via the existing flow paths, which run throughout the sites in poorly defined flow paths. The solar project sites have been laid out to minimize the area that would encroach into the flow paths. Any grading of the solar project sites would direct surface water away from structures and slopes.
- Surface water would not be allowed to pond near the tops or toes of slopes of the solar project sites.
- Stormwater discharge BMPs would be implemented to control runoff from each of the solar project sites.
- Sediment-laden surface water would be treated such that water discharged from each of the solar project sites meets all water quality standards.
- Stormwater would not be discharged over the project site slopes to the north of each solar project site.

(4) Floods. The application shall describe potential for flooding, identify the five, fifty, and one hundred-year flood boundaries, and describe possible flood impacts at the site, as well as possible flood-related impacts both upstream and downstream of the proposed facility as a result of construction and operation of the facility and all protective measures to prevent possible flood damage to the site and facility.

3.3.9 Affected Environment for Floodplains

3.3.9.1 General County

The Flood Emergency Management Agency (FEMA) maps floodplains throughout the country. FEMA-mapped floodplains are found at every Columbia Solar Project site, except for the Fumaria Solar Project site. The FEMA-mapped 100-year floodplain is depicted on the site plans for each of the project sites in Appendix L (FEMA 1981a). The 50-year floodplain is not depicted on FEMA Flood Insurance Rate Maps (FIRMs) for Kittitas County; however, it is described in the FEMA Flood Insurance Study (FIS) for the city of Ellensburg. An FIS is a compilation and presentation of flood risk data for specific watercourses, lakes, and coastal flood hazard areas within a community and contains detailed flood elevation data in flood profiles and data tables (FEMA 1981b). The 5-year floodplain is not included in the FIS or depicted on FIRMs. This Application for Site Certification (ASC) assumes that because the 100-year floodplain boundary occurs at a higher elevation than the 5- and 50-year floodplains, that analysis of impacts within the 100-year floodplain boundary are representative of those to the 5- and 50-year floodplains, with fewer impacts occurring within the 5- and 50-year floodplains.

3.3.10 Impacts to Floodplains

3.3.10.1 General County

TUUSSO utilized avoidance measures during design of the Columbia Solar Projects to avoid, reduce, or eliminate impacts to the 100-year floodplain. Minor encroachment into the FEMA-mapped 100-year floodplain would be unavoidable based on the current project designs and would occur over a total of 7.94 acres across all of the solar project sites. However, actual fill in the solar project sites would be limited to solar panel footings, inverters, and access road installation, with all other areas remaining at the current site elevation. Impacts to the FEMA-mapped 100-year floodplain would be limited to 0.57 acre across all of the solar project sites. All inverters would be located outside of the FEMA-mapped 100-year floodplain.

Refer to Table 3.3-6 for the total area of FEMA-mapped 100-year floodplain within the solar project sites, average distance from the edge of the floodplain boundary to the nearest project disturbance, total 100-year floodplain encroachment, and total impacts to the 100-year floodplain within each of the solar project sites. Impacts to the FEMA-mapped 100-year floodplain along the Fumaria and Typha Solar Project generation tie lines would be avoided by using existing power poles and spanning all floodplain areas; therefore, the generation tie lines are excluded from Table 3.3-6.

Table 3.3-6. FEMA-Mapped 100-year Floodplain Project Encroachment and Impacts within Each Columbia Solar Project Site

Project Site	Total Area of 100-year Floodplain within Project (acres)[1]	Average Distance from Floodplain Boundary Edge to Project Disturbance (feet)	Total 100-year Floodplain Encroachment (acres)	Total Impacts to 100-year Floodplain (acres)
Camas Solar Project Site				
100-year Floodplain	12.41	10	6.78	0.19
Fumaria Solar Project Site				
100-year Floodplain	0.00	626	0.00	0.00
Penstemon Solar Project Site				
100-year Floodplain	1.96	9	0.00	0.00
Typha Solar Project Site				
100-year Floodplain	0.53	60	0.00	0.00
Urtica Solar Project Site				
100-year Floodplain	6.09	30	1.16	0.38

1. 100-year floodplain mapping is based on the FEMA-mapped floodplains depicted on FIRMs (FEMA 1981a).

See Appendix L for site plans for each of the Columbia Solar Project sites. Encroachment and impacts to the FEMA-mapped 100-year floodplain and discussion of the 50-year floodplain are described below for each solar project site.

3.3.10.2 Solar Project Sites

Camas Solar Project Site

The FEMA-mapped 100-year floodplain associated with Little Naneum Creek encompasses approximately 12.41 acres of the Camas Solar Project site. The northernmost 100-year floodplain appears to have been a former overflow channel of Little Naneum Creek. This area of the 100-year floodplain enters the study area in the north, heads west slightly, makes a gradual curve to the south, and follows the edge of the highway, encompassing wetland CW01, to its confluence with Little Naneum Creek in the southwestern corner of the site. The 100-year floodplain is described on the FIRM as ranging from 1,454 to 1,470 feet above mean sea level (amsl) within the “limit of detailed study,” which does not extend north of the intersection of Bull Ditch and Little Naneum Creek (FEMA 1981a). The 50-year floodplain for Little Naneum Creek was described in the FEMA FIS, depicted as Naneum Creek in the FIS, as being 0.2 feet lower in elevation than the 100-year floodplain boundary (FEMA 1981b).

Encroachment of the Camas Solar Project area into the FEMA-mapped 100-year floodplain would be approximately 6.78 acres based on the current design plans. Proposed impacts to the FEMA-mapped 100-year floodplain were avoided to the extent possible through project design to reduce possible fill in these areas. The total proposed project impacts to the FEMA-mapped 100-year floodplain would be approximately 0.19 acre, which includes less than 0.01 acre of fill from the solar panel footings and 0.18 acre of fill from access road installation. The number and placement of panel footings have not been determined in the project design but would not be expected to exceed 0.01 acre within the FEMA-mapped 100-year floodplain. Therefore, the project would result in minimal impacts to floodplains.

Based on observations during Camas Solar Project site visits, the FEMA-mapped 100-year floodplain area does not appear to match the current site conditions and may be smaller than what is depicted on the FIRM.

Fumaria Solar Project Site

No FEMA-mapped 100-year floodplains are depicted within the Fumaria Solar Project site. Therefore, no impacts are proposed to any FEMA-mapped 5-, 50-, or 100-year floodplains within the project site. The nearest 100-year floodplain is along Reecer Creek, over 600 feet from the site. All impacts to FEMA-mapped floodplains would be avoided through project design.

Fumaria Solar Project Generation Tie Line

The FEMA-mapped 100-year floodplain, associated with Reecer Creek, encompasses approximately 1.91 acres along the Fumaria Solar Project generation tie line. The FEMA-mapped 100-year floodplain for Reecer Creek would cross the generation tie line three times. The 100-year floodplain is depicted on the FIRM but does not include elevation ranges (FEMA 1981a). The 50-year floodplain for the portion of Reecer Creek along the generation tie line was not described in the FEMA FIS but can be assumed to be lower in elevation than the 100-year floodplain boundary (FEMA 1981b).

The FEMA-mapped 100-year floodplain would be avoided by spanning the Reecer Creek floodplain using existing power poles. If new power poles need to be installed, then TUUSSO would install them in upland areas outside of the FEMA-mapped 100-year floodplain along the Fumaria Solar Project generation tie line. Impacts to the FEMA-mapped 100-year floodplain would be avoided through project design.

Penstemon Solar Project Site

The FEMA-mapped 100-year floodplain associated with Coleman Creek encompasses approximately 1.96 acres within the Penstemon Solar Project site. The FEMA-mapped 100-year floodplain for Coleman Creek runs along the eastern project site boundary and appears to flood Moe Road regularly. The 100-year floodplain is depicted on the FIRM but does not include elevation ranges (FEMA 1981a). The 50-year floodplain for the portion of Coleman Creek within the project site was not described in the FEMA FIS but can be assumed to be lower in elevation than the 100-year floodplain boundary (FEMA 1981b).

Encroachment into and impacts to the FEMA-mapped 100-year floodplain from the Penstemon Solar Project would be avoided through project design.

Typha Solar Project Site

The FEMA-mapped 100-year floodplain associated with the Yakima River encompasses approximately 0.53 acre within the Typha Solar Project site. The FEMA-mapped 100-year floodplain for the Yakima River runs along the eastern project site boundary, entering the site near where wetland TW02 leaves the site and in the northeastern corner of the site. The 100-year floodplain is described on the FIRM as ranging from 1,567 to 1,572 feet amsl within and directly adjacent to the project site (FEMA 1981a). The 50-year floodplain for this portion of the Yakima River was described in the FEMA FIS as being 0.7 feet lower in elevation than the 100-year floodplain boundary (FEMA 1981b).

Encroachment into and impacts to the FEMA-mapped 100-year floodplain from the Typha Solar Project would be avoided through project design.

Typha Solar Project Generation Tie Line

No FEMA-mapped 100-year floodplains are depicted along the Typha Solar Project generation tie line. Therefore, no impacts are proposed to any FEMA-mapped 5-, 50-, or 100-year floodplains along the Typha Solar Project generation tie line.

Urtica Solar Project Site

The FEMA-mapped 100-year floodplain associated with McCarl Creek encompasses approximately 6.09 acres of the Urtica Solar Project site. The FEMA-mapped 100-year floodplain depicted on the FIRM crosses the site along McCarl Creek (described as Distributary to Manastash Creek on the FIRM) and encompasses the two on-site ponds and their surrounding wetlands, UW02 and UW03. The 100-year floodplain is depicted on the FIRM but does not include elevation ranges (FEMA 1981a). The 50-year floodplain for the portion of Coleman Creek within the project site was not described in the FEMA FIS but can be assumed to be lower in elevation than the 100-year floodplain boundary (FEMA 1981b).

Encroachment of the Urtica Solar Project area into the FEMA-mapped 100-year floodplain would be approximately 1.16 acres based on the current design plans. Proposed impacts to the FEMA-mapped 100-year floodplain were avoided to the extent possible through project design, to reduce possible fill in these areas. The total proposed project impacts to the FEMA-mapped 100-year floodplain would be 0.38 acre, which includes less than 0.01 acre of fill from the solar panel modules and 0.37 acre of fill from access road installation. The number and placement of panel footings have not been determined in the project design but would not be expected to exceed 0.01 acre within the FEMA-mapped 100-year floodplain. Therefore, the project would result in minimal impacts to floodplains.

(5) Groundwater movement/quantity/quality. The application shall describe the existing groundwater movement, quality, and quantity on and near the site, and in the vicinity of any points of water withdrawal associated with water supply to the project. The application shall describe any changes in surface and groundwater movement, quantity, quality or supply uses which might result from project construction or operation and from groundwater withdrawals associated with water supply for the project, and shall provide mitigation for adverse impacts that have been identified.

3.3.11 Affected Environment for Groundwater

3.3.11.1 General County

The Columbia Solar Project sites are located within the Upper Yakima sub-basin of the Yakima groundwater basin. Basaltic rocks beneath most of the Yakima River basin are part of the larger Columbia River Basalt Group (CRBG). The CRBG comprises more than 300 individual basalt flows, and multiple aquifers reside within them (U.S. Bureau of Reclamation [Reclamation] 2012). Reported “depth to water” levels are as shallow as 10 feet below ground surface (bgs) near river valley bottoms, to more than 200 feet bgs. Well yields are generally less than 100 gallons per minute. Groundwater flows in the basin converge toward the Yakima River.

Groundwater quality in the Yakima basin is generally good; most issues are related to the impacts of agricultural operations on drinking water wells (Reclamation 2012). Water quality issues involve excess nitrate levels and bacterial contamination, particularly in the lower portions of the Yakima basin.

Results from Swiftwater’s April 2017 geotechnical survey are discussed above in Section 3.1 and the detailed reports are included as Appendices G through K (Swiftwater 2017a, 2017b, 2017c, 2017d, 2017e). The following site-specific discussions include groundwater observations.

3.3.11.2 Solar Project Sites

Camas Solar Project Site

Regarding existing water quality issues, there is a short segment of the Yakima River mapped as impaired (EPA 2017b). The impaired segment intersects with Wilson Creek, of which the Camas Solar Project's primary drainage is a tributary. There are also short impaired segments up-gradient of the project site, on Cooke Creek. These are located cross-gradient or up-gradient on different local drainage systems not connected to the site.

Well registry data (Washington State Department of Ecology [Ecology] 2017a) identified no wells on the Camas Solar Project site. Two wells were located approximately 400 feet east of the project site. The wells had depths of 80 and 120 feet, but no depth to water or pump capacity was listed in the data files. Other wells in the vicinity had depths of 45 to 180 feet.

A 6-inch-thick, wet sand seam was observed at 10.0 to 11.0 feet below grade on the Camas Solar Project site. This water was encountered in thin, relatively clean sand seams and appears to have been perched within the seams, as additional groundwater was not noted below these depths. Additional groundwater flow may be observed during the wetter winter months.

Fumaria Solar Project Site

Regarding existing water quality issues, there are no impaired reaches in, adjacent to, or up-gradient of the Fumaria Solar Project site (EPA 2017b).

Well registry data (Ecology 2017a) identified one well on the Fumaria Solar Project site (Well Log ID 339775), which had a recorded depth of 120 feet bgs. No depth to water or pump capacity data were available. Other wells within 1 mile of the project site had depths of 80 to 170 feet bgs.

Minor seepage was observed at Boring F-2 on the Fumaria Solar Project site. Groundwater may be present during wetter parts of the year.

Penstemon Solar Project Site

Regarding existing water quality issues, there is a short segment of the Yakima River mapped as impaired (EPA 2017b). The impaired segment intersects with Wilson Creek, of which the Penstemon Solar Project's primary drainage is a tributary. There are also short impaired segments up-gradient of the project site, on Cooke Creek. These are located cross-gradient or up-gradient on a different local drainage system not connected to the project site.

Well registry data (Ecology 2017a) identified no wells on the Penstemon Solar Project site. Two wells were mapped approximately 700 feet east and north of the project site. The wells had depths of 125 to 150 feet bgs, but no depth to water or pump capacity was listed in the data files. Other wells within 1 mile of the project site had depths of 12 to 335 feet bgs.

Below about 10 feet, fine sand seams with minor amounts of perched groundwater were observed on the Penstemon Solar Project site. It is possible, though not likely, that groundwater seepage might be encountered elsewhere on the site.

Typha Solar Project Site

Regarding existing water quality issues, there are no impaired reaches in, adjacent to, or up-gradient of the Typha Solar Project site (EPA 2017b).

Well registry data (Ecology 2017a) identified one well on the Typha Solar Project site (Well Log ID 339775), which had a recorded depth of 120 feet bgs. No depth to water or pump capacity data were available. Other wells within 1 mile of the project site had recorded water depths of 80 to 170 feet bgs.

At 4.5 to 5 feet below grade, there was a 6-inch silty sand seam with perched groundwater seepage on the Typha Solar Project site. The seepage was not continuous. Additional groundwater flow may be observed during the wetter winter months.

Urtica Solar Project Site

Regarding existing water quality issues, there are no impaired reaches in, adjacent to, or up-gradient of the Urtica Solar Project site (EPA 2017b).

Well registry data (Ecology 2017a) identified one well on the Urtica Solar Project site (Well Log ID 339775), which had a recorded depth of 172 feet below bgs. No depth to water or pump capacity data were available. Other wells within 1 mile of the project site had depths of 15 to 290 feet bgs.

No seepage was observed in either boring at the Urtica Solar Project site.

3.3.12 Impacts to Groundwater

No points of groundwater withdrawal, associated with water supplies to the Columbia Solar Projects, are planned. No impacts to groundwater movement, quantity, quality, or supply uses would result from project construction or operation of the solar projects. If grading and/or construction is carried out during the winter or spring months, groundwater seepage might be present. Appreciable amounts of seepage are not anticipated during excavation. However, during the rainy winter months, seepage in excavations at any of the Columbia Solar Project sites could occur and groundwater control measures would be on-site or readily available, including trash pumps, sumps, and discharge ditches.

3.3.13 Mitigation for Groundwater

Groundwater control measures for the Columbia Solar Projects would be on-site or readily available, including trash pumps, sumps, and discharge ditches.

(6) Public water supplies. The application shall provide a detailed description of any public water supplies which may be used or affected by the project during construction or operation of the facility.

3.3.14 Public Water Supply

The Columbia Solar Projects will utilize either municipal water sources (such as from the city of Ellensburg) or on-site existing water allocations to provide the water for construction and ongoing operational needs.

For each of the Columbia Solar Project sites, TUUSSO has conservatively estimated that approximately 10 acre-feet of water would be needed for construction, and 20,000 acre-feet of water would be needed per site per year during the first 3 years of operation for irrigation. Irrigation water for all but the Fumaria Solar Project will very likely be supplied by on-site existing water allocations. After the initial 3 years of operation, TUUSSO would require less than 1 acre-foot of water per site per year for panel washing and dust suppression. The construction needs are likely to be supplied by municipal water sources, as are the panel washing and dust suppression needs. However, the irrigation needs are very likely to be supplied by the on-site existing water allocations.

None of the five Columbia Solar Projects would require or use water intake or conveyance structures. If the solar projects use existing on-site water resources, they would be conveyed using existing piping systems or would be trucked from such systems. TUUSSO has incorporated water conservation methods into its operational water plan as well. Where feasible, TUUSSO would work with the current landowners to incorporate more efficient irrigation systems to water the trees and shrubs forming the visual buffers.

In summary, the Columbia Solar Projects would likely use up to 10 acre-feet of water per site from municipal water sources during construction, and then less than 1 acre-foot of water per site per year from municipal water sources. Further details of the proposed construction and operational water uses are described in Sections 2.6.1 and 2.6.2 of this application.

3.4 Habitat, Vegetation, Fish, and Wildlife 463-60-332

The application shall describe all existing habitat types, vegetation, wetlands, fish, wildlife, and in-stream flows on and near the project site which might reasonably be affected by construction, operation, decommissioning, or abandonment of the energy facility and any associated facilities. For purposes of this section, the term "project site" refers to the site for which site certification is being requested, and the location of any associated facilities or their right of way corridors, if applicable. The application shall contain the following information:

(1) Assessment of existing habitats and their use. The application shall include a habitat assessment report prepared by a qualified professional. The report shall contain, but not be limited to, the following information:

(a) A detailed description of habitats and species present on and adjacent to the project site, including identification of habitats and species present, relative cover, density, distribution, and health and vigor;

3.4.1 Affected Environment for Habitat and Species

3.4.1.1 General County

Analysis Areas

The solar project sites are defined as the footprint of each of the five proposed Columbia Solar Project sites, and the generation tie line corridors associated with two of the sites (Figure 3.4-1). To provide a baseline for analysis of potential impacts to biological resources from the proposed solar projects, two analysis areas are evaluated, a project-scale and a landscape-scale analysis area. These areas are further described below.

Project-scale Analysis Area

The project-scale analysis areas include each Columbia Solar Project site and an associated surrounding 500-meter buffer (Figure 3.4-1). These analysis areas include the habitat that would be directly impacted from construction and operation of each project, through ground disturbance, noise, and habitat alteration. A project-scale analysis area is appropriate for evaluating the potential impacts on species with small home ranges or territories, such as small birds, rodents, mammals, and amphibians.

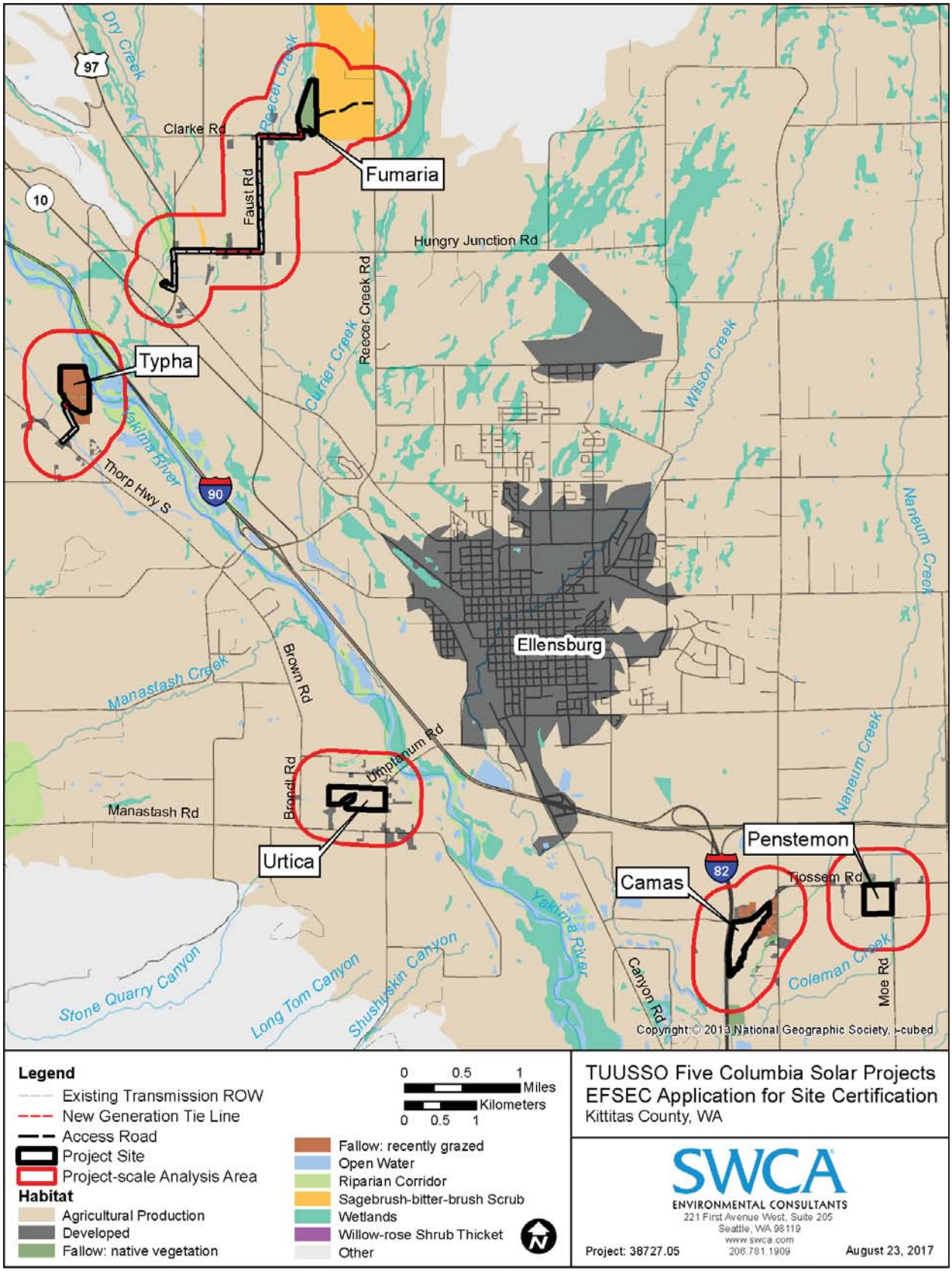


Figure 3.4-1. Columbia Solar Projects project-scale analysis areas.

Landscape-scale Analysis Area

The landscape-scale analysis area includes all five of the project-scale analysis areas, as well as the surrounding sub-watersheds (Figure 3.4-2). This analysis area is intended to evaluate the indirect impacts of Columbia Solar Project construction and operation on habitat in the region, and is appropriate for evaluating the potential impacts on migratory species or those species with larger home ranges such as raptors and large mammals. Although biotic effects could occur outside of the selected sub-watersheds, they become more difficult to accurately predict with increased distance from the source of the impact.

As shown in Figure 3.4-2 and Table 3.4-1, the five Columbia Solar Project sites are all within approximately 2.5 miles of the Yakima River and 3.5 miles of the nearest areas only minimally inhabited by humans (for example foothills, draws, canyons, and mountains). Migratory species are known to occupy and travel through all of these sites.

Habitats and Vegetation

Available habitats within the analysis areas were mapped based on dominant vegetation type as well as past and present land use, and habitat mapping was used to determine the potential impacts from the proposed Columbia Solar Projects' activities. Site-specific descriptions of habitat and vegetation species documented during the April 3 to 12, 2017, field survey are provided to characterize the general habitat, and are considered representative of similar habitats found throughout the landscape-scale analysis area. Areas not surveyed were characterized using vegetation data from the Gap Analysis Project (GAP) (University of Washington, Washington Cooperative Fish and Wildlife Research Unit [WCFWRU] 1997).

The majority of the Columbia Solar Projects project-scale analysis areas are made up of productive agricultural areas, fallow fields, recently grazed areas, and natural vegetation with several riparian, wetland, and open-water areas present. Wetlands and open-water areas are described in detail in Sections 3.3 and 3.5, as well as in the five Critical Areas Reports (Appendices G–K). These aquatic habitats are not anticipated to be affected by the proposed solar projects. Developed areas are mostly located outside or adjacent to the solar project sites, but are common in the landscape-scale analysis area.

Other habitats not observed during the field visits are found in the landscape-scale analysis area, but are not heavily represented in the project-scale analysis areas, and do not provide habitat that is similar to areas potentially impacted by the projects. The habitat types grouped into the "other" category in this report are located within the landscape-scale analysis area, but were not observed during the field surveys. These types include: 1) conifer forest; 2) areas that are non-forested, but are apparently natural, parkland meadows with scattered trees; and 3) areas that are non-forested due to having been logged, and are in various stages of regrowth to herbs or small shrubs. Some of this habitat category is likely sagebrush-bitter-brush, fallow (native vegetation and recently grazed), and willow-rose shrub thicket scrub, but because field surveys were not performed in these areas, their mapping was not altered from the original base mapping (WCFWRU 1997).

The *Habitat, Vegetation, Fish, and Wildlife Assessment Report for Five Proposed TUUSSO Solar Project Sites* provides representative photographs of the vegetation and habitat types found in the Columbia Solar Project project-scale analysis areas (Appendix C). The following sections provide detailed descriptions of the habitat types found in the project-scale analysis areas (Figures 3.4-3 to 3.4-10).

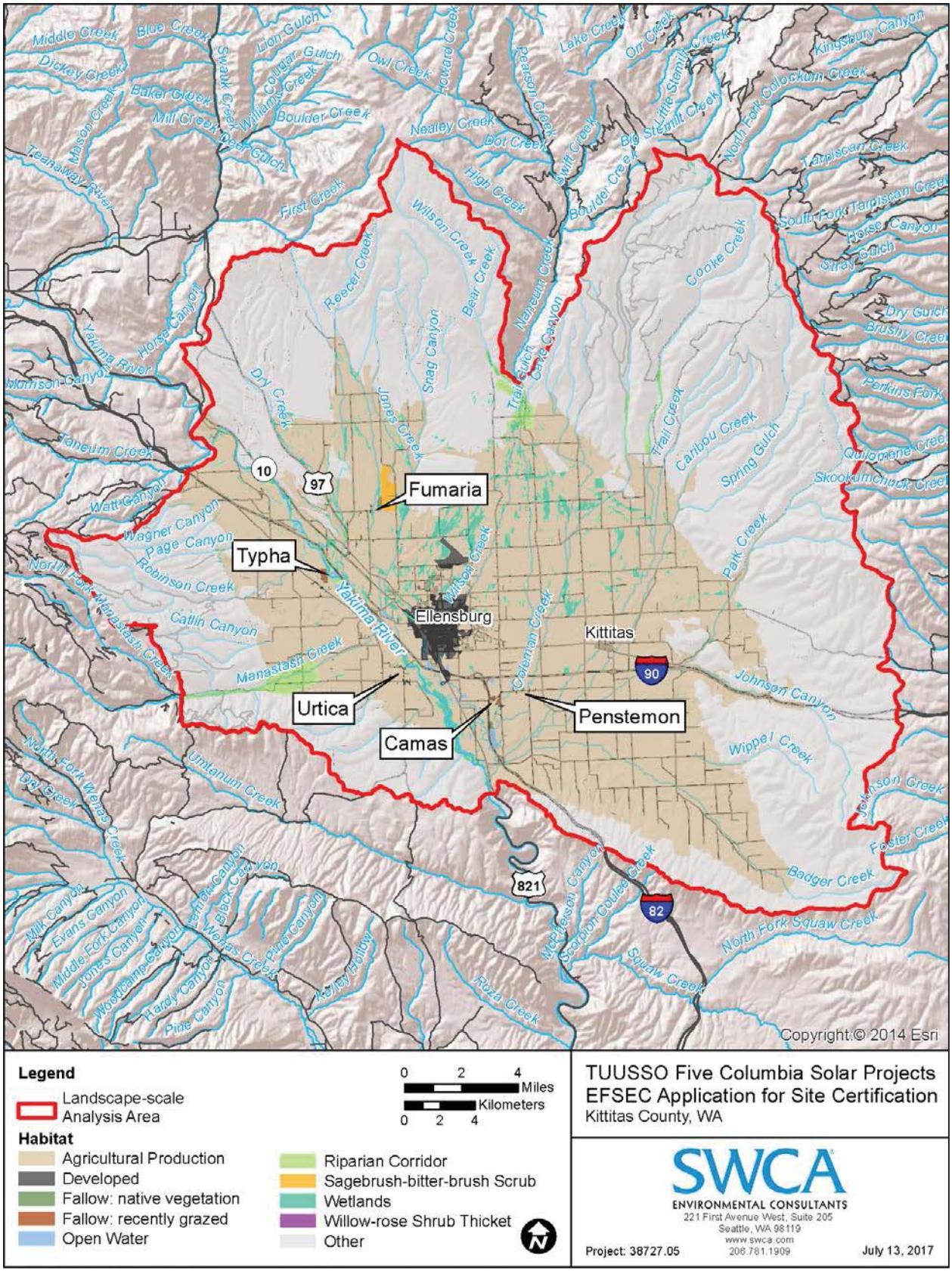


Figure 3.4-2. Columbia Solar Projects landscape-scale analysis area.

Table 3.4-1. Available Habitat Types within the Columbia Solar Project Analysis Areas

Habitat Type	Landscape-scale Analysis Area		Project-scale Analysis Areas (500-meter buffer surrounding each solar project site)									
			Camas		Fumaria (Site with Access Road and Generation Tie Line)		Penstemon		Typha (Site and Generation Tie Line)		Urtica	
	Acres	% of Total	Acres	% of Total	Acres	% of Total	Acres	% of Total	Acres	% of Total	Acres	% of Total
Agricultural Production	115,057	36%	462	82%	1,155 (289 & 1,004)	72% (46% & 65%)	401	93%	352 (249 & 248)	59% (52% & 37%)	433	84%
Developed	4,805	1%	50	9%	58 (14 &55)	4% (2% & 25%)	19	4%	33 (22 & 25)	6% (5% & 39%)	47	9%
Fallow: vegetated	72	<1%	6	1%	41 (41 & 32)	3% (7% & 1%)	5	1%	–	–	–	–
Fallow: recently grazed	94	<1%	29	5%	–	–	–	–	64 (64 & 64)	11% (11% & 4%)	–	–
Open Water	1,247	<1%	4	1%	12 (3 & 12)	1% (<1% & 2%)	2	<1%	70 (69 & 16)	12% (14% & 10%)	13	3%
Riparian Corridor	2,801	1%	13	2%	40 (0 & 41)	2% (0% & 2%)	3	1%	56 (56 & 9)	9% (12% & 6%)	13	3%
Sagebrush-bitter-brush Scrub	442	<1%	–	–	233 (228 & 36)	14% (36% & 1%)	–	–	–	–	–	–
Wetlands	5,315	2%	2	<1%	67 (49 & 27)	4% (5% & 2%)	<1	<1%	19 (19 & 5)	4% (4% & 2%)	9	2%
Willow-rose Shrub Thicket	4	<1%	–	–	3 (2 & 3)	<1% (<1% & 4%)	–	–	<1 (<1 & 0)	<1% (<1% & 2%)	–	–
Other	193,188	60%	–	–	–	–	–	–	–	–	–	–
Total Acres	**323,025**		**566**		**1,609** (626 & 1,210)		**430**		**594** (479 & 366)		**515**	
Distance from project site to: Yakima River			**1.32 miles west**		**Site: 2.12 miles west Generation Tie Line: 0.86 mile west**		**2.54 miles west**		**Site: 0 mile east Generation Tie Line: 0.25 mile east**		**0.19 mile northeast**	
Distance from project site to: nearest area minimally-inhabited by humans			**2.1 miles south**		**Site: 1.07 miles east Generation Tie Line: 1.19 mile east**		**3.31 miles south**		**Site: 2.57 miles southwest Generation Tie Line: 2.35 miles southwest**		**1.02 miles southwest**	

Note: the area calculated for the generation tie line overlaps each of the Fumaria and Typha Solar Project project-scale analysis areas by a 500-meter buffer.

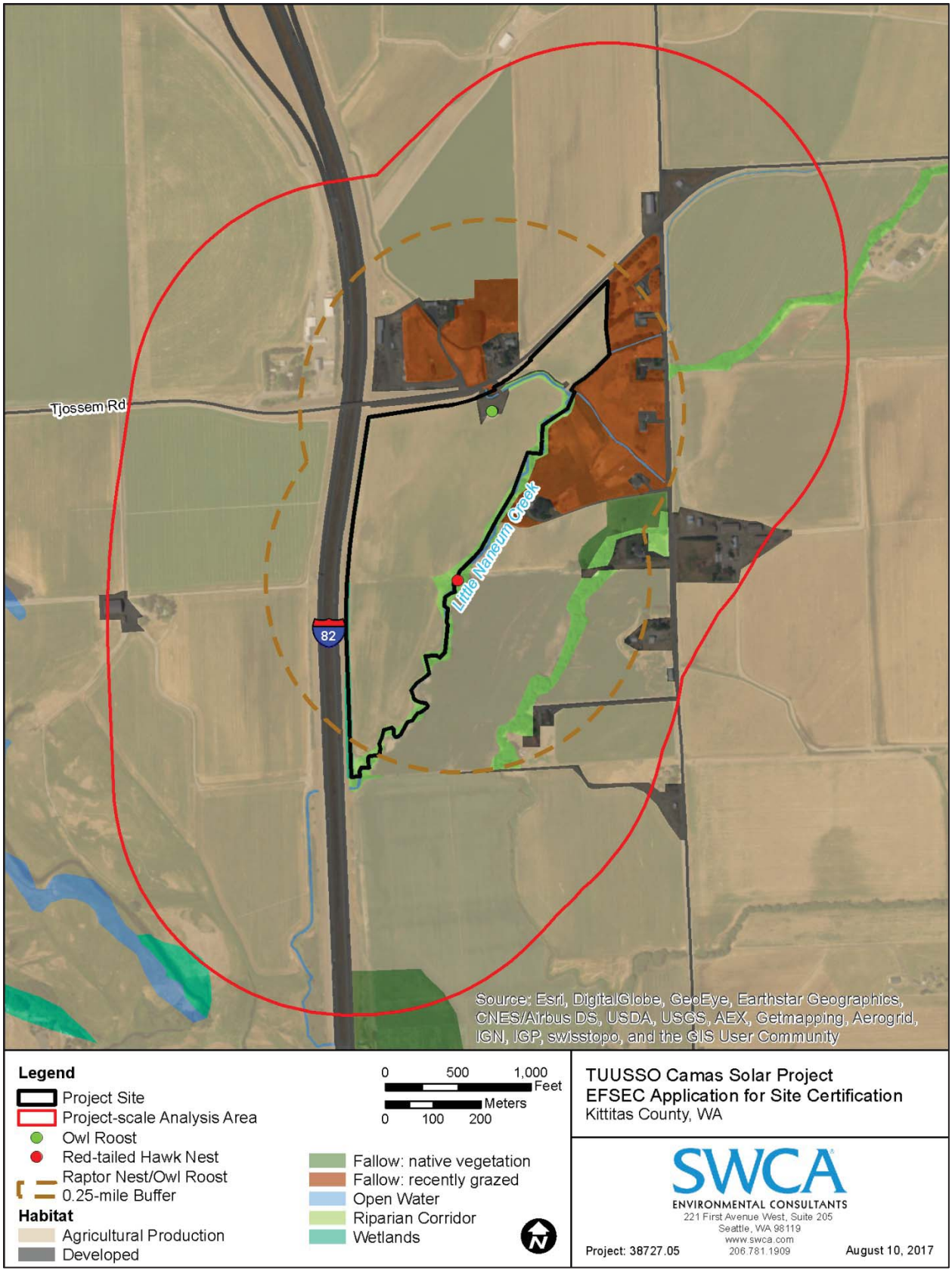


Figure 3.4-3. Habitat types within the project-scale analysis area for the Camas Solar Project site.

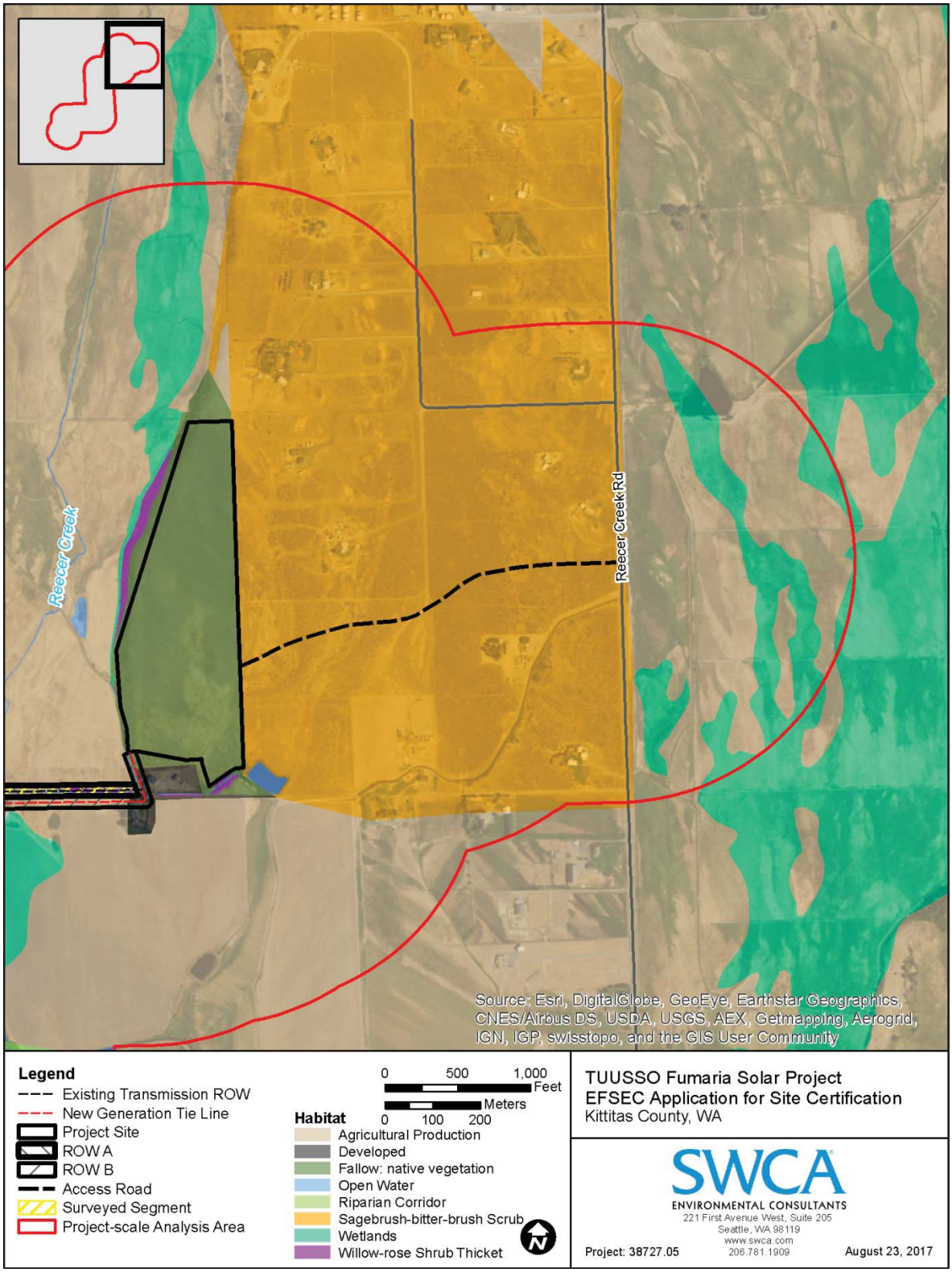


Figure 3.4-4. Habitat types within the project-scale analysis area for the Fumaria Solar Project, Map 1 of 4.

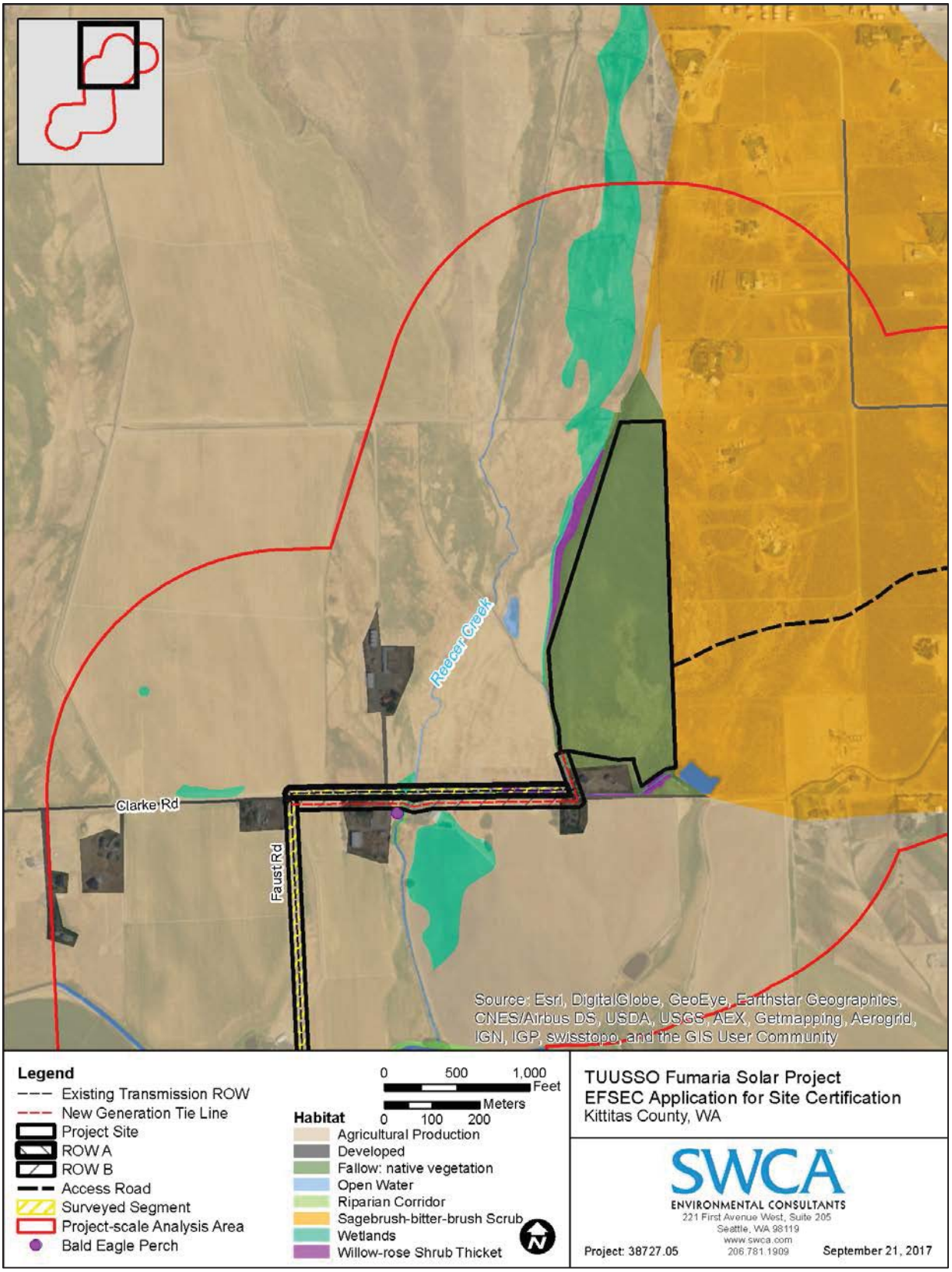


Figure 3.4-5. Habitat types within the project-scale analysis area for the Fumaria Solar Project, Map 2 of 4.

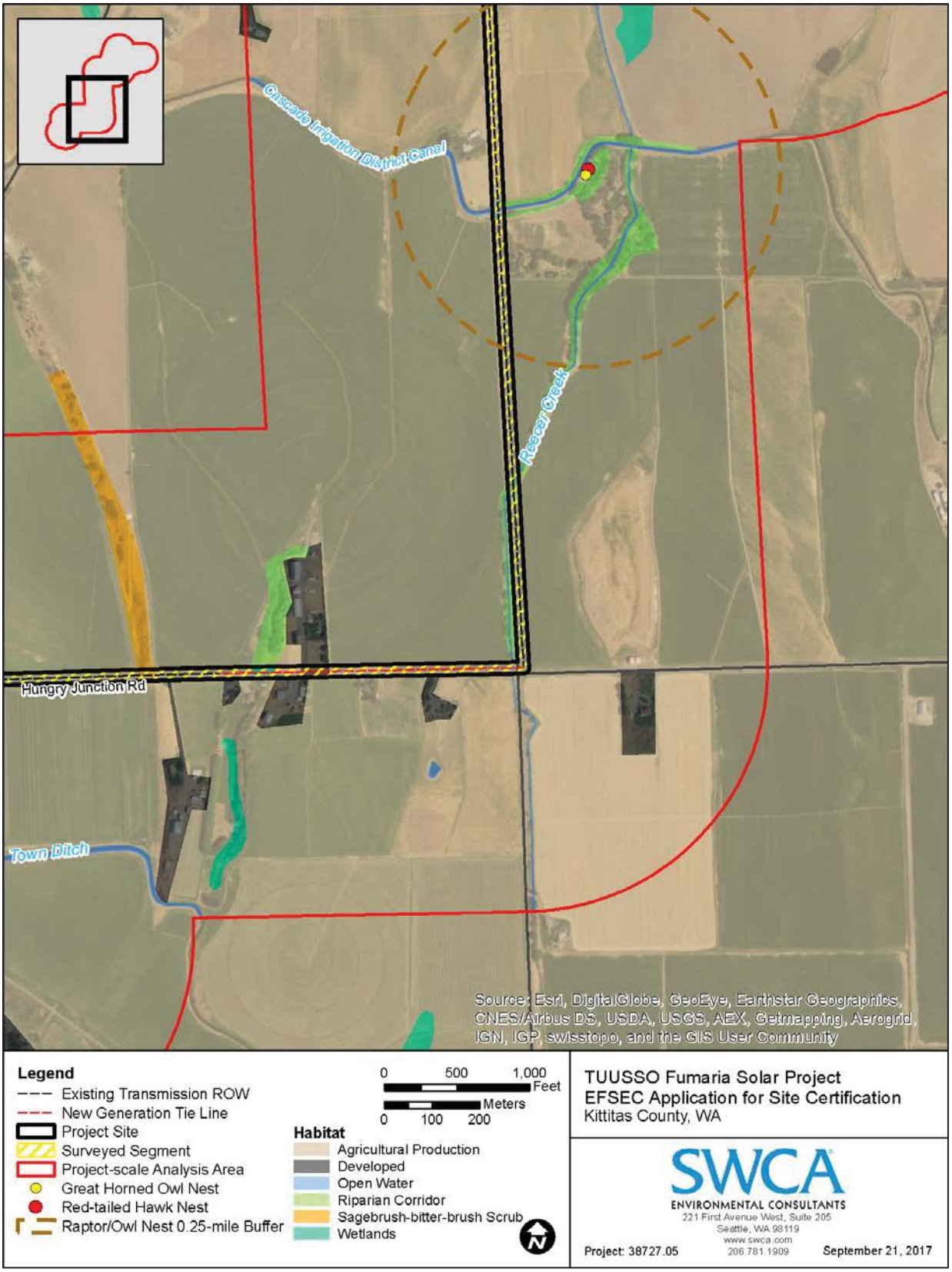


Figure 3.4-6. Habitat types within the project-scale analysis area for the Fumaria Solar Project, Map 3 of 4.

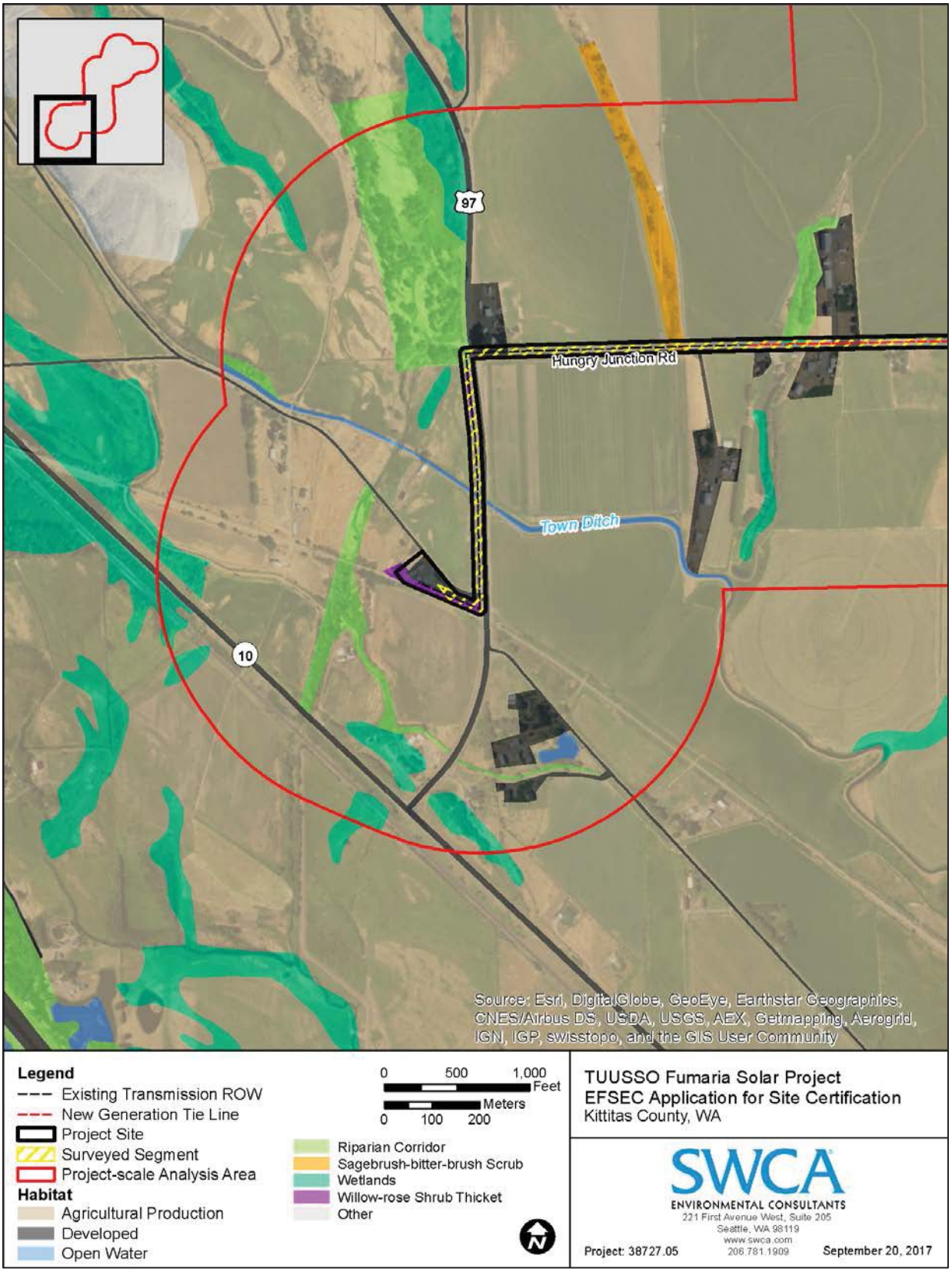


Figure 3.4-7. Habitat types within the project-scale analysis area for the Fumaria Solar Project, Map 4 of 4.

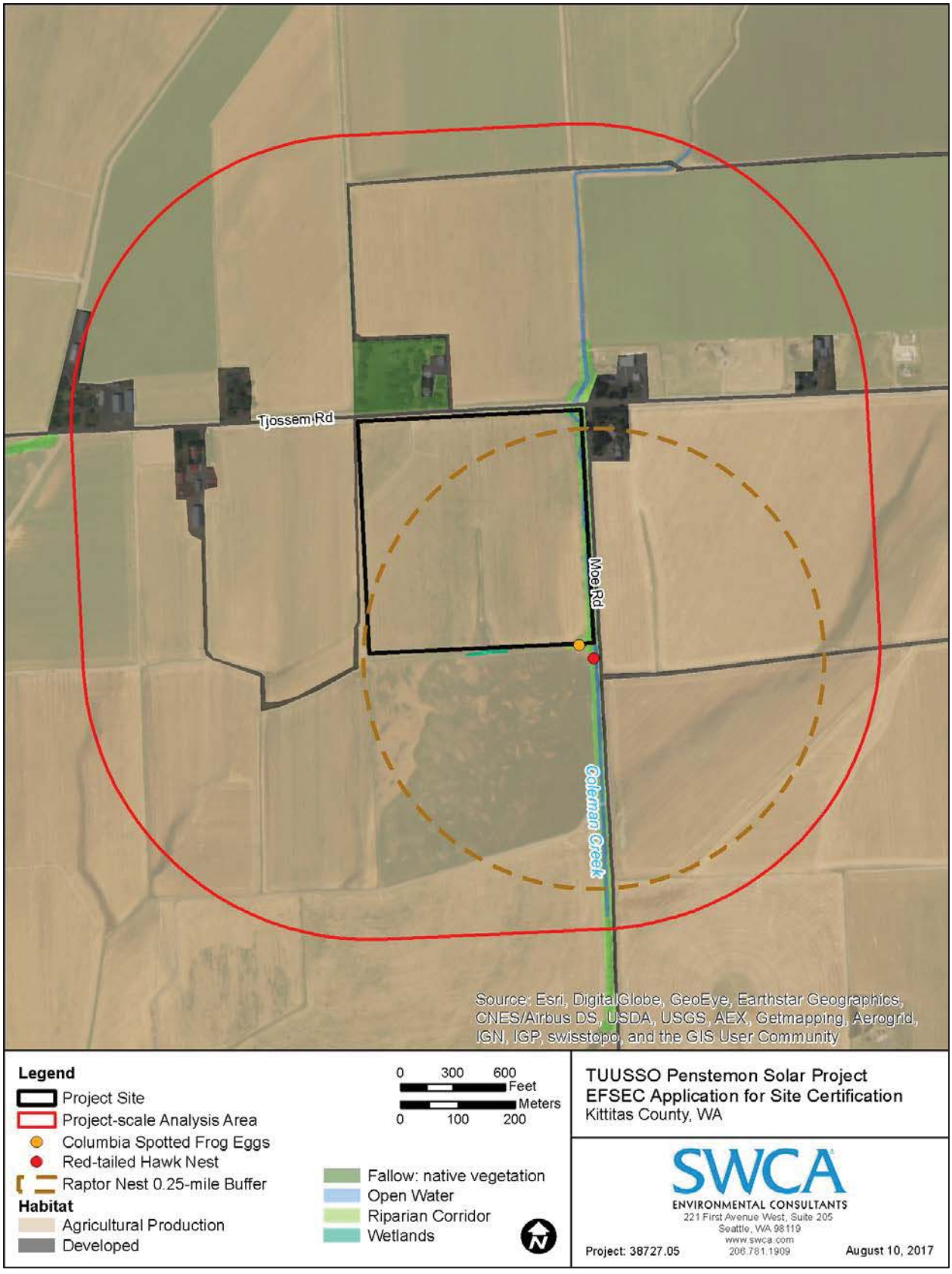


Figure 3.4-8. Habitat types within the project-scale analysis area for the Penstemon Solar Project.

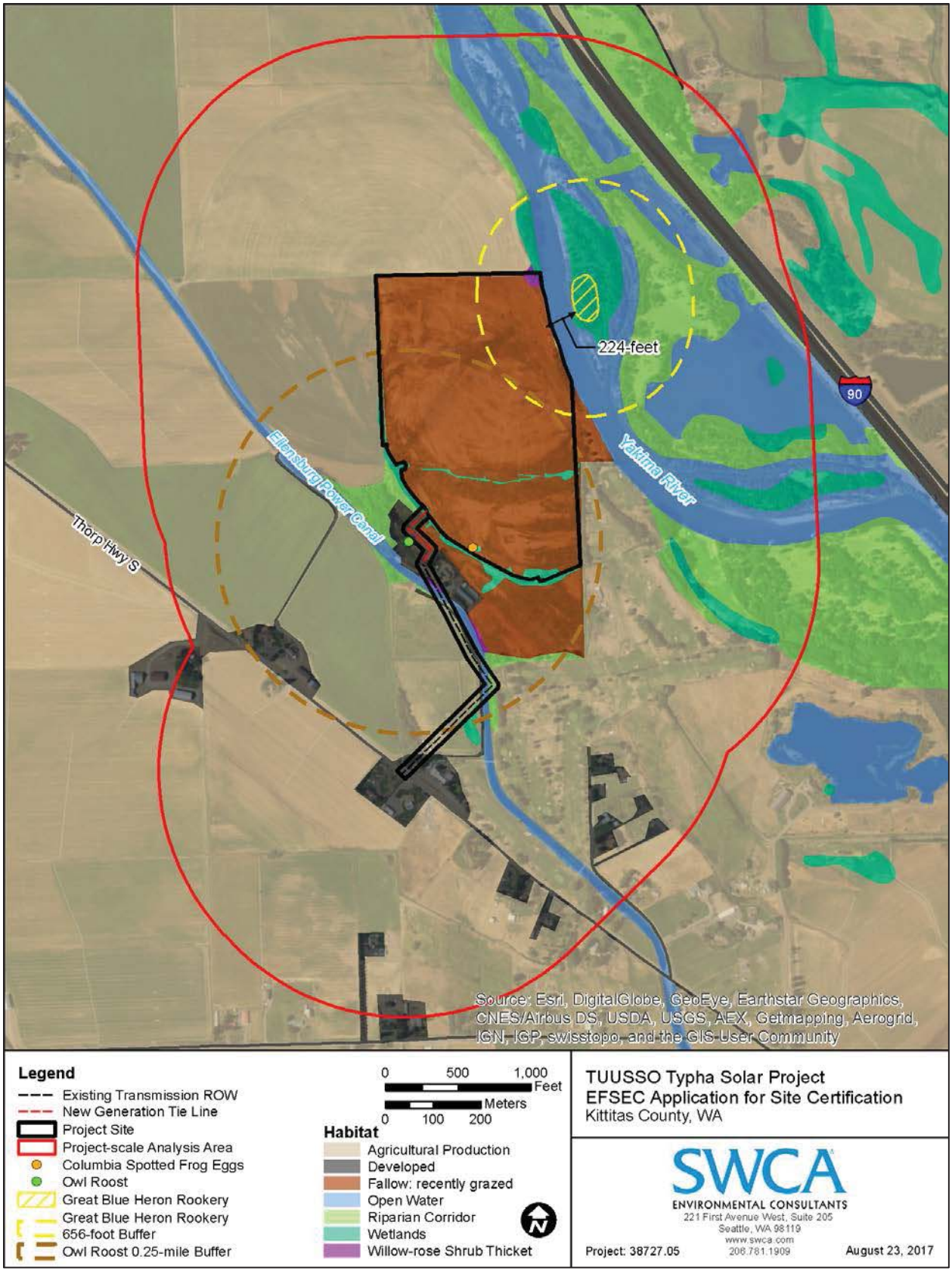


Figure 3.4-9. Habitat types within the project-scale analysis area for the Typha Solar Project.

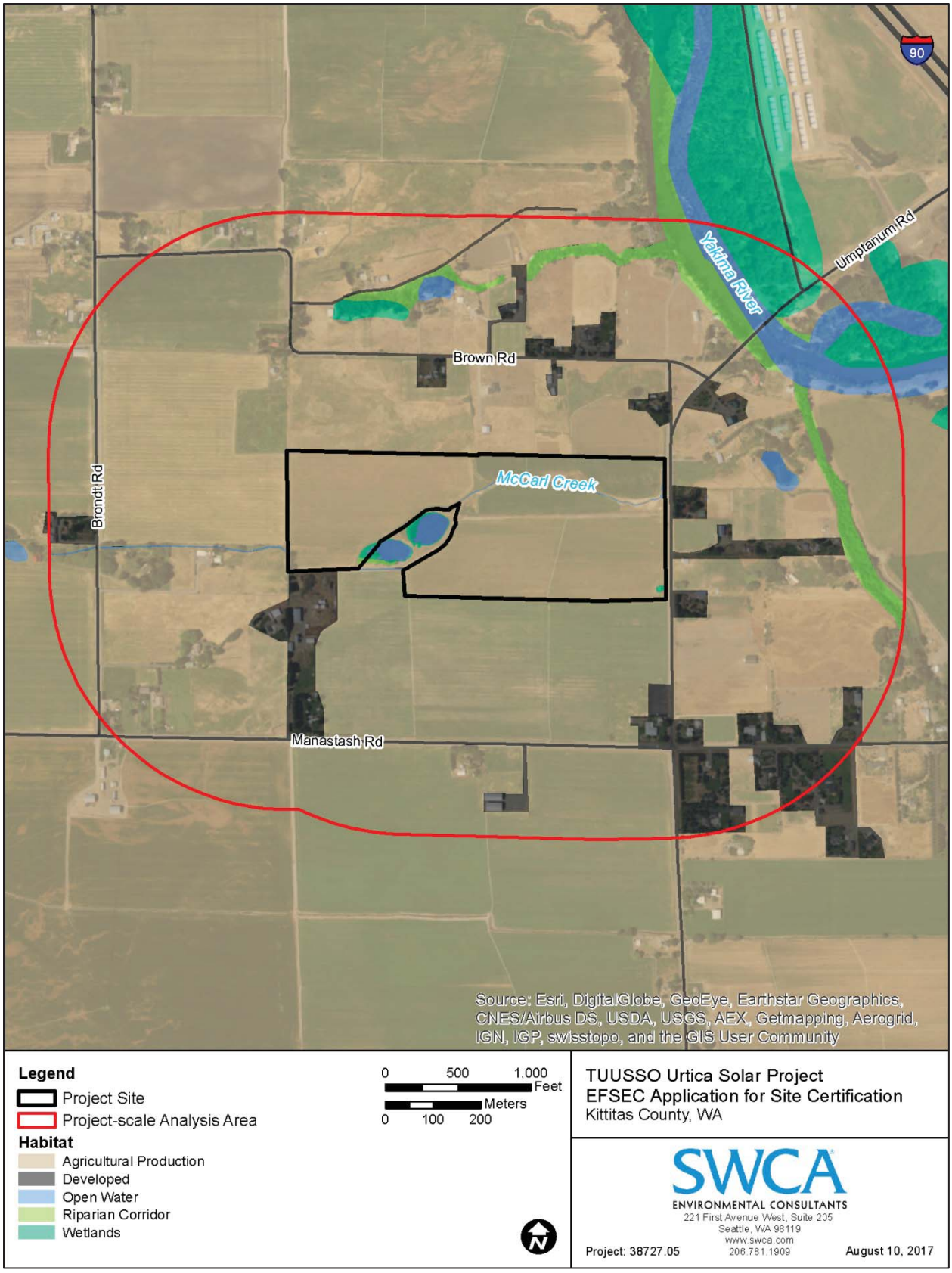


Figure 3.4-10. Habitat types within the project-scale analysis area for the Urtica Solar Project.

Agricultural Production

Three of five of the proposed Columbia Solar Project sites are primarily used for agricultural production (see Figure 3.4-1), including the production of alfalfa (*Medicago sativa*) on the Camas Solar Project site, Sudangrass (*Sorghum bicolor* ssp. *drummondii*) on the Penstemon Solar Project site, and the production of common timothy (*Phleum pratense*) for hay on the Urtica Solar Project site. These sites are dominated by the crops being produced, but often have other species encroaching into the crops in the space between plantings, which usually include bluegrass (*Poa* spp.), tall fescue (*Schedonorus arundinaceus*), hairy cat's-ear (*Hypochaeris radicata*), and common dandelion (*Taraxacum officinale*). In addition, these areas may go through periods during the production lifecycle in which they are unvegetated with exposed soil. Along the edges of these areas, more weedy species usually dominate, including garden yellow-rocket (*Barbarea vulgaris*), downy cheat grass (*Bromus tectorum*), sticky-willy (*Galium aparine*), prickly lettuce (*Lactuca serriola*), great mullein (*Verbascum thapsus*), and Canadian thistle (*Cirsium arvense*).

Developed

This habitat type occurs throughout the Columbia Solar Projects project-scale analysis areas, borders most of the solar project sites, and consists of buildings, roads, and driveways (see Figure 3.4-1). Vegetation in this habitat consists mostly of ruderal species (species that colonize and thrive in disturbed areas), such as the noxious weeds documented below.

Many areas near the proposed Columbia Solar Project sites are partially developed or heavily manicured. The vegetation communities in these areas are either planted ornamental trees and shrubs or routinely mowed grass, and include rural residential landscaping, road ROWs, and manicured golf course areas. Planted trees observed near the proposed sites include quaking aspen (*Populus tremuloides*), ponderosa pine (*Pinus ponderosa*), and grand fir (*Abies grandis*). The maintained lawns and golf course areas are dominated by a mix of grass species likely to include tall fescue, bluegrass, and creeping wild rye (*Elymus repens*). In addition, various weeds and non-native species can dominate roadside areas.

Fallow

Fallow fields are areas that were previously under agricultural production that have been left unsown for a period of time, long enough to allow other non-native, invasive, and native species to become dominant. Areas that are irrigated and used as pasture were included as fallow habitats in this assessment. This habitat type is dominant at the Fumaria and Typha Solar Project sites.

Fallow – Vegetated

At the Fumaria Solar Project site (see Figure 3.4-5), the vegetation community has returning some native species, including common spring-gold (*Crocidium multicaule*), spring draba (*Draba verna*), Gorman's desert-parsley (*Lomatium gormanii*), and bitter-brush (*Purshia tridentata*). It is principally dominated by weedy and non-native plant species, including downy cheat grass, garden yellow-rocket, shepherd's-purse (*Capsella bursa-pastoris*), chicory (*Cichorium intybus*), common dandelion, prickly lettuce, and yellow salsify (*Tragopogon dubius*).

Fallow – Recently Grazed

At the Typha Solar Project site (see Figure 3.4-9), the vegetation community is dominated by mostly low-growing weedy species, including tall fescue, remnant common timothy, hairy cat's-ear, common dandelion, and bluegrass, with patches of Canadian thistle and scotch thistle (*Onopordum acanthium*) scattered throughout the site, as well as Baltic rush (*Juncus balticus*), curly dock (*Rumex crispus*), and Rocky Mountain iris (*Iris missouriensis*) in the lower elevation areas.

Open Water

The open water habitats found in the Columbia Solar Projects project-scale analysis areas are the Yakima River, streams, canals or ditches, and ponds. For more information about the open-water areas documented during the April 3 to 12, 2017, field surveys, refer to each project site's Critical Areas Report (Appendices G–K).

Riparian Corridor

Riparian corridors generally occur along every river, stream, and some ditches and canals, in and adjacent to the proposed Columbia Solar Project sites. Some of these areas are lacking mature trees, but where present the dominant trees typically include crack willow (*Salix* X *fragilis*), quaking aspen, balsam poplar (*Populus balsamifera*), and occasionally ponderosa pine. The herbaceous species that often accompany these riparian corridors include reed canary grass (*Phalaris arundinacea*), Fuller's teasel (*Dipsacus fullonum*), Canadian thistle, stinging nettle (*Urtica dioica*), tall scouring-rush (*Equisetum hyemale*), true forget-me-not (*Myosotis scorpioides*), curly dock, and great mullein.

Sagebrush-bitter-brush Scrub

The upland sagebrush-bitter-brush scrub community is dominant to the east of the Fumaria Solar Project site and is beginning to return to that area (see Figure 3.4-4). This community is characterized by the dominance of native shrubs, including bitter-brush and big sagebrush (*Artemisia tridentata*), and a low-growing herbaceous community, including common spring-gold, spring draba, yellow bell (*Fritillaria pudica*), and various small bunchgrasses.

Wetlands

Wetlands surveyed within the Columbia Solar Projects project-scale analysis areas ranged from <0.01 to 8.45 acres. The wetlands inventoried were depressional, riverine, and slope. Wetland ratings, based on the *Washington State Wetland Rating System for Eastern Washington – Revised*, were typically II, III, or IV (Hruby 2014). For more information about the wetlands documented during the April 3 to 12, 2017, field surveys, refer to the each project site's Critical Areas Report (Appendices G–K).

Willow-rose Shrub Thicket

Shrub thickets are often found along smaller drainages (i.e., small streams and ditches) and are dominated by narrow-leaf willow (*Salix exigua*) and rose (*Rosa* spp.), with occasional inclusions of red osier dogwood (*Cornus alba*) and black hawthorn (*Crataegus douglasii*). This vegetation community often lacks an herbaceous layer because the shrubs are too thick to allow adequate light penetration to the understory. Willow-rose shrub thickets occur in the southeast corner of the Fumaria Solar Project site, as well as along this site's northwest boundary (see Figures 3.4-4 to 3.4-7), and just outside of the northeast corner of the Typha Solar Project site and along the EP Canal.

Available Habitat within the Analysis Areas

The acreage for each habitat type and the percent of the total available habitat has been calculated for both the Columbia Solar Project landscape-scale and project-scale analysis areas (see Table 3.4-1). The majority of the landscape-scale analysis area contains the "other" habitat category (60%) and agricultural production (36%). The majority of the project-scale analysis areas are a mix of agricultural production and developed areas, interspersed with a variety of the remaining habitat types. Available habitat types in the project-scale analysis areas are shown in Figures 3.4-3 through 3.4-10.

Special-status Plants

No sensitive or special-status plant species occur on any of the Columbia Solar Project sites. TUUSSO prepared a Vegetation Management Plan (Appendix B) through coordination with the landowners, the Washington Department of Fish and Wildlife (WDFW), and Kittitas County.

The Washington State Noxious Weed Control Board has produced a noxious weed list for the state that categorizes weeds into three classes: A, B, and C (Washington State Noxious Weed Control Board 2017). A-Listed species are non-native species whose distribution in Washington State is still limited. B-Listed species are non-native species whose distribution is limited to portions of Washington State. C-Listed noxious weeds are widespread in Washington or are of special interest to the agricultural industry. Eleven noxious weeds have been identified in the Columbia Solar Projects project-scale analysis areas, all B- or C-Listed species. A list of noxious weeds identified in the project-scale analysis areas, and a ranking of their relative prevalence at each site, is provided in Table 3.4-2.

Table 3.4-2. Noxious Weeds Documented in the Columbia Solar Projects Project-scale Analysis Areas

Common Name	Scientific Name	Status[1]	Weed Class[2]	Habitat Type Where Observed[3]	Weed Relative Prevalence at Each Solar Project Site (1 = low, 5 = high)				
					Camas	Fumaria	Penstemon	Typha	Urtica
Canadian thistle	*Cirsium arvense*	Invasive, noxious	C	AP, FG, FV, RIP	2	1	2	3	1
Chufa (yellow nutsedge)	*Cyperus esculentus*	Native, noxious	B	WET		1		1	
False mayweed	*Tripleurospermum maritimum*	Non-native, noxious	C	AP, FG	1			1	
Field sow-thistle	*Sonchus arvensis*	Non-native, noxious	C	FV, RIP		1			
Fuller's teasel	*Dipsacus fullonum*	Invasive, noxious	C	RIP, WET	1	1	1	1	2
Hairy cat's-ear	*Hypochaeris radicata*	Non-native, noxious	C	AP, FG, FV	3	3	1	3	3
Pale-yellow iris	*Iris pseudacorus*	Noxious	C	WET	2				
Queen Anne's lace	*Daucus carota*	Non-native	C	AP					1
Reed canary grass	*Phalaris arundinacea*	Invasive, noxious	C	RIP, WET	3	1	2	2	3
Scotch thistle	*Onopordum acanthium*	Noxious	B	FG, RIP	1			3	1
Spotted knapweed	*Centaurea stoebe*	Noxious	B	AP, FV		1			1

1. Native per Hitchcock and Cronquist (1973) and NRCS (2017b); Noxious per Washington State Noxious Weed Control Board (2017).
2. Washington State Noxious Weed Control Board (2017).
3. AP = Agricultural production; DEV = Developed; FG = Fallow, recently grazed; FV = Fallow, vegetated; RIP = Riparian corridor; SBB = Sagebrush-bitter-brush shrub; WRS = Willow–rose shrub thicket; OW = Open water; WET = Wetlands; OTH = Other.

Fish and Wildlife

In all, 39 bird species were documented in the Columbia Solar Project project-scale analysis areas during field surveys conducted from April 3 to 12, 2017, including raptors, passerines, near-passerines, and water birds (Appendix C). The list of documented bird species is not comprehensive and only includes those that were readily identifiable. Of the 39 bird species documented in the project-scale analysis areas, 35 are protected under the Migratory Bird Treaty Act (MBTA) (16 United States Code [USC] 703-711). Habitats within the analysis areas provide nesting and foraging habitat for these MBTA-protected species. These species include ground-nesters, birds that nest in tall grass or shrubs, cavity nesters, and birds that build nests in trees.

Non-listed fish species were observed in some irrigation ditches and wetlands during the April 2017 field surveys. Fish species listed under the federal Endangered Species Act (ESA) of 1973 (as amended) also occur in streams and the Yakima River adjacent to the Columbia Solar Project sites and are briefly listed in Table 3.4-3. The ESA-listed species are further discussed in Section 3.4.2, below.

Columbia spotted frog (*Rana lutreveinus*) egg masses and Pacific tree frogs (*Pseudacris regilla*) were documented in the Columbia Solar Projects project-scale analysis areas.

Signs of several mammals, including of mule deer (*Odocoileus hemionus*), raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), and Virginia opossum (*Didelphis virginiana*), were observed throughout the Columbia Solar Projects project-scale analysis areas. Several burrows likely associated with American badger (*Taxidea taxus*) were observed at the Camas and Fumaria Solar Project sites, but the exact source of the burrows could not be identified. When vegetated, the habitats at all of the solar project sites and generation tie line corridors support small rodents (e.g., mice and voles) that are a prey source for raptors, great blue herons (*Ardea herodias*), and coyotes (*Canis latrans*). As shown in Figure 3.4-1 and Table 3.4-1, the sites are all within approximately 2.5 miles of the Yakima River and 3.5 miles of the nearest areas only minimally inhabited by humans (for example foothills, draws, canyons, and mountains). Migratory species, such as mule deer and coyote, are known to occupy and travel through all of these sites. Some were directly observed during the April 2017 field surveys, sign (i.e., tracks and scat) was observed, and landowners confirmed that these species occur at the solar project sites.

To evaluate the potential Columbia Solar Projects impacts on fish and wildlife habitat, a list of representative species known or suspected to occur in the analysis areas was compiled and their preferred habitat was compared to the habitat types available in the analysis areas. The results of this evaluation are shown in Table 3.4-3. Of the bird species documented in the project-scale analysis areas, four are currently being monitored by the State of Washington: great blue heron, prairie falcon (*Falco mexicanus*), osprey (*Pandion haliaetus*), and turkey vulture (*Cathartes aura*). The Columbia spotted frog is a state candidate for listing, and the American badger is also being monitored by the State of Washington.

Table 3.4-3. Representative Species Observed or Likely to Occur in the Columbia Solar Project Analysis Areas

Common Name	Scientific Name	Management Category	Habitat Description	Habitat Types Used[1]										Acres Available in LSAA[2]
				AP	DEV	FG	FV	RIP	SBB	WRS	OW	WET	OTH	
Birds														
Bald eagle	*Haliaeetus leucocephalus*	MBTA, BGEPA, and Federal Species of Concern	Habitat generalist, associated with most aquatic habitats. Prefer rivers, lakes, and reservoirs with lots of fish and surrounding forests.					X				X	X	8,116
Canada goose	*Branta canadensis*	MBTA	Habitat generalist that occurs near water, grassy fields, and grain fields. Always nests near water and winters where feeding areas are within short distances of water.	X	X	X	X	X		X	X	X	X	129,395
Great blue heron	*Ardea herodias*	MBTA, State Monitored	Found in a wide variety of habitats, including sheltered, shallow bays and inlets, sloughs, marshes, wet meadows, shores of lakes, and rivers. Nesting colonies are typically found in mature forests, on islands, or near mudflats, and do best when they are free of human disturbance and have foraging areas close by.	X		X	X	X			X	X	X	124,586
Great horned owl	*Bubo virginianus*	MBTA	Prefers secondary-growth woodlands, swamps, orchards, and agricultural areas, but are found in a wide variety of deciduous, coniferous, or mixed forests. Home range usually includes some open habitats, such as fields, wetlands, pastures, or croplands, in addition to forested areas.	X		X	X	X				X	X	123,339
Killdeer	*Charadrius vociferus*	MBTA	Inhabits open areas such as sandbars, mudflats, and grazed fields with vegetation generally no taller than 1 inch. Often found near water, but also common in dry areas.	X	X	X	X	X	X		X	X	X	129,833
Northern Harrier	*Circus cyaneus*	MBTA	Breeds in freshwater and brackish marshes, lightly grazed meadows, old fields, tundra, dry upland prairies, drained marshlands, high-desert shrub-steppe, and riverside woodlands. Winter habitat includes areas with low vegetation, including deserts, coastal sand dunes, pasturelands, croplands, dry plains, grasslands, old fields, estuaries, open floodplains, and marshes.	X		X	X	X	X			X	X	123,781

Common Name	Scientific Name	Management Category	Habitat Description	Habitat Types Used[1]										Acres Available in LSAA[2]
				AP	DEV	FG	FV	RIP	SBB	WRS	OW	WET	OTH	
Red-tailed hawk	*Buteo jamaicensis*	MBTA	Occupies most open habitat, including desert, scrublands, grasslands, roadsides, fields and pastures, parks, broken woodland, and (in Mexico) tropical rainforest.	X	X	X	X		X				X	120,470
Sandhill Crane	*Grus canadensis*	MBTA, State Endangered	Prefers open shallow waters along river channels, on alluvial islands of braided rivers, or in natural basin wetlands, but can sometimes occur in fields and agricultural lands during feeding and resting. They typically avoid visual obstructions, such as houses and bridges, and paved or gravel roads.	X		X	X	X			X	X		124,586
Fish														
Bull trout	*Salvelinus confluentus*	Federal Threatened; State Candidate	Both resident or migratory varieties, with migratory bull trout spawning in tributary streams where juvenile fish rear for 1 to 4 years before migrating to either a larger river (fluvial) or lake (adfluvial) as adults. Successful egg incubation and survival requires very cold, clear, well-oxygenated waters, as found in pristine headwater stream habitats.								X			1,247
Dace species	*Rhinichthys* spp.	None	Occurs in many types of aquatic habitats, ranging from cool to warm waters. Typically young are observed in shallow edges.								X	X		6,562
Spring chinook (Upper Columbia River)	*Oncorhynchus tshawytscha*	Federal Endangered; State Candidate	Requires sufficient invertebrate organisms for food; cool, flowing waters free of pollutants; high dissolved oxygen concentrations in rearing and incubation habitats; water of low sediment content during the growing season (for visual feeding); clean gravel substrate for reproduction; and unimpeded migratory access to and from spawning and rearing areas.								X			1,247

Common Name	Scientific Name	Management Category	Habitat Description	Habitat Types Used[1]										Acres Available in LSAA[2]
				AP	DEV	FG	FV	RIP	SBB	WRS	OW	WET	OTH	
Steelhead (Middle Columbia River)	*Oncorhynchus mykiss*	Federal Threatened; State Candidate	Requires sufficient invertebrate organisms for food; cool, flowing waters free of pollutants; high dissolved oxygen concentrations in rearing and incubation habitats; water of low sediment content during the growing season (for visual feeding); clean gravel substrate for reproduction; and unimpeded migratory access to and from spawning and rearing areas.								X			1,247
Summer steelhead (Upper Columbia River)	*Oncorhynchus mykiss*	Federal Threatened; State Candidate	Requires sufficient invertebrate organisms for food; cool, flowing waters free of pollutants; high dissolved oxygen concentrations in rearing and incubation habitats; water of low sediment content during the growing season (for visual feeding); clean gravel substrate for reproduction; and unimpeded migratory access to and from spawning and rearing areas.								X			1,247
Herptiles														
Columbia spotted frog	*Rana luteiventris*	State Candidate	Occurs in a variety of still-water habitats, as well as in some streams and creeks. Breeding habitat includes seasonally flooded margins of wetlands, ponds, and lakes, and even some flooded pools and still-water edges of creeks. Most often found in association with wetland plant communities consisting primarily of non-woody plants, such as sedges, rushes, and grasses.					X			X	X		9,363
Pacific treefrog	*Pseudacris regilla*	None	Found in wetlands, meadows, woodlands, and brushy areas. Breeds in shallow ponds, slow moving streams, seasonal pools, watering tanks, and roadside ditches, and spends the rest of the year in surrounding upland areas.	X			X	X		X	X	X		124,496
Sharp-tailed snake	*Contia tenuis*	State Candidate	Prefers forest openings dominated by Garry oak, particularly with rock accumulations, and riparian deciduous woodlands with accumulations of decaying down woody logs within ponderosa pine, oak, or shrub-steppe.					X				X	X	8,116

Common Name	Scientific Name	Management Category	Habitat Description	Habitat Types Used[1]										Acres Available in LSAA[2]
				AP	DEV	FG	FV	RIP	SBB	WRS	OW	WET	OTH	
Mammals														
American badger	*Taxidea taxus*	State Monitored	Found in open habitats including semi-desert, sagebrush, grasslands, and meadows. Also found in forested areas with grassy cover.	X		X	X		X				X	115,665
Coyote	*Canis latrans*	None	Habitat generalists found in desert, scrub, grassland, foothills, populated neighborhoods, and urban environments.	X	X	X	X	X	X				X	123,271
Mule deer	*Odocoileus hemionus*	Big game	Uses dense conifer forests with sufficient cover for thermal regulation and resting. Also may be found in pockets of dense brush or trees and rugged, broken terrain. Seasonal migration occurs.	X		X	X	X		X			X	118,028
Raccoon	*Procyon lotor*	None	Habitat generalist that traditionally prefers heavily wooded areas with access to trees, water, and vegetation. Often found in urban and suburban environments.		X			X		X		X	X	129,925
Small rodents (mice, voles, etc.)	Various	None	Large group of small mammals that are habitat generalists and provide prey for other species such as raptors, great blue heron, and badger.	X	X	X	X	X	X	X		X	X	128,590
Striped skunk	*Mephitis mephitis*	None	Habitat generalists, particularly associated with open areas with a mix of habitats such as wooded areas, grasslands, or meadows. Usually in close proximity to a source of water.		X		X	X		X			X	7,682
Virginia opossum	*Didelphis virginiana*	None	Habitat generalist, ranging from wooded areas to open fields. Prefers environments near streams or wetlands. Shelters in burrows of other animals, tree cavities, brush piles, or other cover.		X			X		X		X	X	12,925

1. AP = Agricultural production; DEV = Developed; FG = Fallow, recently grazed; FV = Fallow, vegetated; RIP = Riparian corridor; SBB = Sagebrush-bitter-brush shrub; WRS = Willow–rose shrub thicket; OW = Open water; WET = Wetlands; OTH = Other
2. LSAA = Landscape-scale analysis area. Not including “Other.” The Other habitat category was removed from the species habitats because it includes such a wide range of habitats that it is not valuable for the analysis.

3.4.1.2 Solar Project Sites

Camas Solar Project Site

Habitats and Vegetation

The Camas Solar Project project-scale analysis area is 82% (462 acres) alfalfa agriculture, but has other species encroaching into the crops in the space between plantings. In addition, the analysis area may go through periods during the production lifecycle in which it is unvegetated, with exposed soil. Along the edges of the area being farmed, more weedy species dominate. The other major habitats are developed and fallow – recently grazed, representing 9% and 5%, respectively, of the analysis area. There are 6 acres of fallow – vegetated in the analysis area. The southeastern border of the project site is Little Naneum Creek, providing 4 acres of open water and 13 acres of riparian corridor within the analysis area. Two acres of wetlands habitat are available along the western border of the project site. Despite their smaller acreages, these are important fish and wildlife habitats in the analysis area, as demonstrated below by the species occupying these habitats.

Special-status Plants

As indicated in Table 3.4-2, the most prevalent noxious weed species and their associated habitats at the Camas Solar Project site were:

- Canadian thistle along the edges of the agricultural production, within the fallow areas, and along the riparian corridor
- hairy cat's-ear within the agricultural production and fallow areas
- reed canary grass along the riparian corridor and in the wetland (CW01)
- pale-yellow iris in the wetland (CW01)

Other less prevalent noxious weed species observed included Fuller's teasel, scotch thistle, and false mayweed (*Tripleurospermum maritimum*).

Fish and Wildlife

Evaluation of special-status species with the potential to occur in the Camas Solar Project project-scale analysis area is provided below in Section 3.4.2.

Fourteen bird species were observed at the Camas Solar Project site during the April 2017 field survey. The majority of the species were observed in the open water, riparian corridor, and wetland habitats. All of the species listed in Appendix C are likely to occur in the project-scale analysis area, in addition to species that were not observed during any of the field surveys. During the field survey, an active red-tailed hawk (*Buteo jamaicensis*) nest was observed in a large willow along Little Naneum Creek (see Figure 3.4-3). Additionally, the floor of the barn in the northeast part of the site was littered with owl pellets and the rafters contained whitewash (see Figure 3.4-3).

During the April 2017 field survey of the Camas Solar Project site, dace, likely speckled dace (*Rinichthys osculus*), were observed in the wetland (CW01) that flows north to south along the west side of the solar project site, into Little Naneum Creek. A Pacific treefrog was also observed in CW01.

There was evidence of beaver (*Castor canadensis*) activity along Little Naneum Creek. A burrow, which could potentially have been created by an American badger, was observed in the Little Naneum riparian corridor, in the northeast portion of the Camas Solar Project site, south of the Bull Ditch. The Yakima River is located 1.32 miles west of the project site, and the nearest area that is only minimally inhabited by humans is 2.10 miles south of the project site (see Figure 3.4-1 and Table 3.4-1). Because of the site's

proximity to these less-inhabited areas, migratory species (e.g., deer and coyote) forage or hunt on and travel through the project site.

Fumaria Solar Project Site

Habitats and Vegetation

With eight habitat types represented in its project-scale analysis area, the Fumaria Solar Project site has the most wildlife habitat diversity of the five proposed Columbia Solar Project sites (see Figures 3.4-4 and 3.4-5). The most prevalent habitat type is the surrounding agricultural production, occupying 46% of the analysis area. The surrounding sagebrush-bitter-brush scrub habitat represents 36% of the analysis area, and 2% of the analysis area is developed. The project site is principally fallow – vegetated (some native vegetation, but mostly non-native plant species; 41 acres, 7% of the analysis area). National Wetland Inventory (NWI)-mapped wetlands are present in the Reecer Creek floodplain (northwest and southwest of the proposed solar project site) and within 500 meters of the substation. These NWI-mapped wetlands total 8% of the available habitat in the analysis area. Open water habitat (3 acres) is present southeast of the project site. Willow-rose shrub thicket habitat (2 acres) occurs along the project site borders.

Special-status Plants

As indicated in Table 3.4-2, the most prevalent noxious weed and its associated habitat on the Fumaria Solar Project site is hairy cat's-ear within the fallow – vegetated habitat. Other less prevalent noxious weed species observed included Canadian thistle, chufa (yellow nutsedge) (*Cyperus esculentus*), field sow-thistle (*Sonchus arvensis*), Fuller's teasel, reed canary grass, and spotted knapweed (*Centaurea stoebe*).

Fish and Wildlife

Evaluation of special-status species with the potential to occur in the Fumaria Solar Project project-scale analysis area is provided below in Section 3.4.2.

The diversity of habitats at the Fumaria Solar Project site supports at least 21 bird species, all observed during the April 2017 field survey. All of the species listed in Appendix C are likely to occur in the project-scale analysis area, in addition to species that were not observed during any of the field surveys.

Dace were observed in the irrigation ditches south of the Fumaria Solar Project site during the April 2017 field survey. Reecer Creek is known to be fish bearing, containing rainbow trout (*Oncorhynchus mykiss*), a non-anadromous form of steelhead. In the past, the landowner has stocked the ponds southeast of the site with triploid rainbow trout. Pacific treefrogs were observed throughout the site in the fallow – vegetated habitat, as well as the open water in the irrigation ditches.

A burrow, which could potentially have been created by an American badger, was observed near the southwestern access entrance to the Fumaria Solar Project site. The Yakima River is located 0.86 mile southwest of the project site, and the nearest area that is only minimally-inhabited by humans is 1.07 miles east of the project site (see Figure 3.4-1 and Table 3.4-1). Because of the site's proximity to these less-inhabited areas, migratory species (e.g., deer and coyote) forage or hunt on and travel through the project site.

Fumaria Solar Project Generation Tie Line

Habitats and Vegetation

The most prevalent habitat type in the Fumaria Solar Project generation tie line project-scale analysis area is agricultural production, occupying 88% of the analysis area (see Figures 3.4-6 and 3.4-7). Developed and riparian corridor habitats each comprise 4% of the analysis area. The riparian corridor

habitat is located along Reecer Creek and within 500 meters of the substation. NWI-mapped wetlands, open water, and sagebrush-bitter-brush scrub habitats comprise the remaining 4% of the analysis area. NWI-mapped wetlands are present within 500 meters of the substation. Open water habitat (9 acres) is present within the 500-meter buffer of the entire generation tie line corridor.

Special-status Plants

Noxious weeds observed along the Fumaria Solar Project generation tie line included Canadian thistle, Fuller's teasel, hairy cat's-ear, reed canary grass, and spotted knapweed.

Fish and Wildlife

Evaluation of special-status species with the potential to occur in the Fumaria Solar Project generation tie line project-scale analysis area is provided below in Section 3.4.2.

Twenty-one bird species were observed along the Fumaria Solar Project generation tie line during the April 2017 field survey. The majority of the species were observed in the open water, riparian corridor, sagebrush-bitter-brush scrub, and wetland habitats. All of the species listed in Appendix C are likely to occur in the project-scale analysis area, in addition to species that were not observed during any of the field surveys.

East of the Fumaria Solar Project generation tie line, along North Faust Road, two active raptor nests were observed along the Reecer Creek riparian corridor, belonging to a red-tailed hawk and great horned owl (*Bubo virginianus*) (see Figure 3.4-6).

During the April 2017 field survey, dace were observed in the irrigation ditches that are south of the site and are connected to Reecer Creek. Reecer Creek is known to be fish bearing, containing rainbow trout.

The Yakima River is located 0.86 mile west of the western end of the Fumaria Solar Project generation tie line, and the nearest area that is only minimally inhabited by humans is 1.19 miles east of the eastern end of the generation tie line (see Figure 3.4-1 and Table 3.4-1).

Penstemon Solar Project Site

Habitats and Vegetation

The Penstemon Solar Project project-scale analysis area is 93% (401 acres) Sudangrass agricultural production. The other major habitat is developed, representing 4% of the analysis area. There are 5 acres of fallow – vegetated in the analysis area. The eastern border of the project site is Coleman Creek, providing 2 acres of open water and 3 acres of riparian corridor within the analysis area. A small wetland is located south of the project site. Despite their smaller acreages, these are important fish and wildlife habitats in the analysis area, as demonstrated below by the species occupying these habitats.

Special-status Plants

As indicated in Table 3.4-2, the most prevalent noxious weed species and their associated habitats at the Penstemon Solar Project site were:

- Canadian thistle along the edges of the agricultural production, within the adjacent fallow areas, and along the Coleman Creek riparian corridor
- reed canary grass along the riparian corridor

Other less prevalent noxious weed species observed included Fuller's teasel and hairy cat's-ear.

Fish and Wildlife

Evaluation of special-status species with the potential to occur in the Penstemon Solar Project project-scale analysis area is provided below in Section 3.4.2.

Twelve bird species were observed on the Penstemon Solar Project site during the April 2017 field survey. The majority of the species were observed in the riparian corridor habitat. All of the species listed in Appendix C are likely to occur in the project-scale analysis area, in addition to species that were not observed during any of the field surveys. An active red-tailed hawk nest was observed southeast of the southeast site corner, in a cottonwood tree along Coleman Creek (Figure 3.4-8).

The Yakima River is located 2.54 miles west of the Penstemon Solar Project site, and the nearest area that is only minimally inhabited by humans is 3.31 miles south of the project site (see Figure 3.4-1 and Table 3.4-1). Of all the solar project sites, the Penstemon Solar Project site is furthest from less-inhabited areas, but migratory species (e.g., deer and coyote) still forage or hunt on and travel through the project site.

Typha Solar Project Site

Habitats and Vegetation

A review of the WDFW Priority Habitats and Species (PHS) database showed that no priority habitats or species are documented on the Typha Solar Project site. The portion of the Yakima River adjacent to the northeast corner of the site is designated as a shoreline of the state based on the Washington Water Typing Criteria (WAC 222-16-030), and the Shoreline Management Act's list of streams and rivers constituting shorelines of the state for Kittitas County (WAC 173-18-230).

Because of the Typha Solar Project site's proximity to the Yakima River, the habitat in the project-scale analysis area is important for fish and wildlife. The most prevalent habitat type is the surrounding agricultural production, occupying 52% of the analysis area; this includes the Ellensburg Golf Course east of the proposed solar project site. The other main habitats in the analysis area are open water (the Yakima River), fallow – recently grazed, and riparian corridor, occupying 14%, 14%, and 11% of the analysis area, respectively. Five percent of the analysis area is developed. Some wetlands were field-delineated, while along the Yakima River there are also NWI-mapped wetlands within 500 meters of the project site. Wetland habitat totals 4% of the analysis area. Some willow-rose shrub thicket habitat (almost 0.5 acre) occurs along the Yakima River (northeast of the project site) and the EP Canal (south of the project site).

Special-status Plants

As indicated in Table 3.4-2, the most prevalent noxious weed species and their associated habitats at the Typha Solar Project site were Canadian and scotch thistle and hairy cat's-ear throughout the fallow areas. Reed canary grass was present adjacent to riparian corridor and wetland habitats. Other less prevalent noxious weed species observed included chufa (yellow nutsedge), Fuller's teasel, and false mayweed.

Fish and Wildlife

Evaluation of special-status species with the potential to occur in the Typha Solar Project project-scale analysis area is provided below in Section 3.4.2.

Twenty-two bird species were observed at the Typha Solar Project site during the April 2017 field survey. The majority of the species were observed in the open water, riparian corridor, and wetland habitats. All of the species listed in Appendix C are likely to occur in the project-scale analysis area, in addition to species that were not observed during any of the field surveys. A documented great blue heron breeding

area is 224 feet east of the site, on a landform within the Yakima River (see Figure 3.4-9). The floor of the barn, located south of the southwest corner of the site, was littered with owl pellets and the rafters contained whitewash (see Figure 3.4-9).

The Yakima River, located adjacent to the northeast corner of the Typha Solar Project site, is a fish-bearing stream containing coho salmon (*Oncorhynchus kisutch*), mountain sucker (*Catostomus platyrhyncus*), rainbow trout, and Westslope cutthroat trout (*O. clarki lewisi*).

The Yakima River is located directly east of the Typha Solar Project site, and the nearest area that is only minimally inhabited by humans is 2.57 miles southwest of the project site (see Figure 3.4-1 and Table 3.4-1). Because of the site's proximity to these less-inhabited areas, migratory species (e.g., deer and coyote) forage or hunt on and travel through the project site.

Typha Solar Project Generation Tie Line

Habitats and Vegetation

The most prevalent habitat type in the Typha Solar Project generation tie line project-scale analysis area is the surrounding agricultural production, occupying 90% of the analysis area, and the Ellensburg Golf Course to the south. The other main habitat in the analysis area is developed, occupying another 10% of the analysis area. The EP Canal provides 1 more acre of open water habitat.

Special-status Plants

The same noxious weed species as observed at the Typha Solar Project site (see Table 3.4-2), were observed along the Typha Solar Project generation tie line corridor.

Fish and Wildlife

Evaluation of special-status species with the potential to occur in the Typha Solar Project generation tie line project-scale analysis area is provided below in Section 3.4.2.

The same bird species were observed along the Typha Solar Project generation tie line during the April 2017 field survey as were observed at the Typha Solar Project site. All of the species listed in Appendix C are likely to occur in the project-scale analysis area, in addition to species that were not observed during any of the field surveys.

The Yakima River is located 0.25 mile east of the Typha Solar Project generation tie line, and the nearest area that is only minimally inhabited by humans is 2.35 miles southwest of the generation tie line (see Figure 3.4-1 and Table 3.4-1).

Urtica Solar Project Site

Habitats and Vegetation

A review of the PHS database showed that no priority habitats or species are known to occur on the Urtica Solar Project site. The project-scale analysis area is 84% (433 acres) timothy hay agricultural production (see Figure 3.4-10). The other major habitat is developed, representing 9% of the analysis area. McCarl Creek, which functions as an irrigation ditch and includes human-made ponds, flows through the center of the project site, making 6% of the analysis area open water and riparian corridor habitats. The analysis area provides 9 acres of wetlands habitat. These important fish and wildlife habitats are 8% of the analysis area, and fish and wildlife species are known to occupy them.

Special-status Plants

As indicated in Table 3.4-2, the most prevalent noxious weed species and their associated habitats at the Urtica Solar Project site were Fuller's teasel and reed canary grass, adjacent to riparian corridor and wetland habitats. Hairy cat's-ear was also prevalent adjacent to the agricultural production areas. Other less prevalent noxious weed species observed included Canadian and scotch thistle, Queen Anne's lace (*Daucus carota*), and spotted knapweed.

Fish and Wildlife

Evaluation of special-status species with the potential to occur in the Urtica Solar Project project-scale analysis area is provided below in Section 3.4.2.

Eighteen bird species were observed at the Urtica Solar Project site during the April 2017 field survey. The majority of the species were observed in the open water, riparian corridor, and wetland habitats. All of the species listed in Appendix C are likely to occur in the project-scale analysis area, in addition to species that were not observed during any of the field surveys.

During an April 12, 2017, site visit, WDFW biologists stated that McCarl Creek is likely fish bearing. In the past, the landowner has stocked the ponds with triploid rainbow trout. A Canada goose was observed nesting near the ponds.

The Yakima River is located 0.19 mile northeast of the Urtica Solar Project site, and the nearest area that is only minimally inhabited by humans is 1.02 miles southwest of the project site (see Figure 3.4-1 and Table 3.4-1). Because of the site's proximity to these less-inhabited areas, migratory species (e.g., deer and coyote) forage or hunt on and travel through the project site.

(b) Identification of any species of local importance, priority species, or endangered, threatened, or candidate species that have a primary association with habitat on or adjacent to the project site;

3.4.2 Affected Environment for Special-status Species

Federal and state online databases were accessed to obtain current lists of sensitive species that may occur in or near the Columbia Solar Projects project-scale analysis areas, including the U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) system (Appendix C). The USFWS IPaC database provides county-level lists of ESA-listed species, including species proposed or candidates for listing, and designated critical habitat within a defined project area. No ESA-listed species are anticipated to be affected by the proposed solar projects.

The WDFW PHS mapper, which lists sensitive wildlife species and habitats within the five proposed Columbia Solar Project sites, was also accessed (Appendix C). Table 3.4-4 lists state-listed species that have the potential to occur on the proposed solar project sites, and is followed by a brief discussion of each one. As the PHS mapper is dependent on existing records of species, other sensitive species may occur in the vicinity of the solar project sites, if suitable habitat is present. Based on the existing conditions of the sites as developed agricultural lands, it is unlikely that other sensitive species occur in the project-scale analysis areas.

No state- or federally listed threatened or endangered species were observed in the Columbia Solar Projects project-scale analysis areas during the April 2017 field survey.

Table 3.4-4. Special-status Species with Potential to Occur in the Columbia Solar Project Project-scale Analysis Areas

Common Name	Scientific Name	Status	Sites with Potential Occurrence	Likelihood to Occur in Project-scale Analysis Areas
Birds				
Bald eagle	*Haliaeetus leucocephalus*	Federal Species of Concern; MBTA and BGEPA Protected	Fumaria	High
Greater sage-grouse	*Centrocercus urophasianus*	Federal Candidate, State Threatened	Camas, Penstemon	Low
Sandhill crane	*Grus canadensis*	State Endangered	Camas, Fumaria, Penstemon, Urtica	Low
Fish				
Bull trout	*Salvelinus confluentus*	Federal Threatened	Typha	None
Spring Chinook salmon (Upper Columbia River)	*Oncorhynchus tshawytscha*	Federal Endangered	Penstemon	None
Steelhead (Middle Columbia River)	*Oncorhynchus mykiss*	Federal Threatened	Typha	None
Summer Steelhead (Upper Columbia River)	*Oncorhynchus mykiss*	Federal Threatened	Penstemon	None
Herptiles				
Columbia spotted frog	*Rana luteiventris*	State Candidate	Camas, Penstemon	High
Sharp-tailed snake	*Contia tenuis*	State Candidate	Camas, Fumaria	Low
Invertebrates				
Giant Palouse earthworm	*Driloleirus americanus*	State Candidate		Low

Bald Eagle

The bald eagle is a Federal Species of Concern, in addition to being Bald and Golden Eagle Protection Act (BGEPA) and MBTA-protected. They are habitat generalists, typically associated with aquatic habitats, preferring forested areas that surround fish-bearing lakes and rivers.

The PHS mapper did not document any bald eagle occurrences in the Columbia Solar Project analysis areas, but eagles were observed during the field survey on the Fumaria and Penstemon Solar Project sites. Both sites are within 3 miles of the Yakima River (potential nesting habitat). Bald eagles are also scavengers, and calves were observed near both sites; it is likely that the observed eagles were scavenging afterbirth in the vicinity of these sites.

Greater Sage-grouse

The greater sage-grouse (*Centrocercus urophasianus*) is classified as a Federal Candidate by USFWS and a State Threatened species by WDFW. This species lives only on the sagebrush steppe of western North America, and uses several types of sagebrush habitat during different parts of year (Sage Grouse Initiative 2017). Leks, or breeding areas, are located in clear areas such as grassy swales or dry lakebeds. Nesting habitats are usually made up of areas with dense cover from big sagebrush, but can also occur in areas with rabbitbrush (*Chrysothamnus* spp.), greasewood (*Sarcobatus vermiculatus*), and grassy areas (Cornell Lab of Ornithology 2017).

According to the PHS mapper, an occurrence of this species was recorded within the township that includes the entire area of the proposed Camas and Penstemon Solar Project sites (WDFW 2017a). However, the proposed sites do not fit the description for this species' preferred habitat. Therefore, it is unlikely that this species occurs within these two sites.

Sandhill Crane

The sandhill crane (*Grus canadensis*) is classified as a State Endangered species by WDFW. Klickitat and Yakima Counties hold the primary breeding grounds within the State of Washington for sandhill cranes. This species prefers open shallow waters along river channels, on alluvial islands of braided rivers, or in natural basin wetlands, but can sometimes occur in fields and agricultural lands during feeding and resting (California Department of Fish and Game 1990). They typically avoid visual obstructions, such as houses, bridges, and paved or gravel roads (Norling et al. 1992).

Bull Trout

The bull trout (*Salvelinus confluentus*) is classified as a Federally Threatened species by USFWS. Bull trout exhibit a number of life history strategies. Stream-resident bull trout complete their entire life cycle in the tributary streams where they spawn and rear. Most bull trout are migratory, however, spawning in tributary streams where juvenile fish usually rear for 1 to 4 years before migrating to either a larger river (fluvial) or lake (adfluvial) where they spend their adult life, returning to the tributary stream to spawn (Fraley and Shepard 1989). Successful egg incubation and survival requires very cold, clear, well-oxygenated waters as found in pristine headwater stream habitats (Wydoski and Whitney 2003). Bull trout in fresh water feed primarily on whitefish, sculpins, and young salmonids, although they also consume insects, amphibians, crayfish, and other available food (Kraemer 1994). The bull trout has been documented in the Yakima River by PHS, SalmonScape, and StreamNet (Pacific States Marine Fisheries Commission 2016; WDFW 2017a, 2017b). In addition, the part of the Yakima River that is adjacent to the Typha Solar Project site contains designated critical habitat for bull trout (Appendix C).

Chinook Salmon and Steelhead

The Upper Columbia River Spring Chinook and Summer Steelhead are classified as Federally Endangered and Federally Threatened, respectively, by the National Marine Fisheries Service (NMFS). All salmonids require sufficient invertebrate organisms for food; cool, flowing waters free of pollutants; high dissolved oxygen concentrations in rearing and incubation habitats; water of low sediment content during the growing season (for visual feeding); clean gravel substrate for reproduction; and unimpeded migratory access to and from spawning and rearing areas (Spence et al. 1996). Both the Upper Columbia River Spring Chinook and Upper Columbia River Summer Steelhead have been documented in Coleman Creek along the eastern boundary of the Penstemon Solar Project site, by PHS, SalmonScape, and StreamNet (Pacific States Marine Fisheries Commission 2016; WDFW 2017a, 2017b). In addition, the part of Coleman Creek adjacent to the Penstemon Solar Project site contains designated critical habitat for the Upper Columbia River Steelhead (Appendix C). The Middle Columbia River Steelhead has been documented in the Yakima River by PHS, SalmonScape, and StreamNet (Pacific States Marine Fisheries

Commission 2016; WDFW 2017a, 2017b). In addition, the part of the Yakima River that is adjacent to the Typha Solar Project site contains designated critical habitat for Middle Columbia River Steelhead (Appendix C).

Columbia Spotted Frog

The Columbia spotted frog is classified as a State Candidate species by WDFW. This species is rarely found far from water and occurs in a variety of still-water habitats, as well as in some streams and creeks. Their breeding habitat includes seasonally flooded margins of wetlands, ponds, and lakes, and even some flooded pools and still-water edges of creeks. They are most often found in association with wetland plant communities, consisting primarily of non-woody plants such as sedges, rushes, and grasses (Leonard et al. 1993). The egg masses are typically laid in shallow water with little or no shading from vegetation. They are most active in lowland habitats from February through October and hibernate in muddy bottoms near their breeding site in the winter (Licht 1974). Spotted frog tadpoles have been shown to be very sensitive to chemical fertilizers, which may have contributed to the species' decline (Marco 1997).

According to the PHS mapper, an occurrence of this species was recorded within 300 feet of the proposed Camas Solar Project site in a waterway to the northeast, and within 1 mile of the proposed Penstemon Solar Project site in a waterway to the southeast (WDFW 2017a). Egg masses from this species were observed at the Typha and Penstemon Solar Project sites during the April 3 to 12, 2017, field surveys. A pre-construction clearance survey may be recommended by WDFW for developments in or near potential spotted frog habitat, but since current plans are to buffer and avoid water bodies, this is unlikely to be necessary.

Sharp-Tailed Snake

The sharp-tailed snake is classified as a State Candidate species by WDFW. This species prefers forest openings dominated by Garry oak (*Quercus garryana*), particularly with rock accumulations, and riparian deciduous woodlands with accumulations of decaying woody logs within ponderosa pine, oak, or shrub-steppe (Hallock 2009).

According to the PHS mapper, an occurrence of this species was recorded within the quarter-township that includes the entire area of the proposed Camas and Fumaria Solar Project sites (WDFW 2017a). However, the proposed sites do not fit the description for this species' preferred habitat. Therefore, it is unlikely that this species occurs within these two project sites.

Giant Palouse Earthworm

The only special-status invertebrate species known to occur in Kittitas County is the giant Palouse earthworm (*Driloleirus americanus*), a State Candidate species. Known habitats for this species include deep, loamy soils characteristic of the Palouse bunchgrass prairies, and gravelly sandy loam or other rocky soils in forested areas. They have been observed in open forest, shrub-steppe, and prairie habitats and are typically associated with native vegetation (WDFW 2015:Appendix A-5).

3.4.2.2 Solar Project Sites

Camas Solar Project Site

During a site visit to the Camas Solar Project site on April 12, 2017, WDFW biologists stated that Little Naneum Creek could provide anadromous salmon and steelhead habitat.

A review of the PHS database showed that the Camas Solar Project site is located within a township known to support greater sage-grouse, a State Threatened and Federal Candidate species. Greater

sage-grouse are closely associated with large uninterrupted areas of sagebrush, native bunchgrasses, wildflowers, and wet meadows. Because the site does not provide this type of habitat, greater sage-grouse are unlikely to occur in this project-scale analysis area.

The Camas Solar Project site also has historic habitat for Columbia spotted frog, a State Candidate species.

Fumaria Solar Project Site

Also observed during the April 12 WDFW site visit, a bald eagle, a federal species of concern, was perched in the riparian habitat along Reecer Creek, within the 500-meter Fumaria Solar Project project-scale analysis area (at the generation tie line northernmost crossing of Reecer Creek, see Figure 3.4-5).

Reecer Creek is known to be fish bearing, containing rainbow trout.

A review of the PHS database showed that the Fumaria Solar Project site is located within a quarter-township known to support sharp-tailed snake, a State Candidate species. Sharp-tailed snake can occur in a wide variety of habitats, but are most commonly associated with wetter soils in coniferous or mixed woodland forests. Because this site does not provide this type of habitat, sharp-tailed snake are unlikely to occur in this project-scale analysis area.

Fumaria Solar Project Generation Tie Line

Reecer Creek, which is crossed several times by the Fumaria Solar Project generation tie line, is known to be fish bearing, containing rainbow trout.

Penstemon Solar Project Site

A review of the PHS database showed that the Penstemon Solar Project site is located within a township known to support greater sage-grouse, a State Threatened and Federal Candidate species. Greater sage-grouse are closely associated with large uninterrupted areas of sagebrush, native bunchgrasses, wildflowers, and wet meadows. Because the site does not provide adequate greater sage-grouse habitat, they are unlikely to occur in this project-scale analysis area. A bald eagle, a federal species of concern, flew over the project site during the April 2017 field survey, likely traveling to the Yakima River.

Coleman Creek is known to be fish bearing, containing anadromous steelhead and Chinook salmon, and resident rainbow trout.

Additionally, several egg masses, thought to be from Columbia spotted frog, were observed in an irrigation ditch that connects with Coleman Creek south of the southeast corner of the Penstemon Solar Project site (see Figure 3.4-8).

Typha Solar Project Site

The Yakima River contains four ESA-listed species: bull trout, Spring Chinook (Upper Columbia River), Steelhead (Middle Columbia River), and Summer Steelhead (Upper Columbia River).

Two egg masses, thought to be from Columbia spotted frog, were observed in TW04, a wetland located along the southern boundary of the Typha Solar Project site (see Figure 3.4-9).

Typha Solar Project Generation Tie Line

No special-status species occurrences, other than those discussed for the Typha Solar Project site, are known within the project-scale analysis area for the Typha Solar Project generation tie line.

Urtica Solar Project Site

During a site visit to the Urtica Solar Project site on April 12, 2017, WDFW biologists stated that McCarl Creek could provide anadromous salmon and steelhead habitat.

(c) A discussion of any federal, state, or local special management recommendations, including department of fish and wildlife habitat management recommendations, that have been developed for species or habitats located on or adjacent to the project area;

No special management recommendations have been made.

(2) Identification of energy facility impacts. The application shall include a detailed discussion of temporary, permanent, direct and indirect impacts on habitat, species present and their use of the habitat during construction, operation and decommissioning of the energy facility. Impacts shall be quantified in terms of habitat acreage affected, and numbers of individuals affected, threatened or removed. The discussion of impacts shall also include:

3.4.3 Impacts to Habitat

3.4.3.1 Construction Impacts

Landscape-Scale Analysis Area

Table 3.4-5 displays the area that would be impacted by construction of the Columbia Solar Projects. The solar projects would include a total of 223 fenced-in acres (not the entire 232 leased acres), a majority of which would be currently in agricultural production (138 acres). The area of each habitat type removed would be less than 1% of that available in the landscape-scale analysis area, except for three habitat types: fallow – vegetated (some native vegetation, but mostly non-native plant species), fallow (recently grazed), and willow-rose shrub thicket. The impacts to these areas relative to that available in the landscape-scale analysis area is large (49%, 41%, and 34%, respectively) because there is a small area of each of these habitat types available prior to project construction. These habitat types may be more prevalent outside of the project-scale analysis areas in the areas base-mapped as the “other” habitat type, but base mapping outside of the project-scale analysis areas was not altered for this analysis. This artificially makes the proportions of these three habitat types higher. See Table 3.4-1 for the area of each habitat type available in the landscape-scale analysis area. As a result, there would be minor temporary impacts to habitat, vegetation, and wildlife.

The nature of these impacts is described in detail in Sections 3.4.3 to 3.4.5.

Solar Project Sites

Camas Solar Project Site

The Camas Solar Project would primarily impact habitat that is currently under agricultural production. The project site has been designed to avoid impacts on Little Naneum Creek, and the facility incorporates a 40-foot setback from the edge of the creek for any electrical generation equipment. The solar project has also been designed to avoid impacts to the wetland habitat along the western boundary of the project site, with a 20-foot setback from the edge of the wetland to the electrical generation equipment.

Table 3.4-5. Construction and Operation Impacts: Acres of Habitat Types Potentially Affected by Construction Activities and from Fencing during Long-term Operation of the Columbia Solar Project

Habitat Type	Landscape-scale Analysis Area (LSAA)		Project-scale Analysis Areas (PSAA) (500-meter buffer surrounding each solar project site)									
			Camas		Fumaria Site with Access Road (Generation Tie Line)[1]		Penstemon		Typha Site (Generation Tie Line)[1]		Urtica	
	Acres	% of Habitat available in LSAA[2]	Acres	% of Habitat available in PSAA[2]	Acres	% of Habitat available in PSAA[2]	Acres	% of Habitat available in PSAA[2]	Acres	% of Habitat available in PSAA[2]	Acres	% of Habitat available in PSAA[2]
Agricultural Production	138	<1%	42	9%	– (19)	– (2%)	36	9%	– (2)	– (2%)	40	9%
Developed	8	<1%	<1	<1%	– (7)	– (13%)	–	–	– (2)	– (15%)	–	–
Fallow: vegetated	35	49%	–	–	35 (<1)	85% (<1%)	–	–	–	–	–	–
Fallow: recently grazed	38	41%	<1	<1%	–	–	–	–	38 (<1)	60% (<1%)	–	–
Open Water	1	<1%	–	–	– (<1)	– (1%)	–	–	– (<1)	– (44%)	<1	1%
Riparian Corridor	1	<1%	1	4%	– (<1)	– (1%)	–	–	– (<1)	– (<1%)	<1	<1%
Sagebrush-bitter-brush Scrub	<1	<1%	–	–	<1 (<1)	<1% (<1%)	–	–	–	–	–	–
Wetlands	1	<1%	–	–	– (1)	– (4%)	–	–	<1 (<1)	8% (<1%)	<1	1%
Willow-rose Shrub Thicket	1	34%	–	–	<1 (1)	<1% (5%)	–	–	– (<1)	– (<1%)	–	–
Total Acres	**223**		**43**		**35 (30)**		**36**		**39** (4)		**41**	

1. The entries in each cell add up to the total for the site, including the access road and generation tie line.
2. Where the amount of each habitat type in the landscape-scale or project-scale analysis area equals 100%.

Fumaria Solar Project Site

The Fumaria Solar Project would primarily impact habitat that is currently fallow – vegetated with some native vegetation, but mostly non-native plant species. The associated generation tie line would primarily impact habitat that is currently under agricultural production. The Fumaria Solar Project site has been designed to avoid impacts on Reecer Creek. The solar project has also been designed to avoid impacts to the existing drainage ditch along the southwestern boundary of the project site, and the facility incorporates a 60-foot setback from the edge of the wetland on the site to the electrical generation equipment.

Penstemon Solar Project Site

The Penstemon Solar Project would primarily impact habitat that is currently under agricultural production. The project site has been designed to avoid impacts to Coleman Creek, and the facility incorporates a 60-foot minimum setback from the edge of the creek for any electrical generation equipment, and an average 115-foot setback along the majority of the creek.

Typha Solar Project Site

The Typha Solar Project would primarily impact habitat that is currently fallow but has been recently grazed. The associated generation tie line would primarily impact habitat that is currently under agricultural production and developed. The project site has been designed to avoid impacts to the Yakima River, including a greater than 100-foot setback from the Yakima River to any electrical generation equipment, and a 30-foot setback from the wetlands located within the site to any electrical generation equipment.

Urtica Solar Project Site

The Urtica Solar Project would primarily impact habitat that is currently under agricultural production. The project site has been designed to avoid impacts to McCarl Creek, and the facility incorporates a 40-foot minimum setback from the edge of the creek for any electrical generation equipment.

3.4.3.2 Operation Impacts

Table 3.4-6 shows the area of the Columbia Solar Projects that would be converted to an impervious surface, rendering it unusable for plants or wildlife for the life of the projects. A total of 11.86 acres of the five solar projects would be converted to impervious surfaces, a majority of which would be habitat currently under agricultural production (6.01 acres). The area of each habitat type removed would be less than 1% of that available in the landscape-scale analysis area, except for three habitat types: fallow (native vegetation), fallow (recently grazed), and willow-rose shrub thicket. The impacts to these areas relative to that available in the landscape-scale analysis area is 1% or greater (2%, 2%, and 1%, respectively), because there is a small area of each of these habitat types available prior to project construction. These habitat types may be more prevalent outside of the project-scale analysis areas in the areas base-mapped as the “other” habitat type, but base mapping outside of the project-scale analysis areas was not altered for this analysis. This artificially makes the proportions of these three habitat types higher. See Table 3.4-1 for the area of each habitat type available in the landscape-scale analysis area. As a result, there would be minor permanent impacts to habitat, vegetation, and wildlife.

Impacts due to human noise and activity during operation would be minimal, as there would be little human visitation to each site. Eventual decommissioning impacts would be similar to the Construction Impacts to Habitat (Section 3.4.3.1) with ground disturbance and subsequent revegetation.

Table 3.4-6. Acres of Habitat Types Potentially Affected by Impervious Areas from Long-term Operation of the Columbia Solar Projects

Habitat Type	Landscape-scale Analysis Area (LSAA)		Project-scale Analysis Areas (PSAA) (500-meter buffer surrounding each solar project site)									
			Camas		Fumaria Site; Access Road (Generation Tie Line)[1]		Penstemon		Typha Site (Generation Tie Line)[1]		Urtica	
	Acres (with Fumaria Access Road)	% of Habitat available in LSAA[2]	Acres	% of Habitat available in PSAA[2]	Acres	% of Habitat available in PSAA[2]	Acres	% of Habitat available in PSAA[2]	Acres	% of Habitat available in PSAA[2]	Acres	% of Habitat available in PSAA[2]
Agricultural Production	6.01	<1%	2.00	<1%	– (0.97)	– (<1%)	1.31	<1%	– (0.08)	– (<1%)	1.65	<1%
Developed	0.45 (0.55)	<1%	–	–	–; 0.10 (0.37)	–; 1% (1%)	–	–	– (0.08)	– (1%)	–	–
Fallow: vegetated	1.72 (2.44)	3%	–	–	1.71 0.72 (0.01)	4% (<1%) (<1%)	–	–	–	–	–	–
Fallow: recently grazed	1.41	1%	–	–	–	–	–	–	1.40 (0.01)	2% (<1%)	–	–
Open Water	0.05	<1%	–	–	– (0.02)	– (<1%)	–	–	– (0.02)	– (2%)	–	–
Riparian Corridor	0.04	<1%	–	–	– (0.02)	– (<1%)	–	–	– (0.01)	– (<1%)	–	–
Sagebrush-bitter-brush Scrub	0.01 (1.27)	<1%	–	–	–; 1.26 (0.01)	–; 1% (<1%)	–	–	–	–	–	–
Wetlands	0.03	<1%	–	–	– (0.03)	– (<1%)	–	–	– (<0.01)	– (<1%)	–	–
Willow-rose Shrub Thicket	0.07	2%	–	–	– (0.07)	– (<1%)	–	–	– (<0.01)	– (<1%)	–	–
Total Acres	**9.78 (11.86)**	**<1%**	**2.00**	**<1%**	**1.71 Site; 2.08 Access Road (1.50)**		**1.31**	**<1%**	**1.40 (0.21)**		**1.65**	**<1%**

1. The entries in each cell add up to the total for the site, including the access road and generation tie line.
2. Where the amount of each habitat type in the landscape-scale or project-scale analysis area equals 100%.

3.4.3.3 Other Impacts to Habitat and Species

(a) Impacts to water quality, stream hydrology and in-stream flows;

As described in Sections 2.1 and 2.3, the Columbia Solar Project site designs include at least 20-foot setbacks from wetlands, streams, and the Yakima River; see Table 3.3-5 for the specific setback distances from each water body. Additionally, sediment and erosion control measures would be implemented to avoid water quality impacts to adjacent wetlands, streams, and the Yakima River (see Sections 3.1.6, 3.3.3, 3.3.8, and 3.5.5). As described in Section 3.3, no impacts to stream hydrology and in-stream flow would occur because of the setbacks included in the project site designs. Sections 2.6, 2.8, 2.9, 2.10, and 2.11 provide additional details regarding the lack of impacts to water quality and quantity from the proposed project.

(b) Impacts due to introduction, spread, and establishment of noxious or nonnative species;

As discussed in the Special-status Plants section above, noxious weeds and non-native plant species are present on all five of the proposed Columbia Solar Project sites. Table 3.4-2 indicates their relative prevalence on each site. Construction and operation activities have the potential to introduce and further spread or establish these species, as well as others that do not presently occur at the sites. To prevent introduction, spread, and establishment of noxious or non-native species, TUUSSO has prepared and would implement a Vegetation Management Plan through coordination with the landowners, WDFW, and Kittitas County (Appendix B).

(c) Impacts and changes to species communities adjacent to the project site;

As shown in Table 3.4-1, habitat similar to the types available in the Columbia Solar Project project-scale analysis areas is readily available in the landscape-scale analysis area. Long-term modification of vegetation communities would not result in a significant change to the overall habitat available to species in the analysis areas.

The proposed Columbia Solar Projects have the potential to remove and/or reduce the quality of the vegetation communities and plant species in the project-scale analysis areas where ground disturbance would occur. Vegetation clearing or grubbing activities could also increase or introduce noxious plant populations in undisturbed habitat, contribute to soil erosion, lead to slope destabilization, or result in movement of material beyond the grading activities. Soil erosion from ground-disturbing activities may result in a negative effect on streams in the project-scale analysis areas by increasing sedimentation into the streams.

Potential minor impacts to wildlife may result from temporary construction and permanent operation of the five Columbia Solar Projects. Ground disturbance, vegetation clearing, and noise could result in temporary displacement of wildlife species present in the project-scale analysis areas during construction. Long-term effects of the solar projects would be limited to the long-term modification of habitat in each project-scale analysis area (i.e., fencing or conversion of habitat to impervious substances). Some species, such as small rodents, snakes, and insects, could be affected by the ground-disturbing activities due to temporary habitat alteration and could suffer mortalities from direct contact with construction equipment. More commonly, wildlife would be displaced to adjacent habitat areas. The effects from ground disturbances during construction would be considered low, with respect to common wildlife species, all of which can be expected to have robust populations that would be minimally affected by the temporary and localized construction activities associated with the solar projects.

Section 3.4.6 below details the proposed Columbia Solar Projects' BMPs and mitigation measures that would reduce or minimize the potential for impacts to vegetation, fish, and wildlife.

(d) Impacts to fish and wildlife migration routes;

The five proposed Columbia Solar Projects would not affect any identified big game migratory corridors or migratory flyways.

The Columbia Solar Project sites are within 2.5 miles of the Yakima River and 3.5 miles of areas that are only minimally inhabited by humans (Figure 3.4-1 and Table 3.4-1). Because all of the sites are near these less-inhabited areas, migratory species (e.g., deer and coyote) forage or hunt on and travel through the sites. From initiation of construction (with its associated human activity and noise) through long-term operation (with the planned fencing of the sites), 223 acres comprising the fenced-in areas of the solar project sites (not the entire 232 leased acres) would no longer be available to migratory species such as deer (coyote may still use the sites). However, there are 317,997 acres within the landscape-scale analysis area that would still be available to these migratory species, so this would not be a significant impact.

The potential impacts to migratory species from the proposed Fumaria and Typha Solar Project generation tie lines would be the temporary disturbance and the species' avoidance of the human noise and activity during construction of the proposed lines. This would not be a significant impact because these species could use the remainder of the landscape-scale analysis area during this temporary construction season (estimated at 8 months). There would be no long-term impacts to migratory species from the presence of the proposed generation tie lines.

(e) Impacts to any species of local importance, priority species, or endangered, threatened, or candidate species;

3.4.4 Impacts to Special-status Species

3.4.4.1 Construction Impacts

No special-status plant species are known to occur within the construction areas. The proposed Columbia Solar Projects have the potential to minimally impact the following special-status wildlife species:

- Bald eagle (BGEPA- and MBTA-protected; Federal Species of Concern)
- Columbia spotted frog (Washington State Candidate)

No other species described in Section 3.4.2 has the potential to be impacted by the Columbia Solar Projects.

Bald eagles were incidentally observed during ground surveys near the Fumaria and Penstemon Solar Project sites, and are likely present throughout the project-scale analysis areas. No aerial nest surveys were conducted. If nests are present in the project vicinity, they have the potential to be affected by noise and visual disturbances during construction. No bald eagle nests have been identified near the solar project sites; if nests are identified near the sites, construction outside of the critical use period (January 1–May 31) is recommended. If construction near active bald eagle nests might occur during the critical use period, local USFWS biologists would be consulted.

Columbia spotted frog is known to occur near the Typha, Camas, and Penstemon Solar Project sites, and could be affected by construction and operation in and around ponds and canals that provide breeding habitat. To avoid impacts to aquatic and semi-aquatic species, setback distances from aquatic habitats

would be incorporated into the site plans, and appropriate erosion and sediment control measures would be implemented to protect wetlands and streams from sediment and other contaminants.

Recommended mitigation measures for special-status species are described below in Section 3.4.6.

3.4.4.2 Operation Impacts

Table 3.4-7 displays the amount of special-status species habitat that would be impacted by the fenced and impervious areas from implementation of the Columbia Solar Projects (all sites combined). Approximately 2 acres of bald eagle habitat and 3 acres of Columbia spotted frog habitat would be fenced (a minor temporary impact, due to the construction activity that would occur within this habitat).

Table 3.4-7. Acres of Special-status Species Habitat Impacted by Fencing and Conversion to an Impervious Area of the Columbia Solar Projects

Representative Species	Habitat Available in Landscape Scale Analysis Area[1]	Fenced Area		Impervious Area	
		Acres	Percent of Available Habitat	Acres	Percent of Available Habitat
Bald eagle	8,116	2	<1%	0.07	<1%
Columbia spotted frog	9,363	3	<1%	0.11	<1%

1. The “other” habitat category was removed from the species habitats because it includes such a wide range of habitats that it is not valuable for the analysis.

Except for the 11.86 acres of impervious surfaces that would remove 0.07 acre and 0.11 acre of available bald eagle and Columbia spotted frog habitat (a minor permanent impact), respectively (see Table 3.4-7), no long-term operational impacts to special-status species would occur from the five Columbia Solar Projects. Eventual decommissioning impacts would be similar to the Construction Impacts to Special-status Species (Section 3.4.4.1) with human noise and activity and subsequent habitat revegetation.

(f) Impacts due to any activities that may otherwise confuse, deter, disrupt or threaten fish or wildlife;

3.4.5 Impacts to Fish and Wildlife

3.4.5.1 Construction Impacts

Landscape-Scale Analysis Area

As described in Section 3.4.6.1, to ensure compliance with MBTA, vegetation clearing for the Columbia Solar Projects would ideally be undertaken from August 1 through the end of February. If construction or vegetation clearing is required between March 1 and August 1, nest surveys would be conducted in the proposed area of disturbance. If active migratory bird nests are encountered during the surveys, land-disturbing construction activities would be avoided until the birds fledge. An appropriate species avoidance buffer, as determined in conjunction with WDFW and local agencies, would apply to all active nests for migratory bird species.

Setbacks from wetlands, streams, and the Yakima River have also been included in the design of each project site (see Section 2.3.3), so impacts to fish and aquatic species would be avoided.

Table 3.4-3 shows the types of habitats used by the representative species analyzed for the Columbia Solar Projects. Table 3.4-8 shows the amount of representative habitat used by these species (within the landscape-scale analysis area) that would be impacted by the fenced and impervious areas of the

Columbia Solar Projects (all sites combined). These species were chosen to represent wildlife that are likely to occur in the project-scale analysis areas. Not all species listed in Section 3.4.1 are listed here. For most species, less than 1% of the available habitat used by that species (within the landscape-scale analysis area) would be affected from solar project fencing or conversion to impervious areas, except for the spotted skunk, for which 1% of its habitat would be converted to impervious area. As a result, there would no impacts to fish (because of setbacks from water bodies), and there would be minor permanent impacts to habitat, vegetation, and wildlife.

Table 3.4-8. Acres of Representative Species Habitat (in the Landscape-scale Analysis Area) Impacted by Fencing and Conversion to an Impervious Area of the Columbia Solar Projects

Representative Species	Habitat Available in Landscape-scale Analysis Area[1]	Fenced Area		Impervious Area	
		Acres	Percent of Available Habitat	Acres	Percent of Available Habitat
Birds					
Canada goose	129,395	223	<1%	11	<1%
Great blue heron	124,586	214	<1%	10	<1%
Great horned owl	123,339	213	<1%	10	<1%
Killdeer	129,833	222	<1%	12	<1%
Northern Harrier	123,781	214	<1%	11	<1%
Red-tailed hawk	120,470	219	<1%	12	<1%
Sandhill Crane	124,586	214	<1%	10	<1%
Fish					
Bull trout	1,247	1	<1%	0	<1%
Dace species	6,562	2	<1%	0	<1%
Spring chinook (Upper Columbia River)	1,247	1	<1%	0	<1%
Steelhead (Middle Columbia River)	1,247	1	<1%	0	<1%
Summer steelhead (Upper Columbia River)	1,247	1	<1%	0	<1%
Herptiles					
Pacific treefrog	124,496	177	<1%	9	<1%
Sharp-tailed snake	8,116	2	<1%	0	<1%
Mammals					
American badger	115,665	212	<1%	11	<1%
Coyote	123,271	221	<1%	12	<1%
Mule deer	118,028	214	<1%	10	<1%
Raccoon	129,925	11	<1%	1	<1%
Small rodents (mice, voles, etc.)	128,590	223	<1%	12	<1%
Striped skunk	7,682	45	<1%	3	1%
Virginia opossum	12,925	11	<1%	1	<1%

1. The “other” habitat category was removed from the species habitats because it includes such a wide range of habitats that it is not valuable for the analysis.

Solar Project Sites

Camas Solar Project Site

During field surveys of the Camas Solar Project site, an active red-tailed hawk nest was observed in a large willow along Little Naneum Creek (see Figure 3.4-3). Additionally, the floor of the barn in the northeast part of the site was littered with owl pellets and the rafters contained whitewash (see Figure 3.4-

3). This barn would remain in place following solar project construction, based on current design plans. If nesting activity is observed at the nest and barn, then a 0.25-mile seasonal construction avoidance buffer may be requested by WDFW until the young have fledged (see Section 3.4.6 and Appendix C).

Fumaria Solar Project Generation Tie Line

East of the Fumaria Solar Project generation tie line, along North Faust Road, two active raptor nests were observed from a red-tailed hawk and a great horned owl (see Figure 3.4-6). If nesting activity is observed at the nests, then a 0.25-mile seasonal construction avoidance buffer may be requested by WDFW until the young have fledged (see Section 3.4.6 and Appendix C).

Penstemon Solar Project Site

An active red-tailed hawk nest was observed southeast of the southeast site corner of the Penstemon Solar Project site, in a cottonwood tree along Coleman Creek (see Figure 3.4-8). If nesting activity is observed at the nest, then a 0.25-mile seasonal construction avoidance buffer may be requested by WDFW until the young have fledged (see Section 3.4.6 and Appendix C).

Typha Solar Project Site

A documented great blue heron breeding area is 224 feet east of the Typha Solar Project site, on a landform within the Yakima River (see Figure 3.4-9). The great blue heron nesting season is February through September. WDFW may request a seasonal avoidance buffer during the first half of the season, i.e., February through May (Appendix C).

The floor of the barn, located south of the southwest corner of the Typha Solar Project site, was littered with owl pellets and the rafters contained whitewash (see Figure 3.4-9). Current project plans include leaving this barn in place. If nesting activity is observed at the barn, then a 0.25-mile seasonal construction avoidance buffer may be requested by WDFW until the young have fledged (see Section 3.4.6 and Appendix C).

Urtica Solar Project Site

No nests were observed in the Urtica Solar Project project-scale analysis area. Still, if construction occurs between March 1 and August 1, nest surveys would take place to ensure new nests have not been built.

3.4.5.2 Operation Impacts

Table 3.4-8 summarizes the acres of habitat for representative species that may be affected by the long-term operation of the Columbia Solar Projects (i.e., from fencing or conversion of habitat to impervious surfaces). Each site would be visited minimally by humans for maintenance, resulting in minimal permanent impacts due to human noise and activity. Eventual decommissioning impacts would be similar to the Construction Impacts to Fish and Wildlife (Section 3.4.5.1) with human noise and activity and subsequent habitat revegetation.

(g) An assessment of risk of collision of avian species with any project structures, during day and night, migration periods, and inclement weather;

Potential impacts to avian species on Columbia Solar Project sites can include traumatic impact with fencing, PV panels, and other solar structures, and predation due to collision-related injuries (Hernandez et al. 2014; Kagan et al. 2014).

Birds representing a broad range of body sizes, ecological types, resident and non-resident, and nocturnal and diurnal species can be impacted by solar facilities (Kagan et al. 2014). Passerines are the

taxonomic group most frequently found dead or injured at solar facilities, ranging between 40% to nearly 63% of all avian fatalities at a site. The proportion of water-dependent species found at solar projects has ranged between less than 1% to approximately 45% (Kagan et al. 2014). In general, the proportion of water-dependent bird species found dead at PV facilities was higher than for other solar technologies, suggesting that there may be an attraction of water-dependent birds to PV facilities (e.g., lake effect hypothesis). However, no studies have been conducted to test this hypothesis.

In a study of avian mortality at utility-scale solar energy (USSE) facilities in the United States conducted in 2016, Walston et al. estimated that all USSE facilities currently in operation or under construction (totaling approximately 14 GW) would result in 37,800 to 138,600 bird mortalities per year. This estimate was based on the capacity-weighted average mortality rate, which ranged from 2.7 to 9.9 birds/MW/year, and included mortality from both known and unknown causes (Walston et al. 2016). Applying this to the Columbia Solar Project sites, it is estimated that operation of each 5-MW facility could result in between 13 and 50 avian deaths per year, or a total of 67 to 248 bird mortalities per year for all five Columbia Solar Project sites. For comparison, roadway vehicles are thought to cause 89 to 340 million avian deaths per year, and buildings and windows are thought to cause 365 to 988 million avian deaths per year (Walston et al. 2016).

Because the majority of avian mortalities at USSE facilities are the result of unknown causes, it is unclear how factors such as time of day, time of year, and weather can alter the risks of collision.

Avian Power Line Interaction Committee guidelines would be followed to reduce bird perching and collisions on the generation tie lines. These guidelines are intended to minimize the potential for avian fatalities due to electrocution or power line strikes.

(h) An assessment for the potential of impacts of hazardous or toxic materials spills on habitats and wildlife.

Potential impacts to habitats and wildlife from hazardous or toxic materials spills from the five Columbia Solar Projects are unlikely. The solar projects would have Spill Prevention and Control Plans for both the construction and operation phases (see Sections 2.10, 4.1.8, and 4.1.9 for details). There would be measures in place to prevent and contain any accidental spills resulting from construction fuel storage. Construction of the projects would not result in the generation of any hazardous wastes in quantities regulated by state or federal law.

There would not be any long-term fuel storage during operation of the five Columbia Solar Projects. The potential for accidental spills during operations would be minimal, as the sole source of potential spills on-site would be the small amounts of mineral oil contained within the transformers. The transformers would include containment tank welding and corrosion protection specifications.

(3) Mitigation plan. The application shall include a detailed discussion of mitigation measures, including avoidance, minimization of impacts, and mitigation through compensation or preservation and restoration of existing habitats and species, proposed to compensate for the impacts that have been identified. The mitigation plan shall also:

3.4.6 Mitigation for Habitat and Species

Throughout this section, the term “mitigation” refers to avoidance and minimization measures. No compensatory mitigation is proposed for the Columbia Solar Projects, as impacts are not expected to be significant. Mitigation would remain consistent with the WDFW POL-M5002.

(a) Be based on sound science;

The proposed mitigation and BMPs included in this application are typical of the wind energy projects developed to date in Kittitas County, and were developed through coordination with landowners and WDFW. Additional research is required to determine the efficacy of measures intended to reduce avian and bat mortality at utility-scale solar facilities (Multiagency Avian-Solar Collaborative Working Group [CWG] 2016). The mitigation measures in this ASC include the most current and widely-accepted measures referenced by the CWG in their Final Avian-Solar Science Coordination Plan (CWG 2016, Kagan et al. 2014).The USFWS is currently developing programmatic guidance for Bird and Bat Conservation Strategies (BBCS) that will recommend BMPs and minimization and mitigation for utility-scale solar facilities (USFWS 2016a as cited in CWG 2016). When available, this guidance will be reviewed and applicable guidelines will be considered for implementation.

(b) Address all best management practices to be employed and setbacks to be established;

Waterbody setbacks are listed by Columbia Solar Project site in Section 3.4.3.1.

3.4.6.1 Buffers and Seasonal Timing

Migratory Birds and Bald and Golden Eagles

To ensure compliance with MBTA, vegetation clearing for the Columbia Solar Projects would ideally be undertaken from August 1 through the end of February. If construction or vegetation clearing is required between March 1 and August 1, nest surveys would be required in the proposed area of disturbance. If active migratory bird nests are encountered during the surveys, land-disturbing construction activities should be avoided while the birds are allowed to fledge. An appropriate species avoidance buffer, as determined in conjunction with WDFW and local agencies, would apply to all active nests for migratory bird species.

As discussed in Sections 3.4.1 and 3.4.2, the Columbia Solar Project project-scale analysis areas have the potential to provide nesting habitat to raptors and bald and golden eagles. All raptor species are protected under the MBTA, and bald and golden eagles are additionally protected under the BGEPA. If active raptor nests occur within 0.25 mile of the solar project construction activities, noise and construction activities could disturb nesting and fledgling raptors, potentially causing nest abandonment. Based on WDFW guidance (Appendix C), a nest survey within 0.25 mile of construction activities would be conducted within the same year that construction is scheduled, to determine whether nests could be occupied during construction. The nesting seasons vary by species, as shown in Table 3.4-9. WDFW's 0.25-mile buffer is inclusive of the distance recommended by the National Bald Eagle Management Guidelines (USFWS 2007), which specifies a 660-foot (0.125-mile) buffer from active eagle nests. If active raptor nests are observed, then TUUSSO would coordinate with WDFW to determine approaches to minimize disturbance to the nesting raptors. Buffer distances and timing restrictions would collaboratively be developed by WDFW and TUUSSO, dependent upon the sound levels produced by the construction equipment and the sensitivity of the nesting raptors.

Table 3.4-9. Nesting Seasons for Raptor Species Likely to Occur in the Analysis Areas

Species	Nesting Season
Bald eagle	January 1–August 31
Golden eagle	January 1–August 31
Red-tailed hawk	March 15–June 30
Great horned owl	February 1–May 15
Swainson's hawk	April 15–July 31

Source: Personal communication with Scott Downes, WDFW Habitat Biologist, 2017 (Appendix C).

Riparian Corridors

Rivers and streams in Kittitas County are classified according to the Washington State stream typing system, as defined in WAC 222-16-030. Ecology and the Washington Department of Natural Resources (DNR) recognize the WAC stream typing system. Kittitas County has established riparian habitat buffer ranges for each stream type to reflect the impact of certain intense land uses on riparian habitat functions and values. The performance standard buffers are defined in KCC 17A.070.010.

Table 3.4-10 shows the surface waters that were identified in the Columbia Solar Project project-scale analysis areas, their DNR stream type, and the applicable buffers. See also each project site's Critical Areas Report for recommended buffer and setback distances from the wetlands identified within the sites.

Table 3.4-10. Surface Waters in the Project-scale Analysis Areas and Applicable Buffers

Stream ID	Water Type	Flow Type	DNR Stream Type[1]	Kittitas County Buffers (feet)	
				Minimum	Maximum
Yakima River	River	Perennial	S	40	200
Ellensburg Power Canal (TS01)	Canal	Perennial	N/A	–	–
FS01	Ditch	Ephemeral	N/A	–	–
FS02	Ditch	Ephemeral	N/A	–	–
Reecer Creek	Stream	Perennial	F	20	100
Kittitas Reclamation District Canal (FS03)	Canal	Perennial	N/A	–	–
FS04	Stream	Intermittent	Ns	0	15
Town Ditch (FS05)	Canal	Perennial	N/A	–	–
McCarl Creek (US01)	Stream	Intermittent	F	20	100
Little Naneum Creek	Stream	Perennial	F	20	100
Bull Ditch (CS02)	Ditch	Perennial	N/A	–	–
Coleman Creek	Stream	Perennial	F	20	100

1. As defined in WAC 222-16-030: S = shoreline of the state, F = fish-bearing, Ns = non-fish-bearing. N/A = not applicable, due to ditches and canals being excluded from the WAC typing system.

To additionally protect riparian corridors and habitats, peak Columbia Solar Project construction activities would be conducted during the dry season as much as possible, to minimize erosion, sedimentation, and soil compaction. At this time, no in-water work is planned for construction of access roads. If these plans change, then TUUSSO would coordinate and permit their plans with WDFW and construction in fish-bearing streams would occur during agency-approved work windows.

3.4.6.2 Noise

Construction noise is exempt from regulation under the statewide noise standards, WAC 173-60, but most noise generating construction activities would be conducted between the hours of 7 a.m. and 10 p.m., in accordance local noise ordinances, including but not limited to KCC 9.45.010, Public Disturbance noises. These practices would avoid night-time noise disturbances to wildlife species.

3.4.6.3 Other Measures

Additional Columbia Solar Project mitigation measures and BMPs to protect fish and wildlife in the project-scale analysis areas could include the following:

Design and Construction Techniques

- Avoid, when possible, construction in sensitive areas such as riparian zones and wetlands.
- Flag sensitive habitat areas (e.g., raptor nests, wetlands, etc.) near proposed areas of construction activity, and designate such areas as off limits to all construction personnel.
- During the nesting season, monitor raptor nests within 0.25 mile of the sites for nesting activity; coordinate construction timing and activities with WDFW to avoid impacts to nesting raptors.
- Minimize new road construction by improving and using existing roads and trails, instead of constructing new roads.
- Develop and implement a Fire Control Plan, in coordination with local fire districts, to minimize the risk of accidental fires during construction, and respond effectively to any fire that does occur.
- Designate an environmental monitor during construction to monitor construction activities and ensure compliance with mitigation measures.
- Implement a trenching protocol during the installation of underground electrical facilities, to allow for conservation of surface soils.
- Require construction personnel to avoid driving over or otherwise disturbing areas outside of the designated construction areas.
- Properly store and manage all wastes generated during construction.
- Use certified weed-free straw bales during construction to avoid introduction of noxious or invasive weeds.
- There would be one straight row of barbed wire, not circular barbed wire, at the top of the perimeter fence. This would avoid birds becoming trapped in circular barbed wire.
- For poles installed by TUUSSO, when feasible:
    - o equip overhead power lines with raptor perch guards to minimize risks to raptors and
    - o space overhead power line conductors to minimize potential for raptor electrocution.
- Employ an adaptive management strategy to further minimize avian and bat mortality as new information and technology becomes available.

Erosion and Sediment Control

- Use BMPs to minimize construction-related surface water runoff and soil erosion.
- Implement temporary erosion and sediment control measures, as appropriate, both during and after construction.
- Flag sensitive habitat areas (e.g., riparian zones, wetlands, etc.) near proposed areas of construction activity, and designate such areas as off limits to all construction personnel.
- Limit disturbances to the minimum necessary when working in or near waterbodies and install stakes or flagging to restrict vehicles and equipment to designated routes and areas.
- Delineate construction limits within 200 feet of waterbodies, as specified in the Stormwater Pollution Prevention Plan (SWPPP), with a sediment fence, straw wattles, or similarly approved methods to eliminate sediment discharge into waterways and wetlands, minimize the size of construction disturbance areas, and minimize removal of vegetation, to the greatest extent possible.

Restoration and Noxious Weed Control

- Quickly revegetate habitats temporarily disturbed during construction with native plant species.
- Reseed all temporarily disturbed areas with an appropriate mix of native plant species as soon as possible after construction is completed, to accelerate the revegetation of these areas and to prevent the spread of noxious weeds.
- Consult with WDFW regarding the appropriate native seed mixes to include in the Vegetation Management Plan for revegetation of the solar project sites.
- As further detailed in the Vegetation Management Plan, implement noxious weed control measures.
- Develop a noxious weed control plan prior to construction, and implement the plan over the life of the project as mitigation. Herbicide application could be a noxious weed control method used.

(c) Address how cumulative impacts associated with the energy facility will be avoided or minimized;

Historically, Kittitas County land use has been dominated by agriculture. Renewable energy facilities (i.e., wind and solar) have recently been built and proposed. Currently there are two existing solar farms and four completed wind farms in the county. Three additional solar farms and one wind farm are in the proposal/approval process.

Impacts cumulative with other energy facilities include a landscape-scale pattern of habitat removal and fragmentation. This pattern displaces wildlife into other areas that may be of lesser quality, such as developed areas. Fragmentation can disrupt movement patterns, whether on a migratory or local scale.

Post-construction restoration and noxious weed control for the Columbia Solar Projects would replace a weedy vegetation cover type with native plant species in all temporarily disturbed areas (see Table 3.4-2 for noxious weed prevalence at each site; all sites currently are principally vegetated by noxious and non-native plant species). These areas would be reseeded with an appropriate mix of native plant species as soon as possible after construction is completed, minimizing the amount of habitat that is permanently removed and thereby reducing cumulative habitat removal.

Fragmentation to riparian corridors would be avoided by the designed inclusion of waterbody setback distances. Additional fragmentation would be minimized by constructing as few new access roads as possible for the Columbia Solar Projects. Instead, existing roads and trails would be improved and used.

(d) Demonstrate how the mitigation measures will achieve equivalent or greater habitat quality, value and function for those habitats being impacted, as well as for habitats being enhanced, created or protected through mitigation actions;

Application of the Columbia Solar Project mitigation measures and BMPs described above would avoid and minimize impacts such that equivalent habitat value and function would be maintained in each project-scale analysis area. Compensatory mitigation is not proposed because the impacts are not expected to be significant.

(e) Identify and quantify level of compensation for impacts to, or losses of, existing species due to project impacts and mitigation measures, including benefits that would occur to existing and new species due to implementation of the mitigation measures;

Losses of existing species are not anticipated from Columbia Solar Project impacts and mitigation measures. Impacts to species would be avoided and minimized to the greatest extent possible through coordination with WDFW and by following the BMPs described above. Currently, noxious weeds are present on each site. Wildlife could benefit from the post-restoration and noxious weed control planned

for each project site. Post-construction restoration would reduce the weeds and increase the number of native plant species on each site, with the intent of increasing general habitat quality.

(f) Address how mitigation measures considered have taken into consideration the probability of success of full and adequate implementation of the mitigation plan;

The proposed Columbia Solar Project mitigation and BMPs included in this application are typical of the wind energy projects developed to date in Kittitas County, and were developed through coordination with landowners, Kittitas County, and WDFW. They are standard and typical for the project size and type. The probability of success and full and adequate implementation of these measures would be increased with oversight from WDFW. Additionally, employing an on-site biological monitor would ensure full and adequate implementation of the minimization and avoidance measures and also increase the probability of success.

(g) Identify future use of any manmade ponds or structures created through construction and operation of the facility or associated mitigation measures, and associated beneficial or detrimental impacts to habitats, fish and wildlife;

No manmade ponds or structures would be created by the Columbia Solar Projects or associated mitigation measures.

(h) Discuss the schedule for implementation of the mitigation plan, prior to, during, and post construction and operation;

Application of the Columbia Solar Project mitigation measures and BMPs described above (Section 3.4.6.3) would avoid and minimize impacts at each site's project-scale analysis area. The implementation schedule for these measures has already begun with site design, but most measures would be implemented during the construction phase. The Post-construction Restoration and Noxious Weed Control would continue according to the Vegetation Management Plan (Appendix B). Compensatory mitigation is not proposed because the impacts are not expected to be significant.

(i) Discuss ongoing management practices that will protect habitat and species, including proposed monitoring and maintenance programs;

3.4.6.4 General County

Ecology conducts water quality monitoring in the area. Through the Ecological Interactions Team, WDFW conducts fish monitoring and improves fish passage barriers through the Yakima Tributary Access and Habitat Program. Kittitas County Conservation District (KCCD) works with farmers regarding riparian habitat and stream issues in the Kittitas Valley. TUUSSO contacted KCCD regarding project specifics and received the details included per site below.

3.4.6.5 Solar Project Sites

Camas Solar Project Site

KCCD has no current projects in the Camas Solar Project area. Several years ago the Bull Ditch Project involved adding a siphon under the creek. There is a known fish passage barrier south of the project site.

Fumaria Solar Project Site and Generation Tie Line

There are several known fish passage barriers along Reecer Creek, for the Fumaria Solar Project or associated generation tie line.

Penstemon Solar Project Site

KCCD has a Salmon Recovery Funding Board Grant to install a fish screen on Brunson's Outtake, which is located on the property upstream from the Penstemon Solar Project site. KCCD has already installed a number of screens along Coleman Creek, and this is currently the most southerly fish barrier.

Typha Solar Project Site and Generation Tie Line

KCCD has no current projects in the vicinity of the Typha Solar Project site or associated generation tie line. Ecology has a sediment study further east on the Ellensburg Power Canal. The Bonneville Power Administration and the Confederated Tribes of the Yakama Nation are proposing to construct the Melvin R. Sampson Hatchery upriver from the project site. The Final EIS is expected to be released in Fall 2017 (Yakima Basin Coho Project, DOE/EIS-0522; Bonneville Power Administration 2017).

Urtica Solar Project Site

KCCD has no current projects in the Urtica Solar Project area.

(j) Mitigation plans should give priority to proven mitigation methods. Experimental mitigation techniques and mitigation banking may be considered by the council on a case-by-case basis. Proposals for experimental mitigation techniques and mitigation banking must be supported with analyses demonstrating that compensation will meet or exceed requirements giving consideration to the uncertainty of experimental techniques, and that banking credits meet all applicable state requirements.

All proposed Columbia Solar Project mitigation is proven; no experimental mitigation techniques are proposed.

(4) Guidelines review. The application shall give due consideration to any project-type specific guidelines established by state and federal agencies for assessment of existing habitat, assessment of impacts, and development of mitigation plans. The application shall describe how such guidelines are satisfied. For example, wind generation proposals shall consider Washington state department of fish and wildlife Wind Power Guidelines, August 2003, or as hereafter amended. Other types of energy facilities shall consider department of fish and wildlife Policy M-5002, dated January 18, 1999, or as hereafter amended.

The State of Washington regulates fish and wildlife with Title 77 of the Revised Code of Washington (RCW) and Title 220 of the Washington Administrative Code. State and protected species regulations are defined in WAC 220-610, which includes provisions for endangered, threatened, and sensitive wildlife species, ESA-listed fish, and bald eagle protection rules. Fish and aquatic habitats are protected under RCW 77.55, commonly referred to as the Hydraulic Code. Any environmental impacts that could occur in waters of the state below the OHWM would need to be addressed in a Hydraulic Project Approval process. Sections 3.4.3, 3.4.4, and 3.4.5 evaluate the potential for construction and operation impacts on habitats, fish, and wildlife. No significant impacts would occur from the proposed Columbia Solar Projects, therefore this project would comply with state habitat, fish, and wildlife guidelines.

Washington's *State Wildlife Action Plan* (SWAP) is a comprehensive plan for conserving the state's fish and wildlife and their habitats (WDFW 2015). The purposes of the SWAP are to inform conservation priorities and to guide conservation actions statewide.

(5) Federal approvals. The application shall list any federal approvals required for habitat, vegetation, fish and wildlife impacts and mitigation, status of such approvals, and federal agency contacts responsible for review.

Section 7 of the ESA requires an analysis of the effects of major construction projects on any federally listed or proposed threatened or endangered species that may use the Columbia Solar Project sites, if there is a federal nexus. Consultation with the USFWS and National Oceanic and Atmospheric Administration (NOAA) NMFS is necessary if any threatened or endangered species would be affected by a project. Applicable regulations are found in 50 CFR 17. In cases where a project does not require the approval, funding, or conduct of a federal agency, Section 10 of the ESA provides a parallel process whereby non-federal entities may consult with the USFWS or NMFS and acquire a take statement for incidental adverse effects or take of listed species by the project. Because the project does not have a federal nexus and also would not affect any federally-listed threatened or endangered species, ESA Section 7 and Section 10 consultation were not conducted for the proposed solar projects.

The MBTA (16 USC 703–711) prohibits the taking, killing, or possession of migratory birds, except as allowed by the Secretary of the Interior. The list of migratory birds is found in 50 CFR 10, and permit regulations are found in 50 CFR 21.

The federal BGEPA (16 CFR 668-668c) prohibits the taking, possession, purchase, sale, barter, transport, export, or import of any bald or golden eagle or any part, nest, or egg of a bald or golden eagle, except for certain scientific, exhibition, and religious purposes. Eagle permit regulations are found in 50 CFR 22.

3.5 Wetlands 463-60-333

The application shall include a report for wetlands prepared by a qualified professional wetland scientist. For purposes of this section, the term "project site" refers to the site for which site certification is being requested, and the location of any associated facilities or their right of way corridors if applicable. The report shall include, but not be limited to, the following information:

(1) Assessment of existing wetlands present and their quality. The assessment of the presence and quality of existing wetlands shall include:

(a) A wetland delineation performed by a qualified professional according to the Washington State Wetlands Delineation and Identification Manual, 1997, and associated data sheets, site maps with data plots and delineated wetlands areas, photographs, and topographic and aerial site maps.

3.5.1 Affected Environment for Wetland Delineations

3.5.1.1 General County

Wetlands are defined as areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and which under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. The methods used to delineate wetlands within the Columbia Solar Project sites conform to guidance in the *Washington State Wetland Identification and Delineation Manual* (Ecology 1997), the *Corps of Engineers Wetland Delineation*

Manual (Environmental Laboratory 1987), and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0)* (USACE 2008).

To be considered a wetland by the USACE, an area must express hydrophytic vegetation, hydric soils, and wetland hydrology. During the five Columbia Solar Project site surveys conducted from April 3 through 12, 2017, site conditions were documented for these parameters in areas representative of each project site and in areas most likely to exhibit wetland features. Staff collected additional data in associated uplands, as needed, to confirm wetland boundaries. Wetland boundaries, stream boundaries, and wetland data plot locations within each of the five project sites were recorded with a Trimble Geo XT GPS unit with submeter accuracy. All delineated wetlands and streams were processed and projected onto existing base maps using ArcGIS software.

A total of 16 wetlands were delineated within the Columbia Solar Project sites, one on the Camas Solar Project site, six on the Fumaria Solar Project site (one on the solar project site and five along the generation tie line), one on the Penstemon Solar Project site, five on the Typha Solar Project site (three only on the solar project site, one only on the generation tie line, and one on both), and three on the Urtica Solar Project site. Wetlands were distinguished from adjoining uplands by the presence or absence of indicators for wetland hydrology, hydric soils, and hydrophytic vegetation.

All of the wetlands within the five Columbia Solar Project sites are classified as either Palustrine Emergent (PEM) or Palustrine Scrub-shrub (PSS) wetlands based on the *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al. 1979). The Palustrine system includes all non-tidal wetlands dominated by trees, shrubs, persistent emergent species, and/or emergent mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean-derived salts is below 0.5 parts per thousand (Cowardin et al. 1979). The following two sub-classes occur within the five project sites: 1) Emergent wetlands, which are dominated by species that normally remain standing at least until the beginning of the next growing season and 2) Scrub-shrub wetlands, which are dominated by woody vegetation less than 6 meters tall, which includes true shrubs, young trees, and trees or shrubs that are small or stunted because of environmental conditions (Cowardin et al. 1979).

In addition, wetlands within the five Columbia Solar Project sites were classified as either Riverine, Slope, or Depressional based on *Hydrogeomorphic Wetland Classification System: An Overview and Modification to Better Meet the Needs of the Natural Resources Conservation Service* (NRCS 2008). Definitions for these classifications can be found in Section 3.5.2.

Table 3.5-1 summarizes the size, rating, and classification of wetlands found within each of five Columbia Solar Project sites. All delineated wetlands would fall under the jurisdiction of the USACE, Ecology, and Kittitas County. Detailed descriptions of each wetland within the solar project sites are provided in the Critical Areas Wetland and Waters Delineation Reports for each site, which also include a list of vegetation observed within each project site, wetland delineation data sheets, ground-level site photographs, and wetland rating forms.

Table 3.5-1. Wetland Size, Rating, and Classification for Wetlands within the Study Areas for Each Columbia Solar Project Site

Wetland Name	Delineated Area within the Project (Wetland Rating Unit Size)[1] (acres)	Wetland Rating[2]	Hydrogeomorphic Classification[3]	Cowardin Classification[4]	Dominant Species Observed within Wetland
Camas Solar Project Site					
CW01	0.97 (1.72)	III	Riverine	PEM	Reed canary grass, broad-leaf cat-tail, pale-yellow iris
Fumaria Solar Project Site					
FW01	0.00 (estimated 5.57)	III	Slope	PEM	Reed canary grass, Fuller's teasel, sedge species
Fumaria Solar Project Generation Tie Line					
FW02	0.24 (estimated 2.15)	II	Riverine	PEM	Creeping wild rye, dock-leaf smartweed, yellow nutsedge, curly dock
FW03	0.03 (estimated 0.58)	III	Depressional	PEM	Reed canary grass, broad-leaf cat-tail
FW04	0.03 (estimated 0.23)	III	Riverine	PEM/PSS	Reed canary grass, broad-leaf cat-tail, crack willow
FW05	0.20 (estimated 1.67)	IV	Riverine	PEM	Reed canary grass
FW06	0.005 (0.005)	IV	Depressional	PEM	Broad-leaf cat-tail
Penstemon Solar Project Site					
PW01	0.00 (0.14)	III	Depressional	PEM	Remnant cattail along southern property boundary
Typha Solar Project Site					
TW01	0.07 (estimated 0.33)	II	Riverine	PEM/PSS	Narrow-leaf willow, Nootka rose, red osier dogwood, common panic grass, hairy cat's-ear
TW02	0.42 (estimated 0.68)	II	Riverine	PEM	Baltic rush, tall fescue, common timothy, reed canary grass, Fuller's teasel
TW03	0.80 (estimated 8.45)	II	Riverine	PEM/PSS	Reed canary grass, common duckweed, Rocky Mountain iris, bluegrass
TW04	0.05 (0.05)	III	Depressional	PEM	Broad-leaf cat-tail, reed canary grass, tall fescue
Typha Solar Project Generation Tie Line					
TW03	0.06 (estimated 8.45)	II	Riverine	PEM/PSS	Reed canary grass, common duckweed, Rocky Mountain iris, and bluegrass
TW05	0.03 (estimated 0.47)	III	Riverine	PEM	Broad-leaf cat-tail, reed canary grass, Baltic rush
Urtica Solar Project Site					
UW01	0.05 (0.05)	III	Depressional	PEM	Reed canary grass, broad-leaf cat-tail, common duckweed
UW02	0.13 (0.97)	III	Depressional	PEM	Reed canary grass, curly dock, lamp rush, broad-leaf cat-tail
UW03	0.01 (1.19)	III	Depressional	PEM	Reed canary grass, broad-leaf cat-tail, colonial bent grass, curly dock, lamp rush

1. Wetland rating unit size is the total area of wetland delineated or estimated based on aerial photograph interpretation and field reconnaissance. Area of delineated portions of the wetlands is based on SWCA survey data.
2. Wetland ratings are based on Hruby (2014).
3. NRCS (2008).
4. Cowardin et al. (1979).

3.5.1.2 Solar Project Sites

See Figures 3.5-1 through 3.5-15 for the locations of delineated wetland and water features and data plots throughout each of the five Columbia Solar Project sites.

(b) A description of wetland categories found on the site according to the Washington state wetland rating system found in Western Washington, Ecology Publication #93-74 and Eastern Washington, Ecology Publication 391-58, or as revised by the department of ecology.

3.5.2 Affected Environment for Wetland Categories

3.5.2.1 General County

Wetlands within each of the five Columbia Solar Project sites were rated using the *Washington State Wetland Rating System for Eastern Washington, 2014 Update* (Hruby 2014). Table 3.5-2 defines criteria for each wetland rating category.

Table 3.5-2. Washington State Department of Ecology Wetland Rating System Categories

Category I	Category II	Category III	Category IV
Category I wetlands: Represent a unique or rare wetland type; are more sensitive to disturbance than most wetlands; are relatively undisturbed and contain ecological attributes that are impossible to replace within a human lifetime; or provide a high level of functions. Specific wetlands that meet the Category I criteria include: 1. alkali wetlands, characterized by the presence of shallow saline water with a high pH; 2. natural heritage wetlands, specifically, wetlands identified by the Washington Natural Heritage Program/DNR as high quality relatively undisturbed wetlands; and wetlands that support state-listed threatened or endangered plants; 3. bogs and calcareous fens; 4. mature and old-growth forested wetlands with slow growing trees that are over 0.25 acre in size; and 5. wetlands that perform many functions very well, as indicated by a score of 22 or more points out of 27 on the wetland rating form.	Category II wetlands: Wetlands that are difficult, though not impossible, to replace, and provide high levels of some functions. Specific wetlands that meet the Category II criteria include: 1. forested wetlands in the floodplains of rivers; 2. mature and old-growth forested wetlands with fast growing trees that are over 0.25 acre in size; 3. vernal pool that are located in a landscape with other wetlands and that are relatively undisturbed during the early spring; and 4. wetlands scoring between 19 and 21 points, out of 27, on the wetland rating form.	Category III wetlands: Wetlands that provide a moderate level of functions. Specific wetlands that meet the Category III criteria include: 1. wetlands scoring between 16 and 18 points, out of 27, on the wetland rating form.	Category IV wetlands: Wetlands that have the lowest levels of functions and are heavily disturbed. Specific wetlands that meet the Category IV criteria include: 1. wetlands scoring less than 16 points out of 27 on the wetland rating form.

Source: Hruby (2014).

A total of 16 wetlands were delineated within the Columbia Solar Project sites and rated using field observations and desktop analysis to determine the wetland rating category for each wetland area. Refer to Table 3.5-3 for the wetland rating categories, minimum wetland protection buffers (according to guidance in KCC 17A.04.020, and total size for wetlands within each of the solar project sites.

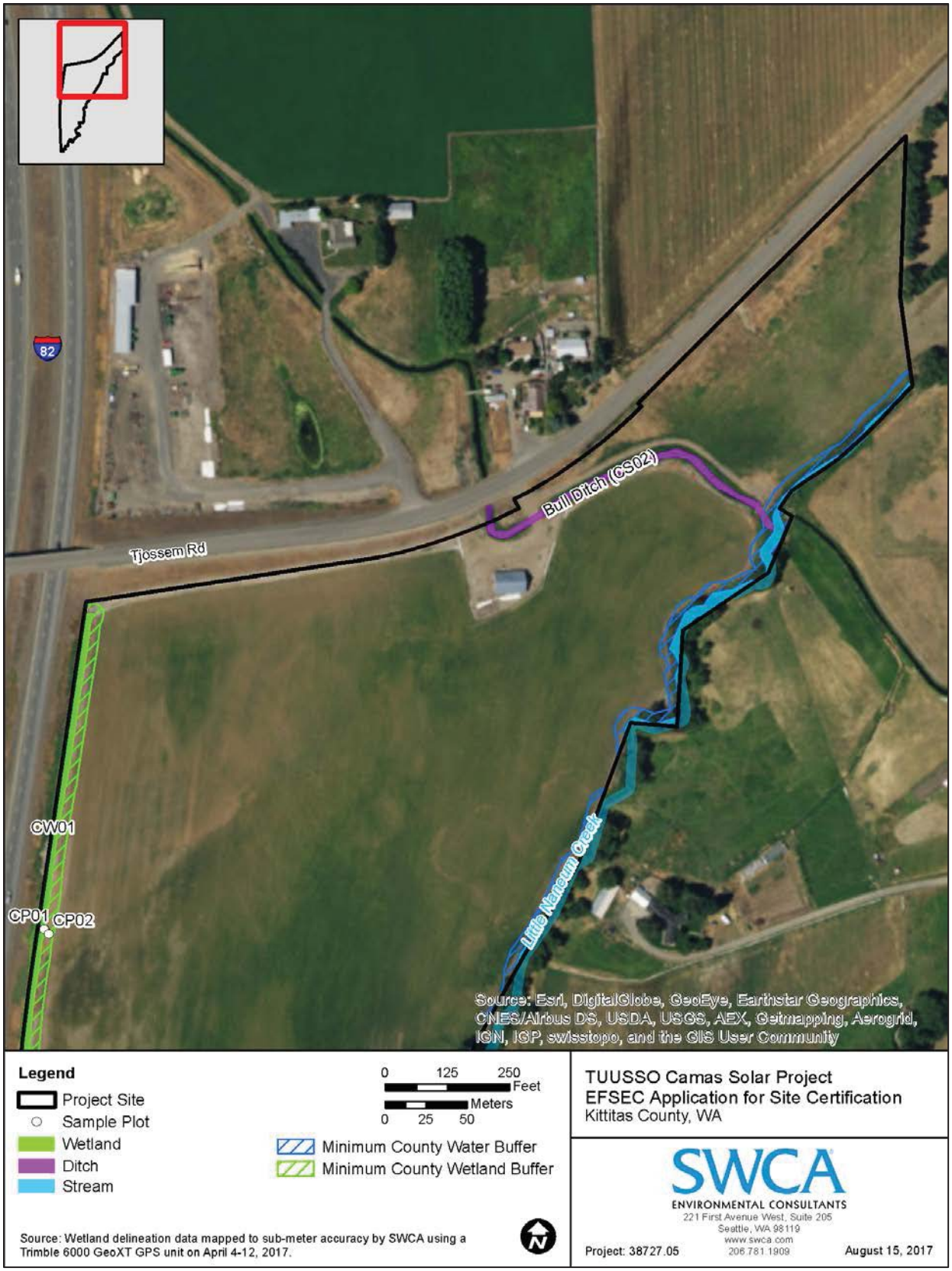


Figure 3.5-1. Camas Solar Project site map showing water resources, north portion.

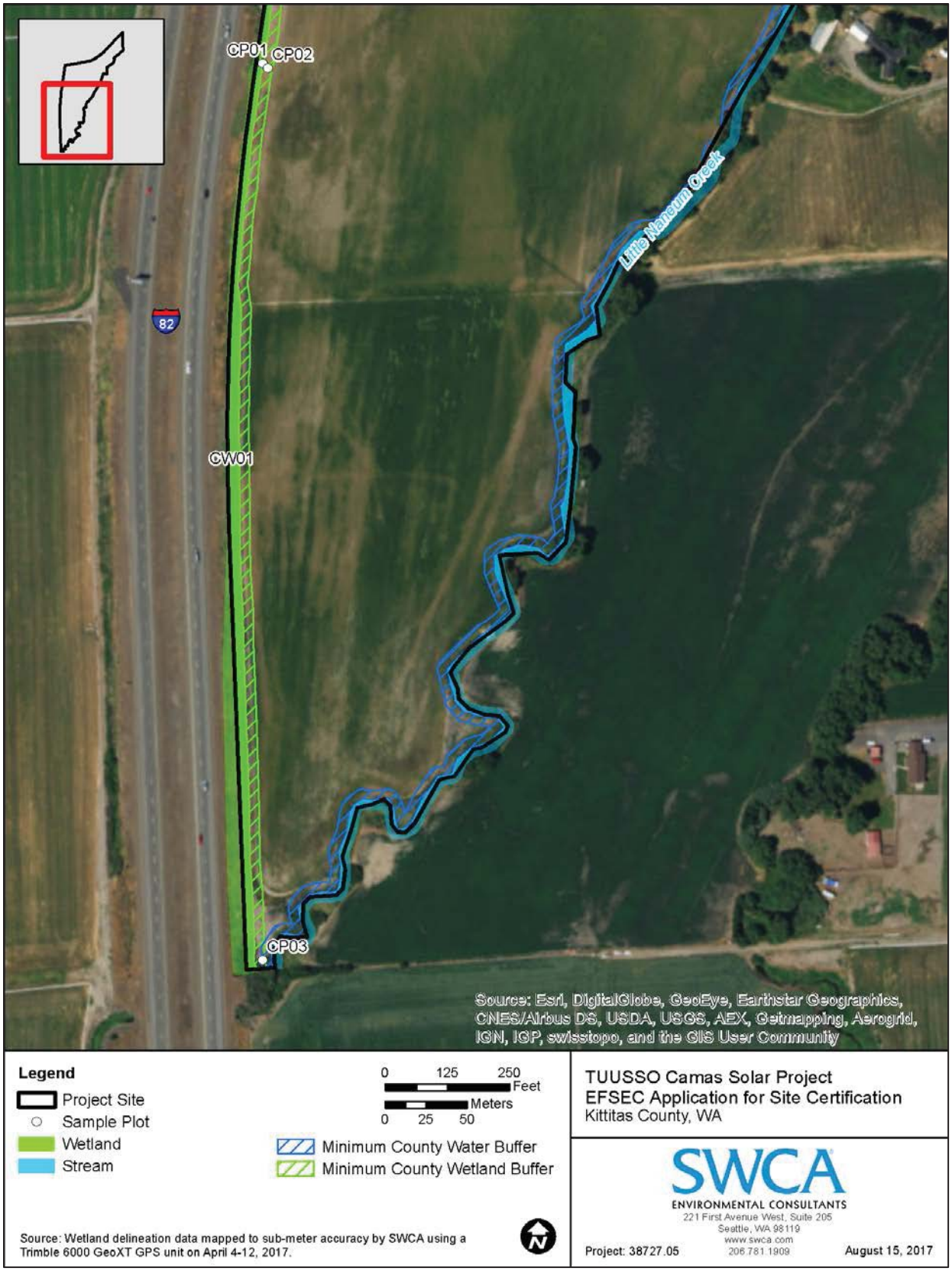


Figure 3.5-2. Camas Solar Project site map showing water resources, south portion.



Figure 3.5-3. Fumaria Solar Project site map showing water resources, Map 1 of 8.

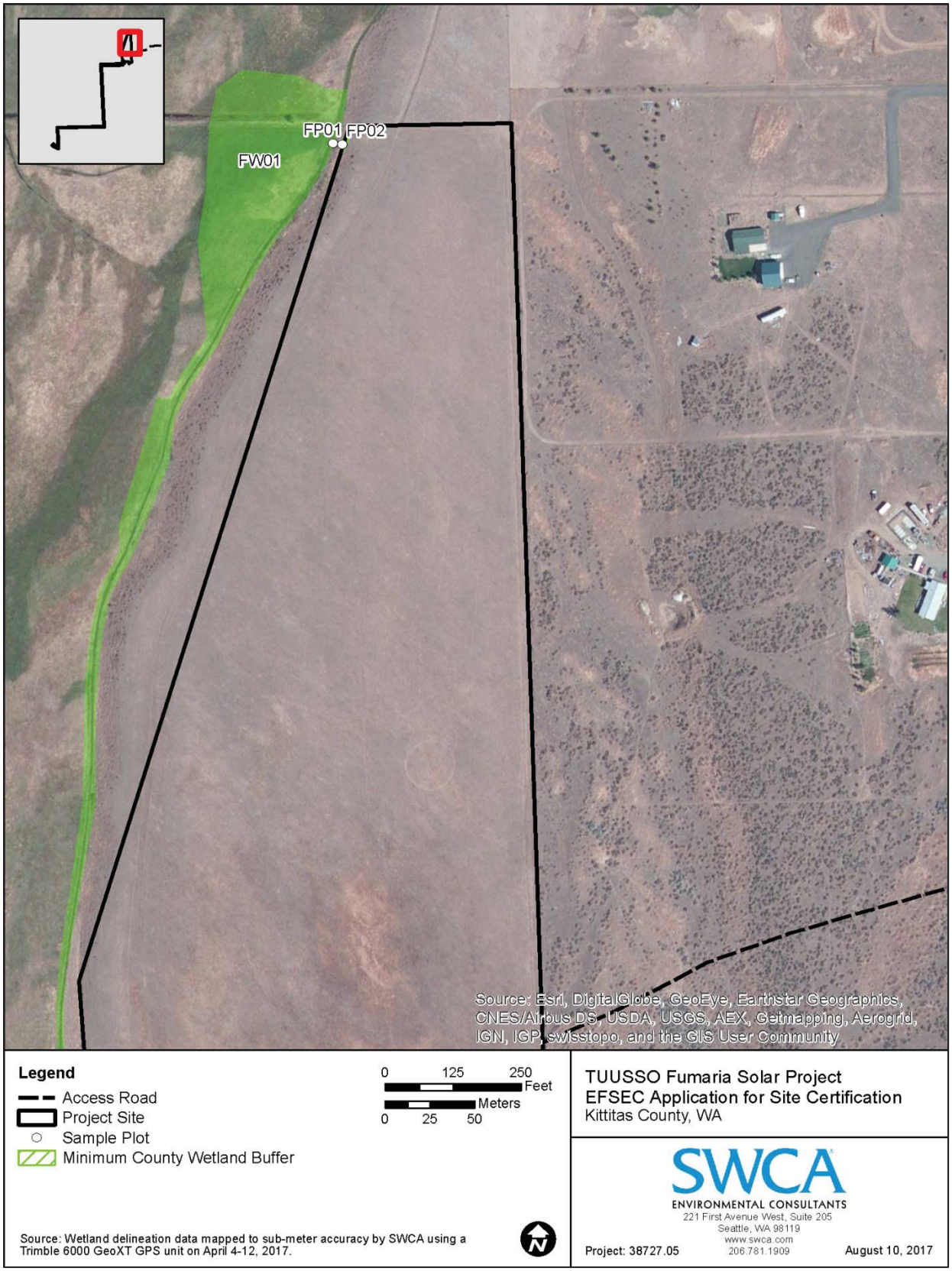


Figure 3.5-4. Fumaria Solar Project site map showing water resources, Map 2 of 8.

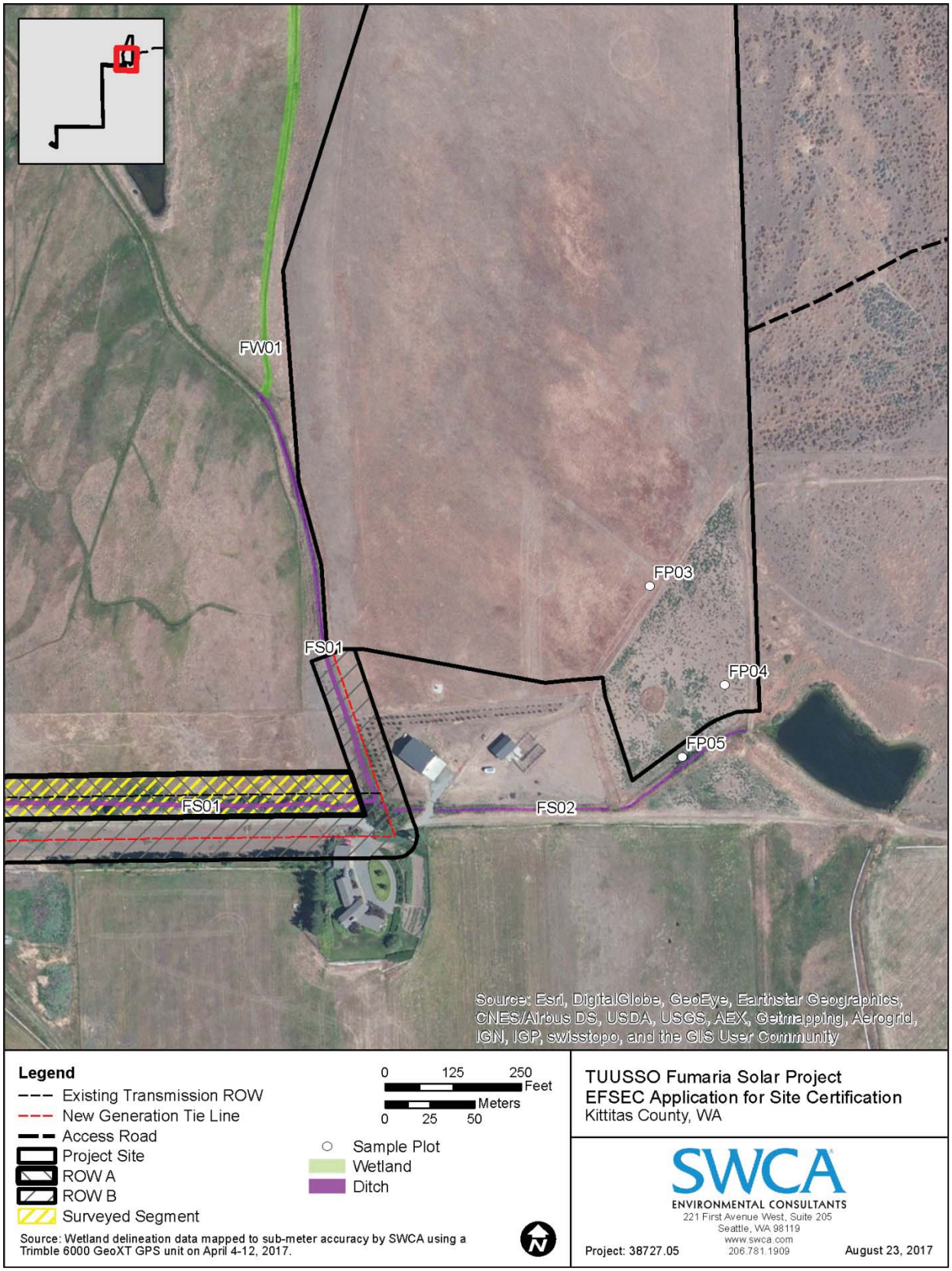


Figure 3.5-5. Fumaria Solar Project site map showing water resources, Map 3 of 8.

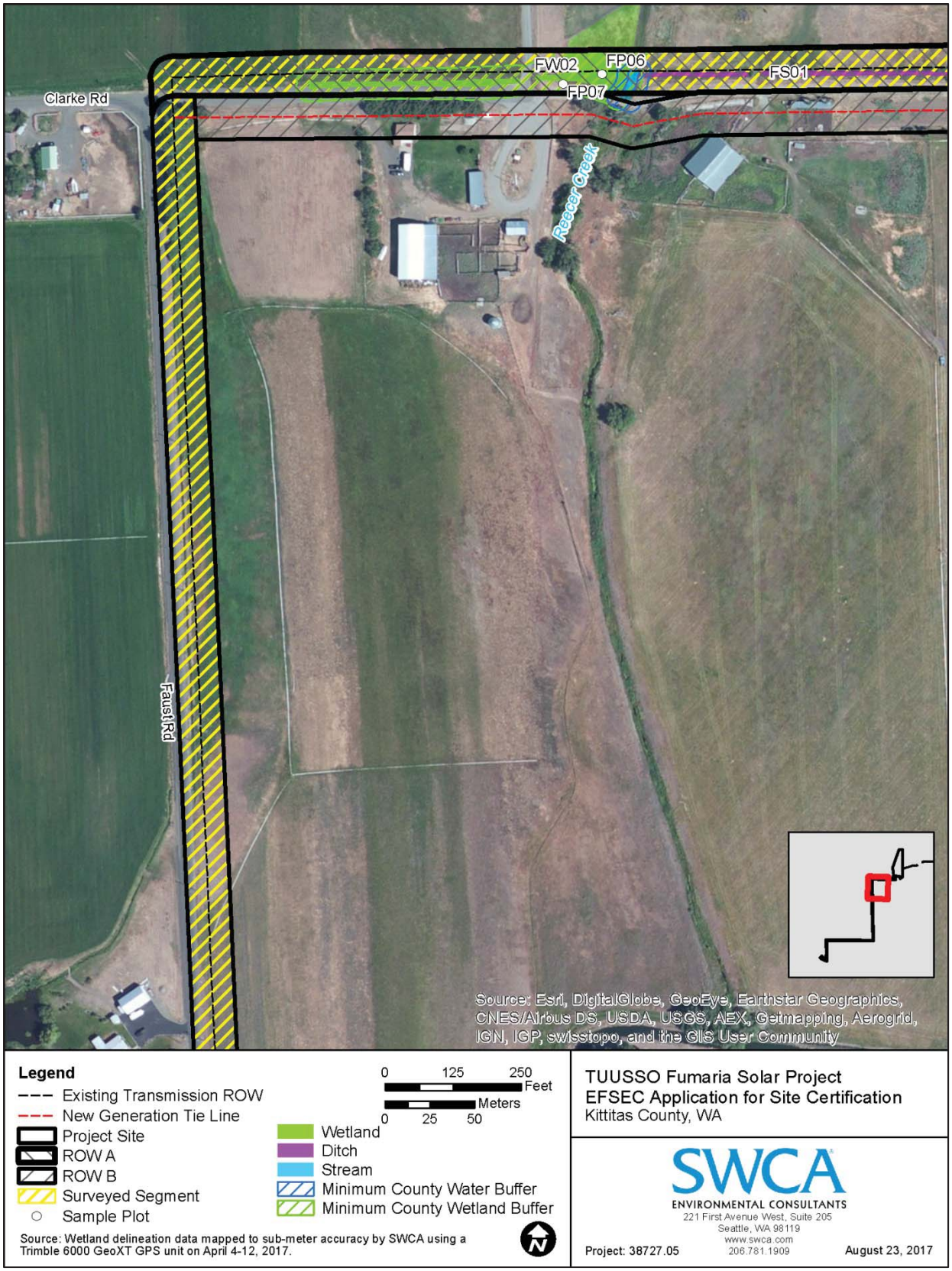


Figure 3.5-6. Fumaria Solar Project site map showing water resources, Map 4 of 8.

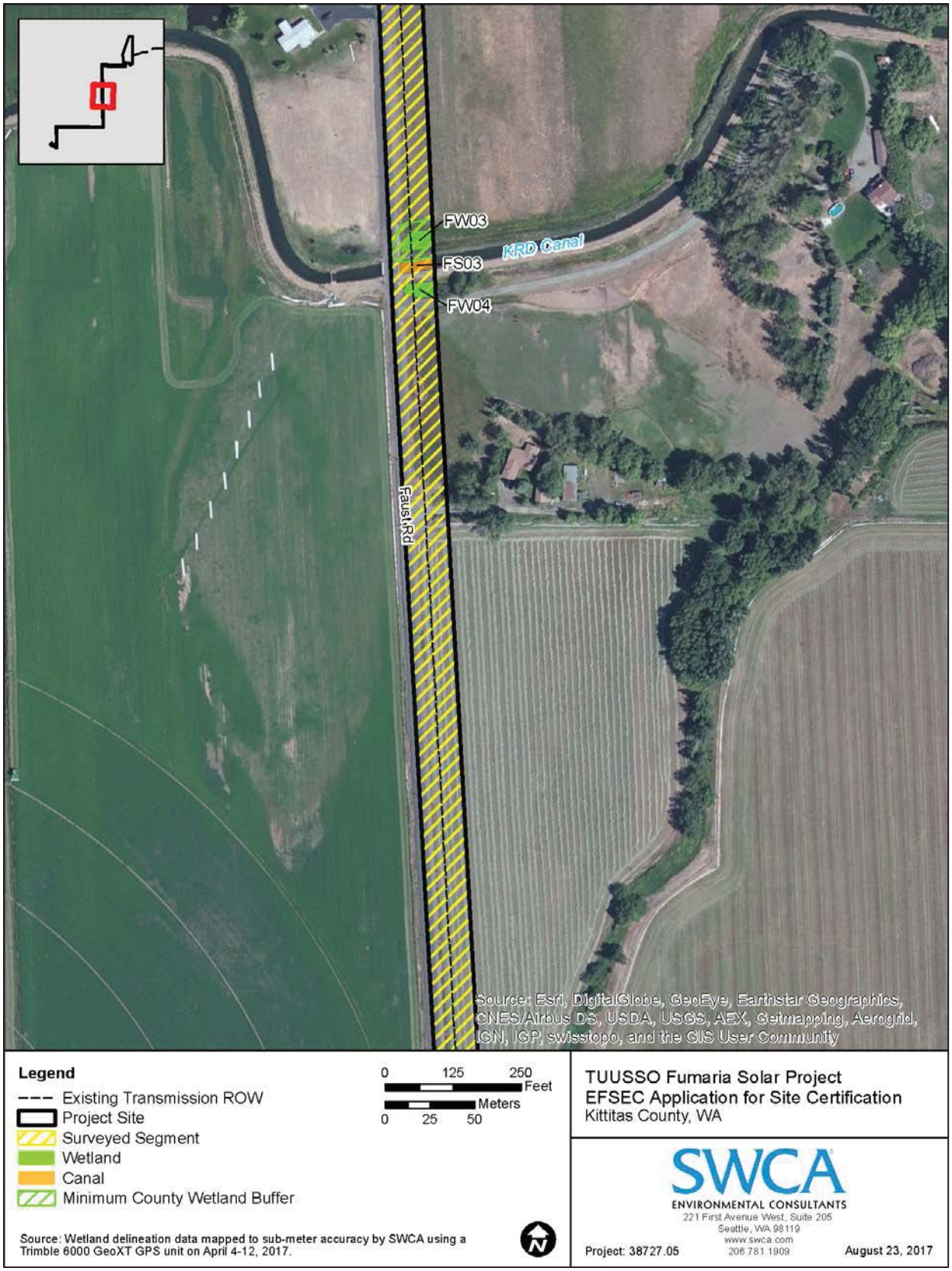


Figure 3.5-7. Fumaria Solar Project site map showing water resources, Map 5 of 8.

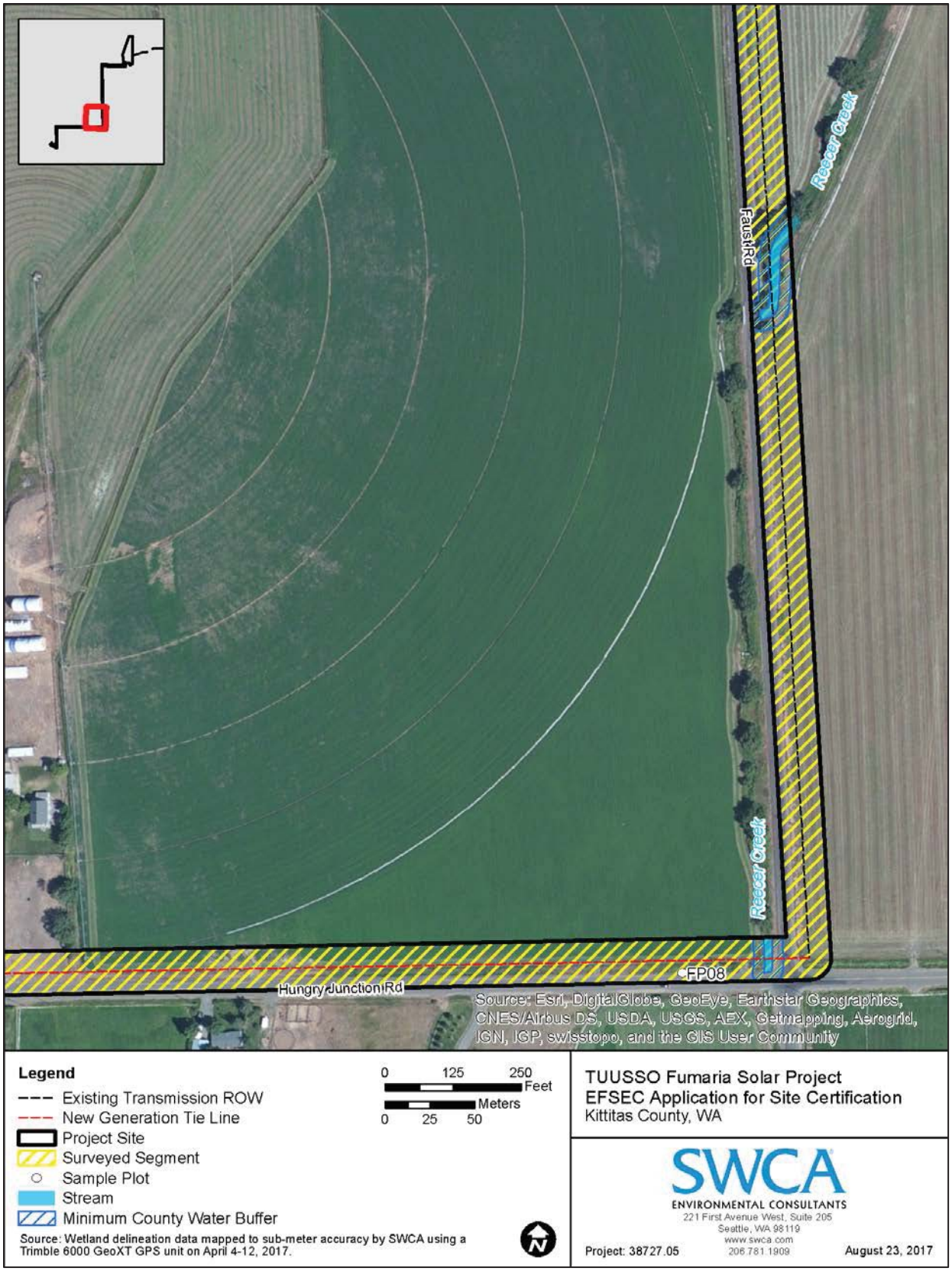


Figure 3.5-8. Fumaria Solar Project site map showing water resources, Map 6 of 8.

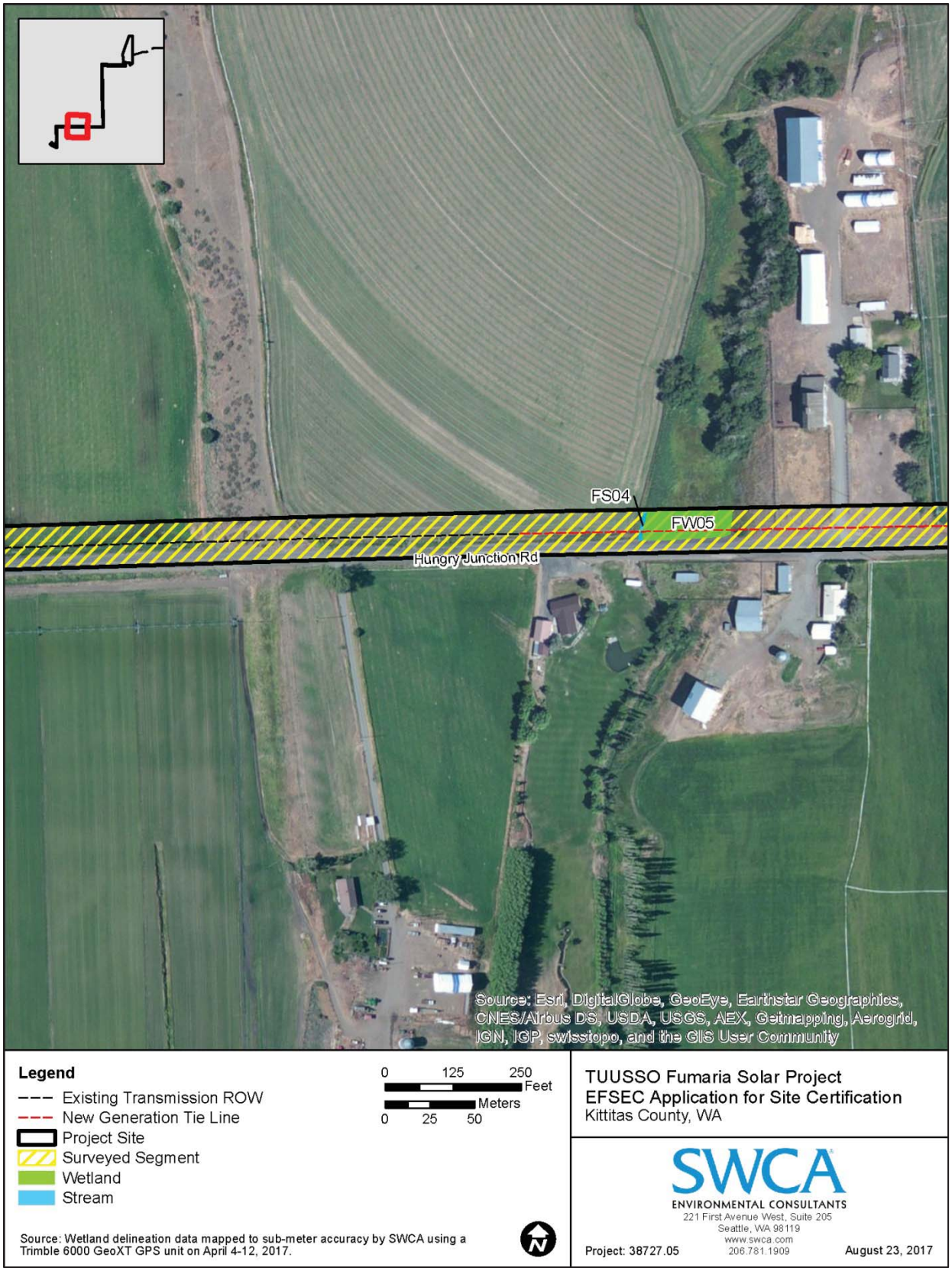


Figure 3.5-9. Fumaria Solar Project site map showing water resources, Map 7 of 8.

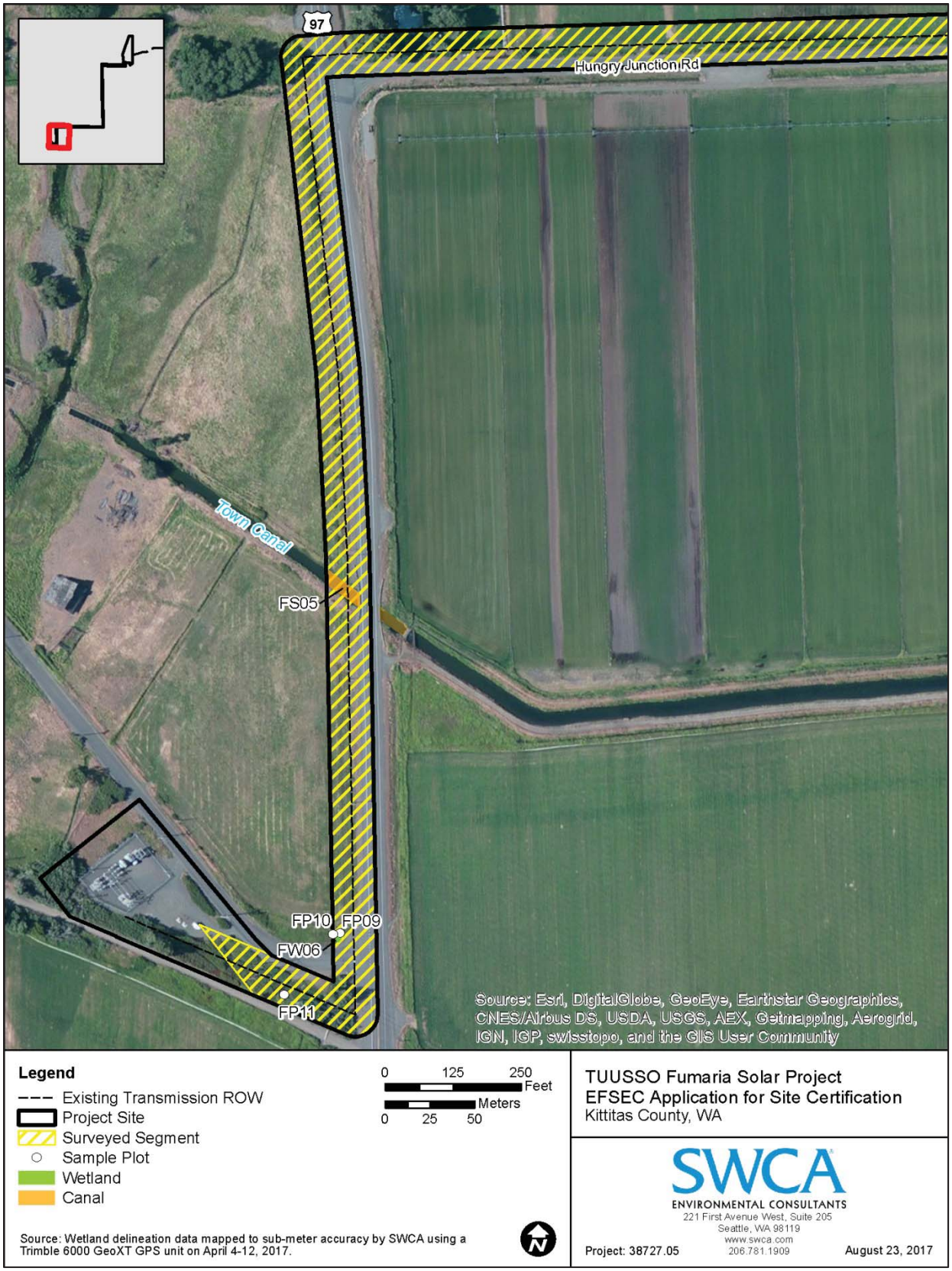


Figure 3.5-10. Fumaria Solar Project site map showing water resources, Map 8 of 8.

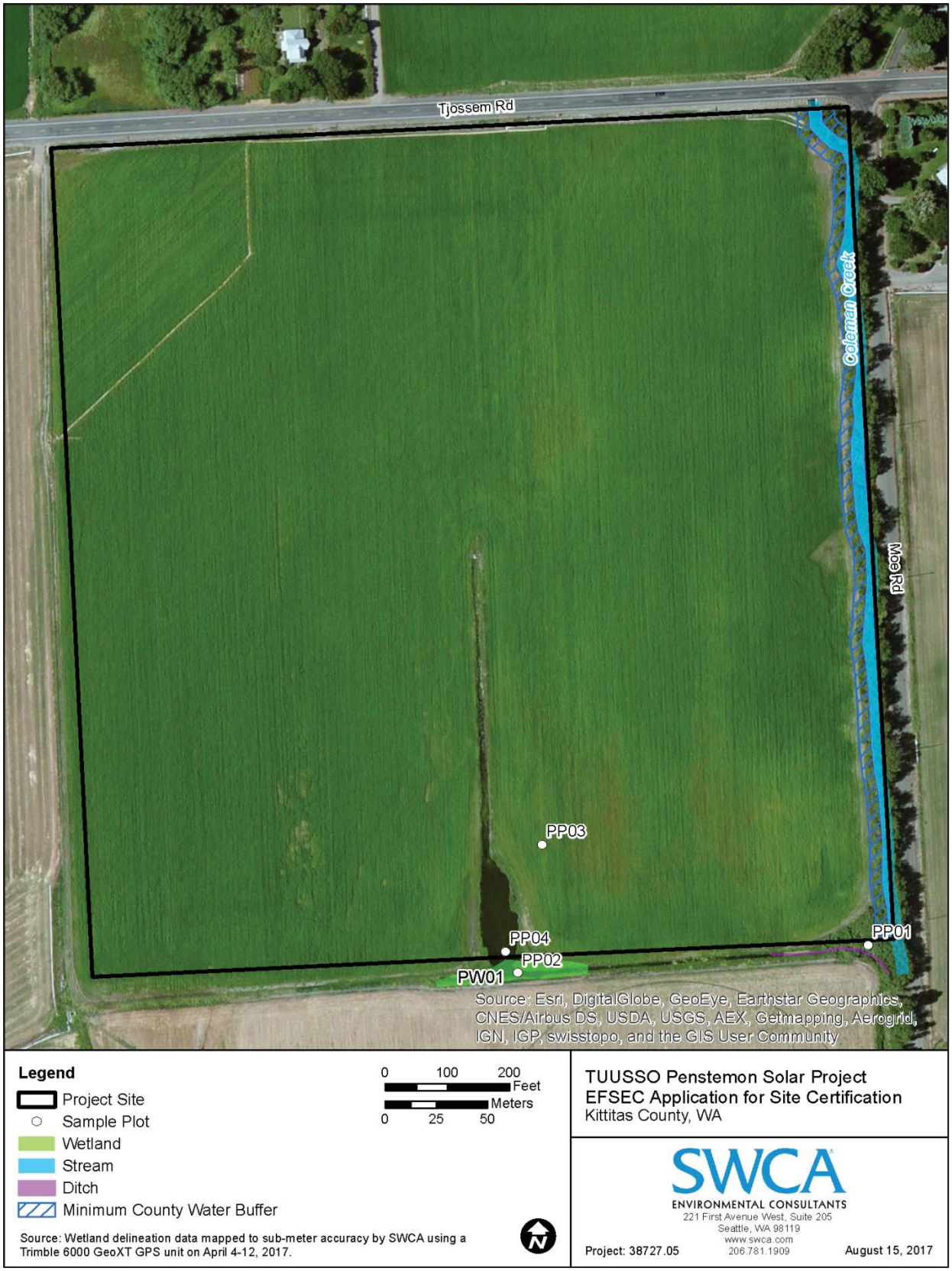


Figure 3.5-11. Penstemon Solar Project site map showing water resources.

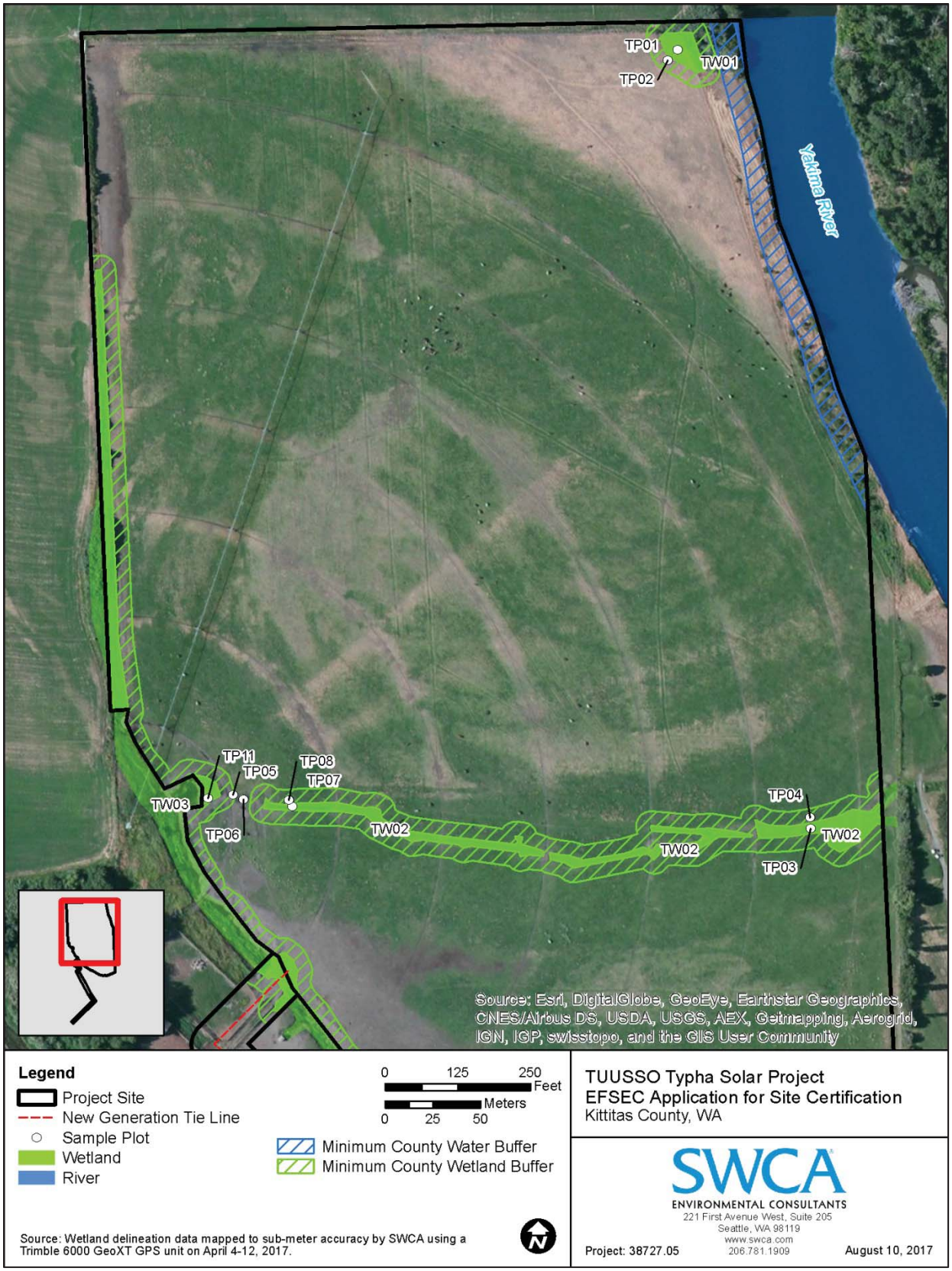


Figure 3.5-12. Typha Solar Project site map showing water resources, north portion.

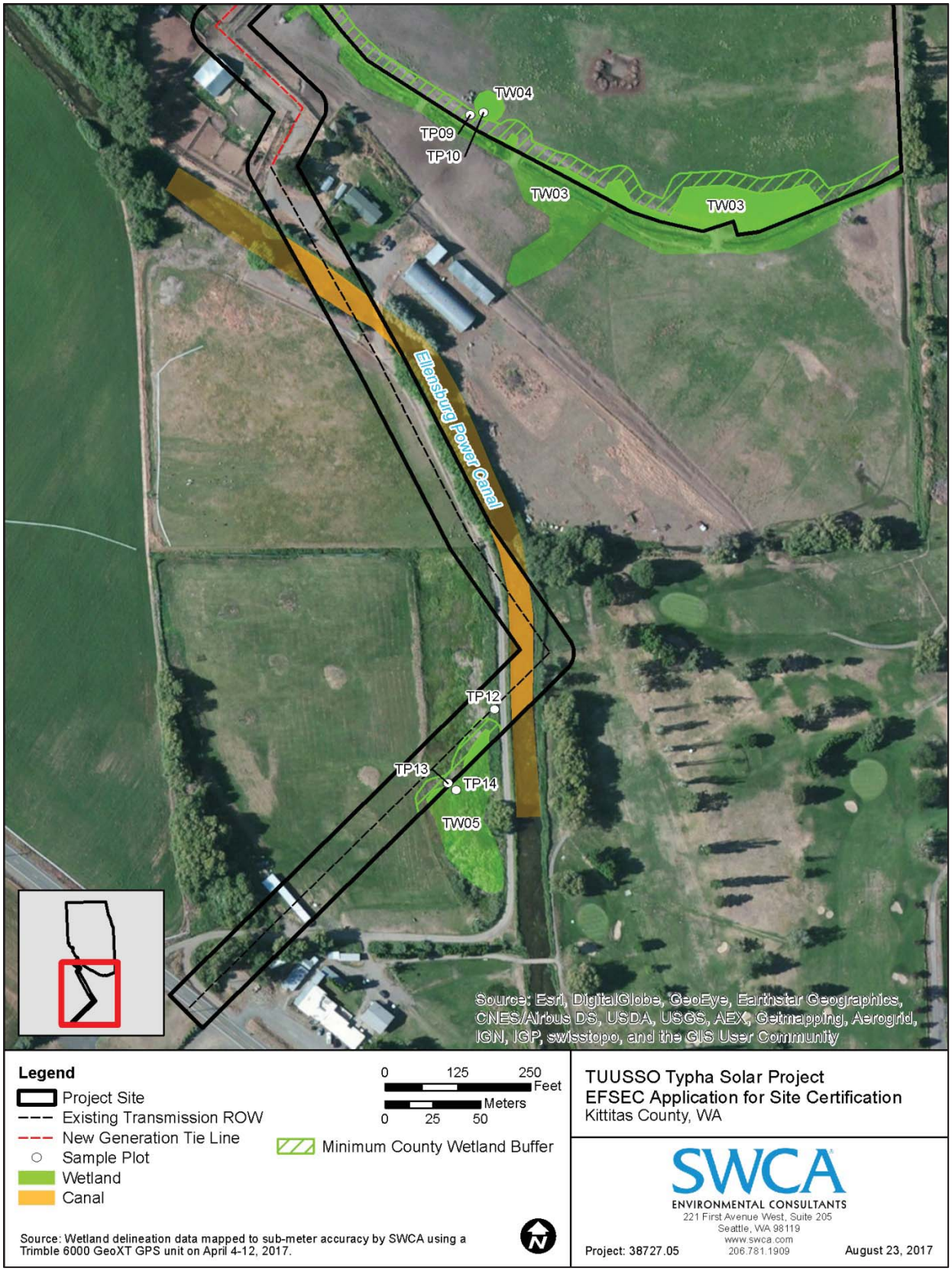


Figure 3.5-13. Typha Solar Project site map showing water resources, south portion.

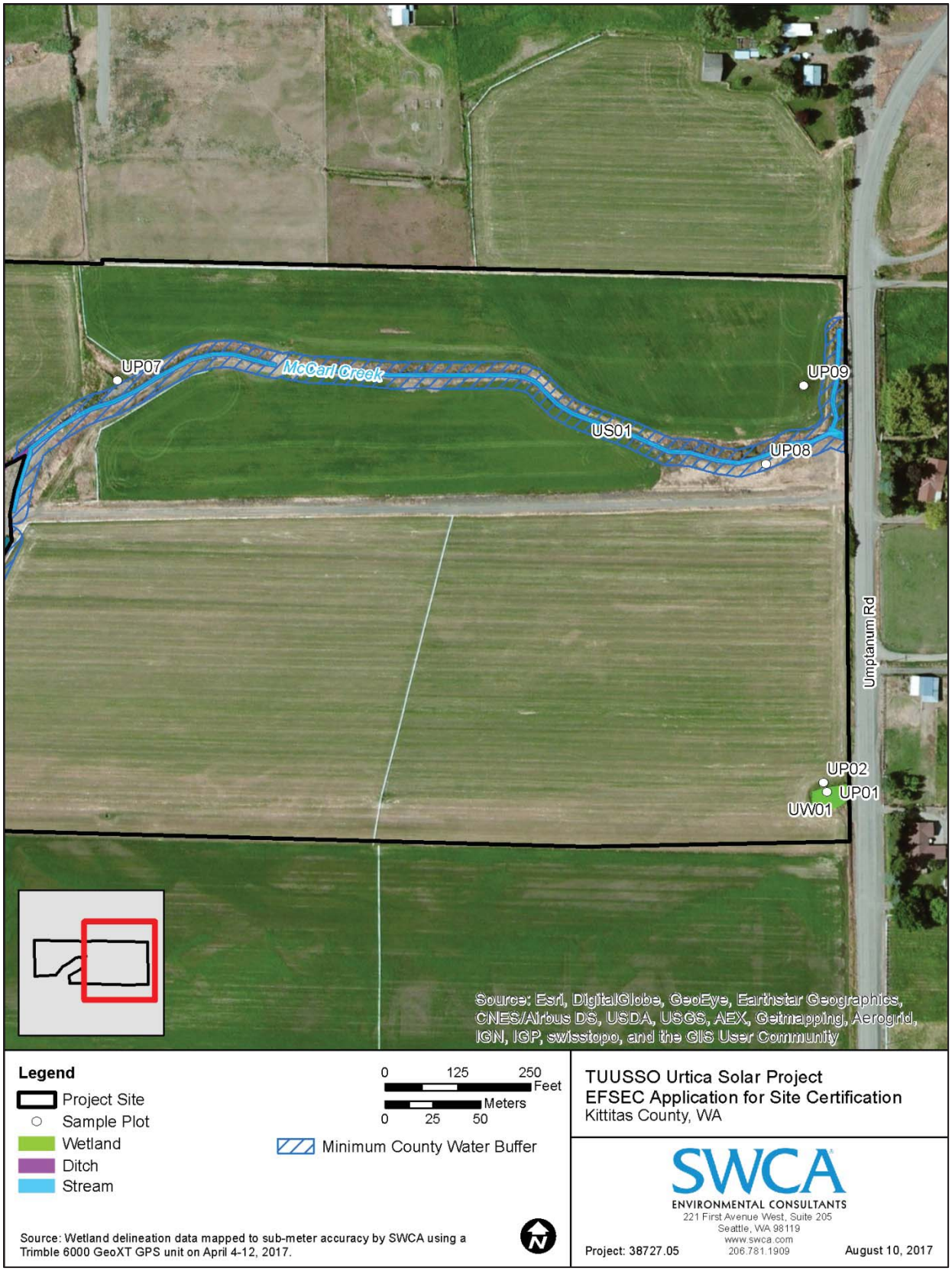


Figure 3.5-14. Urtica Solar Project site map showing water resources, east portion.

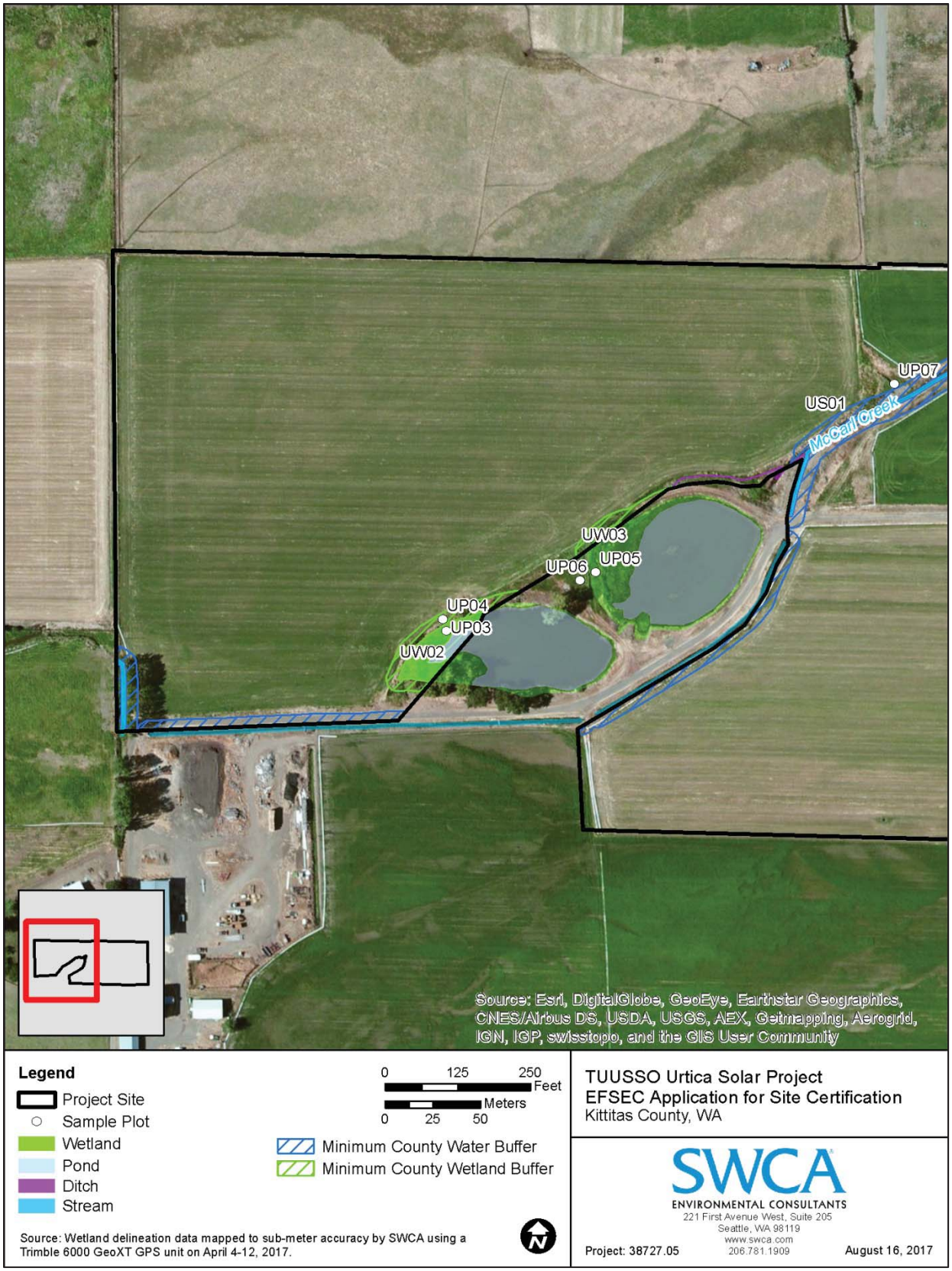


Figure 3.5-15. Urtica Solar Project site map showing water resources, west portion.

Table 3.5-3. Wetland Rating and Minimum Buffer Distance Summary for each Columbia Solar Project Site

Wetlands	Wetland Rating[1]	Kittitas County Minimum Buffer Distance (feet)[2]	Total Size of Wetland Within the Project (acres)[3]
Camas Solar Project Site			
CW01	III	20	0.97
Fumaria Solar Project Site			
FW01	III	20	0.00
Fumaria Solar Project Generation Tie Line			
FW02	II	25	0.24
FW03	III	20	0.03
FW04	III	0[4]	0.03
FW05	IV	0[4]	0.20
FW06	IV	0[4]	0.005
Penstemon Solar Project Site			
PW01	III	0[4]	0.00
Typha Solar Project Site			
TW01	II	25	0.07
TW02	II	25	0.42
TW03	II	25	0.80
TW04	III	0[4]	0.05
Typha Solar Project Generation Tie Line			
TW03	II	25	0.06
TW05	III	20	0.03
Urtica Solar Project Site			
UW01	III	0[4]	0.05
UW02	III	20	0.13
UW03	III	20	0.01

1. II = Category II, III = Category III, IV = Category IV (Hruby 2014).
2. Minimum buffer distances are depicted on maps.
3. Does not include buffer areas.
4. No Kittitas County buffer is defined because the wetland area is below the minimum size threshold for protection or is rated as a Category IV; however, building setbacks may be required based on zoning lot line setbacks, but would not exceed 25 feet.

3.5.2.2 Solar Project Sites

Detailed descriptions of each wetland within the Columbia Solar Project sites and their wetland rating forms are provided in the Critical Areas Wetland and Waters Delineation Reports for each site. Below are descriptions of the wetland rating for wetlands within each solar project site.

Camas Solar Project Site

CW01

Camas Wetland CW01 is rated as a Category III wetland in the Ecology rating system (see Figures 3.5-1 and 3.5-2), with a moderately low score for water quality improvement (5/9 points) and moderate scores for hydrologic function and habitat function (6/9 points). Wetland CW01 has moderate potential to provide water quality function and hydrologic function because it has ungrazed herbaceous vegetation, has a floodplain wider than its channel, is located in an area with intensive land use that generates pollutants, and discharges to a fork of Naneum Creek with water quality and flooding issues. Wetland CW01 has moderate potential to provide habitat function because it contains some vegetation structure diversity and

open water, and is adjacent to three priority habitats including biodiversity areas and corridors, riparian, and instream habitat in Little Naneum Creek.

Fumaria Solar Project Site

FW01

Fumaria Wetland FW01 is rated as a Category III wetland in the Ecology rating system (see Figures 3.5-4 and 3.4-5), with moderately low scores for water quality improvement (5/9 points) and habitat function (5/9 points), and a moderate score for hydrologic function (6/9 points). Wetland FW01 has low potential to provide water quality improvement because slope wetlands do not retain water or excess nutrients. Wetland FW01 has moderate hydrologic function because the surrounding landscape is pasture land and is situated in the Reecer Creek basin where flooding problems occur.

Fumaria Solar Project Generation Tie Line

FW02

Fumaria Wetland FW02 is rated as a Category II wetland in the Ecology rating system (see Figure 3.5-6), with a moderate score for water quality improvement (6/9 points), a high score for hydrologic function (8/9 points), and a moderately low score for habitat function (5/9 points). Wetland FW02 has a moderately high potential to provide hydrologic functions because it is more than twice the width of the adjacent Reecer Creek channel and it has the potential to slow down water movement to help reduce flooding issues directly downstream in Reecer Creek.

FW03

Fumaria Wetland FW03 is rated as a Category III wetland in the Ecology rating system (see Figure 3.5-7), with a moderately high score for water quality improvement (7/9 points) and moderately low scores for hydrologic and habitat functions (5/9 points). Wetland FW03 has a moderately high potential to provide water quality improvements because it is dominated by ungrazed vegetation, has seasonal ponding over half of the wetland area, and is located in a basin where there are total maximum daily loads (TMDLs) defined (Cascade Irrigation District Canal).

FW04

Fumaria Wetland FW04 is rated as a Category III wetland in the Ecology rating system (see Figure 3.5-7), with moderately high scores for water quality improvement and hydrologic function (7/9 points) and a low score for habitat function (4/9 points). Wetland FW04 has moderately high potential to provide water quality improvement and hydrologic function because the majority of it is a depression, all of it is ungrazed, there are TMDLs defined in the same basin (Cascade Irrigation District Canal), the ratio of the wetland width to the adjacent channel width is greater than one, and there are flooding problems in the basin immediately down-gradient (Reecer Creek).

FW05

Fumaria Wetland FW05 is rated as a Category IV wetland in the Ecology rating system (see Figure 3.5-9), with a moderately high score for hydrologic function (7/9 points) and low scores for water quality improvement and habitat function (4/9 points). Wetland FW05 has a moderately high potential to provide hydrologic functions because it has a width greater than two times the width of the stream channel, ungrazed vegetation dominates the wetland, and there are flooding problems down-gradient of the wetland (Yakima River).

FW06

Fumaria Wetland FW06 is rated as a Category IV wetland in the Ecology rating system (see Figure 3.5-10), with a moderately high score for water quality improvement (7/9 points), low score for hydrologic function (4/9 points), and a very low score for habitat function (3/9 points). Wetland FW06 has a moderately high potential to provide water quality improvements because it is dominated by ungrazed vegetation, has a relatively constrained outlet, and eventually discharges into a stream on the Clean Water Act (CWA) 303(d) List that also has defined TMDLs (Dry Creek).

Penstemon Solar Project Site

PW01

Penstemon Wetland PW01 is rated as a Category III wetland in the Ecology rating system (see Figure 3.5-11), with moderate scores for hydrologic function and water quality improvement (6/9 points) and a moderately low score for habitat function (5/9 points). Wetland PW01 has a moderate potential to provide water quality function and hydrologic function because it has an intermittently flowing surface water outlet, it is located in an area with intensive land use that generates pollutants, and it discharges to Coleman Creek, which has water quality and flooding issues.

Typha Solar Project Site

TW01

Typha Wetland TW01 is rated as a Category II wetland in the Ecology rating system (see Figure 3.5-12), with a moderately high score for water quality improvement (7/9 points) and moderate scores for hydrologic function (6/9 points) and habitat function (5/9 points). Wetland TW01 has moderately high potential to provide water quality improvements because of its position within the Yakima River floodplain, which is a CWA 303(d) listed water, has TMDL limits, and has flooding problems within its watershed.

TW02

Typha Wetland TW02 is rated as a Category II wetland in the Ecology rating system (see Figure 3.5-12), with a moderately high score for hydrologic function (7/9 points) and moderate scores for habitat function (6/9 points) and water quality improvement (6/9 points). Wetland TW02 has moderately high potential to provide hydrologic functions because of its potential to slow down water movement and help reduce flooding issues directly downstream in the Yakima River.

TW03

Typha Wetland TW03 is rated as a Category II wetland in the Ecology rating system (see Figures 3.5-12 and 3.5-13), with a high score for hydrologic function (8/9 points) and moderate scores for habitat function (6/9 points) and water quality improvement (6/9 points). Wetland TW03 has high potential to provide hydrologic functions because of its large wetland to channel width ratio and its potential to help reduce flooding issues directly downstream in the Yakima River.

TW04

Typha Wetland TW04 is rated as a Category III wetland in the Ecology rating system (see Figure 3.5-13), with moderate scores for water quality improvement (6/9 points), hydrologic function (6/9 points), and habitat function (6/9 points). Wetland TW04 has moderate potential to provide water quality improvement and hydrologic function because of its lack of a surface water outlet, and it provides moderate habitat function because it provides amphibian egg laying habitat, as positively observed in the field.

Typha Solar Project Generation Tie Line

TW03

See the description of wetland TW03 under Typha Solar Project site, above.

TW05

Typha Wetland TW05 is rated as a Category III wetland in the Ecology rating system (see Figure 3.5-13), with a moderately high score for hydrologic function (7/9 points), a moderately low score for water quality improvement (5/9 points), and a low score for habitat function (4/9 points). Wetland TW05 has moderately high potential to provide hydrologic functions because of its potential to store floodwaters and help reduce flooding issues directly downstream in the Yakima River, and it has a low score for habitat function because it does not provide adequate habitat structure and is isolated from habitat in the surrounding area.

Urtica Solar Project Site

UW01

Urtica Wetland UW01 is rated as a Category III wetland in the Ecology rating system (see Figure 3.5-14), with a moderately high score for hydrologic function (8/9 points), a moderate score for water quality improvement (6/9 points), and a low score for habitat function (4/9 points). Wetland UW01 has a moderately high potential to provide hydrologic function because it does not have a surface water outlet, has high storage during seasonal ponding, and receives stormwater from the adjacent roadside ditch.

UW02

Urtica Wetland UW02 is rated as a Category III wetland in the Ecology rating system (see Figure 3.5-15), with a moderately high score for hydrologic function (7/9 points) and moderately low scores for water quality improvement and habitat function (5/9 points). Wetland UW02 has a moderately high potential to provide hydrologic functions because of its high storage during seasonal ponding and highly constricted outlet feeding into the eastern pond.

UW03

Urtica Wetland UW03 is rated as a Category III wetland in the Ecology rating system (see Figure 3.5-15), with a moderately high score for hydrologic function (7/9 points) and moderately low scores for water quality improvement and habitat function (5/9 points). Wetland UW02 has a moderately high potential to provide hydrologic functions because of its high storage during seasonal ponding and highly constricted outlet feeding into the McCarl Creek.

(c) A discussion of water sources supplying wetlands and documentation of hydrologic regime encountered.

3.5.3 Affected Environment for Water Sources

3.5.3.1 General County

The Columbia Solar Project sites contain wetlands with a variety of water sources and hydrologic drivers. Refer to Table 3.5-1 for the hydrogeomorphic (HGM) classification based on *Hydrogeomorphic Wetland Classification System: An Overview and Modification to Better Meet the Needs of the Natural Resources Conservation Service* (NRCS 2008) for each wetland within the five project sites. The following HGM classifications were identified within the solar project sites:

Riverine

Riverine wetlands occur in valleys and are associated with active floodplains around stream or river channels. Water in these wetlands is surface-water driven and has an active interchange between stream or river systems (Hruby 2014; NRCS 2008). According to the *Washington State Wetland Rating System for Eastern Washington, 2014 Update*, wetlands of this classification are flooded by overbank flow from a stream or river at least once every 10 years (Hruby 2014).

Slope

Slope wetlands occur on hill or valley slopes where there are breaks in the slope that intercept groundwater. Water in these wetlands is groundwater-fed and becomes surface or subsurface water that flows only in one direction without being impounded. These wetlands are not associated with stream flow and lack a defined streambed with banks (Hruby 2014; NRCS 2008).

Depressional

Depressional wetlands include such landforms as kettles, portholes, vernal pools, Carolina bays, and other wetlands in a topographic depression where the elevation of surface within the wetland is lower than in the surrounding landscape. These wetlands can vary greatly but are typically fed by precipitation and overland flow with movement of surface or shallow subsurface water toward the lowest point in the depression. The depression may or may not have an outlet, but, if present, the outlet must not be the lowest point in the wetland to meet the definition of a depressional wetland (Hruby 2014; NRCS 2008).

3.5.3.2 Solar Project Sites

The five Columbia Solar Project sites contain 16 wetlands, which include eight Riverine, one Slope, and seven Depressional HGM classifications. Further details regarding these wetlands and their water sources can be found in the Critical Areas Wetland and Waters Delineation Reports for each project site.

(d) A function assessment report prepared according to the Washington State Wetland Function Assessment Method to assess wetlands functions for those wetland types covered by the method, and including a description of type and degree of wetland functions that are provided.

The Washington State Wetland Function Assessment Method is no longer supported by Ecology (personal communication with Amy Yahnke at Ecology on May 10, 2017) and is not required by the Washington Energy Facility Site Evaluation Council (EFSEC) (personal communication with Stephen Posner at EFSEC on May 17, 2017). The functional assessment of wetlands is now predominantly based on the *Washington State Wetland Rating System for Eastern Washington, 2014 Update* (Hruby 2014), referenced in Section 3.5.2, which was used to rate wetlands within the five Columbia Solar Project sites. Refer to the Critical Areas Wetland and Waters Delineation Reports for wetland rating forms for each wetland within each project site.

(2) Identification of energy facility impacts. The application shall include a detailed discussion of temporary, permanent, direct and indirect impacts on wetlands, their functions and values, and associated water quality and hydrologic regime during construction, operation and decommissioning of the energy facility. The discussion of impacts shall also include impacts to wetlands due to proposed mitigation measures.

3.5.4 Impacts to Wetlands

3.5.4.1 General County

TUUSSO has made every effort to avoid impacts to wetlands throughout all of the Columbia Solar Project sites, which would be achieved through avoidance measures in project design and utilization of BMPs. Table 3.5-4 shows the project impacts to each of the wetlands delineated within each of the solar project sites. There are minimal proposed impacts to any wetlands within the solar project sites.

Table 3.5-4. Proposed Wetland Impact Summary for each Columbia Solar Project Site

Wetlands	Total Size of Wetland Within the Project (acres)[1]	Total Impacts to Wetland Within the Project (acres)
Camas Solar Project Site		
CW01	0.97	0.00
Fumaria Solar Project Site		
FW01	0.00	0.00
Fumaria Solar Project Generation Tie Line		
FW02	0.24	0.00
FW03	0.03	0.00
FW04	0.03	0.00
FW05	0.20	0.00
FW06	0.005	0.00
Penstemon Solar Project Site		
PW01	0.00	0.00
Typha Solar Project Site		
TW01	0.07	0.00
TW02	0.42	0.00
TW03	0.80	0.01
TW04	0.05	0.00
Typha Solar Project Generation Tie Line		
TW03	0.06	0.00
TW05	0.03	0.00
Urtica Solar Project Site		
UW01	0.05	0.00
UW02	0.13	0.00
UW03	0.01	0.00

1. Does not include buffer areas

Solar Project Sites

Camas Solar Project Site

No impacts are proposed to any wetlands within the Camas Solar Project site. All impacts to wetlands would be avoided through project design.

Fumaria Solar Project Site

No impacts are proposed to any wetlands within the Fumaria Solar Project site. All impacts to wetlands would be avoided through project design.

Fumaria Solar Project Generation Tie Line

No impacts are proposed to any wetlands along the Fumaria Solar Project generation tie line. All impacts to wetlands would be avoided through project design.

Penstemon Solar Project Site

No impacts are proposed to any wetlands within the Penstemon Solar Project site. All impacts to wetlands would be avoided through project design.

Typha Solar Project Site

The Typha Solar Project site has one proposed wetland crossing (see Figure 3.5-12). This crossing is for an internal access road that enters the site at the southern site boundary at an existing land bridge. The land bridge is periodically flooded by wetland TW03, due to a clogged or crushed culvert that prevents adequate flow through, which has resulted in wetland characteristics developing in the road crossing. TUUSSO is proposing either: 1) an improvement of the existing land bridge (e.g., by excavation of 8 to 12 inches of topsoil, placement of geotextile fabric in the excavation, and filling the excavation with quarry spalls) or 2) construction of a small culvert at the location of the existing land bridge. This would result in a minimal impact to TW03 of less than 0.01 acre. A JARPA for this proposed wetland impact has been started (see Appendix J-3) and would be updated with final engineering drawings when completed, prior to submission to USACE and Ecology. Additional coordination with EFSEC, USACE, Ecology, and Kittitas County would occur as needed if the proposed wetland crossing is altered during project design.

Typha Solar Project Generation Tie Line

No impacts are proposed to any wetlands along the Typha Solar Project generation tie line. All impacts to wetlands would be avoided through project design.

Urtica Solar Project Site

No impacts are proposed to any wetlands within the Urtica Solar Project site. All impacts to wetlands would be avoided through project design.

(3) Wetlands mitigation plan. The application shall include a detailed discussion of mitigation measures, including avoidance, minimization of impacts, and mitigation through compensation or preservation and restoration of existing wetlands, proposed to compensate for the direct and indirect impacts that have been identified. The mitigation plan shall be prepared consistent with the Department of Ecology Guidelines for Developing Freshwater Wetlands Mitigation Plans and Proposals, 1994, as revised. The application shall also include, but not be limited to:

(a) A discussion of how standard buffer widths have been incorporated into the mitigation proposal. Variances from standard buffer widths must be supported with professional analyses demonstrating that smaller or averaged buffer widths protect the wetland functions and values based on site-specific characteristics;

3.5.5 Impacts to Wetland Buffers

3.5.5.1 General County

A total of 16 wetlands were delineated within the Columbia Solar Project sites. KCC 17A.04.020 defines minimum wetland protection buffers based on the wetland ratings determined using the *Washington State Wetland Rating System for Eastern Washington, 2014 Update* (Hruby 2014), referenced in Section 3.5.2.

TUUSSO utilized avoidance measures during the project design to avoid, reduce, or eliminate impacts to wetlands. A very minor impact to wetlands would be introduced by the proposed Typha Solar Project. However, minor encroachment into the minimum wetland protection buffers would be unavoidable based on the current project designs and would occur over a total of 1.52 acres for all of the solar project sites. Refer to Table 3.5-5 for the wetland rating category, minimum wetland protection buffer distances, total area of buffers within the solar project sites, average distance from the edge of the minimum buffer to the nearest project disturbance, and total buffer area encroachment for wetlands within each of the solar project sites. Impacts to wetland protection buffers along the Fumaria and Typha Solar Project generation tie lines would be avoided by utilizing existing power poles and spanning wetlands and their buffers; therefore, those wetlands are excluded from Table 3.5-5.

Table 3.5-5. Wetland Buffers and Project Encroachment within Each Columbia Solar Project Site

Wetland Name	Wetland Rating [1]	Kittitas County Minimum Buffer Distance (feet) [2]	Total Area of Buffer within Project (acres)	Average Distance from Buffer Edge to Project Disturbance (feet)	Total Buffer Encroachment (acres)
Camas Solar Project Site					
CW01	III	20	1.15	10	0.02
Fumaria Solar Project Site					
FW01	III	20	0.01	4	0.00
Fumaria Solar Project Generation Tie Line					
FW02	II	25	0.69	No power poles would be replaced within the wetland protection buffer	
FW03	II	20	0.08	No power poles would be replaced within the wetland protection buffer	
Penstemon Solar Project Site					
PW01	III	0 [3]	–	–	–
Typha Solar Project Site					
TW01	II	25	0.17	23	0.00
TW02	II	25	1.42	N/A	1.36
TW03	II	25	1.61	70	0.02
TW04	III	0 [3]	–	–	–
Typha Solar Project Generation Tie Line					
TW03	II	25	0.07	No power poles would be replaced within the wetland protection buffer	
TW05	III	20	0.11	No power poles would be replaced within the wetland protection buffer	
Urtica Solar Project Site					
UW01	III	0 [3]	–	–	–
UW02	III	20	0.20	15	0.11
UW03	III	20	0.07	10	0.01

1. Wetland ratings are based Hruby (2014).

2. Minimum buffer distances are depicted on maps.

3. No Kittitas County buffer is defined because the wetland area is below the minimum size threshold for protection or is rated as a Category IV; however, building setbacks may be required based on zoning lot line setbacks, but would not exceed 25 feet.

See Figures 3.5-1 through 3.5-15 for the locations of delineated wetlands and their buffers for each of the five Columbia Solar Project sites. See Appendix L for site plans for each of the Columbia Solar Project sites.

3.5.5.2 Solar Project Sites

Camas Solar Project Site

The Columbia Solar Project would impact 0.02 acre of the KCC-defined minimum wetland protection buffer around wetland CW01 within the project site (Figure 3.5-16). The nearest project impact area (the perimeter fence) is 0 to 22 feet from the edge of the minimum protection buffer for the on-site wetland. During fence installation, there would be temporary fence installation surface disturbance within this 0.02 acre of KCC-defined minimum wetland protection buffer. All other impacts to wetland protection buffers would be avoided through project design.

Fumaria Solar Project Site

No impacts are proposed to the KCC-defined minimum wetland protection buffer around wetland FW01 within the Fumaria Solar Project site. The nearest project impact area is 3 to 15 feet from the edge of the minimum protection buffer for the on-site wetland. All impacts to wetland protection buffers would be avoided through project design.

Fumaria Solar Project Generation Tie Line

No impacts are proposed to the KCC-defined minimum wetland protection buffer around wetlands FW02 and FW03 along the Fumaria Solar Project generation tie line. TUUSSO plans on utilizing the existing power poles and would not cause impacts to wetlands or their buffers along the proposed generation tie line. No KCC-defined minimum wetland protection buffer is defined for FW04 because the wetland area is below the minimum size threshold for a Category III wetland, or for FW05 and FW06 because they are Category IV wetlands. All impacts to wetland protection buffers would be avoided through project design.

If new power poles need to be installed, TUUSSO would install them in upland areas outside of the KCC-defined minimum protection buffers for all wetlands along the Fumaria Solar Project generation tie line.

Penstemon Solar Project Site

No KCC-defined minimum wetland protection buffer is defined for PW01 because the wetland area is below the minimum size threshold for a Category III wetland. Therefore, no impacts are proposed to any KCC-defined minimum wetland protection buffers within the Penstemon Solar Project site. All impacts to wetland protection buffers would be avoided through project design.

Typha Solar Project Site

The proposed Typha Solar Project site design would encroach into the KCC-defined minimum wetland protection buffer around wetland TW03. Approximately 0.02 acre of this protection buffer is within the proposed perimeter fence for the site, with 376 square feet impacted by the proposed access road crossing wetland TW03 (Figure 3.5-17). Wetland TW02 is almost entirely within the site; however, no encroachment activities are proposed in the KCC-defined minimum wetland protection buffer (1.36 acres) at this time. No impacts are proposed to the KCC-defined minimum wetland protection buffer for wetlands TW01 and TW02 within the site. No KCC-defined minimum wetland protection buffer is defined for TW04 because the wetland area is below the minimum size threshold for a Category III wetland.

Typha Solar Project Generation Tie Line

No impacts are proposed to the KCC-defined minimum wetland protection buffer around wetlands TW03 and TW05 along the Typha Solar Project generation tie line. TUUSSO plans on utilizing the existing power poles as much as possible and would not cause impacts to wetlands or their buffers along the proposed generation tie line. All impacts to wetland protection buffers would be avoided through project design.



Figure 3.5-16. Camas Solar Project wetland buffer encroachment.

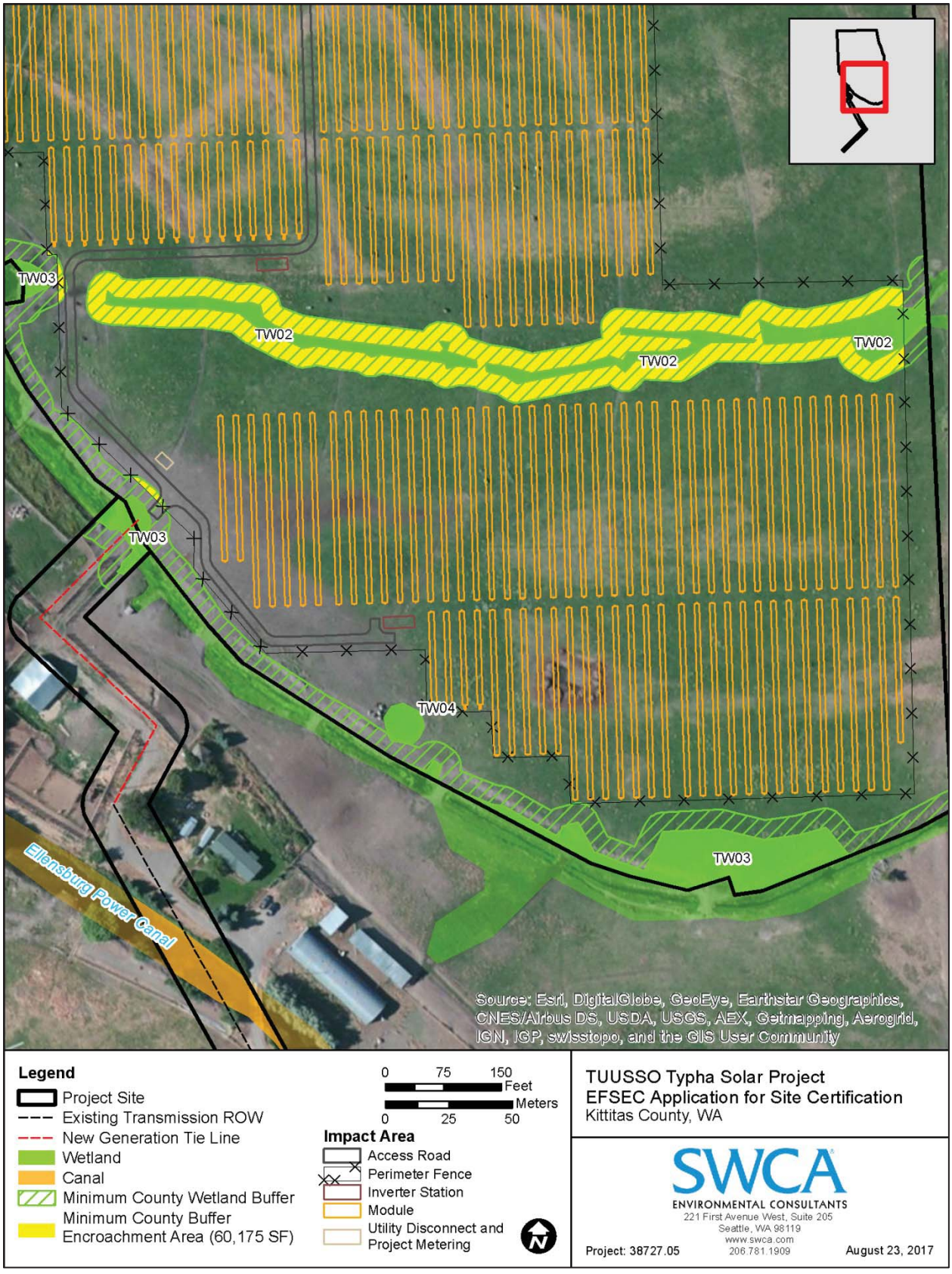


Figure 3.5-17. Typha Solar Project wetland buffer encroachment.

If new power poles need to be installed, then TUUSSO would install them in upland areas outside of the KCC-defined minimum protection buffers for all wetlands along the Fumaria Solar Project generation tie line.

Urtica Solar Project Site

Within the proposed Urtica Solar Project site fence, 0.12 acre of the KCC-defined minimum wetland protection buffer occurs around wetlands UW02 and UW03 (Figure 3.5-18). There is an existing road within these buffers to the east of UW02 and UW03. Improvements to this road could extend outside of the existing road footprint; however, this is not proposed at this time. If the project design is altered, then coordination with Kittitas County would occur for the buffer impacts associated with that design change. During fence installation, there could be temporary fence installation surface disturbance within the KCC-defined minimum wetland protection buffers west and north of wetlands UW02 and UW03. This minor encroachment would likely not exceed 0.01 acre. No KCC-defined minimum wetland protection buffer is defined for UW01 because the wetland area is below the minimum size threshold for a Category III wetland. Minimal impacts to wetland protection buffers would occur based on the current project design.

(b) A demonstration of how enhancement, restoration or compensatory mitigation actions will achieve equivalent or greater hydrologic and biological functions at the impact site, and whether any existing wetland functions would be reduced by the mitigation measures;

No impacts are proposed to wetlands within the Columbia Solar Project sites. All possible impacts to wetlands were avoided through project design. Therefore, no mitigation would be required to implement the proposed solar projects.

(c) A discussion of how standard mitigation ratios have been incorporated into the mitigation proposal. Variances from standard mitigation ratios must be supported with professional analyses demonstrating that equivalent or greater hydrologic and biological functions will be achieved;

No mitigation would be required to implement the Columbia Solar Projects. Therefore, mitigation ratios are not applicable to the proposed solar projects.

(d) A demonstration that the mitigation actions are being conducted in an appropriate location, and that consideration was given in order of preference to: On-site opportunities; opportunities within the same subbasin or watershed assessment unit; opportunities within the same Water Resources Inventory Area (WRIA); opportunities in another WRIA;

No mitigation would be required to implement the Columbia Solar Projects. Therefore, mitigation actions would not be taken as part of the proposed solar projects.

(e) A discussion of the timing and schedule for implementation of the mitigation plan;

No mitigation would be required to implement the Columbia Solar Projects. Therefore, mitigation timing and schedule are not applicable to the proposed solar projects.

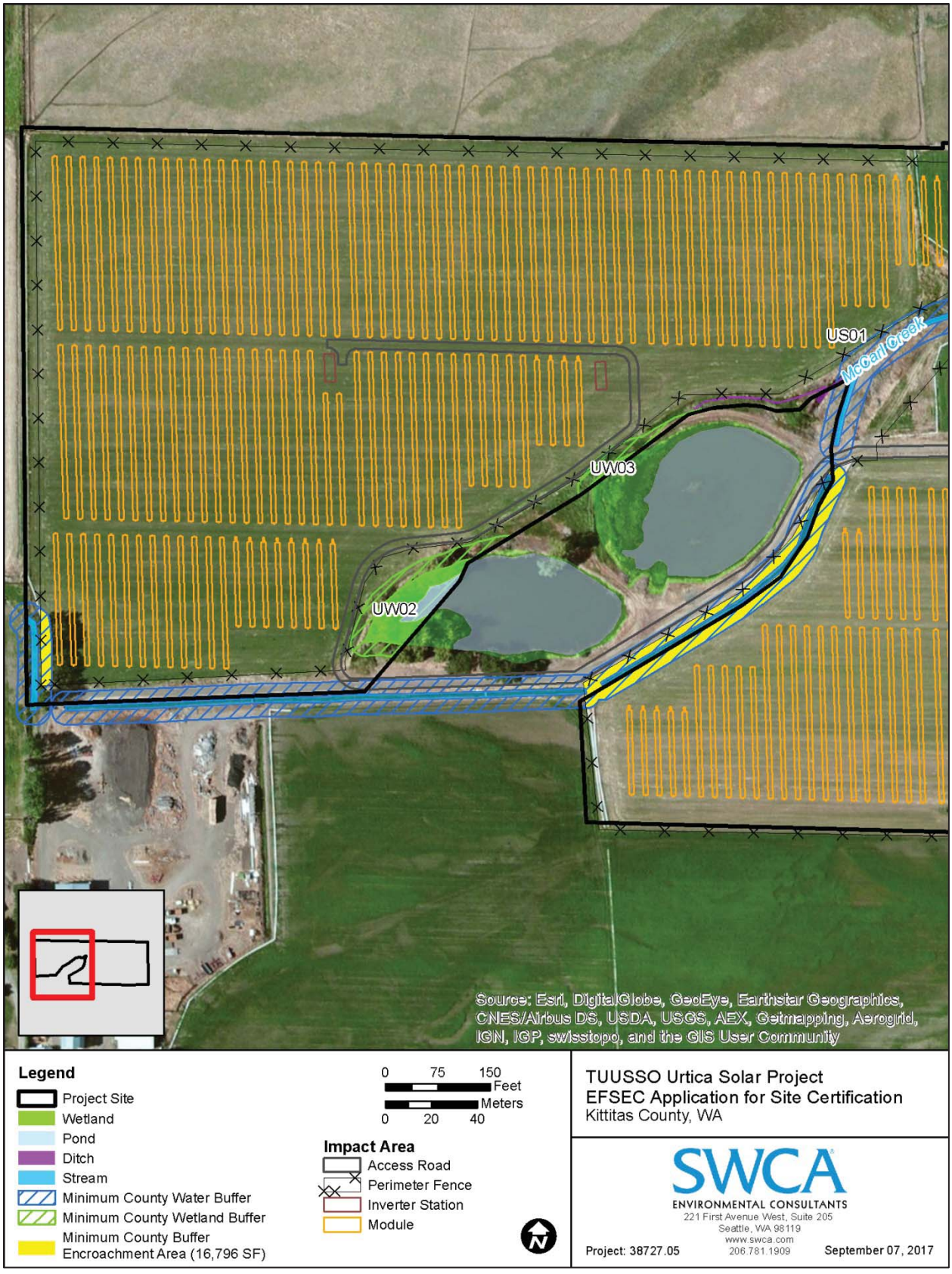


Figure 3.5-18. Urtica Solar Project wetland buffer encroachment.

(f) A discussion of ongoing management practices that will protect wetlands, including proposed monitoring and maintenance programs;

Impacts to wetlands would be avoided through project design and wetland mitigation would not be required for the Columbia Solar Projects. Therefore, no ongoing management of wetlands would be required to implement the proposed solar projects. In addition, the wetlands within the five solar project sites would not require any ongoing management or monitoring, nor are there any ongoing management or monitoring activities currently being conducted within the solar project sites by outside parties.

(g) Mitigation plans should give priority to proven mitigation methods. Experimental mitigation techniques and mitigation banking may be considered by the council on a case-by-case basis. Proposals for experimental mitigation techniques and mitigation banking must be supported with analyses demonstrating that compensation will meet or exceed requirements giving consideration to the uncertainty of experimental techniques, and that banking credits meet all applicable state requirements.

No mitigation would be required to implement the Columbia Solar Projects. Therefore, no experimental mitigation measures would be taken associated with the proposed solar projects.

(4) Federal approvals. The application shall list any federal approvals required for wetlands impacts and mitigation, status of such approvals, and federal agency contacts responsible for review.

A very small portion (<400 square feet) of one wetland, TW03, would be impacted by the improvement of the existing land bridge near the entrance to the Typha Solar Project site. Therefore, a JARPA has been started (see Appendix J-3) and would be submitted to the USACE and Ecology for review, as required.

3.6 Energy and Natural Resources 463-60-342

(1) Amount required/rate of use/efficiency. The application shall describe the rate of use and efficiency of consumption of energy and natural resources during both construction and operation of the proposed facility.

The sources and amounts of energy and natural resources uses, and their potential impacts are described below, in Section 3.6.1 and 3.6.2.

(2) Source/availability. The application shall describe the sources of supply, locations of use, types, amounts, and availability of energy or resources to be used or consumed during construction and operation of the facility.

3.6.1 Affected Environment for Energy and Natural Resources

This section provides a summary of the sources of energy and natural resources available for construction and operation of the five Columbia Solar Projects. The amounts needed and availability of those resources is described in Section 3.6.2, below.

3.6.1.1 Energy

Electricity in the area is available from PSE, Kittitas County Public Utility District (PUD), and the City of Ellensburg (see Section 4.4 for details). Puget Sound Energy provides natural gas in Kittitas County.

Natural gas for residential and commercial uses is available from the City of Ellensburg Natural Gas Utility Division (see Section 4.4 for details). Propane and natural gas are also available from private businesses, including AmeriGas Propane at N Ruby Street, A-1 Petroleum at S Main Street, Midstate Cooperative at W 3rd Avenue, and Northern Energy at S Industrial Way, all in Ellensburg.

3.6.1.2 Natural Resources

Natural resources availability summarized here include concrete, sand, soil, and gravel; lumber and other wood products; and water.

Concrete, Sand, Soil, and Gravel

Ready-mix concrete is available from Carol Ready-dompier, located on Riverbottom Road south of Ellensburg, south of Manastash Road, west of the Yakima River, and southwest of the intersection of I-90 and I-82.

Riverbottom Rock is also located on Riverbottom Road, south of Ellensburg, south of Manastash Road, west of the Yakima River, and southwest of the intersection of I-90 and I-82. They provide sand and gravel.

Ellensburg Cement Products Inc. (ECP) is located on U.S. Route 97, north of I-90 and west of Ellensburg. They provide ready-mix concrete, rock/gravel, fill dirt, sand, and other products (ECP 2017).

Dfm7 Services is located Mcmanamy Road, east of the Yakima River, northwest of Ellensburg, and southeast of Thorp. They also provide sand and gravel.

Lumber/Wood

Several sources of lumber for concrete-form construction and other construction supplies are available in Ellensburg. Knudson Lumber is located at 1791 Vantage Highway in northeast Ellensburg. Matheus Lumber Company is located at 1433 West University Way in northwest Ellensburg also provides lumber and construction supplies.

Water

TUUSSO has considered a number of water supply alternatives for construction purposes. Each of the solar project sites, except for the Fumaria Solar Project site, has on-site existing water allocations that TUUSSO may be able to use during construction. TUUSSO has also explored the use of greywater sources (including those in the Kittitas Valley) for construction, as water for construction activities can be of non-potable quality. However, greywater availability is limited in Kittitas County. Finally, TUUSSO has discussed with the City of Ellensburg the availability of municipal water for construction purposes. Based on this array of possible water sources, TUUSSO intends to use either on-site water or trucked in water from municipal water sources for all projects except the Fumaria Solar Project, and intends to truck in water for the Fumaria Solar Project from a municipal water source.

3.6.2 Impacts to Energy and Natural Resources

3.6.2.1 General County

The following potential impacts are common to all of the proposed Columbia Solar Projects and to the general surrounding area.

Construction Impacts

Energy

Minimal electricity would be required during the construction period, to operate power tools, welders, and other small equipment. This electricity would be available from existing nearby buildings or temporary extensions from nearby distribution lines.

The minimal quantities of natural gas or propane that might be used during construction would be purchased from local distributors and would be readily available. Similarly, gasoline and diesel fuel used for construction vehicles would be purchased from local gas stations. Lubricating oils, grease, and hydraulic fluids would be purchased from distributors of such materials. In all cases, quantities are not anticipated to be large and would be readily available from existing commercial businesses in the Ellensburg area.

Because minimal amounts of electricity, natural gas or propane, and gasoline or diesel fuel would be used during construction, no impacts are anticipated to the demand on or supplies of those energy sources in the Ellensburg area.

Natural Resources

Little or no soil, sand, or gravel is anticipated to be hauled to or away from the five Columbia Solar Project sites, and thus there would be no impacts on those natural resources in the area. In addition, minimal quantities of lumber and wood products would be required during construction, and could easily be provided by the two lumber yards in Ellensburg. Thus, because minimal quantities would be required and would be readily available in the Ellensburg area, there would be no impacts to the availability of lumber or wood products.

Quantities of concrete and potential impacts to available sources are described in detail for each solar project site, below.

During construction, water would be used to suppress fugitive dust during grubbing, clearing, grading, trenching, and soil compaction. In addition, non-toxic soil binding agents may be employed to help with soil stabilization during construction. Construction activities for the five proposed Columbia Solar Projects are conservatively estimated to generate an average water demand of 100,000 gallons per day. That daily water demand estimate assumes that on an average construction day, 20 acres of the project sites are in active construction, requiring 10 continuous hours of water using five water trucks, assuming 4,000-gallon-capacity trucks. Construction time for the Columbia Solar Projects would require approximately 6 months, or 156 work days (Monday–Saturday), to complete. Based upon these parameters, the construction water demand for the proposed Columbia Solar Projects is very conservatively estimated to total 15.6 million gallons, or 47.87 acre-feet (one acre-foot is equal to 325,851 gallons), or approximately 10 acre-feet per project. Because water would be available from existing on-site sources for all but the Fumaria Solar Project site, which would have water trucked in from Ellensburg, there would be no impacts to water sources and supplies.

Operation Impacts

Energy

None of the solar projects would require electric power during operation, because they would be generating electricity, so there would be no negative impacts on energy use. Each of the five Columbia Solar Projects would have the capacity to generate up to 5 MW of electricity, for a total of up to 25 MW. TUUSSO modeled the design and associated energy output using PVSyst v6.21. The energy output simulated by PVSyst is based on the meteorological data at the project site, models of the system

equipment such as the inverters and solar panels, and project design specifications. PVSyst v6.21 was used to simulate the predicted energy output from each of the five Columbia Solar Projects, resulting in a total estimate of approximately 11,500 megawatt hours (MWh) generated in the first full year of project operation. The production of this clean, renewable electricity would have a minimal positive impact on electricity in the Ellensburg and the PSE service areas.

Similar to that used for construction, gasoline and diesel fuel used for operational vehicles would be purchased from local gas stations. Lubricating oils, grease, and hydraulic fluids used for maintenance would be purchased from distributors of such materials. In all cases, quantities would be minimal and readily available from existing commercial businesses in the Ellensburg area so there would be no impacts on the availability of these resources.

Natural Resources

No soil, sand, gravel, lumber, or wood products are anticipated to be hauled to or away from the five Columbia Solar Project sites during operation, and thus there would be no impacts on those natural resources in the Ellensburg area.

On an ongoing basis, water would be used for cleaning PV panels and controlling dust (less than 1 acre-foot per year per project site). Water would also be necessary to establish the tree/shrub visual buffers along portions of the five Columbia Solar Projects, as described above, as well as the native plant species throughout the five project sites. Project landscaping would consist of native and drought tolerant species. Once established, the species would not require ongoing irrigation. The irrigation needs for landscaping establishment are assumed to last for 3 consecutive years following installation.

Based on feedback from farmers familiar with growing conditions in Kittitas Valley (including landowners familiar with the conditions on the five Columbia Solar Project sites), assuming periodic irrigation for establishment purposes over a 3-year period, it is estimated that approximately 400 acre-feet of water per acre per year would be needed over this period to ensure plant establishment on the project sites. These water needs are the same as the current water needs on the actively farmed project sites, and thus there would be no impacts to water supplies as a result of construction of the five Columbia Solar Project sites.

3.6.2.2 Solar Project Sites

Below are descriptions of the potential specific natural resources impacts for each of the proposed solar project sites.

Camas Solar Project Site

Construction Impacts

The inverter pads and switchyard pads may be delivered to the site precast. However, they may also use poured concrete slab foundations. There would be approximately six inverter pads throughout the project site, where the direct current from the arrays would be converted to alternating current and then transmitted by the electric grid. Each inverter pad would include one or two inverter enclosures and one alternating current (AC) transformer. Each inverter pad would be approximately 15 by 30 feet and 1 to 2 feet thick, requiring about 16.75 to 33.50 cubic yards of concrete to construct. Thus, all six inverter pads would require a total of about 100.5 to 201.0 cubic yards of concrete.

There would also be one switchyard pad, measuring roughly 20 by 30 feet and 1 to 2 feet thick, requiring about 22.25 to 44.50 cubic yards of concrete to construct.

In total, the six inverter pads and single switchyard pad would require a total of about 122.75 to 245.5 cubic yards of concrete, or about 12 to 25 truckloads if poured in place (assuming 10 cubic yards/truckload). This ready-mix concrete would be purchased from commercial suppliers in the Ellensburg area and hauled to the site during the primary April to November construction period, would be readily available from those suppliers, and would have no impacts on concrete sources or availability.

If construction of the all-weather access roads calls for aggregate, up to 619 cubic yards could be used to cover the roads with 6 inches of gravel. This would require up to 62 truckloads (assuming 10 cubic yards/truckload). Once final design is completed and a final decision is made about the need for gravel, TUUSSO would work with EFSEC to address any potential impacts, mitigation, and permitting that might be required.

Operation Impacts

No additional gravels, soils, concrete, lumber/wood, or other materials (beyond those mentioned for the general area) would be required during operation of the Camas Solar Project. Thus, no impacts would occur to those natural resources in Kittitas County or the nearby Ellensburg area.

Fumaria Solar Project Site

Construction Impacts

The inverter pads and switchyard pads may be delivered to the site precast. However, they may also use poured concrete slab foundations. There would be approximately five inverter pads throughout the project site, where the direct current from the arrays would be converted to alternating current and then transmitted by the electric grid. Each inverter pad would include one or two inverter enclosures and one AC transformer. Each inverter pad would be approximately 15 by 30 feet and 1 to 2 feet thick, requiring about 16.75 to 33.50 cubic yards of concrete to construct. Thus, all five inverter pads would require a total of about 83.75 to 167.5 cubic yards of concrete.

There would also be one switchyard pad, measuring roughly 20 by 30 feet and 1 to 2 feet thick, requiring about 22.25 to 44.50 cubic yards of concrete to construct.

In total, the five inverter pads and single switchyard pad would require a total of about 106.0 to 212.0 cubic yards of concrete, or about 11 to 21 truckloads if poured in place (assuming 10 cubic yards/truckload). This ready-mix concrete would be purchased from commercial suppliers in the Ellensburg area and hauled to the site during the primary April to November construction period, would be readily available from those suppliers, and would have no impacts on concrete sources or availability.

If construction of the all-weather access roads calls for aggregate, up to 449 cubic yards could be used to cover the roads with 6 inches of gravel. This would require up to 45 truckloads (assuming 10 cubic yards/truckload). Once final design is completed and a final decision is made about the need for gravel, TUUSSO would work with EFSEC to address any potential impacts, mitigation, and permitting that might be required.

Operation Impacts

No additional gravels, soils, concrete, lumber/wood, or other materials (beyond those mentioned for the general area) would be required during operation of the Fumaria Solar Project. Thus, no impacts would occur to those natural resources in Kittitas County or the nearby Ellensburg area.

Penstemon Solar Project Site

Construction Impacts

The inverter pads and switchyard pads may be delivered to the site precast. However, they may also use poured concrete slab foundations. There would be approximately five inverter pads throughout the project site, where the direct current from the arrays would be converted to alternating current and then transmitted by the electric grid. Each inverter pad would include one or two inverter enclosures and one AC transformer. Each inverter pad would be approximately 15 by 30 feet and 1 to 2 feet thick, requiring about 16.75 to 33.50 cubic yards of concrete to construct. Thus, all five inverter pads would require a total of about 83.75 to 167.5 cubic yards of concrete.

There would also be one switchyard pad, measuring roughly 20 by 30 feet and 1 to 2 feet thick, requiring about 22.25 to 44.50 cubic yards of concrete to construct.

In total, the five inverter pads and single switchyard pad would require a total of about 106.0 to 212.0 cubic yards of concrete, or about 11 to 21 truckloads if poured in place (assuming 10 cubic yards/truckload). This ready-mix concrete would be purchased from commercial suppliers in the Ellensburg area and hauled to the site during the primary April to November construction period, would be readily available from those suppliers, and would have no impacts on concrete sources or availability.

If construction of the all-weather access roads calls for aggregate, up to 380 cubic yards could be used to cover the roads with 6 inches of gravel. This would require up to 38 truckloads (assuming 10 cubic yards/truckload). Once final design is completed and a final decision is made about the need for gravel, TUUSSO would work with EFSEC to address any potential impacts, mitigation, and permitting that might be required.

Operation Impacts

No additional gravels, soils, concrete, lumber/wood, or other materials (above those mentioned for the General Area) would be required during operation of the Penstemon Solar Project. Thus, no impacts would occur to those natural resources in Kittitas County or the nearby Ellensburg area.

Typha Solar Project Site

Construction Impacts

The inverter pads and switchyard pads may be delivered to the site precast. However, they may also use poured concrete slab foundations. There would be approximately five inverter pads throughout the project site, where the direct current from the arrays would be converted to alternating current and then transmitted by the electric grid. Each inverter pad would include one or two inverter enclosures and one AC transformer. Each inverter pad would be approximately 15 by 30 feet and 1 to 2 feet thick, requiring about 16.75 to 33.50 cubic yards of concrete to construct. Thus, all five inverter pads would require a total of about 83.75 to 167.5 cubic yards of concrete.

There would also be one switchyard pad, measuring roughly 20 by 30 feet and 1 to 2 feet thick, requiring about 22.25 to 44.50 cubic yards of concrete to construct.

In total, the five inverter pads and single switchyard pad would require a total of about 106.0 to 212.0 cubic yards of concrete, or about 11 to 21 truckloads if poured in place (assuming 10 cubic yards/truckload). This ready-mix concrete would be purchased from commercial suppliers in the Ellensburg area and hauled to the site during the primary April to November construction period, would be readily available from those suppliers, and would have no impacts on concrete sources or availability.

If construction of the all-weather access roads calls for aggregate, up to 401 cubic yards could be used to cover the roads with 6 inches of gravel. This would require up to 40 truckloads (assuming 10 cubic yards/truckload). Once final design is completed and a final decision is made about the need for gravel, TUUSSO would work with EFSEC to address any potential impacts, mitigation, and permitting that might be required.

Operation Impacts

No additional gravels, soils, concrete, lumber/wood, or other materials (above those mentioned for the General Area) would be required during operation of the Typha Solar Project. Thus, no impacts would occur those natural resources in Kittitas County or the nearby Ellensburg area.

Urtica Solar Project Site

Construction Impacts

The inverter pads and switchyard pads may be delivered to the site precast. However, they may also use poured concrete slab foundations. There would be approximately five inverter pads throughout the project site, where the direct current from the arrays would be converted to alternating current and then transmitted by the electric grid. Each inverter pad would include one or two inverter enclosures and one AC transformer. Each inverter pad would be approximately 15 by 30 feet and 1 to 2 feet thick, requiring about 16.75 to 33.50 cubic yards of concrete to construct. Thus, all five inverter pads would require a total of about 83.75 to 167.5 cubic yards of concrete.

There would also be one switchyard pad, measuring roughly 20 by 30 feet and 1 to 2 feet thick, requiring about 22.25 to 44.50 cubic yards of concrete to construct.

In total, the five inverter pads and single switchyard pad would require a total of about 106.0 to 212.0 cubic yards of concrete, or about 11 to 21 truckloads if poured in place (assuming 10 cubic yards/truckload). This ready-mix concrete would be purchased from commercial suppliers in the Ellensburg area and hauled to the site during the primary April to November construction period, would be readily available from those suppliers, and would have no impacts on concrete sources or availability.

If construction of the all-weather access roads calls for aggregate, up to 267 cubic yards could be used to cover the roads with 6 inches of gravel. This would require up to 27 truckloads (assuming 10 cubic yards/truckload). Once final design is completed and a final decision is made about the need for gravel, TUUSSO would work with EFSEC to address any potential impacts, mitigation, and permitting that might be required.

Operation Impacts

No additional gravels, soils, concrete, lumber/wood, or other materials (beyond those mentioned for the general area) would be required during operation of the Urtica Solar Project. Thus, no impacts would occur to those natural resources in Kittitas County or the nearby Ellensburg area.

(3) Nonrenewable resources. The application shall describe all nonrenewable resources that will be used, made inaccessible or unusable by construction and operation of the facility.

Beyond the natural resources listed above, little or no additional nonrenewable resources would be used during construction or operation of the five Columbia Solar Projects.

(4) Conservation and renewable resources. The application shall describe conservation measures and/or renewable resources which will or could be used during construction and operation of the facility.

Beyond the natural resources listed above, little or no additional renewable resources would be used during construction or operation of the five Columbia Solar Projects.

However, during construction, TUUSSO would incorporate water conservation methods wherever possible. For example, water would not be used for concrete hydration on-site because the concrete is expected to be delivered to the site already hydrated. Less water-intensive methods of dust suppression are also under review, including use of soil stabilizers, tightly phasing construction activities, staging grading and other dust-creating activities, and/or compressing the entire construction schedule to reduce the time period over which dust-suppression measures would be required.

TUUSSO has incorporated water conservation methods into its operational water plan as well. Where feasible, TUUSSO would work with the current landowners to incorporate more efficient irrigation systems to water the trees and shrubs forming the visual buffers. TUUSSO has used native and drought tolerant species to ensure that the landscaping can be established quickly with minimal water needs, and once established, would not require any further watering except in extreme drought conditions. TUUSSO would also investigate using sprinkler systems on the Columbia Solar Project sites to irrigate the native ground cover (instead of the current flood irrigation methods used on the project sites).

(5) Scenic resources. The application shall describe any scenic resources which may be affected by the facility or discharges from the facility.

Existing visual and scenic resources, visual simulations, and potential impacts are described in detail in Section 4.2.4.

3.7 References – Chapter 3

Alt, D., and D. W. Hyndman. 1995. *Northwest Exposures: A Geologic Story of the Northwest*. Missoula, Montana: Mountain Press Publishing Company.

Baker, V. R., B. N. Bjornstad, A. J. Busacca, K. R. Fecht, E. P. Kiver, U. L. Moody, J. G. Rigby, D. F. Stradling, and A. M. Tallman. 1991. Quaternary Geology of the Columbia Plateau. In *Quaternary Nonglacial Geology, Conterminous U.S., Decade of North American Geology, Geology of North America*, edited by R. B. Morrison, pp. 215–250. Volume K-2. Boulder, Colorado: Geological Society of America.

Bonneville Power Administration. 2017. Melvin R. Sampson Hatchery, Yakima Basin Coho Project (DOE/EIS-0522). Available at: https://www.bpa.gov/efw/Analysis/NEPADocuments/Pages/MelvinSampsonHatcheryYakimaBasinCohoProject.aspx. Accessed August 14, 2017.

California Department of Fish and Game. 1990. 1989 Annual Report on the Status of California's State Listed Threatened and Endangered Plants and Animals. California Department of Fish and Game, Sacramento, California.

Cornell Lab of Ornithology (Cornell). 2017. All About Birds - Greater Sage-Grouse Available at: https://www.allaboutbirds.org/guide/greater_sage-grouse/lifehistory. Accessed May 19, 2017.

Council on Environmental Quality (CEQ). 2016. *Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews*. August 5, 2016. Available at: https://www.federalregister.gov/documents/2016/08/05/2016-18620/final-guidance-for-federal-departments-and-agencies-on-consideration-of-greenhouse-gas-emissions-and. Accessed July 5, 2017.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. FWS/OBS-79/31. Washington, D.C.: U.S. Fish and Wildlife Service. Available at: http://www.fws.gov/wetlands/Documents/Classification-of-Wetlands-and-Deepwater-Habitats-of-the-United-States.pdf. Accessed March 10, 2017.

Ellensburg Cement Products Inc. (ECP). 2017. Ellensburg Cement Products. Available at: http://www.ellensburgcement.com/. Accessed June 30.

Encompass Engineering & Surveying. 2017a. *TUUSSO Energy, Camas Solar Project: Drainage Report*. Cle Elum, Washington: Encompass Engineering & Surveying.

———. 2017b. *TUUSSO Energy, Fumaria Solar Project: Drainage Report*. Cle Elum, Washington: Encompass Engineering & Surveying.

———. 2017c. *TUUSSO Energy, Penstemon Solar Project: Drainage Report*. Cle Elum, Washington: Encompass Engineering & Surveying.

———. 2017d. *TUUSSO Energy, Typha Solar Project: Drainage Report*. Cle Elum, Washington: Encompass Engineering & Surveying.

———. 2017e. *TUUSSO Energy, Urtica Solar Project: Drainage Report*. Cle Elum, Washington: Encompass Engineering & Surveying.

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual*. Technical Report Y-87-1. Online edition. Vicksburg, Mississippi: U.S. Army Engineer Waterways Experiment Station. Available at: http://el.erdc.usace.army.mil/wetlands/pdfs/wlman87.pdf. Accessed March 10, 2017.

Federal Emergency Management Agency (FEMA). 1981a. Flood Insurance Rate Maps for Kittitas County, Washington (Unincorporated Areas): 5300950436B, 5300950437B, 5300950438C, 5300950552C, and 5300950558B. Effective Dates: May 5, 1981 or July 5, 1982. Available at: https://msc.fema.gov/portal/advanceSearch. Accessed July 25, 2017.

———. 1981b. Flood Insurance Study; City of Cle Elum, City of South Cle Elum, City of Ellensburg, and Kittitas County, Washington (Unincorporated Areas). Available at: http://map1.msc.fema.gov/data/53/S/PDF/530234V000.pdf?LOC=c84d35e3781d40c0c339ebfaea7fca74. Accessed July 25, 2017.

Fraley, J.J., and B.B. Shepard. 1989. Life history, ecology and population status of migratory bull trout (Salvelinus confluentus) in the Flathead Lake and River system, Montana. *Northwest Science* 63:133–143.

Gentry, Herman R. 2010. *Soil Survey of Kittitas County Area, Washington*. U.S. Department of Agriculture, Natural Resources Conservation Service, in cooperation with U.S. Department of Agriculture, Forest Service; Washington State Department of Natural Resources; and Washington State University, Agricultural Research Center.

Hallock, L. 2009. *Conservation Assessment for the Sharp-tailed Snake in Washington and Oregon*. Prepared for U.S. Forest Service, Region 6 and Bureau of Land Management. Olympia, Washington: Washington Natural Heritage Program, Department of Natural Resources.

Hernandez, R.R., S.B. Easter, M.L. Murphy-Mariscal, F.T. Maestre, M. Tavassoli, E.B. Allen, C.W. Barrows, J. Belnap, R. Ochoa-Hueso, S. Ravi, and M.F. Allen. 2014. Environmental Impacts of Utility-scale Solar Energy. *Renewable and Sustainable Energy Reviews* 29:766–779. Available at: http://escholarship.org/uc/item/62w112cg#page-1. Accessed August 3, 2017.

Hitchcock, C. Leo, and Arthur Cronquist. 1973. *Flora of the Pacific Northwest: An Illustrated Manual*. Seattle: University of Washington Press.

Hruby, T. 2014. *Washington State Wetland Rating System for Eastern Washington – Revised.* Washington State Department of Ecology Publication No. 14-06-030. Olympia, Washington: Department of Ecology. Available at: https://fortress.wa.gov/ecy/publications/SummaryPages/1406030.html. Accessed March 10, 2017.

Intergovernmental Panel on Climate Change (IPCC). 2013. Climate Change 2013: The Physical Science Basis, Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Available at: http://www.climatechange2013.org/images/report/WG1AR5_SPM_FINAL.pdf. Accessed July 5, 2017.

———. 2014. *Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Table A.III.2. Available at: https://www.ipcc.ch/pdf/assessment-report/ar5/wg3/ipcc_wg3_ar5_annex-iii.pdf#page=5. Accessed July 5, 2017.

Kagan R.A., T.C. Viner, P.W. Trail, E.O. Espinoza. 2014. Avian Mortality at Solar Energy Facilities in Southern California: A Preliminary Analysis. Ashland, Oregon: National Fish and Wildlife Forensics Laboratory. Available at: http://alternativeenergy.procon.org/sourcefiles/avian-mortality-solar-energy-ivanpah-apr-2014.pdf. Accessed August 3, 2017.

Kittitas County Code (KCC). 2017. Kittitas County, Washington, Ordinances and Resolutions. Available at: http://co.kittitas.wa.us/boc/countycode/. Accessed March 13, 2017.

Kraemer, Curtis. 1994. *Some observations on the life history and behavior of the native char, Dolly Varden (*Salvelinus malma*) and bull trout (*Salvelinus confluentus*) of the North Puget Sound Region*. Washington Department of Fish and Wildlife.

Leonard, W.P., H.A. Brown, L.L.C. Jones, K.R. McAllister, and R.M. Storm. 1993. *Amphibians of Washington and Oregon*. Seattle, Washington: Seattle Audubon Society.

Licht, L.E. 1974. Survival of embryos, tadpoles, and adults of the frogs *Rana aurora aurora* and *Rana pretiosa pretiosa* sympatric in southwestern British Columbia. *Canadian Journal of Zoology* 52:613–627.

Marco, A. 1997. Effects of Nitrate and Nitrite in the Oregon Spotted Frog and Other Amphibians. *Conference Proceedings: The spotted frogs of Oregon*. Corvallis: Oregon Chapter, Wildlife Society.

McKee, B. 1972. *Cascadia: the Geologic Evolution of the Pacific Northwest*. New York: McGraw-Hill.

Multiagency Avian-Solar Collaborative Working Group. 2016. Avian-Solar Science Coordination Plan. Available at: http://blmsolar.anl.gov/program/avian-solar/docs/Final_Avian-Solar_Science_Coordination_Plan.pdf. Accessed August 10, 2017.

National Interagency Fire Center (NIFC). 2003. Remote Automatic Weather Stations. Available at: http://www.raws.dri.edu/documents/RAWS.pdf. Accessed July 5, 2017.

Natural Resources Conservation Service (NRCS). 2008. *Hydrogeomorphic Wetland Classification System: An Overview and Modification to Better Meet the Needs of the Natural Resources Conservation Service*. Technical Note No. 190-8-79. Available at: http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs143_010784.pdf. Accessed March 10, 2017.

———. 2017a. Web Soil Survey. Available at: http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx. Accessed July 26, 2017.

———. 2017b. Plants Database. Available at: http://plants.usda.gov/. Accessed May 19, 2017.

Norling, Bradley S., Stanley H. Anderson, and Wayne A. Huber. 1992. Roost Sites Used by Sandhill Crane Staging Along the Platte River, Nebraska. *Great Basin Naturalist* 52(3):253–261.

Pacific States Marine Fisheries Commission. 2016 StreamNet Mapper. Portland, Oregon: Pacific States Marine Fisheries Commission. Available at: http://psmfc.maps.arcgis.com/apps/webappviewer/index.html. Accessed August 25, 2016.

Sage Grouse Initiative. 2017. The Habitat. Available at: https://www.sagegrouseinitiative.com/sagebrush-community/the-habitat/. Accessed May 19, 2017.

Spence, B.C., G.A. Lomnicky, R.M. Hughes, and R.P. Novitzki. 1996. *An Ecosystem Approach to Salmonid Conservation*. TR-4501-96-6057. Corvallis, Oregon: ManTech Environmental Research Services Corp,.

Swiftwater Environmental & Geotechnical (Swiftwater). 2017a. *Geotechnical Engineering Study, Phase 1, Camas Solar Array Site, 4561 NE 6 Road, Ellensburg, Washington*. Project No. 170019:GES. Issaquah, Washington: Swiftwater Environmental & Geotechnical.

———. 2017b. *Geotechnical Engineering Study, Phase 1, Fumaria Solar Array Site, 2130 Clarke Road, Ellensburg, Washington*. Project No. 170020:GES. Issaquah, Washington: Swiftwater Environmental & Geotechnical.

———. 2017c. *Geotechnical Engineering Study, Phase 1, Penstemon Solar Array Site, 1585 Tjossem Road, Ellensburg, Washington*. Project No. 170016:GES. Issaquah, Washington: Swiftwater Environmental & Geotechnical.

———. 2017d. *Geotechnical Engineering Study, Phase 1, Typha Solar Array Site, 3401 South Thorpe Highway, Ellensburg, Washington*. Project No. 170017:GES. Issaquah, Washington: Swiftwater Environmental & Geotechnical.

———. 2017e. *Geotechnical Engineering Study, Phase 1, Urtica Solar Array Site, 751 Manashtash Road and Umptanum Road, Ellensburg, Washington*. Project No. 170018:GES. Issaquah, Washington: Swiftwater Environmental & Geotechnical.

University of Washington, Washington Cooperative Fish and Wildlife Research Unit. 1997. Washington Gap Project 1991 Land Cover for Washington State. Available at: ftp://ftp.dfw.wa.gov/pub/gapdata/lcv6. Accessed May 3, 2017.

U.S. Army Corps of Engineers (USACE). 2008. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0)*, edited by J.S. Wakeley, R.W. Lichvar, and C.V. Noble. ERDC/EL TR-08-28. Vicksburg, Mississippi: U.S. Army Engineer Research and Development Center.

U.S. Bureau of Reclamation (Reclamation). 2012. *Yakima River Basin Integrated Water Resource Management Plan, Final Programmatic Environmental Impact Statement*. March 2012. U.S. Bureau of Reclamation, Pacific Northwest Region. Available at: https://www.usbr.gov/pn/programs/yrbwep/reports/FPEIS/fpeis.pdf.

U.S. Environmental Protection Agency (EPA). 2010. General Conformity Training Module. 2010. Available at: https://www.epa.gov/sites/production/files/2016-03/documents/general_conformity_training_manual.pdf. Accessed July 5, 2017.

———. 2014. 2014 National Emissions Inventory: Data & Documentation. Available at: https://www.epa.gov/air-emissions-inventories/2014-national-emissions-inventory-nei-data. Accessed July 5, 2017.

———. 2015. Greenhouse Gas Reporting Program 2014: Petroleum and Natural Gas Systems. Available at: https://www.epa.gov/ghgreporting/ghgrp-2014-petroleum-and-natural-gas-systems. Accessed July 5, 2017.

———. 2017. NAAQS Table. Available at: https://www.epa.gov/criteria-air-pollutants/naaqs-table. Accessed July 5, 2017.

———. 2017b. MyWATERS Data Mapper Google Earth kmz file. Available at: https://www.epa.gov/waterdata/viewing-waters-data-using-google-earth. Accessed March 7, 2017.

U.S. Fish and Wildlife Service (USFWS). 2007. National Bald Eagle Management Guidelines. May 2007. Available at: https://www.fws.gov/southdakotafieldoffice/NationalBaldEagleManagementGuidelines.pdf. Accessed May 19, 2017.

Waitt, R.B. Jr. 1979. *Late Cenozoic Deposits, Landforms, Stratigraphy, and Tectonism in Kittitas Valley, Washington*. Geological Survey Professional Paper 1127. Available at: https://pubs.usgs.gov/pp/1127/report.pdf. Accessed July 28, 2017.

Walston, L.J. Jr., K.E. Rollins, K.E. LaGory, K.P. Smith, S.A. Meyers. 2016. A Preliminary Assessment of Avian Mortality at Utility-scale Solar Energy Facilities in the United States. *Renewable Energy* 92:40–414. Available at: http://www.sciencedirect.com/science/article/pii/S0960148116301422. Accessed August 3, 2017.

Washington Department of Wildlife (WDFW). 2015. Washington State Wildlife Action Plan. Available at: http://wdfw.wa.gov/publications/01742/. Accessed May 18, 2017.

———. 2017a. Priority Habitats and Species on the Web. Available at: http://wdfw.wa.gov/mapping/phs/. Accessed January 11, 2017.

———. 2017a SalmonScape. Available at: http://apps.wdfw.wa.gov/salmonscape/. Accessed January 11, 2017.

Washington State Department of Ecology (Ecology). 1997. *Washington State Wetland Identification and Delineation Manual*. Publication No. 96-94. Olympia, Washington: Washington State Department of Ecology.

Washington State Noxious Weed Control Board. 2017. Printable Noxious Weed List. Available at: http://www.nwcb.wa.gov/printable-noxious-weed-list. Accessed May 19, 2017.

Western Regional Climate Center (WRCC). 2017a. Climate of Washington. Available at: https://wrcc.dri.edu/narratives/WASHINGTON.htm. Accessed July 5, 2017.

———. 2017b. Ellensburg, Washington - Climate Summary. Station No. 452505, from 2/1/1893 to 6/7/2016. Available at: https://wrcc.dri.edu/cgi-bin/cliMAIN.pl?wa2508. Accessed July 5, 2017.

———. 2017c. Peoh Point, Washington Wind Frequency Table. Mean wind speed from July 1, 2000 to July 5, 2017. Available at: https://wrcc.dri.edu/cgi-bin/rawMAIN.pl?waWPEO. Accessed July 6, 2017.

Wydoski, R. S., and R. R. Whitney. 2003. *Inland Fishes of Washington*. University of Washington Press, Seattle, Washington.

4 BUILT ENVIRONMENT AFFECTED ENVIRONMENT AND IMPACTS

4.1 Environmental Health 463-60-352

(1) Noise. The application shall:

(a) Describe and quantify the background noise environment that would be affected by the energy facility. The number of locations used for assessment of the existing noise environment shall be commensurate with the type of energy facility being proposed, the impacts expected, and the presence of high density receptor locations in the vicinity of the proposed site.

4.1.1 Affected Environment for Noise

4.1.1.1 Noise Characteristics and Measurement

Community sound levels are generally presented in terms of A-weighted decibels (dBA). The A-weighting network measures sound in a similar fashion to how a person perceives or hears sound, thus achieving a strong correlation with how people perceive acceptable and unacceptable sound levels.

A-weighted sound levels are typically measured or presented as the equivalent sound pressure level (L_{eq}), which is defined as the average noise level on an equal-energy basis for a stated period of time and commonly is used to measure steady-state sound that is usually dominant. Another metric used in determining the impact of environmental noise is the differences in response that people have to daytime and nighttime noise levels. During the evening and at night, exterior background noises generally are lower than daytime levels. However, most household noise also decreases at night, and exterior noise becomes more noticeable. Furthermore, most people sleep at night and are sensitive to intrusive noises. The L_{dn} is a noise metric that accounts for the greater annoyance of noise during the nighttime hours (10:00 p.m. to 7:00 a.m.).

Local conditions such as traffic, topography, and winds characteristic of the region can alter background noise conditions. In general, the L_{dn} sound levels for outdoor quiet urban nighttime noise range from 40 to 50 dBA (Environmental Protection Agency [EPA] 1974). The American National Standards Institute (ANSI) has published a standard (ANSI S12.9-1993/Part 3) with estimates of general ambient noise levels (L_{eq} and L_{dn}) based on detailed descriptions of land use categories. The ANSI document organizes the land use based on six categories. The descriptions and estimated daytime and nighttime L_{eq} ambient noise levels for each category are provided in Table 4.1-1.

The five proposed Columbia Solar Project sites are located in largely undeveloped, sparsely populated areas. Thus, the majority of the analysis area would be expected to have background noise L_{dn} of about 40 dBA or less. This noise level would occasionally increase due to passing vehicular traffic from Interstate 90 (I-90) as well as airplanes traveling to the nearby Bowers Field airport. There are also temporary increases in the existing noise level from farm equipment (e.g., tractors) used to grow and harvest crops and to raise cattle and other farm animals.

Table 4.1-1. Representative Existing Conditions Based on Land Use

Category	Land Use	Description	Estimated Existing Daytime L_{eq}, dBA	Estimated Existing Nighttime L_{eq}, dBA
1	Noisy Commercial and Industrial Areas	Very heavy traffic conditions, such as in busy downtown commercial areas, at intersections of mass transportation and other vehicles, including trains, heavy motor trucks and other heavy traffic, and street corners where motor buses and heavy trucks accelerate.	69	61
2	Moderate Commercial and Industrial Areas, and Noisy Residential Areas	Heavy traffic areas with conditions similar to Category 1 but with somewhat less traffic, routes of relatively heavy or fast automobile traffic but where heavy truck traffic is not extremely dense, and motor bus routes.	64	56
3	Quiet Commercial, Industrial Areas, and Normal Urban and Noisy Residential Areas	Light traffic conditions where no mass transportation vehicles and relatively few automobiles and trucks pass, and where these vehicles generally travel at low speeds. Residential areas and commercial streets and intersections with little traffic comprise this category.	58	52
4	Quiet Urban and Normal Residential Areas	These areas are similar to Category 3 above but, for this group, the background is either distant traffic or is unidentifiable.	53	47
5	Quiet Suburban Residential Areas	Isolated areas, far from significant sources of sound.	48	42
6	Very Quiet, Sparse Suburban or Rural Areas	These areas are similar to Category 5 above but are usually in unincorporated areas and, for this group, there are few if any near neighbors.	43	37

Source: ANSI S12.9-1993/Part 3.

4.1.1.2 Sensitive Receptors

Noise-sensitive receptors generally are defined as locations where people reside or where the presence of unwanted sound may adversely affect the existing land use. Typically, noise-sensitive land uses include residences, hospitals, places of worship, libraries, performance spaces, offices, and schools, as well as nature and wildlife preserves, recreational areas, and parks. The nearest sensitive receptor was located for each of the five solar project sites, and are listed in Table 4.1-2.

Table 4.1-2. Nearest Sensitive Receptor to Each Solar Project

Project Site	Type	Distance from Property Boundary	Direction from Project Site
Camas	Residence	Within 175 feet	East side of property boundary
Camas	Commercial – Better Life for Dogs	Within 155 feet	Northwest side of property boundary
Fumaria	Residence	Adjacent	Southern property boundary
Penstemon	2 Residences	Each within 130 feet	East and north sides of property boundaries
Typha	Commercial – Ellensburg Golf and Country Club	Adjacent	Southeast side of property boundary
Typha	Residence	Within 266 feet	Southwest side of property boundary
Urtica	Residence	Within 160 feet	Northern property boundary

(b) Identify and quantify the impact of noise emissions resulting from construction and operation of the energy facility, using appropriate state-of-the-art modeling techniques, and including impacts resulting from low frequency noise;

4.1.2 Impacts to Noise

4.1.2.1 Calculation Methodologies and Sources of Noise Generation

Construction noise levels were estimated using the Federal Highway Administration (FHWA) Roadway Construction Noise Model (RCNM). The RCNM is FHWA's national model for the prediction of construction noise. This software is based on actual sound level measurements from various equipment types taken during the Central Artery/Tunnel Project conducted in Boston, Massachusetts, during the early 1990s.

Estimates of noise from the construction of the access roads and improvements to the access roads are based on a roster of the maximum amount of construction equipment used at each of the five solar project sites on a given day. Table 4.1-3 shows a list of typical construction equipment and the noise level at 10 feet and 50 feet. The RCNM has noise levels for various types of equipment pre-programmed into the software; therefore, the noise level associated with the equipment is typical for the equipment type and not based on any specific make or model.

Construction Noise Calculations

The RCNM assumes that the maximum sound level for the project (L_{max}) is the maximum sound level for the loudest piece of equipment. The approximate noise generated by the construction equipment used at each of the five proposed Columbia Solar Project sites has been conservatively calculated based on the maximum amount of construction equipment that would be used at the project site at one time, and not taking into account further attenuation due to atmospheric interference or intervening structures. Results of the RCNM construction noise calculations are given for each solar project site, below.

Table 4.1-3. Maximum Noise Levels for Common Construction Equipment

Equipment Type	Typical Maximum Noise Levels at 10 Feet (dBA)	Typical Maximum Noise Levels at 50 Feet (dBA)
Backhoes	92	78
Bulldozers	96	82
Crane	95	81
Concrete Mixer Truck	93	79
Drill Rig	98	84
Drum Rollers	94	80
Dump Trucks	91	77
Graders	99	85
Excavators	95	81
Construction Pickup/Water/Fuel Truck	89	75
Delivery Truck	88	74
Tractor	98	84
Vibratory Pile Driver	115	101

Operational Noise Calculations

For noise generated by the operation of the Columbia Solar Projects, standard acoustical engineering methods were used and were based on vendor-supplied equipment noise levels. For simplicity, these noise levels were based on the loudest equipment: the SGI 500XTM inverters. Predicted levels at the closest sensitive receptor were calculated based on geometric spreading attenuation using International Organization for Standardization (ISO) 9613-2, Acoustics – Sound Attenuation during Propagation Outdoors (ISO 1996). Additional attenuation factors, such as noise-reducing intervening terrain, structures, and barriers cannot be considered with this methodology. Thus, this methodology is conservative. In addition, because solar panels produce electricity only when the sun is shining, the inverters would be completely silent at night. Furthermore, central inverters are usually surrounded on all sides by the solar panel arrays whose electricity they manage, which further distances them from anyone who might happen to be nearby, and would potentially act as a noise buffer.

4.1.2.2 Solar Project Sites

The loudest noise-generating operational equipment on the Solar Project sites would consist of approximately ten SGI 500XTM inverters per project site.

No operational components of the Columbia Solar Projects would include significant ground-borne noise or vibration sources, and no significant vibrations sources currently exist, or are planned, in the area. Thus, no significant ground-borne vibration impacts would occur with operation of the solar projects. The solar projects would not emit any noise at night, because they would not be generating electricity then. In addition, blasting would not be required as part of the projects, as all components would be installed as described in Chapter 2.

Construction and operational-related noise generation levels and impacts are described below for each of the five proposed Columbia Solar Project sites.

Camas Solar Project Site

Construction Impacts

As shown in Table 4.1-4, construction of the Camas Solar Project would result in increased noise levels for a limited period of time. Per Washington Administrative Code (WAC) 173-60-050 and Kittitas County Code (KCC) 9.45.040, the state and county exempt construction noise from local noise standards, provided that such activities take place within the hours of 7:00 a.m. to 10:00 p.m. Construction of the Camas Solar Project would take place within those hours.

Table 4.1-4. Calculated Noise Levels at Nearest Receptor Due to Construction of the Camas Solar Project Site

	Calculated L_{max} (dBA)	Calculated L_{eq} Total (dBA)	Community Noise Level (dBA)	
			L_{day}	L_{night}
Estimated Ambient Noise Level[1]	–	–	43.0	37.0
Noise Level at Nearest Receptor[2]	84.2	86.4	85.8	37.0

1. ANSI S12.9-1993/Part 3
2. It is assumed that the construction equipment would be operating at the property boundary closest to the considered receptor. The nearest sensitive receptor is located 155 feet from the property boundary.

Operation Impacts

Table 4.1-5 shows the sound level at the property boundary and nearest sensitive receptor from the Camas Solar Project site. At the nearest property boundary, the noise level was estimated to exceed the

Washington State Maximum Permissible Noise Levels by 2.6 dBA. The basis for the screening level noise attenuation calculation assumed continuous operation of the inverters. This is a conservative estimate. The noise levels estimated at the nearest sensitive receptor (a commercial facility), were all below the Washington State Maximum Permissible Noise Levels (65 dBA). Furthermore, there is a public road between the nearest sensitive receptor and the Camas Solar Project property boundary. Traffic noise from these roads could be a significant source of noise as part of the existing soundscape and potentially louder than the noise from the inverters located at the Camas Solar Project site. Therefore, exceedance of the Washington State Maximum Permissible Noise Levels is unlikely. Any exceedance from the Camas Solar Project would be within the permissible noise level exceedance time allowance of WAC 173-60-040 (see Section 4.1.4). Furthermore, TUUSSO has committed to post-construction monitoring, and working out any mitigation necessary with EFSEC. If necessary, a noise-mitigating barrier with a minimum 3-dBA reduction would be installed to comply with the applicable noise standard.

Table 4.1-5. Calculated Noise Levels at Property Boundary Due to Operation of the Camas Solar Project Site

	Calculated L_{max} (dBA)	Calculated L_{eq} Total (dBA)	Community Noise Level (dBA)	
			L_{day}	L_{night}
Estimated Ambient Noise Level [1]	–	–	43.0	37.0
Noise Level at Property Boundary	67.6	67.6	67.6	37.0
Noise Level at Nearest Commercial Receptor [2]	48.2	50.2	51.0	37.0
Noise Level at Nearest Residential Receptor [3]	40.3	42.9	46.0	37.0

1. ANSI S12.9-1993/Part 3
2. The nearest sensitive receptor is a commercial facility located 155 feet from the property boundary.
3. The nearest residential sensitive receptor is located 284 feet from the property boundary.

Fumaria Solar Project Site

Construction Impacts

As shown in Table 4.1-6, construction of the Fumaria Solar Project would result in increased noise levels for a limited period of time. Per WAC 173-60-050 and KCC 9.45.040, the state and county exempt construction noise from local noise standards, provided that such activities take place within the hours of 7:00 a.m. to 10:00 p.m. Construction of the Fumaria Solar Project would take place within those hours.

Table 4.1-6. Calculated Noise Levels at Nearest Receptor Due to Construction of the Fumaria Solar Project Site

	Calculated L_{max} (dBA)	Calculated L_{eq} Total (dBA)	Community Noise Level (dBA)	
			L_{day}	L_{night}
Estimated Ambient Noise Level[1]	–	–	43.0	37.0
Noise Level at Nearest Receptor[2]	76.4	78.7	78.0	37.0

1. ANSI S12.9-1993/Part 3
2. It is assumed that the construction equipment would be operating at the property boundary closest to the considered receptor. The nearest sensitive receptor is located 378 feet from the property boundary.

Operation Impacts

Table 4.1-7 shows the sound level at the property boundary and nearest sensitive receptor from the Fumaria Solar Project site. The estimated operational noise level at the Fumaria Solar Project property

boundary is below the 60 dBA Washington State Maximum allowed at a residential property (60 dBA). There would be no impact due to noise from operation of the Fumaria Solar Project.

Table 4.1-7. Calculated Noise Levels at Property Boundary Due to Operation of the Fumaria Solar Project Site

	Calculated L_{max} (dBA)	Calculated L_{eq} Total (dBA)	Community Noise Level (dBA)	
			L_{day}	L_{night}
Estimated Ambient Noise Level[1]	–	–	43.0	37.0
Noise Level at Property Boundary	37.3	42.1	45.6	37.0
Noise Level at Nearest Receptor[2]	37.3	42.1	45.6	37.0

1. ANSI S12.9-1993/Part 3
2. The nearest sensitive receptor is located 378 feet from the property boundary.

Penstemon Solar Project Site

Construction Impacts

As shown in Table 4.1-8, construction of the Penstemon Solar Project would result in increased noise levels for a limited period of time. Per WAC 173-60-050 and KCC 9.45.040, the state and county exempt construction noise from local noise standards, provided that such activities take place within the hours of 7:00 a.m. to 10:00 p.m. Construction of the Penstemon Solar Project would take place within those hours.

Table 4.1-8. Calculated Noise Levels at Nearest Receptor Due to Construction of the Penstemon Solar Project Site

	Calculated L_{max} (dBA)	Calculated L_{eq} Total (dBA)	Community Noise Level (dBA)	
			L_{day}	L_{night}
Estimated Ambient Noise Level[1]	–	–	43.0	37.0
Noise Level at Nearest Receptor[2]	80.5	82.8	82.1	37.0

1. ANSI S12.9-1993/Part 3
2. It is assumed that the construction equipment would be operating at the property boundary closest to the considered receptor. The nearest sensitive receptor is located 236 feet from the property boundary.

Operation Impacts

Table 4.1-9 shows the sound level at the property boundary and nearest sensitive receptor from the Penstemon Solar Project site. The estimated operational noise level at the Penstemon Solar Project property boundary is below the 60 dBA Washington State Maximum allowed at a residential property. There would be no impact due to noise from operation of the Penstemon Solar Project.

Table 4.1-9. Calculated Noise Levels at Property Boundary Due to Operation of the Penstemon Solar Project Site

	Calculated L_{max} (dBA)	Calculated L_{eq} Total (dBA)	Community Noise Level (dBA)	
			L_{day}	L_{night}
Estimated Ambient Noise Level[1]	–	–	43.0	37.0
Noise Level at Property Boundary	45.9	50.1	50.9	37.0
Noise Level at Nearest Receptor[2]	40.3	45.4	47.4	37.0

1. ANSI S12.9-1993/Part 3
2. The nearest sensitive receptor is located 236 feet from the property boundary.

Typha Solar Project Site

Construction Impacts

As shown in Table 4.1-10, construction of the Typha Solar Project would result in increased noise levels for a limited period of time. Per WAC 173-60-050 and KCC 9.45.040, the state and county exempt construction noise from local noise standards, provided that such activities take place within the hours of 7:00 a.m. to 10:00 p.m. Construction of the Typha Solar Project would take place within those hours.

Table 4.1-10. Calculated Noise Levels at Nearest Receptor Due to Construction of the Typha Solar Project Site

	Calculated L_{max} (dBA)	Calculated L_{eq} Total (dBA)	Community Noise Level (dBA)	
			L_{day}	L_{night}
Estimated Ambient Noise Level[1]	–	–	43.0	37.0
Noise Level at Nearest Receptor[2]	79.5	81.7	81.1	37.0

1. ANSI S12.9-1993/Part 3
2. It is assumed that the construction equipment would be operating at the property boundary closest to the considered receptor. The nearest sensitive receptor is located 266 feet from the property boundary.

Operation Impacts

Table 4.1-11 shows the sound level at the property boundary and nearest sensitive receptor from the Typha Solar Project site. The estimated operational noise level at the Typha Solar Project property boundary is below the 60 dBA Washington State Maximum allowed at a residential property. There would be no impact due to noise from operation of the Typha Solar Project.

Table 4.1-11. Calculated Noise Levels at Property Boundary Due to Operation of the Typha Solar Project Site

	Calculated L_{max} (dBA)	Calculated L_{eq} Total (dBA)	Community Noise Level (dBA)	
			L_{day}	L_{night}
Estimated Ambient Noise Level[1]	–	–	43.0	37.0
Noise Level at Property Boundary	56.1	56.4	56.6	37.0
Noise Level at Nearest Sensitive Receptor[2]	46.3	47.9	49.1	37.0

1. ANSI S12.9-1993/Part 3
2. The nearest sensitive receptor is a residence located 266 feet from the property boundary.

Urtica Solar Project Site

Construction Impacts

As shown in Table 4.1-12, construction of the Urtica Solar Project would result in increased noise levels for a limited period of time. Per WAC 173-60-050 and KCC 9.45.040, the state and county exempt construction noise from local noise standards, provided that such activities take place within the hours of 7:00 a.m. to 10:00 p.m. Construction of the Urtica Solar Project would take place within those hours.

Table 4.1-12. Calculated Noise Levels at Nearest Receptor Due to Construction of the Urtica Solar Project Site

	Calculated L_{max} (dBA)	Calculated L_{eq} Total (dBA)	Community Noise Level (dBA)	
			L_{day}	L_{night}
Estimated Ambient Noise Level[1]	–	–	43.0	37.0
Noise Level at Nearest Receptor[2]	83.5	85.7	85.1	37.0

1. ANSI S12.9-1993/Part 3
2. It is assumed that the construction equipment would be operating at the property boundary closest to the considered receptor. The nearest sensitive receptor is located 168 feet from the property boundary.

Operation Impacts

Table 4.1-13 shows the sound level at the property boundary and nearest sensitive receptor from the Urtica Solar Project site. The estimated operational noise level at the Urtica Solar Project property boundary is below the 60 dBA Washington State Maximum allowed at a residential property. There would be no impact due to noise from operation of the Urtica Solar Project site.

Table 4.1-13. Calculated Noise Levels at Property Boundary Due to Operation of the Urtica Solar Project Site

	Calculated L_{max} (dBA)	Calculated L_{eq} Total (dBA)	Community Noise Level (dBA)	
			L_{day}	L_{night}
Estimated Ambient Noise Level[1]	–	–	43.0	37.0
Noise Level at Property Boundary	46.9	48.4	49.8	37.0
Noise Level at Nearest Receptor[2]	40.9	43.9	46.5	37.0

1. ANSI S12.9-1993/Part 3
2. The nearest sensitive receptor is located 168 feet from the property boundary.

(c) Identify local, state, and federal environmental noise impact guidelines;

4.1.3 Kittitas County Noise Regulations/Guidelines

KCC Title 9: Public Peace, Safety and Morals, Chapter 9.45 Noise Control, regulates noise generation in the county. That chapter states (9.45.030 Public Disturbance – Noise Unlawful When) that it is unlawful to:

1. It is unlawful for any person to make, continue, or cause to be made or continued or any person owning or in possession of property to make, continue, or cause to be made or continued or allow to originate from the property any sound which:

   a. Is plainly audible within any dwelling unit which is not the source of the sound or is generated within two hundred feet of any dwelling unit, and;

   b. Either reasonably annoys, disturbs, injures or endangers the comfort, repose, health, peace or safety of others.

2. Sound which is “plainly audible” is sound that can be understood or identified.

3. It shall be a rebuttable presumption that sounds created between 8:00 a.m. and 10:00 p.m. do not unreasonably annoy, disturb, injure, or endanger.

Chapter 9.45.040 provides 21 exemptions to these rules, including the following that might be applicable to the TUUSSO Energy, LLC (TUUSSO), solar projects:

2. Sounds created by safety and protective devices, such as relief valves, where noise suppression would defeat the safety release intent of the device;

10. Sounds created by warning devices not operated continuously for more than thirty minutes per incident;

12. Sounds created by construction between 6:00 a.m. and 10:00 p.m.;

13. Sounds created by refuse removal equipment or personal snow removal equipment;

15. Sounds created by motor vehicles while being driven upon public highways. Such motor vehicles are nevertheless subject to the provisions of WAC Chapter 173-62;

17. Sounds created by unamplified human voices from 6:00 a.m. to 10:00 p.m.;

19. Sounds created by lawfully established commercial and industrial uses;

The county sheriff and other law enforcement officers are authorized to enforce the provisions of this chapter. Upon a finding that a civil infraction has occurred, a civil penalty of $100 can be levied for the first offense, $250 for the second offense, and $500 for each offense thereafter (Ord. 2016-009, 2016).

4.1.4 Washington Noise Regulations/Guidelines

The Washington Department of Ecology (Ecology) regulations governing noise generation in the state include:

- Revised Code of Washington (RCW) 70.107 – Noise Control
- RCW 46.09– Off-road and Highway Vehicles
- WAC 173-58– Sound Level Measurement Procedures
- WAC 173-60– Maximum Environmental Noise Levels
- WAC 173-62– Motor Vehicle Noise Performance Standards

State regulations set the amount of noise residential, commercial, and industrial noise sources can generate for similar categories of receiving properties. WAC 173-60-040, as shown in Table 4.1-14, stipulates the maximum allowed noise that can be received at a property, from a noise source.

Table 4.1-14. Washington State Maximum Allowed Amount of Noise Coming into a Property

Noise Source	Receiving Property (dBA)		
	Residential	Commercial	Industrial
Residential	55	57	60
Commercial	57	60	65
Industrial	60	65	70

Source: WAC 173-60-040.

As shown, industrial facilities are allowed to generate a maximum of 60 dBA for neighboring residential properties, 65 dBA for commercial properties, and 70 dBA for other industrial properties.

At any hour of the day or night the applicable state noise limitations may be exceeded for any receiving property by no more than:

(i) 5 dBA for a total of 15 minutes in any 1-hour period; or

(ii) 10 dBA for a total of 5 minutes in any 1-hour period; or

(iii) 15 dBA for a total of 1.5 minutes in any 1-hour period.

Furthermore, WAC 173-60-050 provides two exemptions to WAC 173-60-040, except insofar as such provisions relate to the reception of noise within Class A Environmental Designation for Noise Abatements (EDNAs) between the hours of 10:00 p.m. and 7:00 a.m.:

(a) Sounds originating from temporary construction sites as a result of construction activity.

(b) Sounds originating from forest harvesting and silvicultural activity.

4.1.5 Federal Noise Regulations/Guidelines

No federal regulations limit overall environmental noise levels; however, federal guidance documents exist that address environmental noise and regulations for specific noise sources. For example, the Federal Highway Administration (FHWA), U.S. Department of Transportation (DOT), Federal Railroad Administration (FRA), Federal Transit Administration (FTA), Federal Aviation Administration (FAA), and Federal Interagency Committee on Urban Noise (FICUN) provide regulations and guidelines for noise impacts resulting from federal highways, aircraft usage, railroads, and other development, as described in the following paragraphs. While these standards are not directly applicable to utility construction projects, they provide some context for the impact analysis.

4.1.5.1 Federal Highway Administration

The FHWA noise abatement criteria establish absolute exterior noise levels for varying land use categories where an impact is triggered. The noise abatement criteria require maintenance of L_{eq} for noise levels emitted in lands classified as categories “A” (lands for which serenity and quietness are significant), “B” (lands near sensitive receptors, defined as picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals) as 67 dBA, and “C” (developed lands, properties, or activities not included in categories “A” or “B”) as 72 dBA.

Federal Transit Administration

The FTA has established guidelines for construction vibration to avoid harmful effects from excessive ground-borne vibration. The damage criteria developed by FTA are in the range of 0.12 to 0.5 peak particle velocity (PPV) for structural damage depending on the fragility of the structure of concern. The project is not subject to FTA regulations; however, these guidelines serve as a useful tool to evaluate vibration impacts on structures.

Federal Aviation Administration and Federal Interagency Committee on Urban Noise

Finally, FAA and FICUN have issued land-use compatibility guidelines indicating that a yearly L_{dn} of less than 65 dBA (59 dBA L_{eq}) is compatible with residential land uses and that, if a community determines it is necessary, levels up to 75 dBA (69 dBA L_{eq}) may be compatible with residential uses and transient lodgings that incorporate noise-reduction features (Code of Federal Regulations [CFR] Title 14, Part 150).

(d) Describe the mitigation measures to be implemented to satisfy WAC 463-62-030;

The Columbia Solar Projects would limit construction to the hours of 7:00 a.m. to 10:00 p.m. The solar projects would also incorporate various measures to reduce construction-related noise where feasible using the following methods:

- Construction equipment would use noise reduction devices that are no less effective than those originally installed by the manufacturer.
- Stationary equipment used during construction would be located as far as practical from sensitive noise receptors.
- "Quiet" equipment (i.e., equipment that incorporates noise control elements into the design—compressors have "quiet" models) would be used during construction when reasonably available.

(e) Describe the means the applicant proposes to employ to assure continued compliance with WAC 463-62-030.

Per WAC 463-62-030, EFSEC requires that energy facilities meet the noise standards established in 173-60 WAC. The Columbia Solar Projects construction schedule would be limited to the hours of 7:00 a.m. to 10:00 p.m. to ensure compliance via exemption per WAC 463-62-030.

The estimated operational noise level at most of the project sites would be below the Maximum Permissible Noise Levels and thus would be in compliance. The estimated operational noise levels at the Camas Solar Project site were above the Maximum Permissible Noise Levels at the property boundary, but below the Maximum Permissible Noise Levels when calculated at the nearest sensitive receptor. The site conservatively assumed that the inverters would be operating continuously at 100% and also does not account for any offsets due to traffic on the roads separating the sensitive receptors from the project site. Additionally, the noise level does not take into account further attenuation due to atmospheric interference, intervening structures, or seasonal noises common to the area, such as farm machinery and crop dusters. The Columbia Solar Projects would be designed to be within the Maximum Permissible Noise Levels and thus comply with WAC 463-62-030.

(2) Risk of fire or explosion. The application shall describe any potential for fire or explosion during construction, operation, standby or nonuse, dismantling, or restoration of the facility and what measures will be made to mitigate any risk of fire or explosion.

Because there would be minimal amounts of fossil fuels transported, stored, or used to operate equipment during construction, there would be no potential impacts from explosions.

Unlike thermal power plants, solar power projects pose a much smaller risk of accidental fires or explosions because there is no need to transport, store, or combust fossil fuels to generate electricity. The Columbia Solar Projects also would be designed comply with the National Electric Code (NEC) and the National Fire Protection Agency (NFPA) requirements, to avoid potential electrical fire risks. A strict Fire Prevention and Safety Plan would be developed and enforced during project construction and operation, to reduce and address potential fire risks.

As with any major developments, construction of the Columbia Solar Projects presents some minimal fire risks. Each of the project sites is currently farmed agricultural land, mostly for hay production or grazing. Fumaria is the only fallow agricultural field (not recently grazed) at this time. Thus the predominant groundcover is non-native grasses and weeds, with the greatest fire risks being associated with grass fires during the hot, dry summer season. TUUSSO would maintain the vegetation at or below 12 inches in

height to mitigate the risk of fire. TUUSSO has also initiated discussions with the Kittitas County Fire Marshal about potential fire issues, locations and dimensions of access gates and internal access roads, and other issues. A Fire Protection and Safety Plan would be developed and implemented prior to construction, in coordination with the Kittitas County Fire Marshal and other appropriate agencies.

4.1.5.2 Construction Impacts to Fire Suppression and Safety

Construction equipment would have spark-arresting mufflers, heat shields, and other protection measures to avoid starting fires. Fire extinguishers would be available in vehicles and on equipment, to quickly address any accidental fire issues. Work crews also would be trained about fire avoidance and response measures.

If a fire were to occur, water would be available on-site that could be applied to the fire. For the Camas, Penstemon, Typha, and Urtica Solar Project sites the water sources are already available on-site. For the Fumaria Solar Project site, water would be trucked onto the site from the Ellensburg area.

During construction, water would be used to suppress fugitive dust during grubbing, clearing, grading, trenching, and soil compaction. If a fire were to occur, that water could be diverted for firefighting purposes.

As a result of the above fire avoidance measures and ability to respond on-site to potential fires, the risks of and potential impacts from on-site fires during construction of the five Columbia Solar Projects would be minimal.

4.1.5.3 Operation Impacts to Fire Suppression and Safety

Combustible vegetation on and around each of the five Columbia Solar Project boundaries would be maintained by TUUSSO and the landowner. Each solar project site would include fire breaks around the project boundary, in accordance with State and/or County standards, as applicable. TUUSSO would maintain the on-site vegetation at or below 12 inches in height to mitigate the risk of fire. TUUSSO would also coordinate with the Kittitas County Fire and Rescue to provide PV training to fire responders, construction, operational, and maintenance staff. The intent of this training would be to familiarize both responders and workers with the codes, regulations, associated hazards, and mitigation processes related to solar electricity. This training would include techniques for fire suppression of PV systems.

As a result of the above fire avoidance measures and ability to respond on-site to potential fires, the risks of and potential impacts from on-site fires during operation of the five Columbia Solar Projects would be minimal.

(3) Releases or potential releases to the environment affecting public health, such as toxic or hazardous materials. The application shall describe any potential for release of toxic or hazardous materials to the environment and shall identify plans for complying with the federal Resource Conservation and Recovery Act and the state Dangerous waste regulations (chapter 173-303 WAC). The application shall describe the treatment or disposition of all solid or semisolid construction and operation wastes including spent fuel, ash, sludge, and bottoms, and show compliance with applicable state and local solid waste regulations.

4.1.6 Construction Phase Spill Prevention, Control, and Countermeasure Plan

A detailed construction Spill Prevention, Control, and Countermeasure (SPCC) Plan would be developed by TUUSSO's engineering, procurement, and construction (EPC) contractor and submitted to EFSEC for review prior to construction. EFSEC, as well as pertinent local emergency response organizations, where appropriate, would review and approve all plans before they are implemented. The plan would address prevention and clean-up of any potential spills from construction activities.

Petroleum fuels are the only potentially hazardous materials that would be used in any significant quantity during construction of the Columbia Solar Projects. Construction of the projects would require the use of diesel fuel for operating construction equipment and vehicles. Measures to prevent and contain any accidental spills resulting from this fuel storage and use are described in detail below in Section 4.1.6.2. Construction of the projects would not result in the generation of any hazardous wastes in quantities regulated by state or federal law.

4.1.6.1 Construction Spill Prevention

Fuel and lubricating oils from construction vehicles and equipment and, if the transformers used are not dry-type, then the mineral oil used to fill the transformers are the only potential sources for a spill. The EPC contractor would be responsible for training its personnel in spill prevention and control and, if an incident occurs, would be responsible for containment and cleanup.

4.1.6.2 Fuel Spill Prevention

During construction, the EPC contractor would utilize fuel trucks for refueling of construction vehicles, fuel storage tanks, and equipment on-site. The fuel trucks would be properly licensed and would incorporate features in equipment and operation, such as automatic shut-off devices, to prevent accidental spills. Some construction vehicles, such as pickup trucks, would be fueled in town at gas stations. Any spills would be addressed in accordance with the Construction Spill Prevention Plan.

Potential risks would be additionally mitigated by using dedicated fuel-delivery trucks driven by professional, appropriately licensed drivers and by ensuring adherence to the site speed-limits. No other equipment fueling plan is anticipated. A fuel tanker accident would trigger activation of the SPCC Plan. The SPCC plan would include a description of procedures that would be followed in the event of a fuel tanker spill and would contain a list of equipment that would be on-site for spill response emergencies.

4.1.6.3 Lubricating Oils

Lubricating oils used during construction would mostly be contained in the vehicles and equipment for which they are used. Small quantities of lubricating oils may also be stored in appropriate containers at the construction staging area. The details of storage and containment of lubricating oils and other materials at the construction staging area would be addressed in the construction-phase SPCC. Appropriate measures would be taken to ensure these materials are not spilled and that if a spill does occur, it is promptly cleaned up and reported to the proper agencies.

4.1.6.4 Transformer Mineral Oil

The pad-mounted transformers found throughout each of the five Columbia Solar Project sites would likely be filled with mineral oil at the factory and not at the site during construction. Appropriate measures

would be taken to ensure these materials are not spilled and that if a spill does occur, it is promptly cleaned up and reported to the proper agencies.

Because fuel and lubricating oils from construction vehicles and equipment are the only potential sources for a spill, equipment and operational features such as automatic shut-off devices would be used to prevent accidental spills, fuel-delivery trucks would be driven by licensed drivers who would ensure adherence to the site speed limits, the solar projects would not result in the generation of any hazardous wastes in quantities regulated by state or federal law, and an approved SPCC Plan would be followed, no impacts would occur from the potential releases of toxic or hazardous materials during construction.

4.1.7 Operational Phase Spill Prevention, Control, and Countermeasure Plan

An operational-phase SPCC Plan would be developed and submitted to EFSEC prior to the commencement of Columbia Solar Project operations. Operation of the projects would not require the storage or use of significant quantities of fuel or other materials that could cause a spill or other accidental release.

Columbia Solar Project operations would not require the use of a permanent fuel storage tank, as fuel use during operations is limited to maintenance vehicle fueling, which would be done at existing licensed gas stations in nearby communities. The potential for accidental spills during operations is minimal, as the sole source of potential spills on-site would be the small amounts of mineral oil contained within the pad-mounted transformers. The transformers are designed to meet stringent electrical industry standards, including containment tank welding and corrosion protection specifications.

Thus, as with construction, because fuel and lubricating oils from construction vehicles and equipment are the only potential sources for a spill, equipment and operational features such as automatic shut-off devices would be used to prevent accidental spills, fuel-delivery trucks would be driven by licensed drivers who would ensure adherence to the site speed limits, the solar projects would not result in the generation of any hazardous wastes in quantities regulated by state or federal law, and an approved SPCC Plan would be followed, no impacts would occur from the potential releases of toxic or hazardous materials during operation.

4.1.8 Environmental Protection and Compliance Program

An Environmental Protection and Compliance Program would be developed by the EPC contractors to ensure that all construction activities meet the conditions, limits, and specifications set in environmental standards established in the Site Certification Agreement and all other federal, state, and local environmental regulations. The Environmental Compliance Program would cover avoidance of wetlands and any other sensitive areas during construction, waste handling and storage, stormwater management, spill prevention and control, and other components required by state and county regulation. Copies of the plan and all applicable construction permits would be kept on-site. The project manager would be responsible for ensuring that all the requirements in the Environmental Protection and Compliance Plan and the construction permits are adhered to, and that any deficiencies are promptly corrected.

4.1.9 Solid or Semi-solid Wastes

Unlike thermal power plants, construction and operation of solar projects would not generate spent fuel, ash, sludge, or “bottoms,” and thus there would be no impacts from these materials. The five Columbia

Solar Projects would comply with all applicable state and local solid waste regulations during all phases of the projects.

A Decommissioning Plan has been developed outlining how each of the Columbia Solar Project sites would be cleared and returned to usable agricultural production. At the time of decommissioning, a detailed Removal Work Plan and Schedule and a Site Restoration Plan would also be developed. The Removal Work Plan and Schedule would describe the proposed equipment that would be removed and an associated schedule for such removal based on expected future uses of the project site. The currently envisaged plan involves completion of the decommissioning, excluding establishment of revegetation, in a 6-month period. TUUSSO also would file a Discretionary Site Plan Review for review and approval by EFSEC.

In general, TUUSSO would attempt to maximize the recycling of facility components during decommissioning. PV solar panels, metals, and other materials would be recycled to the extent possible, including:

- tracker motors and any tracker control equipment, as per state e-waste recycling requirements;
- support piers/posts;
- underground 12.47-kV cables and conduits that form the AC and direct current(DC) collection systems;
- above ground DC electrical conductors;
- generation tie line conductors; and
- all other steel, copper, and aluminum, to the maximum extent possible.

Any insulating and cooling mineral oil and fluids from the transformers would be drained and recycled or disposed of at an appropriately licensed disposal facility. If recycling could not occur with any remaining materials (e.g., broken asphalt from access driveways), they would be transported to the nearest landfill for disposal.

Because materials and equipment would be recycled to the maximum extent possible, and there would be adequate capacity to landfill the remaining materials, no impacts would occur from solid wastes during construction or operation of the solar projects.

(4) Safety standards compliance. The application shall identify all federal, state, and local health and safety standards which would normally be applicable to the construction and operation of a project of this nature and shall describe methods of compliance therewith.

TUUSSO and its contractors would comply with all applicable local, state, and federal safety, health, and environmental laws, ordinances, regulations, and standards. Some of the main laws, ordinances, regulations, and standards (LORS) that would be reflected in the design, construction, and operation of the Columbia Solar Projects include:

- American Concrete Institute Standards
- American Institute of Steel Construction Standards
- American National Standards Institute, which provides plant design standards
- American Society of Mechanical Engineers, which provides plant design standards
- American Society for Testing and Materials
- Americans with Disabilities Act
- Institute of Electrical and Electronic and Installation Engineers
- National Electric Safety Code;

- National Fire Protection Association, which provides design standards for the requirements of fire protection systems
- National Institute for Occupational Safety and Health (NIOSH), which requires that safety equipment carry markings, numbers, or certificates of approval for stated standards
- Occupational Safety and Health Act of 1970 (29 U.S.C. 651, et seq.) and 29 CFR 1910, Occupational Safety and Health Standards
- Uniform Building Code
- Uniform Fire Code Standards

(5) Radiation levels. For facilities which propose to release any radioactive materials, the application shall set forth information relating to radioactivity. Such information shall include background radiation levels of appropriate receptor media pertinent to the site. The application shall also describe the proposed radioactive waste treatment process, the anticipated release of radionuclides, their expected distribution and retention in the environment, the pathways which may become sources of radiation exposure, and projected resulting radiation doses to human populations. Other sources of radiation which may be associated with the project shall be described in all applications.

The TUUSSO solar facilities do not have radiation, generate radiation, or release any radioactive materials and this section is thus not applicable.

(6) Emergency plans. The application shall describe emergency plans which will be required to assure the public safety and environmental protection on and off the site in the event of a natural disaster or other major incident relating to or affecting the project as well as identifying the specific responsibilities that will be assumed by the applicant.

As described above, TUUSSO would prepare and submit to EFSEC for approval the following plans:

- Fire Protection and Safety Plan
- Construction Spill Prevention, Control, and Countermeasure Plan
- Operation Spill Prevention, Control, and Countermeasure Plan
- Stormwater Pollution Prevention Plan
- Environmental Protection and Compliance Plan
- Vegetation Management Plan
- Incidental Avian Monitoring Plan

TUUSSO's EPC contractor would be responsible for implementing the applicable plans during construction, and their operational contractor would similarly do so during operation of the five Columbia Solar Projects.

4.2 Land and Shoreline Use 463-60-362

(1) The application shall identify land use plans and zoning ordinances applicable to the project site.

4.2.1 Affected Environment for Land Use and Zoning

4.2.1.1 General County

All of the proposed solar project sites would be located in unincorporated Kittitas County, Washington (Figure 4.2-1). Land use in Kittitas County is guided by the Kittitas County Comprehensive Plan. The 20-year plan is currently being revised and is the subject of public review. The plan is scheduled to be adopted in April 2018 and will be the guiding document for land use for the county through 2037.

Kittitas County includes 1,449,568 acres. According to the current draft of the Kittitas County Comprehensive Plan, seven overall land use designations are identified to guide land use decisions: commercial agriculture, commercial forest, mineral, rural residential, rural working, rural recreation, limited area of more intense rural development (LAMIRD), and urban. As shown in Table 4.2-1, commercial forest mineral land uses comprise over 800,500 acres and 55% of the entire county, rural working comprises almost 330,000 acres and 23%, and commercial agriculture comprises almost 292,000 acres and 20% of the total county land uses (Kittitas County 2016).

Table 4.2-1. Kittitas County Comprehensive Plan Land Use Designations and Acreages

Land Use Designation	Land Area (acres)	Percent of County
Commercial Agriculture	291,614	20.1
Commercial Forest Mineral	800,511	55.2
Mineral	5,745	0.3
Rural Residential	30,013	2.1
Rural Working	329,982	22.8
Rural Recreation	10,535	7.3
Limited Areas of More Intensive Rural Development	1,168	>0.1
Urban	7,000	0.5
Total	**1,449,568**	**100**

Source: Kittitas County (2016).

4.2.1.2 Solar Project Sites

The Kittitas County Comprehensive Plan established the policy framework for Kittitas County's legislative actions designating the land use zones for the five proposed Columbia Solar Project sites. The five sites would be located on lands zoned as either Commercial Agriculture or Rural Working – Agriculture 20. Within these zones, Kittitas County allows many non-agricultural land uses, including solar PV facilities, as permitted, conditional uses of the land, subject to criteria that are intended to identify local, site-specific impacts that can be addressed through conditioned permits. These zones are described below.

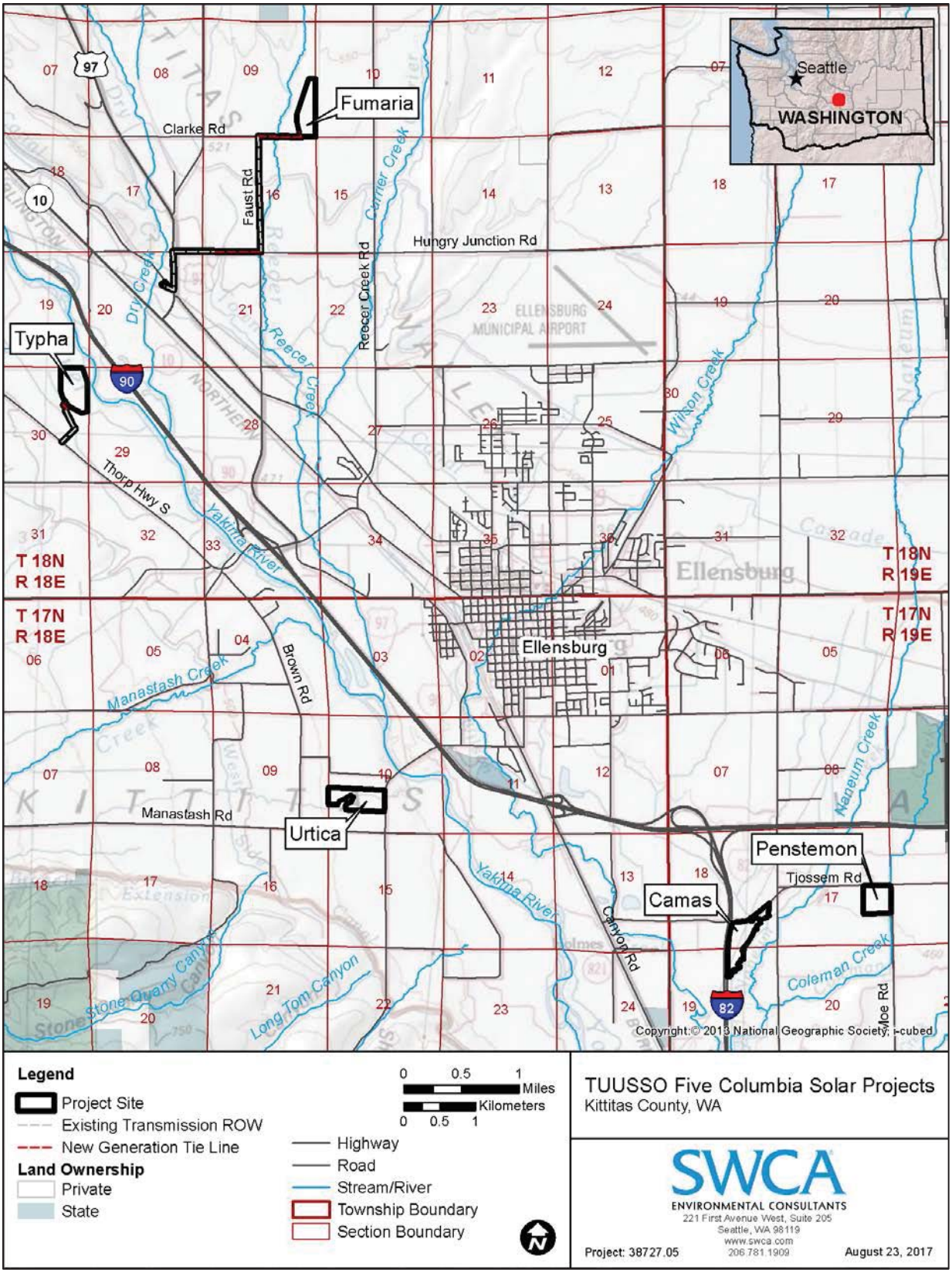


Figure 4.2-1. Columbia Solar Project site locations.

Commercial Agriculture Land Use Zone

Per the Kittitas County Comprehensive Plan, the Commercial Agriculture land use zone "is an area wherein farming and ranching are the priority." The purpose of this zoning classification "is to preserve fertile farmland from encroachment by nonagricultural land uses and protect the rights of those engaged in agriculture." The Commercial Agriculture zone only allows for agricultural land use with no more than two residential dwellings per 20 acres. According to KCC 17.15.050.01, utilities, including "solar farms" as defined by KCC 17.61, are a permitted conditional use of a Commercial Agriculture zone.

Rural Working – Agriculture 20 Land Use Zone

Per the Kittitas County Comprehensive Plan, the Rural Working general land use designation "generally encourages farming, ranching and storage of agriculture products, and some commercial and industrial uses compatible with rural environment and supporting agriculture and/or forest activities." The purposes of the Rural Working designation are to:

- Provide preservation of agriculture activities where producers can live and work on their own lands separate from resource lands.
- Support the continuation, whenever possible, of agriculture, timber and mineral uses on lands not designated for long-term commercial significance.
- Provide some buffer between rural residential lands and resource lands.
- Provide areas of low intensity land use activities within the agriculture and forest activities.

Within the Rural Working general land use designation, the project sites are zoned Agriculture 20 (A-20). According to KCC 17.29.10, the A-20 zone "is an area wherein farming, ranching and rural life styles are dominant characteristics. The intent of this zoning classification is to preserve fertile farmland from encroachment by nonagricultural land uses; and protect the rights and traditions of those engaged in agriculture." According to KCC 17.15.060.1, utilities, including "solar farms" as defined by KCC 17.61, are a permitted conditional use within an A-20 zone.

Camas Solar Project Site

The Camas Solar Project site would be located on land with a Commercial Agriculture land use designation, also zoned as Commercial Agriculture, and would be an allowed conditional use in that zone.

Fumaria Solar Project Site

The Fumaria Solar Project site would be located on land with a Rural Working land use designation, zoned as Agriculture 20 (i.e., Rural Working – Agriculture 20), and would be an allowed conditional use in that zone.

Penstemon Solar Project Site

The Penstemon Solar Project site would be located on land with a Commercial Agriculture land use designation, also zoned as Commercial Agriculture, and would be an allowed conditional use in that zone.

Typha Solar Project Site

The Typha Solar Project site would be located on land with a Commercial Agriculture land use designation, also zoned as Commercial Agriculture, and would be an allowed conditional use in that zone.

Urtica Solar Project Site

The Urtica Solar Project site would be located on land with a Rural Working land use designation, zoned as Agriculture 20 (i.e., zoned as Rural Working – Agriculture 20), and would be an allowed conditional use in that zone.

4.2.2 Impacts to Land Use and Zoning

4.2.2.1 General County

Construction Impacts

As indicated above, development of all five of the Columbia Solar Projects would be allowed conditional uses under Kittitas County land use planning and zoning regulations. Construction of the solar projects would represent a conversion of the roughly 232 acres of leased properties currently used for agricultural hay production and grazing, to use as solar electricity generation facilities for the approximately 30-year lives of the solar projects. Of that total, 144.9 acres are designated as Commercial Agricultural land uses and 87.2 acres are designated as Rural Working land uses (Kittitas County 2016). Conversion of those lands to solar facilities would represent only:

- 0.05% of the 291,614 acres of lands specifically designated as Commercial Agricultural land uses in the county's comprehensive plan (Kittitas County 2016);
- 0.03% of the 329,982 acres of lands specifically designated as Rural Working land uses in the county's comprehensive plan (Kittitas County 2016);
- 0.13% of the total 183,124 acres of farmlands in Kittitas County (U.S. Department of Agriculture [USDA] 2012); and
- 0.34% of the 68,314 acres of total croplands in Kittitas County (USDA 2012).

By choosing agricultural lands, TUUSSO has intentionally avoided areas of significant habitat, such as shrub steppe and other areas that are important wildlife habitat. The Columbia Solar Projects are not anticipated to affect areas beyond the solar project sites' footprints and the associated generation tie lines, encompassed within the described 232 acres. Because of the minimal percentages of effects and the fact that they would be allowed conditional uses, the five Columbia Solar Projects would have minimal impacts to land uses in the county.

Operation Impacts

Mounting of the panels on post-and-frame systems on the five Columbia Solar Project sites and the continued growth of low vegetation below and between the panels would result in minimal land disturbances. Once the solar projects are decommissioned, all equipment and materials would be removed. Because of the minimal disturbances to the top soils, the lands could be readily converted back to their former or new agricultural uses. Thus, there would be no operational or post-operational impacts to land uses in the county.

4.2.2.2 Solar Project Sites

Camas Solar Project Site

The Camas Solar Project site is 51.21 acres of active agricultural land, growing alfalfa, and representing 0.02% of the 291,614 acres of lands specifically designated as Commercial Agricultural land uses in the county's comprehensive plan.

Fumaria Solar Project Site

The Fumaria Solar Project site is 35.24 acres of fallow agricultural land, representing 0.01% of the 329,982 acres of lands specifically designated as Rural Working land uses in the county's comprehensive plan.

Penstemon Solar Project Site

The Penstemon Solar Project site is 39.38 acres of active agricultural land, growing Sudangrass, and representing 0.01% of the 291,614 acres of lands specifically designated as Commercial Agricultural land uses in the county's comprehensive plan.

Typha Solar Project Site

The Typha Solar Project site is 54.29 acres, primarily consisting of irrigated agricultural land being used for grazing pasture, and representing 0.02% of the 291,614 acres of lands specifically designated as Commercial Agricultural land uses in the county's comprehensive plan.

Urtica Solar Project Site

The Urtica Solar Project site is 51.94 acres, primarily consisting of active agricultural land growing common timothy hay, and representing 0.02% of the 329,982 acres of lands specifically designated as Rural Working land uses in the county's comprehensive plan.

The proposed Columbia Solar Projects represent changes from the sites' current agricultural uses, but the projects' impacts would be minimal and isolated, and the projects are an allowable use under the current zoning and land use. Solar project development is a permitted conditional use in these areas under their designated zoning of Commercial Agriculture or Rural Working – Agriculture 20. Moreover, as noted above, the combined 232 acres represent only 0.13% of the total 183,124 acres of farmlands in Kittitas County and 0.34% of the 68,314 acres of total croplands.

4.2.2.3 Impacts to Natural and Human Environment

The environmental impacts from the proposed five Columbia Solar Projects and two associated generation tie lines would not be significant enough to warrant full environmental impact statement (EIS) review. Below is a discussion of the minor impacts from the construction and operation of the solar projects. Additional discussion of WAC 463-60 and 463-62 criteria are provided in Chapters 3 and 4.

The Earth components would not experience significant impacts from construction or operation of the Columbia Solar Projects. The geology, soils, and topography could see minor impacts from installation of the solar projects' support beams and the minimal grading associated with the construction. Because the sites are relatively flat, erosion risk is low. The only unique physical feature, the Yakima River, would not be impacted by the projects.

Air resources would experience minimal impacts from construction of the Columbia Solar Projects. Anticipated emissions of carbon dioxide equivalent (CO_2e), nitrogen oxides (NO_X), carbon monoxide (CO), and PM_{10} would result in at most 0.12% of Kittitas County's emissions inventory for each pollutant during construction. Once construction is complete, the air impacts would stop, as operating the solar projects would not cause air emissions.

Impacts to water resources would also be limited to isolated impacts. Construction would not cause any impacts to water resources that the Columbia Solar Projects must cross because TUUSSO plans to span water resources rather than constructing in them. Two water resource buffers would experience minor permanent impacts through encroachment of 7 square feet on the Penstemon Solar Project and 0.39 acres on the Urtica Solar Project. All other buffers would be avoided and experience no impacts. Similarly, wetlands, streams, and the Yakima River would also be buffered with at least 20-foot setbacks. Since no stormwater discharges are proposed and less than 5% of impervious surfaces would be added, any increased runoff would be negligible compared to the reduction in current flood irrigation. In addition, the Columbia Solar Projects can meet their stormwater discharge obligations through coverage under the

Construction Stormwater General Permit. The 100-year floodplain would experience minor permanent impacts from fill at only two locations: 0.19 acre on the Camas Solar Project site and 0.38 acre on the Urtica Solar Project site. Finally, groundwater might see impacts through seepage if construction occurs in rainy winter months, but control measures would be readily available and groundwater otherwise would not be impacted. The TUUSSO is submitting a Kittitas County Shoreline Management Act permit application and supporting narrative for informational purposes (Appendix J-3) for two distinct and minor activities within the 200-foot shoreline jurisdictional area of the Yakama River (and well away from the river's ordinary high water mark). However, pursuant to RCW 90.58.140(9), WAC 173-27-045, and WAC 173-27-030(7), the Columbia Solar Projects are exempt from Shoreline Management Act permits.

The impacts to habitat, vegetation, fish, and wildlife would not be significant. Within the Columbia Solar Projects' 232 acres, the most prevalent wildlife habitats are designated as fallow (native vegetation), fallow (recently grazed), and willow-rose shrub thicket. The solar projects would result in modification or removal of less than 1% of the total available habitat in the landscape analysis area. No sensitive or special-status plants occur on the project sites. Fish and wildlife might experience low levels of impacts during construction through temporary displacement to adjacent habitat or temporary habitat alteration, with some species (e.g., small rodents, snakes, and insects) also suffering minor levels of mortality from direct contact with construction equipment, which would not adversely impact those populations. In addition, 11.86 acres (approximately 5% of the project sites) would be converted to impervious surfaces, almost 8 acres of which would have been under agricultural production. These impervious surfaces account for 1% of the spotted skunk's habitat on the project sites and less than 1% for other species. Finally, no long-term operational impacts to special-status animal species are anticipated beyond the fencing of 2 acres and removal of 0.07 acre of bald eagle habitat and the fencing of 3 acres and removal of 0.11 acre of spotted frog habitat. The impacts to habitat, vegetation, fish, and wildlife are not significant.

One wetland on the Columbia Solar Projects would experience a minor permanent impact, and wetland protection buffers would experience minor permanent and temporary impacts. To provide access to the Typha Solar Project, approximately 0.01 acre of wetland fill would be placed in wetland TW03 to address a culvert replacement. This minor fill would require a Joint Aquatic Resource Application and a shoreline development permit. All other wetlands would be avoided and see no impacts. Approximately 0.01 acre of wetland protection buffers at the Typha Solar Project would experience minor permanent impacts from road construction, while wetland protection buffers at the Camas, Typha, and Urtica Solar Projects would experience minor temporary impacts. These minor impacts to wetlands and wetland protection buffers are not significant.

The Columbia Solar Projects would cause no impacts to energy sources, as the projects are not anticipated to place a demand on energy supplies. Similarly, the solar projects would cause no impacts to soil, sand, gravel, or wood products or other natural resources in the Ellensburg area, as the resources needed for the solar projects are readily available. Water demand would also not impact water sources because the projects' limited water demands would be met by on-site existing water allocations or water trucked in from municipal sources.

Environmental health, including noise, fire risk, spills, and solid waste, would experience only minimal impacts. One project, the Camas Solar Project, might cause minimal, daytime-only impacts from noise at the property boundary with a commercial facility. While this noise level would occur during the time allowance provided by regulation, TUUSSO is committed to ongoing monitoring and mitigation, as needed to ensure the impacts are not significant.

Fire and explosion impacts would be minimal. Potential fire risks and impacts from the Columbia Solar Projects would be minimal because the projects' equipment has fire protection and prevention measures

and project water can be diverted for firefighting. Moreover, the risk of explosion is low because fossil fuels would be transported, stored, or used on the solar projects in small quantities.

Like fossil fuels, toxic, hazardous, or solid waste materials are unlikely to pose impacts because they would be generated in such small quantities. To the maximum extent possible, these materials would be recycled and the remainder would be landfilled.

Construction and operation of the Columbia Solar Projects would cause minor visual changes but would not substantially degrade the existing visual character or quality of the vicinity of the projects. While the solar projects would be visible from key observation points (KOPs), none of the KOPs would experience a major or significant change to the characteristic view. The solar projects would create a minor visual contrast in the viewshed, but they would be less likely to be visible as the viewer moves further away. The projects' mitigation measures are intended to decrease the aesthetic impacts of construction of the Columbia Solar Projects.

While some land uses and resources, like recreation facilities and parking, would see no impacts from the Columbia Solar Projects, some land uses and resources could experience some non-significant impacts. Isolated cultural resources that are not eligible for the National Register of Historic Places would be minimally to moderately impacted by the solar projects, but such impacts are not expected to be significant. The majority of the roads in the area would see no impacts from the solar projects, but the three county roads that access the Fumaria Solar Project would experience temporary minor to moderate impacts from increased traffic. Similarly, during construction, traffic from slow-moving construction vehicles could cause minor, temporary impacts. None of these impacts are expected to be significant.

The Columbia Solar Projects would have minimal beneficial to no impacts on socioeconomics and employment, with the likely minimal benefit to employment coming from temporary construction hiring. Similarly, no impacts are expected on housing and potentially beneficial impacts are expected on tax revenues, with an estimated $4,880,000 in property tax revenue for Kittitas County over the 30-year project life. Because of the solar projects' on-site fire prevention and protection measures, the risk and impacts of potential fires are minimal. Impacts on police and law enforcement would be limited to minimal impacts from responding to traffic issues, emergency medical calls, and coordination in the unlikely event of a fire. Finally, no impacts would occur for other city services, such as schools, communications, utilities, maintenance, and sewer and solid waste, since no permanent relocations or in-migration is anticipated and no toilet, septic, or sewer system connections would be made at the solar project sites.

Each of the five proposed Columbia Solar Projects is estimated to cost $8 to 10 million, for a total estimated cost of $40 to $50 million for all five projects. As to magnitude, the solar projects would generate approximately 5 MWac each, approximately 25 MWac in total. Please refer to the responses in Sections 2.1 and 2.2 for more detailed information about the magnitude of the five proposed Columbia Solar Projects.

The Columbia Solar Projects' impacts to the natural and human environment are, in many cases, minor and/or temporary. In fact, a number of resources would not be impacted at all by the solar projects. Based on the discussion above, the environmental impacts should be viewed as not significant enough to warrant a full review of this application.

(2) Light and glare. The application shall describe the impact of light and glare from construction and operation and shall describe the measures to be taken in order to eliminate or lessen this impact.

4.2.3 Light and Glare

4.2.3.1 General

PV flat plate solar panels are designed to absorb sunlight, with an anti-reflective layer to maximize solar absorption and minimize glare. In practice, from satellite view and airplanes, large arrays of solar modules resemble a dark blue body of water and are not a significant contributor of glare in most conditions.

A mono-crystalline silicon solar cell absorbs two-thirds of the sunlight reaching the panel's surface. Therefore, only one-third or 30% of the sunlight reaching the surface of the solar panel has the opportunity to be reflected. This reflected light from the panels is referred to as glare, a continuous source of bright light, and is considered a nuisance concept of light. Other comparable levels of glare are listed below to help put this into context:

- Dry sand – 45%
- Mono-crystalline silicon solar cell – 30%
- Grass-type vegetation – 25%
- Needle-leaf coniferous trees – 20%
- Broad-leaf deciduous trees – 10%

The U.S. Air Force has studied glare impact from flat-panel solar projects to airports, and determined that such glare is similar to "weathered white concrete" and poses minimal risk (for more detail see U.S. Air Force [2011]).

Glare would only impact a particular receptor nearby for a brief period throughout the day, as the panels would constantly track the angle of the sun. Any existing vegetation surrounding the properties, plus any additional vegetative screening planted as part of the five proposed Columbia Solar Projects, could mitigate additional glare from the projects.

4.2.3.2 Solar Project Sites

The Solar Glare Hazard Analysis Tool (SGHAT), created by Sandia National Laboratories, was used to conduct the glare analyses for the five Columbia Solar Projects. In 2017, the Solar Glare Hazard Analysis Tool was licensed to the private company Forge Solar, run by one of the original engineers who designed the popular glare modeling tool, which now appears on the reports and have a new, simpler format for presenting ocular impacts. Representative models of the five proposed PV system were constructed in the SGHAT application for each of the projects' three KOPs relative to the solar module arrays. Potential glare hazards were evaluated against the current FAA guidelines and industry standards for acceptable glare.

Figure 4.2-2 shows how the SGHAT tool results are displayed.

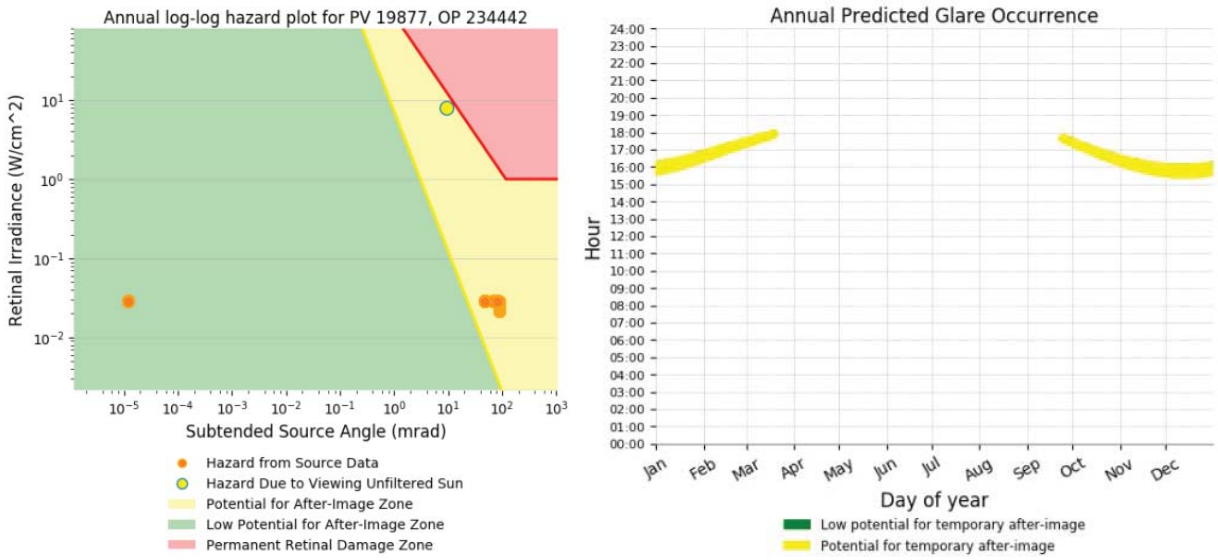


Figure 4.2-2. SGHAT tool results example.

In the above case, yellow glare potential is indicated for temporary after-image during sunset hours in winter months. However, the source data intensity is two orders of magnitude below the direct sun intensity and within normal driving conditions during sunset hours as indicated in the plot to the top left.

Based on the SGHAT analysis for all five Columbia Solar Projects, the ocular impact or glare intensity is below 2×10^2 W/cm^2 in the "Hazard plot for PV" and, therefore, the projects would have no dangerous or detrimental visual impact to the KOPs and would not poise a visual nuisance.

Camas Solar Project Site

Camas KOPs 2 and 3 indicate, as expected, that the elevated approach above the lower-lying Camas Solar Project would result in some longer periods of green and yellow potential indicators during morning hours.

Fumaria Solar Project Site

All KOPs are a significant distance and at similar elevation to the Fumaria Solar Project. As such there is practically no glare component contributing to the KOPs.

Penstemon Solar Project Site

KOPs 1 and 2 for the Penstemon Solar Project site indicate a reasonable amount of yellow potential glare indications. However, all are low intensity and acceptable. It is also noted that between both observations showing more potential glare minutes per month, both would have visual obstructions between them not reflected in this model. KOP 1 would have a future fence and landscaping, and KOP 2 an existing vegetative screen. Both are within acceptable glare intensity levels for observers in motion as shown.

Typha Solar Project Site

Similar to Fumaria, all KOPs for the Typha Solar Project are a significant distance from the project site. Given this, there is practically no glare component from the solar project contributing to the KOPs.

Urtica Solar Project Site

All KOPs for Urtica are green and yellow indicators and within acceptable intensities for KOPs in motion.

(3) Aesthetics. The application shall describe the aesthetic impact of the proposed energy facility and associated facilities and any alteration of surrounding terrain. The presentation will show the location and design of the facilities relative to the physical features of the site in a way that will show how the installation will appear relative to its surroundings. The applicant shall describe the procedures to be utilized to restore or enhance the landscape disturbed during construction (to include temporary roads).

4.2.4 Affected Environment for Aesthetics

4.2.4.1 Visual Resource Assessment Methodology

For the purposes of analyzing the environmental effects from the development of the five proposed Columbia Solar Projects on the visual resources of the area, the U.S. Bureau of Land Management's (BLM's) Visual Resource System was applied. The BLM manages landscapes for varying levels of protection and modification, giving consideration to other resource values and uses and the scenic quality of the landscape. While each of the five solar project sites is located on private agricultural lands, the BLM's Visual Resource Management (VRM) analysis approach provides a useful tool for providing data that help to identify potential impacts to visual resources.

Four steps were followed to assess the impacts to the landscape using the BLM VRM system: 1) create viewshed delineations from each project location to determine areas from where each solar project can be seen and to select key observation points (KOPs); 2) use the viewshed delineations and points of interest to the public to select KOPs; 3) collect field data including photos at each KOP and a description of the affected environment; 4) create visual simulations for each solar project using the KOP photos and complete contrast rating forms to assess impacts. These four steps are outlined in detail in the Visual Resources Report in Appendix D.

4.2.4.2 General County Setting

The five proposed Columbia Solar Project sites are located in the Columbia Basin physiographic province, just east of the Northern and Southern Cascades provinces in Washington State. The area consists of scattered houses and farm buildings, flat agricultural fields, irrigation ditches, county roads, and major highways. The agricultural flatlands give way to rolling hills, and to the north to the high peaks of the Cascade Range. The topography of each of the five project areas can be characterized as flat. Elements of line, form, color and texture common to all project sites in the existing environment are shown in Table 4.2-2. Additional elements for each KOP site can be found in the descriptions for each KOP below and in the Contrast Rating Forms in Appendix D. Note that the photographs for the KOPs were taken in April, before all of the vegetation had fully developed and during a time that there was no snow on the ground.

Table 4.2-2. Elements of Line, Form, Color, and Texture Common to all Five Columbia Solar Project Sites

Element	Land/water	Vegetation	Structures
Form	Flat, rolling, tall, steep, and triangular	Oval, circular, and lanceolate	Houses/Buildings: Triangular, square, and rectangular Fences/Roads: Bold, simple, horizontal, and directional Signs/Utility Poles: Circular, square, hexagonal, and rectangular
Line	Straight, horizontal, and parallel	Vertical, parallel, and converging	Houses/Buildings: Straight, vertical, horizontal, and semi-circular Fences/Roads: Straight, bold, horizontal, vertical, parallel, and perpendicular Signs/Utility Poles: Geometric and bold
Color	Land: Brown, gray, and white Water: Dark olive green	Various shades of green, tan, gray, and brown	Houses/Buildings: Gray, white, red, and tan Fences/Roads: Gray, silver, white, and brown
Texture	Fine, medium, and smooth	Fine, medium, and coarse	Smooth, fine, directional, and matte

4.2.4.3 Solar Project Sites

The overall visual character of each of the five Columbia Solar Project sites, as well as views KOPs for each site, are described below.

Camas Solar Project Site

The Camas Solar Project site is comprised of actively farmed alfalfa agricultural land, associated irrigation lines and ditches, an underground natural gas pipeline in the northwest portion of the site crossing from northeast to southwest, and Little Naneum Creek forming the eastern property boundary. The project site is located southeast of the city of Ellensburg. It is in Sections 18 and 19, Township (T) 17 North (N), Range (R) 19 East (E), Willamette Meridian, and in the southeast corner of where the Tjossem Road overpass crosses Interstate 82 (I-82). The project site is divided by an irrigation ditch.

Camas KOP 1

Camas KOP 1 is located on U.S. Highway 82 at the southernmost tip of the Camas Solar Project site. The view is to the northeast, where the project would be constructed. The foreground and middle ground topography includes the highway and flat agricultural fields, a tan grassy area surrounding a ditch, a few white and gray houses, and fences with straight smooth lines. The background view, while initially flat, eventually gives rise to the blue-gray Ellensburg Hills and then to the Cascade Range with snowy white peaks. Dominant colors for the landscape are brown, green, and tan while the structures (e.g., houses, highway, and fencing) are white and gray. The grasses, deciduous trees, and shrubs have varying textures of fine, medium, and coarse (Appendix D, KOP Photograph Log). Table 4.2-3 summarizes the location, direction of view, and elements not common to each KOP.

Table 4.2-3. Summary of Five Columbia Solar Project KOP Locations, Directions of View, and Viewsheds

KOP	Location	Direction of the View from the KOP	Viewshed
Camas Solar Project Site			
Camas KOP 1	U.S. Highway 82 at the southernmost tip of the Camas Solar Project site	Northeast	*Foreground*: Highway, fields, houses, and fences *Middle ground*: Same as the foreground *Background*: Rolling hills and snow-capped peaks
Camas KOP 2	Northeast tip of the Camas Solar Project site on Tjossem Road	Southwest to Southeast	*Foreground:* Open fields, roads, houses, farm buildings, fencing, road signs, and rows of trees *Middle ground:* Same as the foreground *Background*: Distant structures, flat agricultural lands, and trees
Camas KOP 3	Northwest intersection of U.S. Highway 82 and Tjossem Road.	Northeast to Southeast	*Foreground:* Same as Camas KOP 2 *Middle ground:* Same as Camas KOP 2, with more prominent road views *Background*: Same as Camas KOP 2
Fumaria Solar Project Site			
Fumaria KOP 1	Reecer Creek Road at the intersection of a private house driveway and an irrigation canal	Southwest to Northwest	*Foreground:* Buildings, driveway, cattle guard, ditch, shrubs, and utility poles *Middle ground:* Shrubs, trees, house and barn, and industrial and farm buildings *Background*: Ridges and distant peaks
Fumaria KOP 2	Northwest of the Fumaria Solar Project site, approximately 2.0 miles from the western boundary and generation tie line corridor on U.S. Route 97	Southeast	*Foreground:* County road, fencing, trees, houses, and utility poles *Middle ground:* Pond, agricultural field, and farm buildings *Background*: Flat-topped mountain and distant peaks
Fumaria KOP 3	Southwest of the Fumaria Solar Project site, on Hungry Junction Road, 200 feet east of its intersection with Faust Road	West to Northeast	*Foreground:* Roads, ditch, fencing, and agricultural field *Middle ground:* Agricultural fields, sparse trees, and houses *Background*: Rolling hills and distant peaks
Penstemon Solar Project Site			
Penstemon KOP 1	Along Tjossem Road, approximately 140 feet from the intersection of Moe Road, and a few feet from the northeast boundary of the Penstemon Solar Project site	Southwest	*Foreground:* Agricultural field and no trespass sign *Middle ground:* Trees and sporadic houses *Background*: Agricultural fields, houses, rolling hills, and distant peaks
Penstemon KOP 2	Approximately 1,500 feet south of the Penstemon Solar Project southeast site boundary, on Moe Road	Northwest	*Foreground:* Coleman Creek, grass, and agricultural field *Middle ground:* Trees of varying shapes, houses, and farm buildings with red roofs *Background*: Agricultural fields, houses, hills, and distant peaks

KOP	Location	Direction of the View from the KOP	Viewshed
Penstemon KOP 3	Approximately 840 feet west of the Penstemon Solar Project northwest site boundary, on Tjossem Road	Southeast	*Foreground:* Concrete-lined irrigation ditch, white water line, and grassy field *Middle ground:* Grassy field, trees of varying shapes, and houses *Background*: Fields, houses, farm buildings, rolling hills, and distant peaks
Typha Solar Project Site			
Typha KOP 1	Approximately 2.0 miles northwest of the Typha Solar Project site, on U.S. Route 97 and southwest of Thorp Highway South	Southeast	*Foreground:* I-90 freeway, green road sign, grassy area, agricultural field, and overhead irrigation sprinklers *Middle ground:* Same as the foreground *Background*: Rolling hills and distant peaks
Typha KOP 2	1.4 miles northwest from the Typha Solar Project site, on Thorp Highway South and the intersection of a county road	Southeast	*Foreground:* Road with gravel edge, utility poles, mailboxes, and agricultural field *Middle ground:* Farm buildings, trees, and agricultural fields *Background*: Boylston and Saddle Mountains
Typha KOP 3	1.0 mile to the southwest of the Typha Solar Project site, at the intersection of Cove Road and Robinson Canyon Road	Northeast	*Foreground:* Overhead irrigation sprinklers, agricultural field, houses, and trees *Middle ground:* Rolling agricultural fields and houses *Background*: Mountain ridges of Wenatchee National Forest
Urtica Solar Project Site			
Urtica KOP 1	On Umptanum Road, approximately 65 feet north of where it diverges from Brown Road	Southwest	*Foreground:* Umptanum Road, agricultural field, wire fence, and metal gate *Middle ground:* Houses, fences, and trees *Background*: Manastash and Umptanum Ridges, and the distant peaks of Snoqualmie National Forest
Urtica KOP 2	On Umptanum Road, approximately 800 feet from the Urtica Solar Project site southern boundary	Northwest	*Foreground:* Shallow ditch, wire and wood fencing, and road signs *Middle ground:* Trees, road, houses, fences *Background*: Rolling hills and peaks of Wenatchee National Forest
Urtica KOP 3	On Brondt Road, approximately 2,000 feet (0.4 mile) from the northeast boundary of the Urtica Solar Project site	Southeast	*Foreground:* Irrigation pipe and agricultural field *Middle ground:* Barn, houses, and trees *Background*: Manastash and Umptanum Ridges, and the peaks of Snoqualmie National Forest

Camas KOP 2

Camas KOP 2 is located at the northeast tip of the Camas Solar Project site on Tjossem Road. The view from the KOP is southwest to south-southeast, where the project would be constructed. The foreground and middle ground at Camas KOP 2 consist of strong vertical and diagonal lines of demarcated agricultural fields, roads, houses, farm buildings, fencing, utility poles, and a road sign along with straight rows of trees and randomly placed trees with oval, lanceolate, and circular canopies. The background consists of distant buildings, flat agricultural lands, and green trees, which all give way to Manastash Ridge in the distant background (Appendix D, KOP Photograph Log).

Camas KOP 3

Camas KOP 3 is located at the northwest intersection of U.S. Highway 82 and Tjossem Road. KOP 3 is located at a superior position, elevated approximately 25 feet higher than the Camas Solar Project site. The view from Camas KOP 3 is a panorama looking east to southeast, where the Camas Solar Project would be constructed. The foreground, middle ground, and background are all similar to Camas KOP 2, except there are long curving lines from the gray and white-striped four-lane freeway and overpass that dominate the foreground. The freeway curves in the middle ground as it retreats into the blue-gray undulating Manastash Ridge in the background. To the southeast there is a flat grassy field where the project would be constructed (Appendix D, KOP Photograph Log).

Fumaria Solar Project Site

The Fumaria Solar Project site consists of fallow agricultural land and a ditch along the western boundary. It is located northwest of the city of Ellensburg. It is in the southeast portion of Section 9, T18N, R18E, north of Hungry Junction Road and east of Lower Green Canyon Road. An 80-foot-wide by 2.6-mile-long generation tie line corridor with wooden poles along much of it would be included as part of the project site. This generation tie line would run along existing roads from the southwest corner of the project site: approximately 0.4 mile east to west along Clarke Road, turning due south for 1.0 mile along Faust Road, and turning west again for 0.75 mile on Hungry Junction Road. From Hungry Junction Road, the final segment would continue south along U.S. Route 97 before turning northwest into an electrical substation near the John Wayne Pioneer Trail. As described above, portions of the generation tie line would comprise new poles and lines, while other portions would share existing transmission right-of-ways and infrastructure.

Fumaria KOP 1

Fumaria KOP 1 is located on Reecer Creek Road at the intersection of a private house driveway and an irrigation canal, approximately 2,650 feet (0.5 mile) from the eastern boundary of the Fumaria Solar Project site. The view from Fumaria KOP 1 is westerly, from southwest to west. The foreground topography includes gray and white buildings next to a lot full of scrap metal and industrial vehicles including dump trucks, backhoes, and trailers. There is also a grey-brown dirt/gravel road with a cattle guard, utility poles, a brown earthen ditch bordered by tall tan grasses on one side and bright green short clump grass on the other, and a slightly inclining hill covered with low lying dense shrubs in the foreground (e.g., bitter-brush [*Purshia tridentate*] and big sagebrush [*Artemisia tridentate*]). The middle ground topography contains shrubs giving way to a line of trees of various shapes, a large brown and tan house, a red barn, and other industrial and farm buildings. The background consists of blue-gray ridges and the distant snowy peaks of the Wenatchee National Forest (Appendix D, KOP Photograph Log).

Fumaria KOP 2

Fumaria KOP 2 is located to the northwest of the Fumaria Solar Project site, approximately 2.0 miles from the western boundary and the generation tie line corridor on U.S. Route 97. The view from Fumaria KOP

2 is east to southeast toward the project site. The foreground topography is dominated by the gray U.S. Route 97, straight wire fencing, a few roundish trees shielding a house, a mailbox, white irrigation pipes, and brown wooden utility poles. The middle ground has an agricultural field surrounded by patches of shrubs and trees, with a sparse distant buildings and houses. The background consists of blue-gray flat topped Table Mountain and the distant peaks of the Wenatchee National Forest (Appendix D, KOP Photograph Log).

Fumaria KOP 3

Fumaria KOP 3 is located to the southwest of the Fumaria Solar Project site, on Hungry Junction Road, 200 feet east of its intersection with Faust Road. The view from Fumaria KOP 3 is a panorama from west to north toward the project site and the generation tie line that would travel along Hungry Junction and Faust Roads. The foreground consists of gray roads with yellow striping, a ditch blackened by fire and surrounded by grasses, brown smooth wire fencing, and a green agricultural field. The middle ground consists of agricultural fields, sparse trees, and gray and white houses and storage buildings. The background consists of blue-gray rolling hills and the distant peaks of the Wenatchee National Forest (Appendix D, KOP Photograph Log).

Penstemon Solar Project Site

The Penstemon Solar Project site consists of actively farmed Sudangrass or hay agricultural land, associated irrigation lines and ditches, and Coleman Creek forming the eastern property boundary. The project site is located southeast of the city of Ellensburg. It is in Section 17, T17N, R19E, at the corner of the intersection of Tjossem Road and Moe Road.

Penstemon KOP 1

Penstemon KOP 1 is located on Tjossem Road, approximately 140 feet from its intersection with Moe Road, and is a few feet from northeast boundary of the Penstemon Solar Project site. The view from the Penstemon KOP 1 is a panorama from southeast to southwest. A row of trees borders Coleman Creek on the east boundary of the project site, providing cover for a blue houses located 145 feet away. The foreground topography is a flat brown, tilled agricultural field with a black, orange, and brown “private property no trespass” sign, and a short section of a guardrail. The middle ground consists of various shapes (e.g., round, lanceolate, and circular) and heights (e.g., short, medium, and tall) of trees and wood utility poles. Sporadic houses are mostly white and gray. The background has more fields and houses, and the distant background consists of blue-gray rolling hills and the distant peaks of the Wenatchee National Forest (Appendix D, KOP Photograph Log).

Penstemon KOP 2

Penstemon KOP 2 is located approximately 1,500 feet south of the Penstemon Solar Project site southeast boundary, on Moe Road. Moe Road runs parallel to the eastern project site boundary. The view from Penstemon KOP 2 is to the northwest where the project site would be located. The foreground topography consists of Coleman Creek, which is surrounded by tall grasses trees and shrubs edging up to Moe Road, a flat agricultural field, and wood utility poles and lines. The middle ground topography consists of various shaped trees, as noted in Penstemon KOP 1. Several houses and farm buildings are present, many with red roofs or sides. The background consists of smooth green and brown fields, gray and white houses, and the distant background consists of blue-gray rolling hills and the distant peaks of the Wenatchee National Forest (Appendix D, KOP Photograph Log).

Penstemon KOP 3

Penstemon KOP 3 is located approximately 840 feet west of the Penstemon Solar Project site northwest boundary, on Tjossem Road. Tjossem Road runs parallel to the northern project site boundary. The view

from Penstemon KOP 3 is east to southeast, where the project site would be located. The foreground topography consists of a gray, concrete-lined irrigation ditch; a smooth, white, tubular water line; and a flat, medium-textured grassy field. The middle ground topography also has a flat grassy field, along with a line of trees of varying shapes and a few white and gray houses and farm buildings to the southeast. The background has more fields and houses, and the distant background consists of blue-gray rolling hills and the distant peaks of the Wenatchee National Forest (Appendix D, KOP Photograph Log).

Typha Solar Project Site

The Typha Solar Project site consists of irrigated agricultural land being used for a grazing pasture, associated irrigation ditches and a circular irrigator, and small wetlands. The project site is located northwest of Ellensburg. It is in Section 30, T18N, R18E, with the Yakima River running near the northeast border of the site, a wetland along the southern border, I-90 to the northeast, and Thorp Highway South to the southwest.

Typha KOP 1

Typha KOP 1 is located approximately 2.0 miles northwest of the Typha Solar Project site on I-90/U.S. Route 97, southwest of Thorp Highway South. The view from Typha KOP 1 is to the southeast, where the project site would be located. The foreground consists of an agricultural field that at the time of the photograph had a long, metal overhead irrigation system present and a white pipeline. There are grasses and shrubs in the foreground bordering the agricultural field. The middle ground consists of trees, houses, and more agricultural fields. The background consists of dark blue-gray rolling hills and the distant peaks of the Wenatchee National Forest (Appendix D, KOP Photograph Log).

Typha KOP 2

Typha KOP 2 is located 1.4 miles northwest from the Typha Solar Project site at the intersection of Thorp Highway South and Miller Road, a county road. The view from Typha KOP 2 is to the east-northeast and to the east-southeast. The foreground topography consists of a short, brown utility pole and a creosote log that appears to be part of an old fence that lies in front of a bright green grassy agricultural field. The middle ground consists of farm buildings, trees of varying shapes, and smooth brown and green agricultural fields. The background consists of the blue-gray Boylston and Saddle Mountains (Appendix D, KOP Photograph Log).

Typha KOP 3

Typha KOP 3 is located 1.0 mile to the southwest of the Typha Solar Project site, at the intersection of Cove Road and Robinson Canyon Road. The view from Typha KOP 3 is north to the east-northeast, where the project would be constructed. The foreground consists of smooth, silver, overhead irrigation sprinklers; a finely textured grassy agricultural field; red, tan, and gray houses with flat and triangular roofs; and a few roughly textured, dark green sparse trees. The middle ground consists of rolling agricultural fields and houses. The background consists of the curving line of the blue-gray mountains of the Wenatchee National Forest (Appendix D, KOP Photograph Log).

Urtica Solar Project Site

The Urtica Solar Project site consists of actively farmed timothy hay agricultural land, associated irrigation lines and ditches, and McCarl Creek running through the center of the site. The project site is located southwest of Ellensburg. It is in Section 10, T17N, R18E, bordered on the west side by Umptanum Road and located north of Manastash Road.

Urtica KOP 1

Urtica KOP 1 is located on Umptanum Road, approximately 65 feet north of where it diverges from Brown Road. The Urtica Solar Project site northeast boundary is approximately 350 feet from Urtica KOP 1. The view is south to west-southwest, where the project would be constructed. The foreground topography includes the gray- and white-striped, curving Umptanum Road; a flat, grassy, green agricultural field; bunched medium-height trees near a wood and metal brown wire fence; a gray, smooth, metal gate; road signs; wire fencing; and wooden utility poles. The middle ground consists of more houses and farm buildings, agricultural fields, and medium and tall trees. The background consists of Manastash and Umptanum Ridges and the distant snowy peaks of the Snoqualmie National Forest (Appendix D, KOP Photograph Log).

Urtica KOP 2

Urtica KOP 2 is located on Umptanum Road, approximately 800 feet from the Urtica Solar Project site southern boundary. The view from Urtica KOP 2 is to the west and the northwest. The foreground topography includes a chain-link fence that divides a parking lot from an agricultural field, a wire fence with metal and wood poles, the backside of a road sign, and a brown and green agricultural field. The middle ground appears as a line of trees of varying heights and shapes, houses, and farm buildings. The background consists of curving blue-gray rolling hills and the distant snowy peaks of the Wenatchee National Forest (Appendix D, KOP Photograph Log).

Urtica KOP 3

Urtica KOP 3 is located on Brondt Road, approximately 2,000 feet (0.4 mile) from the northeast boundary of the Urtica Solar Project site. The view from Urtica KOP 3 is east-southeast to southeast. The foreground topography includes a silver irrigation pipe with circular wheels and a medium-textured, green, grassy field. The middle ground topography includes a red barn with a diagonal gray roof, several white and brown houses, and a line of trees of various shapes and different heights. The background consists of the blue-gray Manastash and Umptanum Ridges and the distant snowy peaks of the Snoqualmie National Forest (Appendix D, KOP Photograph Log).

4.2.5 Impacts to Aesthetics

Sections 4.2.5.1 and 4.2.5.2 provide an overview of the impacts to Aesthetics from all five proposed Columbia Solar Project sites. Appendix D presents detailed impact analysis for each site, for each KOP.

4.2.5.1 Construction Impacts

Construction impacts (visual contrasts) with the characteristic landscape of the Columbia Solar Project sites would result from activities associated with construction of the five solar sites. Removal of existing vegetation, grading for the all-weather access roads, and trenching would result in visual contrasts to the color and irregular texture and lines of the characteristic landscape over the 6 to 9-month construction period. In addition, construction equipment, vehicles, supplies, and associated project activities would be clearly visible from the KOPs during construction activities. During the initial phases of construction, these changes to the views may seem uncharacteristic or appear out of place, discordant, or distracting. However, as construction progresses and much of the equipment is no longer needed, equipment is removed from the site, and the views would appear more normal, less discordant, and less distracting. Construction activities would be transient and of short duration as construction progresses, and given the other activities in the area (e.g., commercial agriculture), construction would not substantially degrade the existing visual character or quality.

Construction of the proposed Columbia Solar Projects would be visible from 10 of the 15 project sites' KOPs and contrast to a minor to moderate degree with the surrounding landscape. The level of change to the landscape apparent from the construction of any of the five sites would be minor to moderate based on the visual resource contrast analysis. Minor to moderate contrasts in the elements of the environment would generally be consistent with the characteristic landscape. Although primarily agricultural in setting, there are numerous transmission lines, pipelines, metal buildings, and fence lines visible from each of the KOPs. There are existing visible contrasts apparent from each of the KOPs. None of the KOPs would experience a major or significant change to the characteristic views.

The proposed Columbia Solar Projects would generally repeat the basic elements of line, texture, color, and form found in the predominant natural features of the characteristic landscape. Contrast from construction would be less apparent the further the view is from each site, and would be more apparent the closer the view is to each site. Adjacent viewers (e.g., farmers, private landowners, and motorists) would experience the greatest change in views since the contrast is most noticeable when viewing up close (i.e., 25 feet or closer); However, as these views are not representative of public views, they were therefore not considered for KOP selection.

Viewers accustomed to the typical rural, agrarian landscape would be affected by the minor contrast created from construction impacts. The construction of the Columbia Solar Project sites would cause a long-term change to scenery (see Operational Impacts, below), while the actual construction of the sites and facilities would be short-term changes. During construction, the motion associated with construction equipment, movement, panel placement, alteration of topography, earthwork, vegetation clearing, short-term impacts from dust generation, and landform modification would be noticeable to all viewers (e.g., residents, motorists, and tourists) and create visual contrast within the viewshed.

The minor contrast would occur along routes of various travel speeds (e.g., trail, unpaved routes, and high-speed interstate) and would generally be visible in the foreground for only a few hundred feet and for a brief duration. As described below in detail, contrasts are less likely to be visible the further away the viewer is from the Columbia Solar Project sites, eventually becoming indiscernible as the viewer moves further away. When considering the minor to moderate contrast cumulatively, construction of the solar projects would attract attention and be seen, but would not dominate the view of the casual observer from the KOPs. In most cases, the views from the KOPs would be altered to a minor degree from existing conditions.

Simulations demonstrate that the construction of the Columbia Solar Projects would result in changes to the visual and aesthetic conditions, but these changes would be moderate and weak when considering the surrounding landscapes. In addition, TUUSSO's proposed mitigation measures (provided in Appendix D) are intended to decrease the contrasts of constructing the solar projects.

4.2.5.2 Operation Impacts

During operation of the five Columbia Solar Project sites, the regular geometric forms and strong horizontal and vertical lines associated with the solar arrays and associated infrastructure would result in a visual contrast with the irregular, organic forms and colors of the existing landform and vegetation. However, the existing fence lines, transmission/distribution lines, metal buildings, and roads also possess horizontal and vertical lines and, therefore, the introduction of the solar project sites would not dominate the landscape. TUUSSO-proposed mitigation, such as vegetation screening, would decrease the contrast more each year as the vegetation matures and covers larger areas.

In addition, color contrast associated with the solar panels would vary throughout the day as the panels rotate to track the sun from east to west. Although concentrated light would not be directly reflected

toward any of the KOPs, the solar panels, when viewed from distant elevated viewing positions at certain times of the day, would reflect the sky, resembling a dark blue body of water, resulting in a contrast with the dull hues of the surrounding green/tan agricultural fields and grey-green vegetation. The contrast would be dull due to the flat plate and anti-reflective design.

Once operational, the contrast would remain unchanged from construction. As vegetative screening (see mitigation measures) matures and grows, the contrast of the Columbia Solar Project sites would become less visible and the contrast of each site to the surrounding areas would be decreased.

Operation of the Columbia Solar Project sites would require routine and periodic equipment testing, panel cleaning, and other ongoing maintenance tasks. However, these activities would not increase in duration or intensity in such a way as to alter or adversely affect the existing landscape (i.e., the aesthetics) beyond what occurred during construction.

TUUSSO has proposed numerous mitigation measures intended to decrease the contrasts that may result from construction (Appendix D).

(4) Recreation. The application shall list all recreational sites within the area affected by construction and operation of the facility and shall then describe how each will be impacted by construction and operation.

4.2.6 Affected Environment for Recreation

This section describes the recreational parks and facilities, trails, and dispersed uses in the North Cascades Region, the general Kittitas County area, and Ellensburg.

4.2.6.1 Recreation in the North Cascades Region

The Washington Recreation and Conservation Office regularly prepares a Washington State Comprehensive Outdoor Recreation Plan (SCORP) to characterize recreational use at the statewide and regional analysis levels. The latest SCORP was prepared in 2012 using information obtained with a recreational use telephone survey conducted from August to October 2012 (Responsive Management 2012).

Kittitas County is located at the southernmost border of the North Cascades Region (which also includes Chelan, Snohomish, Okanogan, Skagit, and Whatcom Counties). The highest participation rates for general recreational categories (Table 4.2-4) in the North Cascades Region included those for walking, hiking, climbing, and mountaineering (90.7% of North Cascades Region residents); other outdoor recreational activities (84.2%); picnicking, barbecuing, or cooking out (83.3%); nature activities (81.1%); and water-related activities (79.8%). Notable individual recreational activities included walking without a pet (68%), observing or photographing wildlife (62%), hiking (59%), gardening (58%), walking with a pet (56%), and camping (50%). Overall, residents of the SCORP North Cascades Region participated in the same recreational activities at very similar rates to other Washington residents (Responsive Management 2012).

4.2.6.2 General County

Tourism is an important sector of the Kittitas County economy. Local recreational opportunities include cross-country skiing, snowmobiling, hiking, camping, fishing, river rafting, and hunting (Pless et al. 2015). Two major rivers provide a number of dispersed recreational opportunities. The Columbia River flows from north to south in central Washington and forms the eastern border of the county. It provides

significant fishing, boating, water skiing, and other recreational opportunities. The Yakima River flows out of the Cascade Mountains, east through the center of the county, and just south of Ellensburg. It provides opportunities for rafting and fly-fishing for trout (City of Ellensburg 2015).

Table 4.2-4. Recreational Use Rates in the SCORP North Cascades Region and Washington

Recreational Activity	Use by Residents (%)	
	North Cascades Region	Washington
Walking, Hiking, Climbing, Mountaineering	90.7	90.0
Other Outdoor Recreational Activities	84.2	82.7
Picnicking, BBQing, or Cooking Out	83.3	80.9
Nature Activities	81.1	81.4
Water-Related Activities	79.8	75.2
Sightseeing	61.8	56.8
Camping	50.0	42.4
Bicycle Riding	43.5	36.9
Snow and Ice Activities	37.9	31.3
Fishing or Shellfishing	33.9	34.1
Indoor Community Facilities	27.9	28.4
Hunting or Shooting	22.8	21.4
Off-Roading for Recreation	15.7	15.3
Frisbee Activities	14.8	16.8
Horseback Riding	9.8	7.7
Air Activities	3.5	3.8

Note: The recreational telephone survey was conducted from August to October 2012.
Source: Responsive Management (2012).

Kittitas County also has significant downhill and cross-country skiing and snowshoeing opportunities. The county extends west to Snoqualmie Pass in the Cascade Mountains, which is one of the most popular ski areas in the state. There are three major ski facilities at Snoqualmie Pass that collectively attract more than 500,000 ski visitors annually and employ about 750 people during the ski season. The Washington State Department of Transportation (WSDOT) is currently constructing Phase 1 of I-90 improvements. This $45-million, multi-year project would reduce congestion and, thus, benefit Kittitas County tourism as well as provide heavy construction sales tax revenues to the county. Kittitas County also recently partnered with WSDOT and others to submit a $14-million request for federal funds to design Phase 2A of the I-90 project in the area of Exit 62 (Pless et al. 2015).

Recreational Parks and Facilities

Major recreational facilities within Kittitas County (Figure 4.2-3) include parks and campgrounds, river-access parks, trails, other facilities and golf courses, and venues where major events are held including:

- Olmstead Place Historical State Park
- Helen McCabe Memorial State Park
- Washington State Horse Park
- Lake Easton State Park
- Ginkgo Petrified Forest State Park, Ginkgo State Park Interpretive Trails, and Wanapum State Park/Recreation Area
- Iron Horse Trail, also known as the John Wayne Pioneer Trail
- Coal Mines Trail
- Other facilities, golf courses, and venues for major events

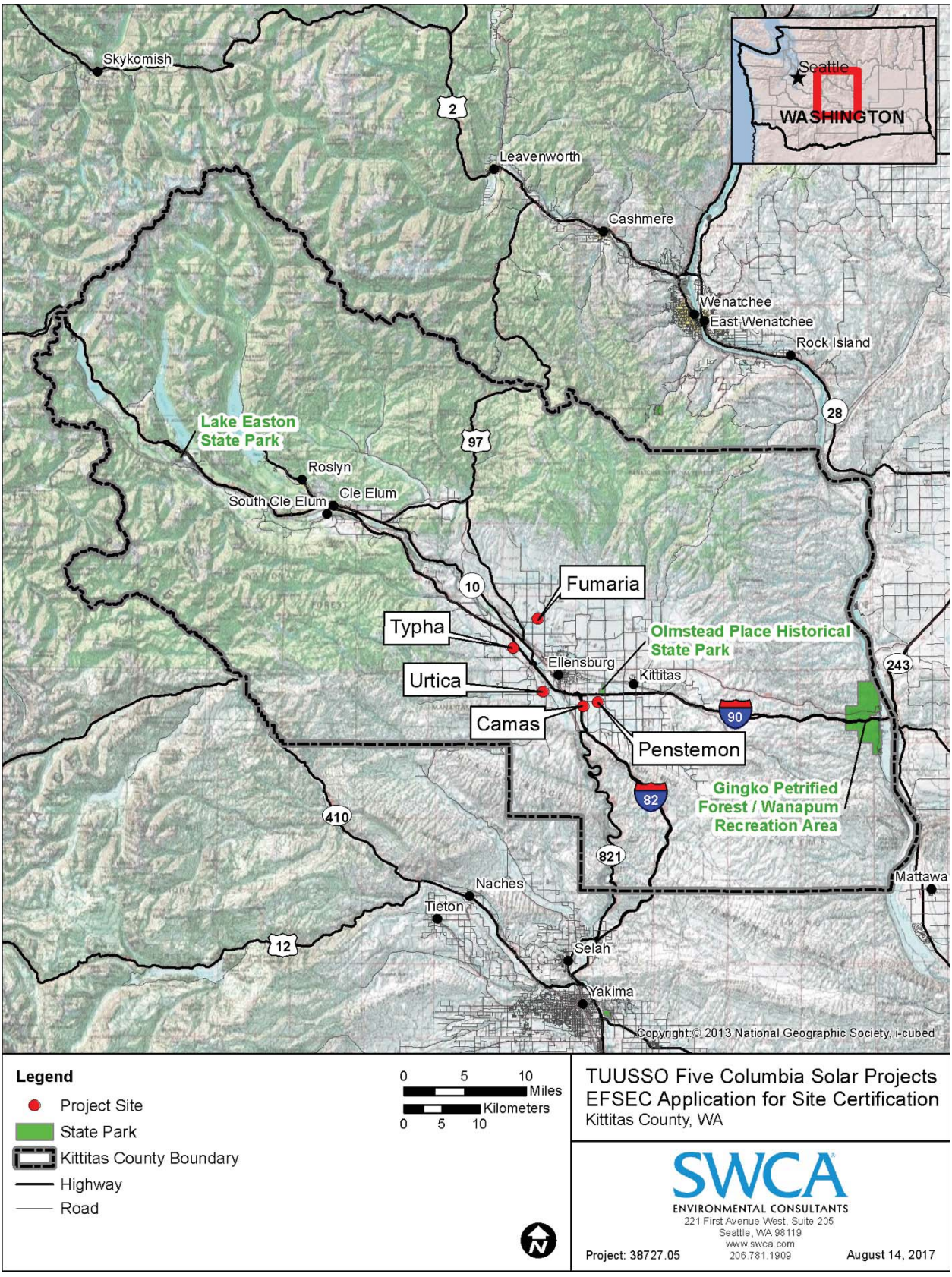


Figure 4.2-3. Kittitas County selected major state recreational parks.

The key features of some representative major facilities and recreational opportunities are described below.

Olmstead Place Historical State Park is a working pioneer-era farm and was one of the first homesteads in the Kittitas Valley, with an original log cabin built in 1875. It is a day-use 217-acre park located southeast of Ellensburg. It is managed by Washington State Parks. The park includes historic gardens and farm artifacts, a dairy barn, a granary, a wagon shed, a hay barn, the Olmstead family home, 17 unsheltered picnic tables, and restrooms. Activities at the park include hiking, fishing, interpretive activities, wildlife viewing, and a living farm museum. Recreationists can walk along Coleman Creek, following 1 mile of the Altapes Creek Interpretive Trail. During the winter, there is also cross-country skiing and snowshoeing on the site (Washington State Parks 2017a).

The Helen McCabe Memorial State Park is located on Thrall Road and the Yakima River Canyon Road, about 5 miles south of Ellensburg. It is a relatively undeveloped park located at the entrance to the Yakima River Canyon. Washington State Parks maintains the park year round. There is an 8-acre stocked pond in the park for fishing, and there are also several hiking trails around the area. An interpretive center is being built in the park, to share information about the natural and cultural values of the 33-mile Yakima River Byway (Kittitas County Chamber of Commerce 2017b).

Washington State Horse Park, a premier equestrian facility near the city of Cle Elum, serves the recreational, competitive, and educational needs of riders and horse enthusiasts in all disciplines, age groups, and skill levels. The 112-acre venue has four large arenas that can accommodate large horse events or smaller, less formal activities. The park includes (Pless et al. 2015; Washington State Horse Park 2017):

- Four large sand arenas
- 160+ covered stalls
- Two cross-country courses, for starter through preliminary skill levels
- Competitive trail course
- Trails and water crossings designed for carriage driving
- Dressage court
- Show jump courses (one schooling and one competition)
- Wash racks with safe matted footing
- Lunging areas
- Cattle pens
- Safe and sturdy mounting blocks near stalls and arenas
- Bleacher seating
- 23 recreation vehicle (RV) hook-ups with water, sewer, electricity, and a RV sanitary dump station
- Space for dry camping or tent camping, outside of the RV hook-up spaces, for no charge
- Shower building with three private shower rooms
- Hospitality tent with picnic tables, water, and electricity that accommodates large groups for meals or entertainment
- Show office with internet access
- Large gravel parking areas with plenty of turn-around space for large rigs

Lake Easton State Park is a forested, 515-acre, year-round campground located on Lake Easton State Park Road, near Easton. It features a clear lake and a beach swimming area with 24,000 feet of freshwater access to Lake Easton, in the Cascade Range. There is also a boat ramp to the lake, allowing freshwater fishing and non-motorized boating. The park has 95 tent spaces near the Yakima River and 45 RV utility spaces near the lake, an amphitheater, basketball court, playground equipment, and two horseshoe pits. There are 40 picnic tables throughout the park, available on a first-come, first-served

basis. The park also has 6 miles of mountain bike trails and 6.5 miles of hiking trails for summer use. Winter uses include general snow play and 5 miles of groomed trails for cross-country skiing, snowshoeing, and dog sledding, as well as a snowmobiling trail (Kittitas County Chamber of Commerce 2017b; Washington State Parks 2017b).

River Water Parks and Recreation

Ginkgo Petrified Forest State Park and Wanapum State Park/Recreation Area is located on Huntziger Road and the Columbia River, 2 miles south of Vantage and I-90. It is a 7,470-acre park that is heavily used during the Columbia River Gorge concert season, and fills early on weekends. The Ginkgo Petrified Forest portion is a day-use park with an interpretive center, museum, 3 miles of hiking trails, 57 unsheltered picnic tables available on a first-come, first-served basis, and restrooms. Petrified wood was discovered in the region in the early 1930s, which led to the creation of the park as a national historic preserve. Ginkgo Petrified Forest is a registered national natural landmark and is regarded as one of the most unique fossil forests that exists in the world, with artifacts dating back thirteen to seventeen million years. It features displays of petrified wood, Native American petroglyphs, and historic buildings. The Ginkgo Petrified Forest Interpretive Center offers views of the Columbia River, Sentinel Gap, and the surrounding Ice Age flood–carved basalt landscape. Indoor exhibits tell the geologic story of the Vantage Petrified Forest. The Ginkgo State Park Interpretive Trails are short winding trails with petrified wood in its natural state. Wanapum State Park/Recreation Area features 27,000-feet of freshwater shoreline on the Wanapum Reservoir, along the Columbia River. Recreational activities include a trailer park with 50 full hookups and tent camping; showers; a boat ramp with boating, personal watercraft, water skiing, and freshwater fishing; swimming; bird watching; and wildlife viewing (Kittitas County Chamber of Commerce 2017b; Washington State Parks 2017c).

The Vantage Boat Launch is located on the Columbia River, in Vantage and next to I-90. It is managed by Kittitas County, was built in 1990, and includes a double-lane boat launch with an Americans with Disabilities Act boarding float, large parking area, kiosk/signage with interpretive/educational materials, 342 square feet of facilities including restrooms, and nine picnic tables and barbecue grills (Pless et al. 2015; Grant County PUD 2017).

The Cove Recreation Area is managed by the Grant County PUD and Washington State Parks. The recreation area encompasses about 20 acres and is located west of Huntzinger Road near Wanapum Dam. Public access is for day use from Thursdays through Mondays (Pless et al. 2015).

Trails

The John Wayne Pioneer Trail/Iron Horse State Park is managed by Washington State Parks and is part of the National Recreational Trail system. It is a 100-mile trail from North Bend to Vantage, and used to be a Chicago, Milwaukee, St. Paul and Pacific Railroad bed (Pless et al. 2015). The trail is open year round to non-motorized vehicle and foot traffic (Pless et al. 2015).

Coal Mines Trail is managed by the Coal Mines Trail Commission, the City of Cle Elum, the City of Roslyn, and Kittitas County. It is a 10.4-mile trail from Cle Elum to Ronald, and used to be a Northern Pacific Railway bed. (Pless et al. 2015)

Wind/Solar Facilities and Golf Courses

The Wild Horse Wind and Solar Facility and Renewable Energy Center is located on Whiskey Dick Mountain, about 16 miles east of Ellensburg on high, open-range hilltops. Built by Horizon Wind Energy and owned by Puget Sound Energy, the 149 wind turbines generate 273 MW and the solar facility generates up to 502 kW. The Renewable Energy Visitor Center has educational displays so visitors can learn more about wind and solar technology, as well as the area's unique natural history. The visitor

center also has a conference facility, with a meeting room able to accommodate up to 48 people. The conference area is used for wind and solar presentations to visiting schools, businesses, clubs, and community groups. It can also be reserved for meetings, retreats, and fundraisers. Presentations lasting 45 to 60 minutes, depending on the content and audience questions, are offered to groups by appointment. Outdoor trails lead to a solar array, blade, turbine generator, gearbox, and other displays. The visitor center is open daily from April through November, is free to the public, and tours can be scheduled by appointment during the off-season, depending on staff availability and weather (Kittitas County Chamber of Commerce 2017b; Puget Sound Energy [PSE] 2017c).

Ellensburg Golf Course is a nine-hole semi-private golf club located on Thorp Highway South in Ellensburg. It is a full-service golf course featuring 2,988 yards of golf, a restaurant and bar, pro shop, locker rooms, driving range, and putting green. The course offers memberships as well as play to the public at daily rates (MyEllensburg 2017).

Some other recreational facilities in the city include (City of Ellensburg 2015):

- Memorial Pool and Fitness Center – has a 25-meter pool, a 22 × 4–foot kiddie pool, 1-meter diving board, drop slide, hot tub, sauna, fitness center, and other features
- Stan Bassett Youth Center– 406 E Capitol Avenue
- Adult Activity Center – 506 S Pine Street
- Ellensburg Racquet and Recreation Center – 6061 Vantage Highway; has two heated indoor tennis courts, three racquetball courts, a 50 × 108-foot indoor soccer facility, a fitness/weight room, and other features
- Park Administration – Second Floor, 501 N Anderson Street

Sun Country Golf and RV is located on Saint Andrews Drive in Cle Elum. It has an 18-hole, par 71, 5,715-yard golf course designed by J. Gaylord Riach/John Steidel. The RV park features include 14 full hook-up gravel sites, 50-amp service, showers, bathrooms, cable TV hookups, wireless internet connections, a self-service RV wash station, and space for tent camping (SunCountry Golf 2017).

Suncadia Resort and Golf Course is a large destination resort located on Suncadia Trail, near the city of Roslyn. The development includes several thousand acres of lodges, four golf courses, recreation centers, condominiums, clustered recreational homes and single-family recreational homes. Prospector Gold Course is an 18-hole, 7,100-yard course designed by the Palmer Course Design Company and includes a golf shop. The Rope Rider Golf Course is also an 18-hole, par 72, and 7,112-yard course designed by Jacobsen Hardy Golf Course Design, with a pro shop, driving range, pitch/chipping area, putting green, and teaching professionals (GolfNow 2017). The Tumble Creek Golf Course is a private course designed by Tom Doak. Finally, there is the par-3 Rope Rider Golf Park, a practice and casual play course. Development had slowed due to the lending crisis, but activity has since continued. The most significant of that renewed activity was the construction of Swiftwater Cellars, a 20,000-square-foot winery and distillery. This resort has contributed to significant growth in the western part of Kittitas County (Pless et al. 2015).

Major Events

The Kittitas County Fair occurs every Labor Day weekend, attracts over 30,000 visitors, and is one of the oldest fairs in the State of Washington, as it was first held in 1886. The fair features food, fine arts and photography, youth crafts, 4-H/Future Farmers of America agricultural and livestock exhibitions, Davis Amusement Cascadia carnival rides and games, and a Frontier Village. Concurrent with the fair is the Ellensburg Rodeo and Saturday night's Xtreme Bull, both top-ranking Pro Rodeo Cowboy Association outdoor arena events (Kittitas County 2017; Pless et al. 2015).

4.2.6.3 City of Ellensburg

In addition to the above facilities located throughout the county, there are a variety of other parks and recreational facilities in the city of Ellensburg. Ellensburg has 15 parks totaling over 250 acres, or about 1 acre of park for every 73 residents.

Ellensburg's Irene Rinehart Riverside Park is located on 117 acres, on Umptanum Road. Due to the park's location between the Yakima River and I-90, the park is only accessible via Umptanum Road. The park has a small parking lot on the north side of Umptanum Road. The park features a boat launch for the Yakima River, two ponds and lake swimming access, a sand volleyball area, picnic and barbecue shelters, hiking/biking trails, scenic walking paths, and other standard park facilities (City of Ellensburg 2015).

Paul Rogers Wildlife Park is a 20-acre park that has improved trails with natural settings. McElroy Park is a 6.7-acre park with walking trails, a pond, natural areas, picnic tables, large open turf area, and a natural play structure. Other parks include Rotary Park (72 acres), Lions/Mt. View Community Park (8.0 acres), West Ellensburg Neighborhood Park (6.0 acres), North Alder Street Park (5.5 acres), Kiwanis Neighborhood Park (4.0 acres), Reed Neighborhood Park (4.0 acres), Veterans' Memorial Park (3.0 acres), Skate Park (0.66 acre), and Wippel Neighborhood Park (0.6 acre) (City of Ellensburg 2015).

Additionally, a local developer has approval to build a 90-acre water park and hotel in Ellensburg. The project is considered to be a destination water park, attracting visitors locally and from the west side of the state. When construction is completed it is estimated the park would employ 750 to 800 workers (Pless et al. 2015).

Notable regular recreational events that occur in Ellensburg include (City of Ellensburg 2015):

- The Western Art Show – occurs in the third full weekend in May
- Jazz in the Valley – a 3-day music event that occurs during the last weekend of July
- A weekly farmers market that provides the vegetables and garden products to residents

4.2.6.4 Solar Project Sites

No recreation areas are located within or immediately adjacent to the proposed solar project sites. The recreation areas that are the nearest to each of the proposed solar facilities are identified below.

Camas Solar Project Site

The nearest designated potential recreation opportunity to the Camas Solar Project site is Olmstead Place State Park, located approximately 1.5 miles ("as the crow flies") northeast of the project site.

Fumaria Solar Project Site

The nearest designated potential recreation opportunity to the Fumaria Solar Project site is the Iron Horse Trail, also known as the John Wayne Pioneer Trail. The proposed generation tie line associated with this site would parallel the trail, approximately 550 feet away between U.S. Route 97 and an existing substation.

Penstemon Solar Project Site

Similar to the Camas Solar Project site, the nearest designated potential recreation opportunity to the Penstemon Solar Project site is Olmstead Place State Park, located approximately 0.75 mile ("as the crow flies") northeast of the project site.

Typha Solar Project Site

The closest recreation facility to the Typha Solar Project site is the Iron Horse Trail, across the Yakima River and I-90, approximately 1 mile (“as the crow flies”) to the north of the proposed site.

Urtica Solar Project Site

The closest recreation facility to the Urtica Solar Project site is the Ellensburg’s Irene Rinehart Riverside Park. The southernmost part of the park is located approximately 0.25 mile (“as the crow flies”) northeast of the project site, across the Yakima River on Umptanum Road.

4.2.7 Impacts to Recreation

4.2.7.1 Construction Impacts

General County

Recreational Facilities

As described in Section 4.4.2, construction of the five Columbia Solar Projects would begin in the second quarter of 2018 and would end in the fourth quarter of 2018, occurring over about 8 months from April through November. Construction of the five solar projects would employ up to 100 workers per day during the peak construction period. Approximately 80 of the peak workforce would likely be hired locally and the remaining 20 non-local peak workforce might elect to commute to the Ellensburg area on a daily basis. However, if they elect not to commute, they are likely to either stay in a personal RV at a camp site or to rent a motel room for the duration of the construction period.

Because there would be relatively few non-local construction workers working on the Columbia Solar Projects, no positive or negative impacts are anticipated to recreational facilities, RV parks, or motels in Kittitas County overall, or in the Ellensburg area.

Recreational Activities/Opportunities

The anticipated 20 additional peak workers that could temporarily relocate into the Ellensburg area during the 8-month construction period from April through November would likely participate in some recreational activities (e.g., fishing, boating, swimming, golf, hiking, or attending the Kittitas County Fair or the Ellensburg Rodeo and Saturday night's Xtreme Bull) during their time off from work. This would overlap with the primary May–September recreational period in the county. However, because there would only be up to 20 additional participants in any one activity at any one time, there would be no impacts to recreational uses in the county or the Ellensburg area.

Solar Project Sites

As stated above, no recreation facilities are located within or immediately adjacent to the five proposed Columbia Solar Project sites, and thus no facilities would be displaced or altered by construction of the solar projects. In addition, because the sites are private, generally active agricultural lands, no other dispersed recreational uses (i.e., fishing, boating/canoeing/rafting, hunting, or hiking) are occurring on the sites, so impacts would not occur to any potential on-site dispersed recreational opportunities.

4.2.7.2 Operation Impacts

The five Columbia Solar Projects would begin operation in the fourth quarter of 2018, and would operate for approximately 30 years. The operational workforce would be relatively small and would typically be off-site. In addition, it is anticipated that four to five operations and maintenance (O&M) personnel would make about two to three visits per year to each of the five Columbia Solar Project sites to conduct the on-

site O&M functions. Because there would be minimal operational staff levels, no positive or negative operational impacts are anticipated to recreational facilities or use levels in Kittitas County overall, or in the Ellensburg area.

(5) Historic and cultural preservation. The application shall coordinate with and provide a list of all historical and archaeological sites within the area affected by construction and operation of the facility to the Washington state office of archaeology and historic preservation and interested tribe(s). The application shall:

(a) Provide evidence of this coordination;

4.2.8 Washington State Department of Archaeology and Historic Preservation Consultation

SWCA Environmental Consultants (SWCA) completed the architectural and archaeological surveys for each of the five proposed TUUSSO Columbia Solar Project sites, and five individual project cultural resources reports were submitted to the Washington State Department of Archaeology and Historic Preservation (DAHP) for review on June 9, 2017. On June 12, 2017, Mike Cannon, with SWCA, received a call from Gretchen Kaehler at DAHP. Ms. Kaehler notified Mr. Cannon that DAHP would await EFSEC notifying them that the ASC was received and EFSEC had learned more about the projects, before beginning their review of the five cultural resources reports. DAHP wishes to comprehensively review the five solar project cultural resources reports as part of the entire application.

4.2.9 Tribal Consultation

On behalf of TUUSSO, on March 23, 2017, SWCA sent a letter via certified mail to notify the Tribal Council and the Cultural Resources Program of the Confederated Tribes and Bands of the Yakama Nation about all five proposed Columbia Solar Projects and the cultural resource surveys that would be conducted. On March 30, 2017, SWCA also sent a letter via certified mail to Johnson Meninick, of the Cultural Resources Program at the Confederated Tribes and Bands of the Yakama Nation. The purpose of this communication was to seek input and identify any of the Cultural Resources Program's Tribal concerns related to cultural resources, and it was not intended to replace any government-to-government consultation that may be required pursuant to National Historic Preservation Act (NHPA) Section 106.

Joy Potter, as a representative for TUUSSO, met with Johnson Meninick of the Yakama Nation on June 15, 2017. He recalled seeing the letter sent by SWCA on March 30, 2017, but had not responded. Joy provided Mr. Meninick with a copy of the letter and associated map, and provided an overview of the proposed solar projects. Mr. Meninick informed Ms. Potter that all of Kittitas County once held villages of the Yakama Nation. He stated that the Yakama Nation is very concerned about the actual village locations and burial grounds. He noted that the proposed solar project sites were not at known villages or burial locations. He was concerned that the Tribe did not do the study, as they are mostly concerned about the oral interview history portion of the cultural resource study. The ground disturbance was a secondary concern. Ms. Potter told Mr. Meninick that the reports had a great deal of narrative and history, and also described the number of hand-dug shovel probes that were analyzed. Mr. Meninick seemed pleased with the ground surveys, but indicated that he still wanted to review the cultural resources reports. On that same day, Ms. Potter spoke with Jessica Lally, who is employed by the Yakama Nation. Ms. Lally seemed excited about the solar projects and asked to be copied when solar project representatives communicated with Mr. Johnson.

(b) Describe how each site will be impacted by construction and operation; and

The following sections describe the affected environment and potential impacts to cultural resources as a result of construction and operation of the five proposed Columbia Solar Project sites. Additional, more detailed information is provided in cultural resources reports for each of the five sites, in Appendices G through K.

4.2.10 Affected Environment for Historical and Cultural Preservation

4.2.10.1 General County

The following sections describe the pre-contact, ethnographic, and historic settings for the five Columbia Solar Project sites, focusing on material culture and cultural trends that can inform archaeologists about the kinds of cultural resources that might be present archaeologically.

Pre-contact

Archaeologists and anthropologists define the Plateau culture area of Washington and Oregon as the landscape drained by the Columbia and Fraser Rivers, bordered by the Cascade Range to the west, the Blue Mountains and the Salmon River to the south, the Rocky Mountains to the east, and the northern reaches of the Columbia River to the north. Linguistically, the people in the Plateau culture area speak Interior Salishan, Sahaptian, Athapaskan, Kootenai, Cayuse, and some linguistic isolates. Plateau settlement and culture are characterized by riverine adaptation settlement patterns; a diverse subsistence base; extensive, institutionalized trading partnerships and regional trade fairs; and political organization at the band and village level, until the adoption of the horse (Walker 1990:1).

Paleoindian

Archaeological evidence shows that people entered what is now Washington State as glaciers retreated between 14,000 and 11,000 years ago at the end of the Pleistocene (Waitt and Swanson 1987). The earliest period of human presence characterized by these inhabitants is commonly referred to as the Paleoindian period. Their presence is marked in the archaeological record by the appearance of distinctive fluted projectile points, followed by large stemmed and shouldered styles. In 1987, a cache of fluted points was discovered in East Wenatchee in association with Glacier Peak ash dating to 11,250 radiocarbon years before present (B.P.) (Mehringer 1989). These early people are believed to have been highly mobile bands of hunters and gatherers with a focus on large megafauna such as mammoth that became extinct soon after the end of the glacial epoch. Stemmed and shouldered points have been found in other nearby Plateau sites that also date to the end of the Pleistocene, between 11,000 and 8,000 years ago (Daugherty 1956; Galm and Gough 2000). Changing climate contributed to the demise of many of the animals hunted by people during the Pleistocene, causing later hunters to broaden their prey spectrum and seek other large game such as elk, bighorn sheep, antelope, and deer. People during this time lived in small groups that moved frequently to find new game and other resources (Binford 1980).

The Paleoindian material culture local to the project area is known as the Windust phase (11,000–8000 B.P.) and is known from archaeological components from Windust Caves, Marmes Rockshelter, Granite Point, and Lind Coulee (Reid 1991). Typical artifact assemblages from this phase include lithic (stone) lanceolate and oval knives, distinctive shouldered Windust points, large scrapers, and utilized flakes. Edge-ground cobbles, bone awls, needles and atlatl spurs, and antler and shell artifacts are often found in the assemblages.

Vantage

The local Vantage phase (8000–4500 B.P.) corresponds with the Cascade phase defined for the Lower Snake River (Leonhardy and Rice 1970). It coincided with the Antithermal climatic period, a warming trend that occurred across the Plateau that brought drier conditions to uplands, possibly making them less productive for hunting and gathering. This is reflected in the lack of archaeological sites found in upland areas and an apparent subsistence focus on riverine areas. Vantage artifact assemblages include lanceolate Cascade-style project points, lanceolate and triangular knives, scrapers, edge-ground cobbles, atlatl weights, bone awls, needles, and atlatl spurs.

Frenchman Springs

The Frenchman Springs phase (4500–2500 B.P.) shows an increase in population, inferred from the proliferation of subterranean pithouse dwellings. The presence of large, stationary plant processing mortars shows a more intensive use of upland areas than was seen in the previous phase. Housepit sites are found at comparatively higher elevations along the Columbia River and its tributaries as well as on terraces of small streams. Other sites and isolated artifacts from this phase are found on all of the major landforms and ecological zones of the southern Plateau. Artifact assemblages from this phase include a greater proportion of cryptocrystalline silicate (CCS) material used as toolstone and greater numbers of ground stone and cobble tools. Stemmed and corner-notched points predominate and hopper mortars and pestles become much more common. The presence of net sinkers indicates greater emphasis on fishing than in the preceding phase. These traits represent the early emergence of the Plateau culture pattern that continued until the historic period (Ames et al. 1998; Galm et al. 1981).

Cayuse

The Cayuse phase (2500 B.P.) is marked by the appearance of small, corner-, basal-, and side-notched projectile points. Regional population increased, as indicated by a shift to larger, semipermanent villages along the Columbia and Snake Rivers and an increased emphasis on fishing along with the continued exploitation of upland resources. Sites from the Cayuse phase have been found in a broad array of environmental settings and on landforms such as ridgelines, natural springs, mountain benches, and small tributary streams in the Cascade Range. Some sites exhibit seasonal use for specialized functions including root gathering, hunting, fishing, and lithic quarrying. Artifact assemblages from this recent pre-contact period consist of end scrapers, lanceolate and pentagonal knives, net weights, pestles, grinding stones, hopper mortar bases, and cobble implements. Given better preservation, wood shafts, cordage, and mats have also been recovered along with bone shafts, bone beads, bone points, and shell (DePuydt 1990).

Ethnography

The five proposed Columbia Solar Projects are located within the traditional territory of the Confederated Tribes and Bands of the Yakama Nation (Ames et al. 1998; Ray 1936; Spier 1936). The Yakama and their neighbors practiced seasonal rounds traveling from salmon fisheries on creeks and rivers, to plant gathering and hunting areas in the surrounding uplands. Winter villages were clustered along primary rivers (Schuster 1998).

Yakama people and their neighbors lived in semisedentary villages until the introduction of the horse in the 1700s (Ames and Marshall 1980–1981). Introduction of the horse into the Plateau region fostered a greater degree of mobility and increased frequency of interaction with neighboring people, leading to changes in technology and shifts in seasonal resource procurement patterns. European and American trade items, such as metal knives, were obtained as a result of wider participation in Pacific Coast– and Plains-region trade networks afforded by the horse.

Late pre-contact and ethnographic-period villages were largely independent, led by a headman who governed by consensus, assisted by a council of other respected village men. Other leadership roles might be earned on the basis of special accomplishments such as proficiency at fishing or hunting or root-digging, as well as in the crafts of weaving and basketry (Schuster 1990:28). Each village claimed the surrounding lands for fishing, hunting, and gathering, though there were often reciprocal agreements for other groups to use them, based mainly on ties through marriage. Fishing stations were owned by families or individuals and passed onto their heirs, but arrangements for others' use might also be granted.

These permanent villages were occupied for the most part through the winter months. Early dwellings consisted of semisubterranean pithouses, depressions dug into the earth with a framework of branches supporting roofs made of woven mats. Temporary mat-covered summer houses or lean-tos were used at seasonal locations (Hollenbeck and Carter 1986:152; Schuster 1990). In the eighteenth century, four-sided, A-frame kaatnams, also made of poles covered with mats, largely replaced pithouses. They were easily assembled and broken down and highly transportable once travel by horse became common (Schuster 1990:29).

Extended family groups spent the winter in the sheltered villages living on stored food and hunting locally available game until spring, when the winter villages broke up as people set out on the seasonal round of fishing, hunting, and gathering. The appearance of the first stalk of wild celery in February signaled the time for departure, and was celebrated with a feast of the First Food (Schuster 1990:21). Soon after, many of the villagers departed for fishing stations along the Yakima and Columbia Rivers.

As the spring progressed, Yakama people made their way to seasonal gathering places where the women concentrated on root-digging or gathering other wild plants, while men hunted elk, deer, bear, foxes, and game birds with bow and arrow. Mountain goats and sheep were also hunted (Shuster 1990:22–23). Groups at temporary resource camps tended to be small and focused on gathering the resources at hand, but throughout the season people congregated in larger groups at shared rendezvous sites such as fishing stations or root-digging grounds. These gatherings provided an opportunity for groups to mingle for an extended time for trade and festive activities such as horse racing, games, and gambling (Schuster 1990).

One of the largest annual gatherings took place in May and June at the Cilaxan root-digging grounds near the present-day town of Kittitas (Depuydt 1990; Ray 1936). According to explorer Alexander Ross who passed through at this time of year in 1814, the root-gathering camp stretched for 6 miles in all directions and numbered about 3,000 people and three times that number of horses (Schuster 1990:26). The Columbia Solar Project areas were also the scene of large gatherings where hundreds of people came for root-digging. At these camps, women harvested the roots and corms with special digging sticks, roasting camas and other bulbs in pits and making them into cakes to store and add to the winter food supply (Schuster 1990).

From the Cilaxan root-digging grounds, the Yakama moved on to various fishing places on the Yakima River or to Wenatchapam on the Wenatchee River for the second seasonal salmon run (Depuydt 1990; Ray 1936). Two of the most popular traditional meeting places on the Plateau were fishing stations at Celilo Falls and The Dalles, where tribes from throughout the area as well as those from the Pacific Coast and the Plains gathered to trade as well as fish (Schuster 1990). Trade items included dried roots and berries, dried salmon and pemmican, skins and hides, and weaving and basketry materials.

August brought a final push for gathering foods to store for the winter. Many from the various Yakama bands met up with other groups at root-digging grounds in Klickitat territory to the south. Trout fishing and trading occupied the men's time while the women gathered roots to prepare for winter use. Later, people

moved on to camps upriver at Salmon La Sac and Fish Lake and up into the timberline to pick the ripening huckleberries, celebrating once more with a First Food feast. The berries were dried on smoking logs and packed into woven cedar bark baskets to store for winter (Shuster 1990:24–25). A variety of plants were gathered in the uplands, including various trees and bracken fern shoots that provided food, fiber, and medicines. Other foods gathered in summer months were golden current, gooseberry, serviceberry, and chokecherry (DePuydt 1990). One ethnographer mentioned at least 23 kinds of roots and 18 types of berries used by Yakama peoples, along with numerous other plants. One noted plant food was “black moss,” actually hanging lichen that was dried in the sun, and was eaten like bread (Curtis 1911, as cited in Hollenbeck and Carter 1986:160). In addition to plant gathering, hunting was good in the uplands at this time of year as well, with elk, deer, mountain goat, and bear available. Dried foods such as salmon, roots, and berries were brought back to the villages for winter use.

Yakama religious beliefs were expressed in everyday living as well as in specialized rituals and celebrations. Schuster (1990) provides a general overview of aspects of individual and collective religious life. Part of the ancient belief system related to powers of tákh, spirit guardians who could forge a relationship with an individual, conferring special powers such as ability in hunting or fishing or healing. Success in such endeavors and other needs were also addressed through petitions to the guardian spirit at special wishing sites, where individuals left offerings of stones, shells, beadwork, cloth, and other items.

Purification of the physical and spiritual body was attended to in the sweatlodge or sweatbath, where rituals were followed and prayers offered up. The village longhouse was the site of communal ceremonies. Members of the village gathered to participate in singing and dancing accompanied by drumming and special prayers and invocations. Special events such as the First Foods feasts were held in the longhouse (Schuster 1990). As for other Native Americans in the Pacific Northwest, the effects of European American contact were catastrophic for the Yakama people. Introduction of diseases for which they lacked immunities, reduction of game by European American hunters and settlers, restrictions on seasonal migration through traditional lands, and loss of lands in general contributed to the loss of many Native traditions. In spite of changes that brought most of their age-old lifeways to an end, Yakama groups persisted in some of the traditional ways.

History

Early Exploration and Early Native American Policy

The first description of Washington east of the Cascades came from the Lewis and Clark expedition, which stopped at the confluence of the Yakima and the Columbia Rivers in October of 1805 on their way to the Pacific Coast. With the help of the native people they encountered, they made the first map of the Yakima River basin. The headman of one of the Yakama groups sketched the Columbia River beyond the confluence for them. On their return trip from the coast, they visited the Yakama again, apparently obtaining horses (Babcock et al. 1986). Within a few years, fur traders made their way into the Columbia and Yakima River basins. Alexander Ross visited the Kittitas Valley in 1814, looking to trade horses with the natives. He described a celebration of an estimated 3,000 Native people gathered for collecting roots, horse-racing, gambling, and other festivities (Becker 2005). In 1840, a Yakama leader, Kamiakin, traded horses for cattle at Fort Vancouver, setting the precedent for later cattle raising in the valley. Other Yakama leaders, including one named Owhi, established cattle herds, and the cultivation of gardens began. The first wagon train passed over Naches Pass into the Puget Sound basin in 1853 (Becker 2005), passing through Owhi’s and Kamiakin’s camps (Schuster 1990).

By the 1850s, in response to the pressures of encroaching settlement, political influence among the Yakama peoples divided them into two main groups: the Kittitas or Upper Yakama led by headmen Teias and Owhi, and the Lower Yakama south of Wenas Creek led by Kamiakin. Yakama territory was ceded to

the U.S. government in the Yakima Treaty, signed in 1855 by Washington Territorial Governor Isaac Stevens at the Walla Walla Council. The Yakama Nation formed by the treaty was composed of 14 formerly independent bands and treated as a single political entity (Schuster 1990). The treaty barred settlement on the ceded land. After gold was discovered in eastern Washington in 1855, the federal government opened all ceded lands for settlement, in violation of the treaty. Increased tensions between miners passing through Yakama land, settlers, and the Yakama led to the Yakama Wars of 1855–1858. After defeats in 1856 and 1858, and the ratification of the Yakima Treaty in 1859, the Yakama groups were settled on reservation lands, allowing European American settlement to accelerate east of the Cascades (Holstine 1994:3.7–3.8).

The Homestead Act and Early European American Settlement

The Homestead Act of 1862 brought more settlers across the Cascades from the Puget Sound, but focus in the area was on the search for minerals including coal, gold, and iron. The Northern Pacific Railroad sent surveyors across Snoqualmie Pass in 1867 in preparation for construction of a road that would replace a rugged supply trail originating in The Dalles that linked the numerous, small, east-side settlements to Seattle. As miners, settlers, and herders came through the area, wagon roads replaced native trails. By the 1880s, settlers arriving from the Willamette Valley and herders driving cattle, horses, and sheep along the Columbia River corridor had discovered their own route across the Yakima River and over Snoqualmie Pass (Holstine 1994:3.8).

When miners followed goldstrikes into the area in the 1860s, herders also followed with cattle to supply them with beef, settling in small ranches throughout the Yakima Valley and creating the foundation for an ongoing industry. Between 1861 and 1869, cattle drives passed through the Kittitas Valley to the Cariboo mines on the Fraser River. Beginning in 1869 and persisting until 1879, Yakima cattle were summer grazed in the Kittitas Valley and then driven over Snoqualmie Pass in the fall to Puget Sound markets.

From 1861 to 1881, the typical farmstead consisted of a cabin, a corral, and an orchard. Gardens and small grain fields were planted, but the practice of storing hay for winter feed did not become common until after the unusually hard winter of 1880–1881, when widespread cattle death ended the open range practices in the area (Whitley 1949:24). In the Kittitas Valley, stockmen began to irrigate alfalfa and clover to put up winter feed for the cattle. Early irrigation systems were simply diversions of creeks into private or partnership ditches but as more complex and expensive projects were required to respond to the demand for more irrigated acreage, private irrigation companies were organized by local farmers and bankers. The early irrigation networks tended to be small and irrigated modest patches of land but were soon followed by larger, more complex projects.

Intensified Population, Irrigation, Agriculture, and Railroads

As the markets in the mining districts dried up in the 1880s, cattle were increasingly driven to Puget Sound or the Willamette Valley. Some cattle were also shipped to Montana to stock the growing cattle industry in eastern Montana (Oliphant 1932). Moving cattle out of the valley to other markets was made much easier when the Northern Pacific Railroad mainline was constructed through the valley in 1886 on its way to Tacoma. Ellensburg was made the headquarters for the Cascade Division of the Northern Pacific and the region experienced another influx of mostly urban population. Increases in population drove the need for further complex irrigation and infrastructure development. The Town Ditch in Ellensburg was built in 1885 by the City of Ellensburg, and was capable of irrigating 12,000 acres. The West Kittitas Canal was built in 1889 and could irrigate 10,000 acres.

During this period of intensified European American population growth, conflicts arose between the Yakama Nation and the settlers for access to land. In 1887, the Yakama Nation sued to regain access to a traditional fishing site at Celilo Falls that had been fenced off by a settler. The U.S. Supreme Court

ordered forced removal of the fence (Cohen 1986:54–55). Over the decades, in their determination to follow traditional fishing practices in accustomed places, Tribal members defied state law by fishing without a license and using methods such as gaffing and dip netting. Arrests and jail sentences sometimes resulted.

Twentieth Century and Modern History

Irrigation and the completion of the Northern Pacific and the Great Northern Railway to Puget Sound between 1890 and 1910 brought striking changes in eastern Washington and the West in general. The region saw increased development through the establishment of the U.S. Bureau of Reclamation under the National Reclamation Act in 1902. The Cascade Canal was built in 1903–1904, and was planned to irrigate 25,000 acres (Whitley 1949). In Kittitas County, the value of irrigated land ranged from $100 to $150 per acre, and farming on irrigated land placed a high premium on commercialized, highly capitalized agriculture utilizing intensive methods and crops that brought relatively high returns. The average size of an irrigated farm in Kittitas County in 1910 was about 108 acres. Kittitas County's farmers accounted for three-fourths of the irrigated timothy hay produced in the state in 1910 and three-fifths of the irrigated clover (Nesbit and Gates 1946).

The effects of the railroads on the interior areas of Washington transformed agriculture and ranching from a small-holder subsistence to commercial enterprise (Nesbit and Gates 1946). The Chicago, Milwaukee, St. Paul and Pacific Railroad completed its transcontinental line through the valley and over Snoqualmie Pass in 1909. Stock driveways were established to uplands along ridgelines and other easily traveled routes to move livestock from winter feed areas to summer pasturage. Due to overgrazing by cattle, sheep became more common on degraded rangeland and eventually became more important than cattle as they fared better in the mountains and were more efficient grazers. As late as the turn of the nineteenth to twentieth century, the winter range of grazing lands in the basins draining the eastern Cascades slopes were still considered to be in poor condition.

The Yakama Nation's fight for fishing, land, and treaty rights continued into the twentieth century. Yakama politicians successfully litigated for access to their accustomed fisheries in 1905 in United States v. Wicans. In 1913, George Meminock and Jim Wallahee were successful in litigation that reaffirmed Yakama treaty fishing rights in United States v. State of Washington. During the 1960s, in response to state regulations, the Yakama participated in widespread fish-ins, non-violent forms of civil protest that eventually led to a lawsuit against the State of Washington on behalf of Tribes throughout the state. In 1974, a judicial ruling known as the Boldt Decision reiterated the right of the Tribes to fish in common in their usual and accustomed places. "In common" was interpreted to mean the Tribes were entitled to one-half of the salmon catch. As a result of the decision, many Tribes, including the Yakama, developed or revised their own fisheries laws and management programs.

4.2.10.2 Background Research and Field Survey Methods

The following sections describe preparation activities and the methods used to conduct field surveys for each of the five Columbia Solar Project sites.

Specific Background Research

Prior to field investigations, SWCA staff searched DAHP's Washington Information System for Architectural and Archaeological Records Data (WISAARD) database to identify previous cultural resource assessments and recorded archaeological and historical sites located within and near each solar project site. Additional archival research examined historical documents, maps, research publications, and books that provided information about the natural history, human settlement, and land

use around the Kittitas Valley. Specific attention was given to review of available historical maps, such as General Land Office plats and Metsker Maps, as part of this overview investigation.

WISAARD Review

The WISAARD review indicated that 56 cultural resource investigations have been completed within 1 mile of the solar project sites (Table 4.2-5). The Camas, Fumaria, Typha, and Urtica Solar Project sites themselves have not been previously surveyed for cultural resources. One cultural resources survey was previously conducted along the north and east edges of the Penstemon Solar Project site. Schroeder and Landreau (2013a) excavated 13 probes in the Penstemon Solar Project site, but did not identify cultural resources within the solar project site.

Table 4.2-5. Previous Cultural Resource Investigations Within Approximately 1 Mile of the Project Area

Author	Date	Project	Relation to Project	Results[1]
Rutan and Stevens	1982	A Survey for Cultural Resources at Quarry Site QS-S-234 and Pit Site PS-S-226	0.5 mi W of Camas	Information has been redacted
Hartt	1989	Olmstead Place State Park Interpretive Master Plan	0.5 mi N of Penstemon	
Schalk	1990	Cultural Resources Reconnaissance in Washington State Parks, Biennial Summary for 1987–1989	0.7 mi NE of Penstemon	
Bicchieri	1994	Olmstead Place State Park Survey Report	0.6 mi NE of Penstemon	
Emerson	1995	Cultural Resources Surveys of Nine Yakima Fish Production Project Phase II Fish Screen Sites, Kittitas and Yakima Counties, Washington	Within 1 mi of Typha	
Hartmann	1997	Cultural Resources Surveys of the Fogarty Fishscreen and John Cox Fishscreen Facilities, Kittitas and Yakima Counties, Washington	0.2 mi E of Urtica	
Valentine	1998	U.S. Fish and Wildlife Service Archaeological and Historical Resources Identification Report: Naneum Creek	0.5 mi S of Camas	
Chapman and Fagan	1999	Cultural Resources Survey of Irrigation Features Within the Proposed Level 3 Fiber Optic Line in Kittitas and Yakima Counties, Washington	1 mi W of Typha	
Fagan et al.	1999	Cultural Resources Survey of Level 3's Proposed Fiber Optic Line from Seattle to Boise: Washington Segment, Non-Federal Lands	0.8 mi SW of Typha	
Schablitsky et al.	1999	Cultural Resources Survey of Route Modifications and Shovel Testing of Sites for Level 3's Proposed Fiber Optic Line from Seattle to Boise: Washington Segment, Non-Federal Lands, Addendum	0.8 mi SW of Typha	
Cleveland and Fraser	2000	Safe Access for Salmonids on Lower Wilson Creek	Adjacent to Camas; 0.7 mi W of Penstemon	
Juell	2000	Cultural Resources Inventory of the proposed Washington Light Lanes Project Regeneration Station Surveys Associated with the Route 3 Backbone (I-90)and the Route 4 Backbone (I-82)	0.7 mi N of Camas	
Miller and Lentz	2002	From Native American Trails to the Inland Empire Highway: A Cultural Resources Inventory of Tile Canyon Road Improvement Project	0.8 mi W of Camas	
Miller	2003	Archaeological and Historic Resources Inventory of Kittitas County's Proposed Faust Road Improvement Project Kittitas County, Washington	0.9 mi S of Fumaria	
Orvald	2003a	Dry/Cabin Creek Fish Access and Protection Project Kittitas County, Washington	0.6 mi SW of Fumaria; 0.4 mi NE of Typha	

Table 4.2-5. Previous Cultural Resource Investigations Within Approximately 1 Mile of the Project Area

Author	Date	Project	Relation to Project	Results[1]
Amara	2004a	EQIP Projects in Kittitas County, Washington: OAHP Log no: 102003-23-NRCS (Graaff, Hanson), OAHP Log no: 022304-08-NRCS (Mellegaard, Brunson)	0.6 mi W of Camas; 0.9 mi NW of Urtica	
Amara	2004b	EQIP Projects in Kittitas County, Washington: Katzele; Laub Farm; Jack Wheatley/Level Best Farms; Cooke Coleman LLC, Gardinier, Kayser, and Morgan; Davis, Duncan, Hunter & Titus; Anderson, Edwards, Gregerich, Mason, Mihelich and Poulsens	0.7 mi W of Typha	
Middleton and Hackenberger	2004a	Coleman Creek – Hernandez/Ringer Project Archaeological Monitoring Report	0.8 mi SE of Camas	
Middleton and Hackenberger	2004b	Cultural Resource Pedestrian Survey for Ludwick Diversion Replacement/Redesign Project	0.5 mi W of Camas; 0.8 mi SW of Penstemon	
Amara	2005a	NRCS Don Rinehart EQIP 2005 Site Identification Survey in Kittitas County, Ellensburg, Washington	0.4 mi S of Fumaria	
Amara	2005b	NRCS Extreme Farms LLC EQIP 2005 Cultural Resources Site Identification Survey in Kittitas County, Washington	Adjacent to Typha	
Amara	2005c	NRCS John Smith EQIP 2005 Site Identification Survey in Kittitas County, Washington	0.8 mi S of Urtica	
Middleton and Hackenberger	2005	Naneum Creek/Bull Canal Project Archaeological Monitoring Report	Adjacent to Camas; 0.9 mi W of Penstemon	
Orvald	2005	Cultural Resource Inventory for Proposed Fogarty Ditch Diversion Redesign Project, Kittitas County, Washington	0.2 mi E of Urtica	
Sharley	2005	A Cultural Resources Survey of the Bonneville Power Administration's Proposed Fogarty Ditch Fish Screen Project, Kittitas County, Washington	0.2 mi NE of Urtcia	
Amara	2006a	NRCS Jeff Brunson Farm EQIP 2006 Cultural Resources Site Identification	0.1 NW of Camas	
Amara	2006b	NRCS Double DJ Farms EQIP 2006 Cultural Resources Site Identification Survey in Kittitas County, Washington	0.2 mi E of Fumaria	
Orvald	2006	Cultural Resource Inventory for the Proposed Durand-Fagalde Diversion Redesign Project, Lower Reecer Creek, Kittitas County, Washington	0.7 mi NE of Urtica	
Orvald and Hoyt	2006	Cultural Resource Inventory for Bonneville Power Administration's Proposed Lyle Creek Barrier Removal and Restoration Project	Adjacent to Camas; 1 mi W of Penstemon	
Green	2007	NRCS Taylor Ranches LLC Environmental Quality Incentives Program EQIP 2005 Site Identification Survey in Kittitas County, Washington	0.2 mi S of Fumaria; 0.9 mi NE of Typha	
Landreau et al.	2007	An Archaeological Review and Inventory of the Proposed Coleman and Cherry Creek Irrigation Projects	0.4 mi E of Camas; Adjacent to Penstemon	
Anderson and Roulette	2008	Letter Report: Results of an Archaeological Survey of the Ellensburg-Columbia No.1 Transmission Line, Kittitas County, Washington	1 mi E of Fumaria	
Landreau	2008	An Archaeological Review and Inventory of the Proposed Gregerich Rill Irrigation Modification Project, Kittitas County, Washington	0.6 mi SW of Typha	
Bowden and Shaw	2009	Olmstead Place State Park Pioneer Cabin Site Archaeological Investigation: Addendum to the Olmstead Place State Park Pioneer Cabin Historic Structures Report	0.7 mi NE of Penstemon	
Landreau	2009	A Section 106 Archaeological Review and Inventory of Six Proposed Installation/Upgrade Irrigation Sites Along the Menastash Ditch, Kittitas County, Washington	1 mi SW of Typha	

Table 4.2-5. Previous Cultural Resource Investigations Within Approximately 1 Mile of the Project Area

Author	Date	Project	Relation to Project	Results[1]
Luttrell	2009	Letter Report: Olmstead Place State Park - Coleman Creek Bridge Removal Project Letter Report, Kittitas County, Washington	0.7 mi NE of Penstemon	
Becker and Ragsdale	2010	Results of Archaeological Investigations of the Wenatchee Facilities Modification Project – Plymouth to Zillah and Yakima to Wenatchee	0.5 mi SW of Camas	
Hoyt et al.	2011	City of Ellensburg Hayward and Route 10 Water Wells Cultural Resources Assessment Project, Kittitas County, Washington	0.6 mi NW of Fumaria	
Luttrell	2011b	Letter Report: Olmstead Place State Park – Culvert Replacement Project, Kittitas County, Washington	0.7 mi NE of Penstemon	
Luttrell	2011c	Letter Report: Olmstead Place State Park – Coleman Creek Increased Riparian Buffer Project, Kittitas County, Washington	0.6 mi NE of Penstemon	
Landreau and Schroeder	2012	Section 106 Archaeological Review and Inventory of the Mellergaard Sprinkler Conversion Project, Kittitas County, Washington	0.9 mi SW of Urtica	
Vaughn and Schroeder	2012	2012 Pedestrian Survey and Subsurface Reconnaissance of the Schaake Parcels, Kittitas County	0.4 mi NE of Urtica	
Schroeder	2013	A Section 106 Archaeological Review and Inventory of the Cherry Creek Tributaries Sprinkler Conversion, Fish Screening and Passage Project, Kittitas County, Washington	0.5 mi S of Penstemon	
Schroeder and Landreau	2013a	A Section 106 Archaeological Review and Inventory of the YTAHP–Coleman Creek Poulsen/Hanson Project	0.8 mi NE of Camas; overlaps Penstemon	
Schroeder and Landreau	2013b	A Section 106 Archaeological Review and Inventory of the Bland Sprinkler Conversion Project, Kittitas County, Washington	0.2 mi S of Urtica	
Emerson	2014	Cultural Resources Survey for the Kittitas County No. 6 Road Improvements Project	0.5 mi SE of Camas	
Landreau	2014	A 05-05 Archaeological Review and Inventory of the Bland Family Farm Sprinkler Conversion Project, Kittitas County, Washington	0.6 mi NW of Urtica	
Landreau and Schroeder	2014	Archaeological Review and Inventory of the Circle Lazy H Sprinkler Conversion #2 Project, Kittitas County, Washington	0.6 mi N of Urtica	
Woody	2014	Cultural Resources Identification Survey of the Lynn Brown 2014 NRCS EQIP Project	0.5 mi SE of Fumaria	
Amara	2015	NRCS Bland Environmental Quality Incentives Program Cultural Resources Site Identification Survey in Kittitas County, Washington	0.5 mi W of Urtica	
Landreau	2015	A Section 106 Archaeological Review and Inventory of the David Rinehart Sprinkler Conversion Project, Kittitas County, Washington	0.9 mi NW of Fumaria	
McFarland et al.	2015	Cultural Resources Review for the Non-Bureau of Reclamation Owned Portion of the Schaake Property Habitat Improvement Project, Kittitas County, Washington	0.9 mi SE of Urtica	
Woody	2015a	Cultural Resources Identification Survey of the Circle Lazy H Farm 2015 NRCS EQIP Project	0.5 mi N of Urtica	
Amara	2016	KCCD Three Bar G Ranch Sprinkler Conversion Cultural Resources Site Identification Survey in Kittitas County, Washington	0.9 mi SE of Typha	
Landreau	2016a	A Section 106 Archaeological Review and Inventory of the Naneum Creek-Valley Land Company Diversion and Fish Screen project, Kittitas County, Washington	0.2 mi E of Camas; 0.4 mi W of Penstemon	
Landreau	2016b	An Archaeological Review and Inventory of the Broadmoor Farm, Berry Road Sprinkler Conversion Project, Kittitas County, Washington	1 mi NW of Camas	

1. Newly recorded cultural material identified within 1 mile of solar project sites.

Eight archaeological sites have been recorded within 1 mile of the solar project sites (Table 4.2-6); however, no cultural resources have been recorded within the solar project sites.

Table 4.2-6. Previously Recorded Sites Within Approximately 1 Mile of the Project Areas

Site No.	Compiler/Date	Age	Description	Relation to Project Area
Table has been redacted				

Field Methods

Archaeological Survey

Archaeological fieldwork for each project site was conducted on the following dates:

- Camas Solar Project site – April 12 to 15, 2017
- Fumaria Solar Project site – April 4 to 8, 2017
- Penstemon Solar Project site – April 16 and 17, 2017
- Typha Solar Project site – April 4 to 6, 2017
- Urtica Solar Project site – April 9 to 15, 2017.

Yonara Carrilho directed 11 SWCA archaeologists and field technicians.

Archaeological surveys were conducted in a similar manner at each solar project site, and deviations are described in the individual project reports in in Appendices G through K. Each solar project site was surveyed with pedestrian transects spaced at approximately 20-meter intervals. The pedestrian surveys were supplemented with shovel probes (SPs) measuring between 35 and 40 cm in diameter. SPs were spaced approximately 30 meters apart. The SPs were excavated in arbitrary 20-cm levels, and the sediments from each level were passed through a ¼-inch mesh screen.

SPs were terminated at 100 cm, when native alluvial cobbles or gravels were encountered, or when other obstructions prevented further excavation. If a probe was positive for cultural material, a minimum of two 20-cm negative levels were excavated beyond the lowest positive level, unless an obstruction or depth of 100 cm was reached first. Any cultural material identified during the pedestrian survey and SP survey was recorded and photographed. Subsurface artifacts were bagged in plastic bags, labeled, and reburied where they were found.

The findings of each probe were recorded on standard shovel/auger probe forms that included information regarding soil color, texture, composition, and observed cultural materials. A Trimble handheld global positioning system (GPS) unit was used to collect the Universal Transverse Mercator (UTM) coordinates of shovel probes. Digital photographs were taken of each solar project site and a sample of the excavated SPs, and information about the photographs was recorded on a standard photograph log. SP photographs included cardinal direction overview photos and at least one photograph of the soil stratigraphy. Project field records and files are on file at SWCA's office in Seattle.

Information about any identified archaeological sites or isolates was recorded on State of Washington Archaeological Site Inventory Forms, which were entered into the WISAARD database.

Built Environment Survey

SWCA architectural historian Eileen Heideman conducted field surveys for built environment resources for all five solar projects on April 5 and 6, 2017. Built environment resources over 50 years old were identified, and included buildings such as houses, barns, and sheds, and structures such as bridges and irrigation ditches. Resources were photographed and described on field forms, and these data were then entered into the WISAARD database, and an inventory form was generated for each resource.

4.2.10.3 Solar Project Sites

The following sections describe the cartographic reviews and results of field surveys conducted for each of the five proposed Columbia Solar Project sites.

Camas Solar Project Site

Cartographic Review

Historical sources provided additional important information about the Camas Solar Project site. A Native American trail is shown [redacted] on a General Land Office (GLO) map of T17N, R19E from 1884, and a Shooshooskin camp is shown [redacted] (GLO 1884b). By 1956, land in the project site was farmed by A.B. Paine, Paul Wipple, E. Clerf, and Louis E. Poulsen (Metsker Maps 1956). The Poulsen family still owns the land across Tjossem Road from the project site. Today, there is a barn in the project site, and the Valley Land Company owns the land.

Field Survey Findings

One pre-contact isolate and two historic properties were identified during the survey for the Camas Solar Project site (Figures 4.2-4 and 4.2-5).

A utilized white chalcedony tertiary flake, designated 45KT4010, was found [redacted]. The flake exhibits retouch on the distal margin and three facets on the dorsal surface. As an isolate, it is recommended not eligible for the National Register of Historic Places (NRHP).

The Paul Wipple Barn appears to date to the early twentieth century and has undergone several changes in the course of its existence, including the enlargement of several door openings and removal of most doors, the loss of most windows, and the removal of a portion of one wall. This building has lost its integrity of design, materials, workmanship, and association and is recommended not eligible for the NRHP.

An unlined irrigation lateral extends through the northern portion of the project site. The lateral measures approximately 10 to 15 feet across. The lateral contains several irrigation features of varying ages, including a turnout for a field pipe and a group of weirs and turnouts where the ditch connects to Naneum Creek. The weirs located at the confluence of the ditch and Naneum Creek also appear to be less than 50 years old. This irrigation resource is recommended not eligible for the NRHP due to the loss of integrity of location and design.

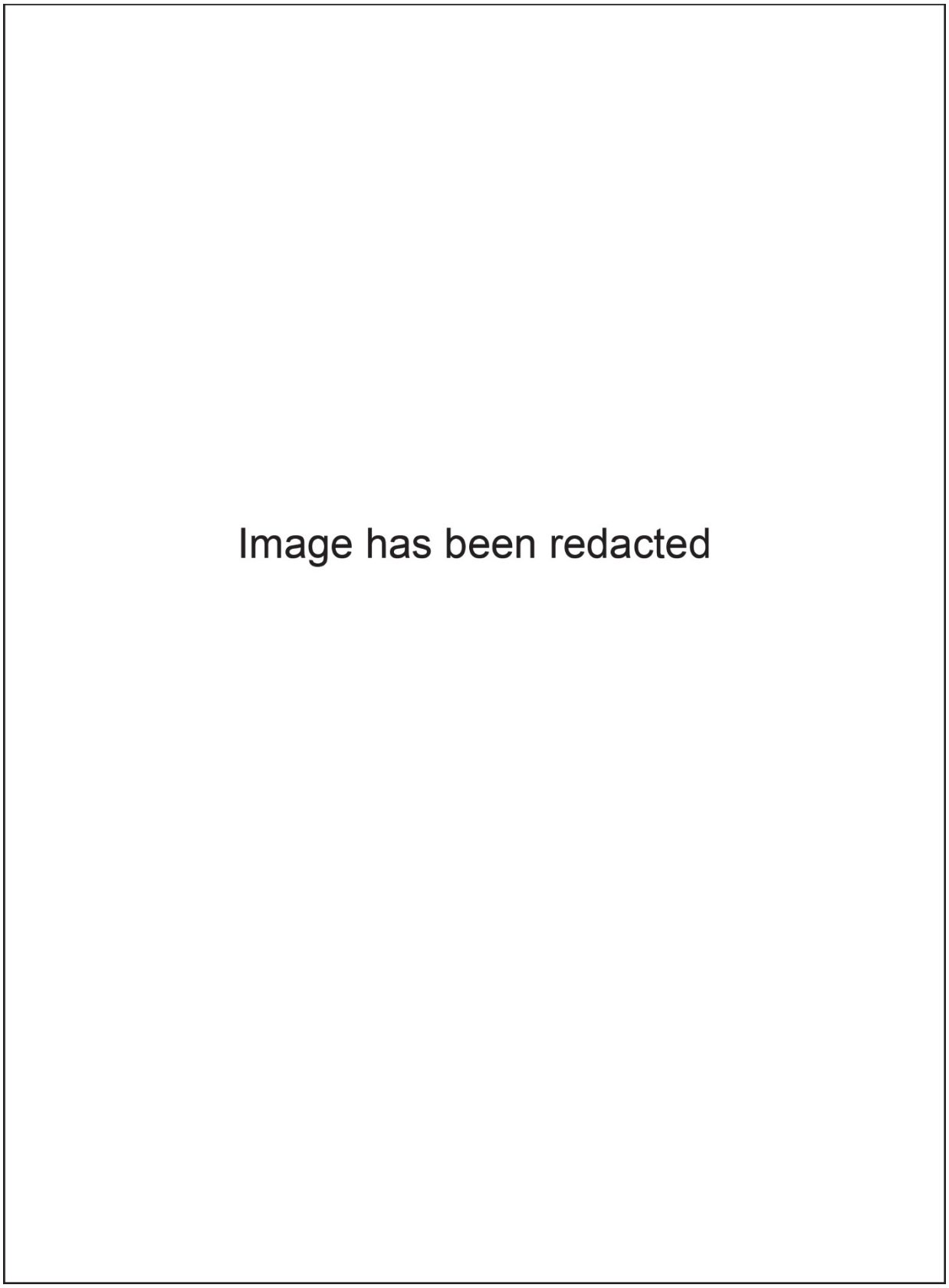


Figure 4.2-4. Camas Solar Project cultural and built environment resources, north portion.

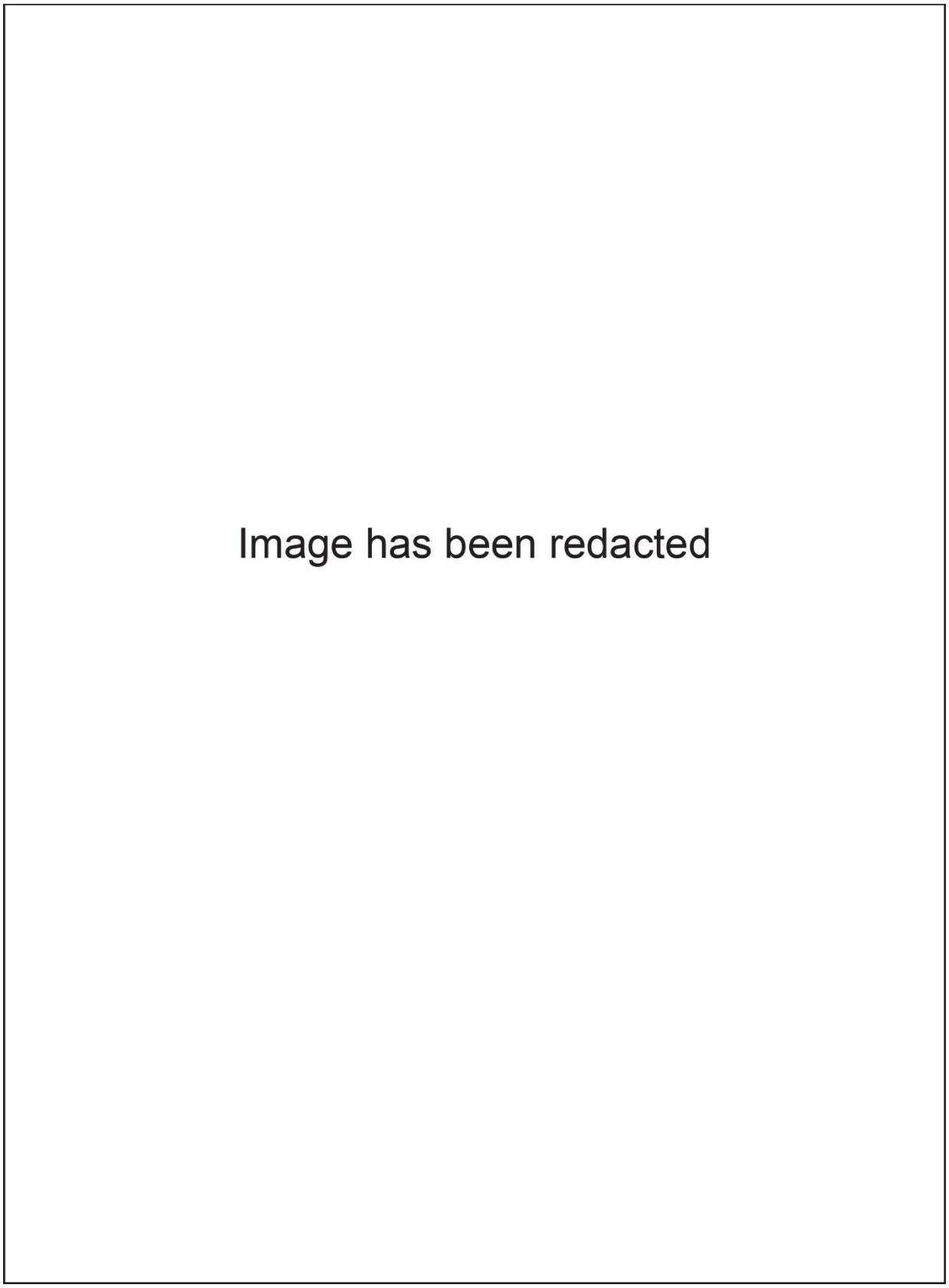


Figure 4.2-5. Camas Solar Project cultural and built environment resources, south portion.

Fumaria Solar Project Site

Cartographic Review

Review of historical sources provides additional important information about the Fumaria Solar Project area. Trails used by the Yakama to travel between their villages and resource-gathering locales may have once followed [redacted], up from the Yakima River, but the original locations of these creeks have shifted due to irrigation canals and roads (GLO 1884c). In 1864, the Northern Pacific Railroad Company was granted most of the land in Sections 9 and 17, T18N, R19E, as well as the NW¼ of Section 21, which they claimed in 1895. According to the BLM, the State of Washington obtained Section 16 in 1934 via a grant for numbered school sections. Land in the NE¼ of Section 20 left public domain when Carl Justus Larson and Peter A. Wold claimed their homesteads in 1892 and 1883, respectively. The 1884 GLO map of T18N, R18E does not show any historical structures in the project vicinity (GLO 1884c).

By 1956, the land where the Fumaria Solar Project is proposed was farmed by Creston S. Crest. Reecer Creek is shown as an intermittent creek flowing across the Crest property (Metsker Maps 1956). The land south of the solar project site and along Faust Road, which holds the Cascade Canal, was farmed by the Penningtons and Howard Altice. Jack Bopp and John Liboky farmed the land on the south side of Hungry-Junction Road where Reecer Creek once flowed freely and another irrigation canal, the Town Ditch, was present. Liboky's property was also adjacent to the railroad and land owned by Joseph McManamy at the southwest end of the proposed project. Several highways were present in the vicinity by 1956.

The Fumaria Solar Project site is currently used for agriculture and is owned by Jay T. and Lori A. Pittenger, as is the land on the north and south sides of Clarke Road following the proposed generation tie line right-of-way. Three buildings were constructed on the solar project site in 2002 and no other structures are present.

Field Survey Findings

One pre-contact site, four pre-contact isolates, and three historic properties were identified during the survey of the Fumaria Solar Project site (Figures 4.2-6 to 4.2-12). As isolates, it is recommended that 45KT3592, 45KT4007, 45KT4008, and 45KT4009 are not eligible for the NRHP.

Site 45KT4000 consists of two small flakes of semi-translucent white CCS material. One is a proximal tertiary flake measuring 1.2 × 0.9 × 0.2 cm; the second is the broken proximal portion of a secondary flake measuring 3.0 × 2.0 × 6 cm. Found during shovel probing, the artifacts originated [redacted]. Because the archaeology site consists of only two artifacts, it is not likely to provide additional information about prehistory, and it is recommended not eligible for the NRHP.

A tertiary flake, designated 45KT3592, was found [redacted]. The artifact is a 2-cm flake of semi-translucent CCS with a hinge fracture.

A modified flake, designated 45KT4007, was found [redacted]. The flake is a semi-translucent gray CCS and measures 2.5 × 2 × 0.25 cm.

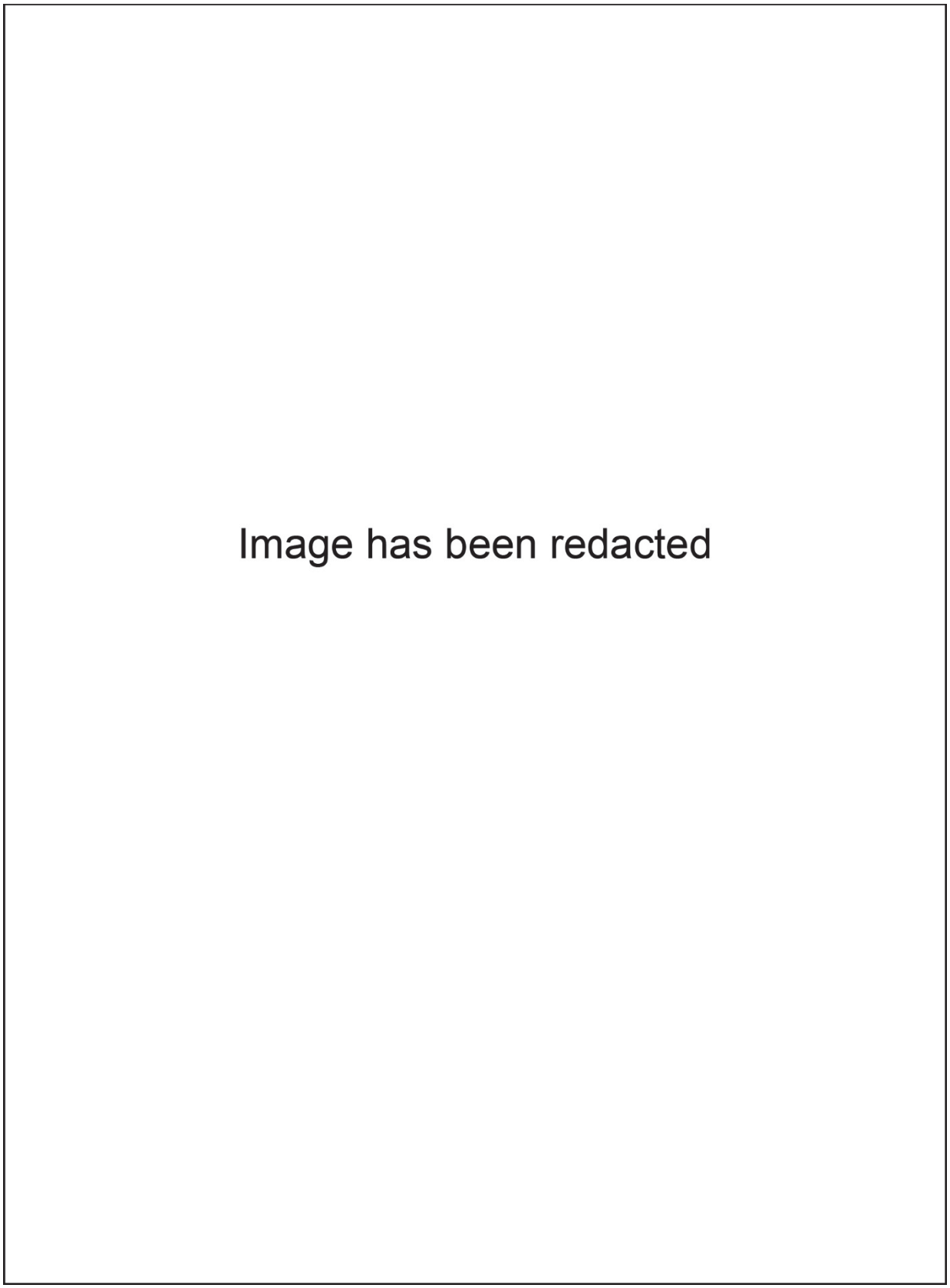


Figure 4.2-6. Fumaria Solar Project cultural and built environment resources, Map 1 of 7.

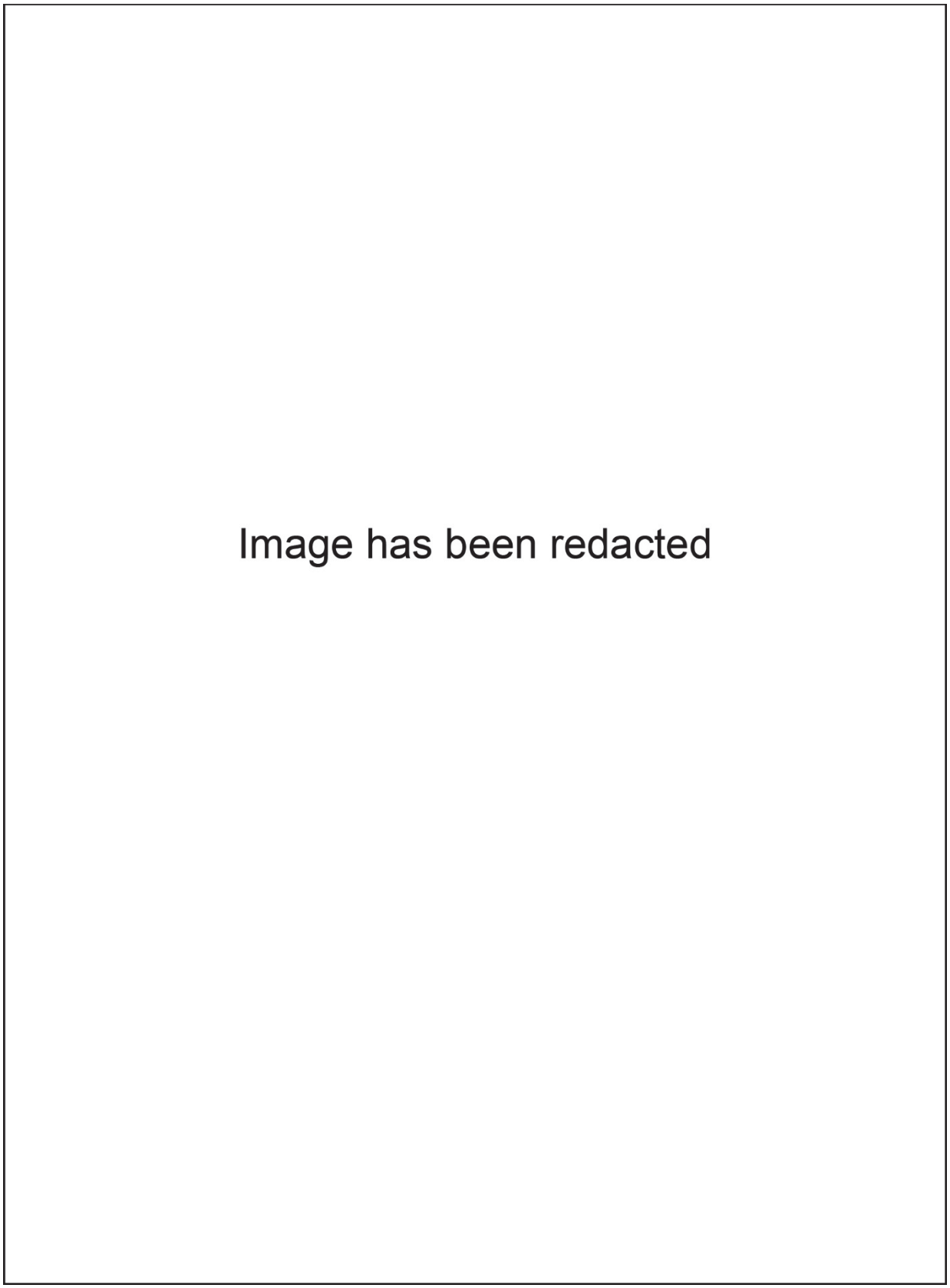


Figure 4.2-7. Fumaria Solar Project cultural and built environment resources, Map 2 of 7.

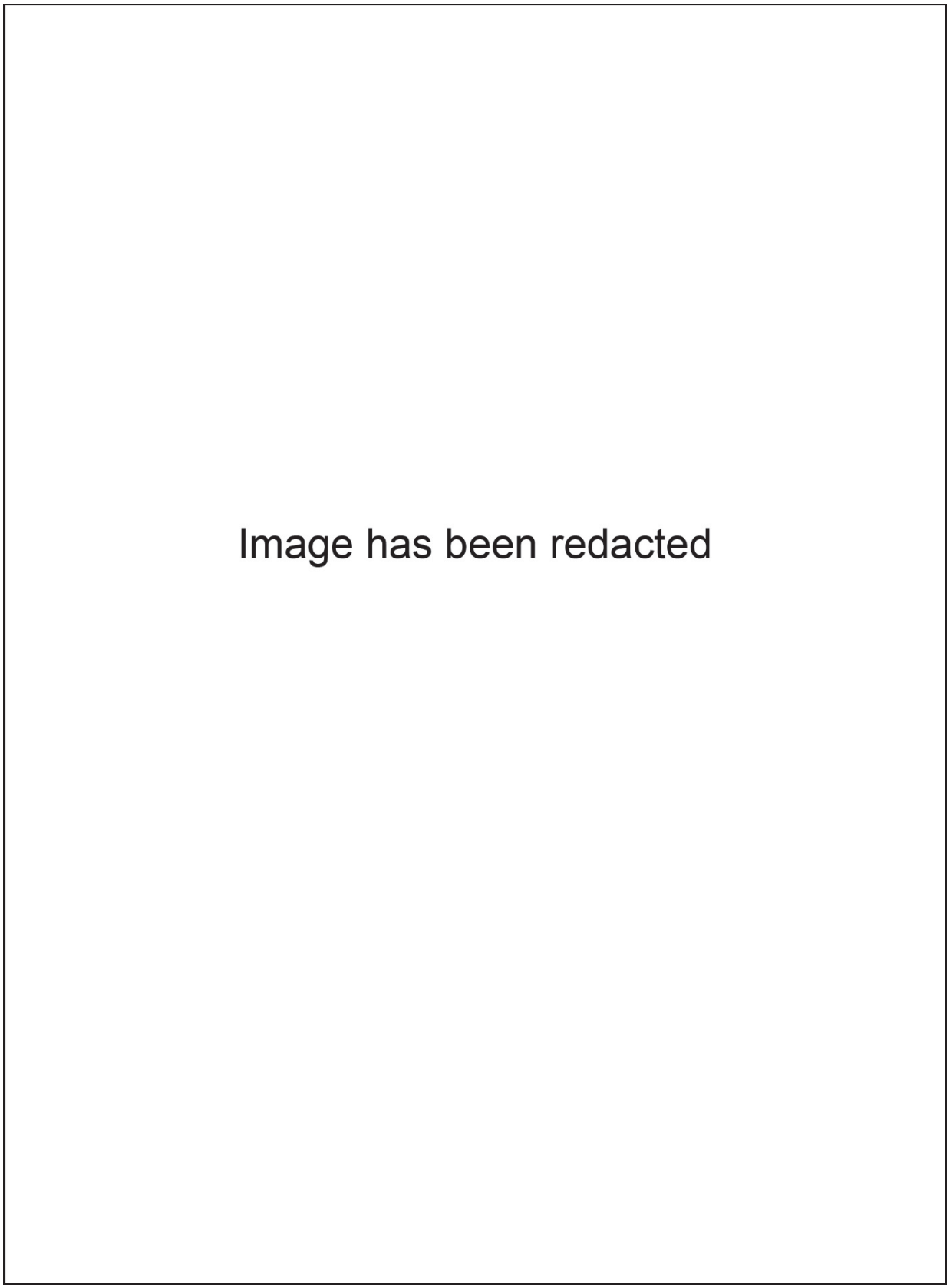


Figure 4.2-8. Fumaria Solar Project cultural and built environment resources, Map 3 of 7.

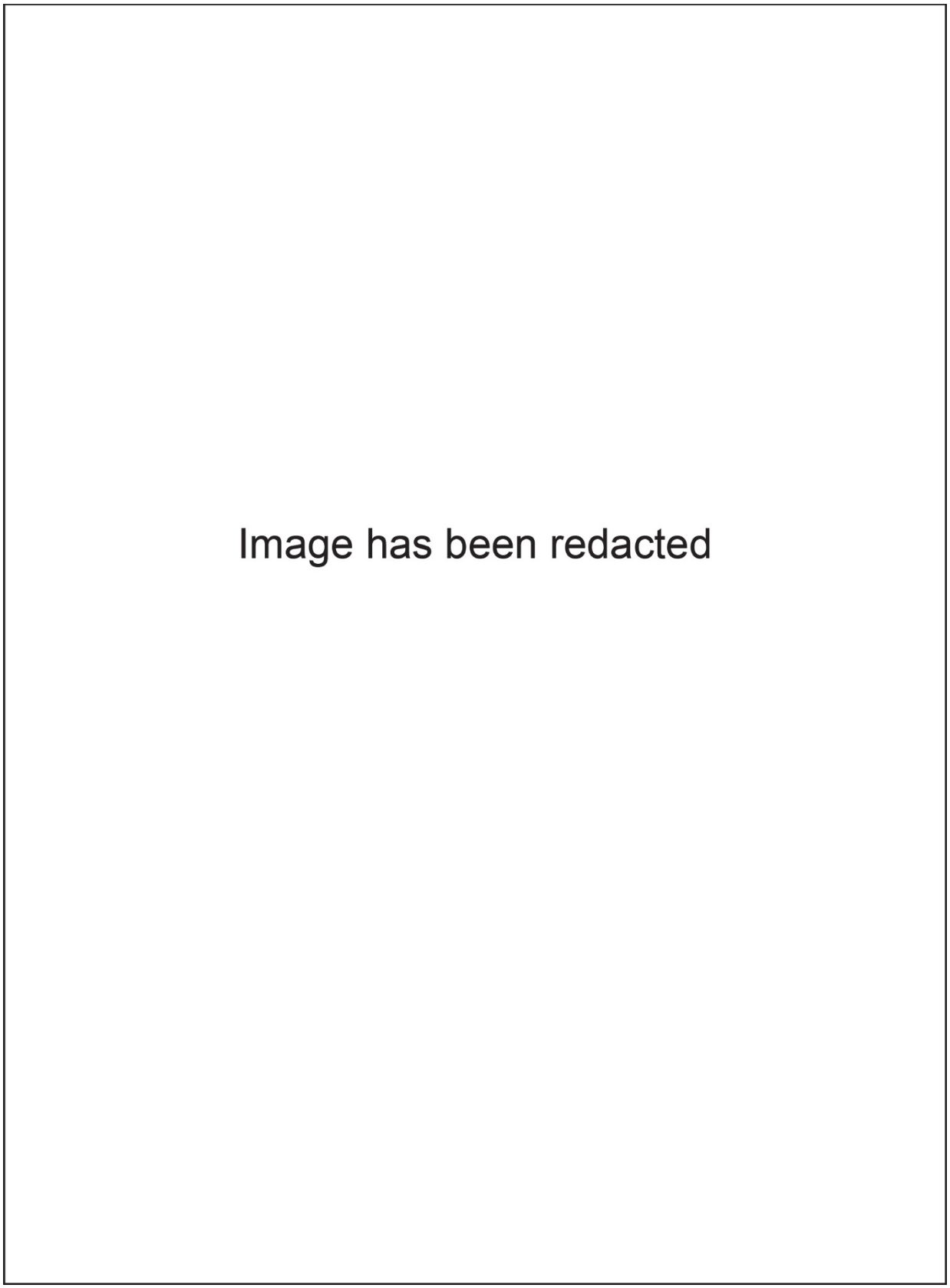


Figure 4.2-9. Fumaria Solar Project cultural and built environment resources, Map 4 of 7.

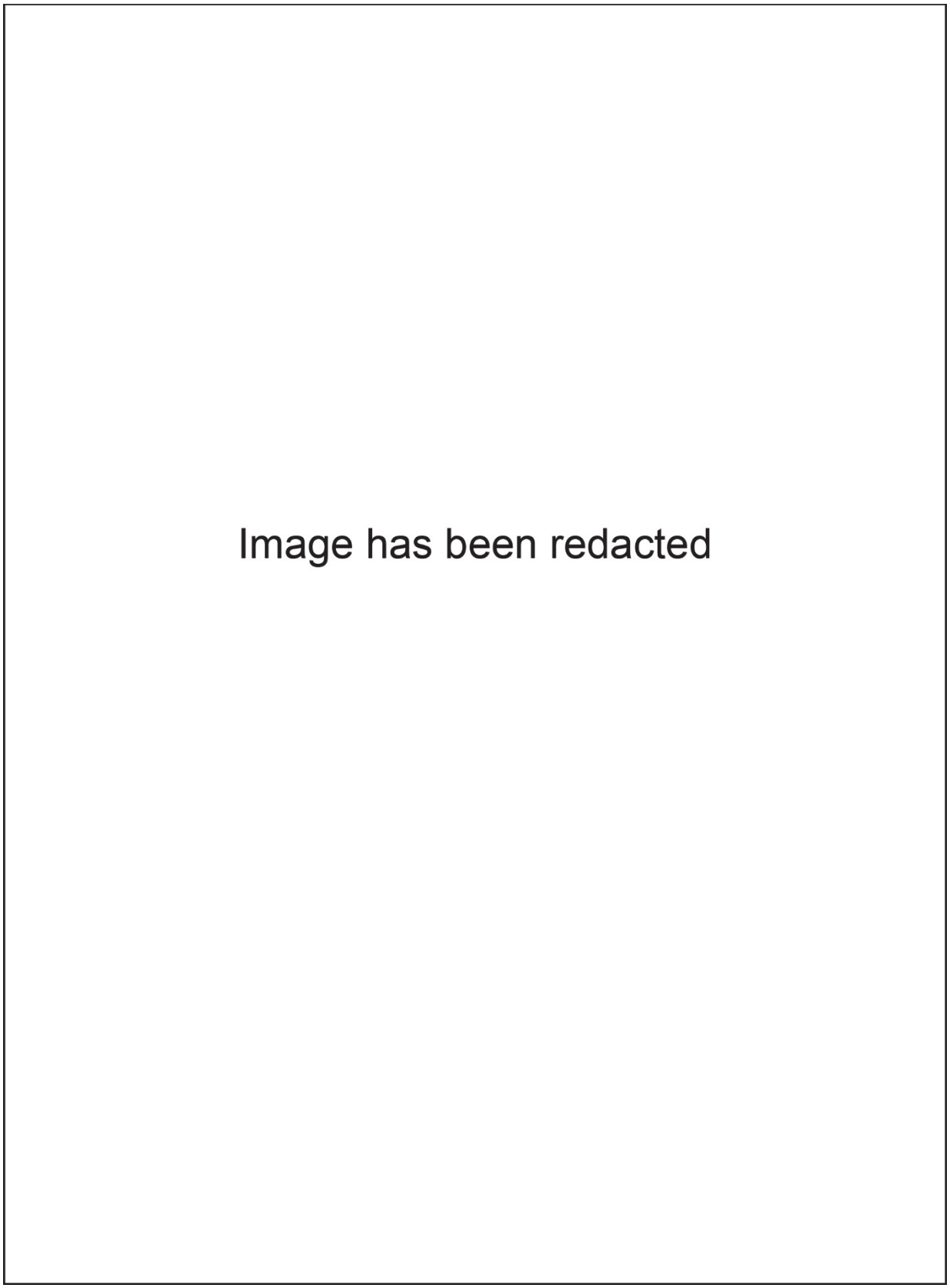


Figure 4.2-10. Fumaria Solar Project cultural and built environment resources, Map 5 of 7.

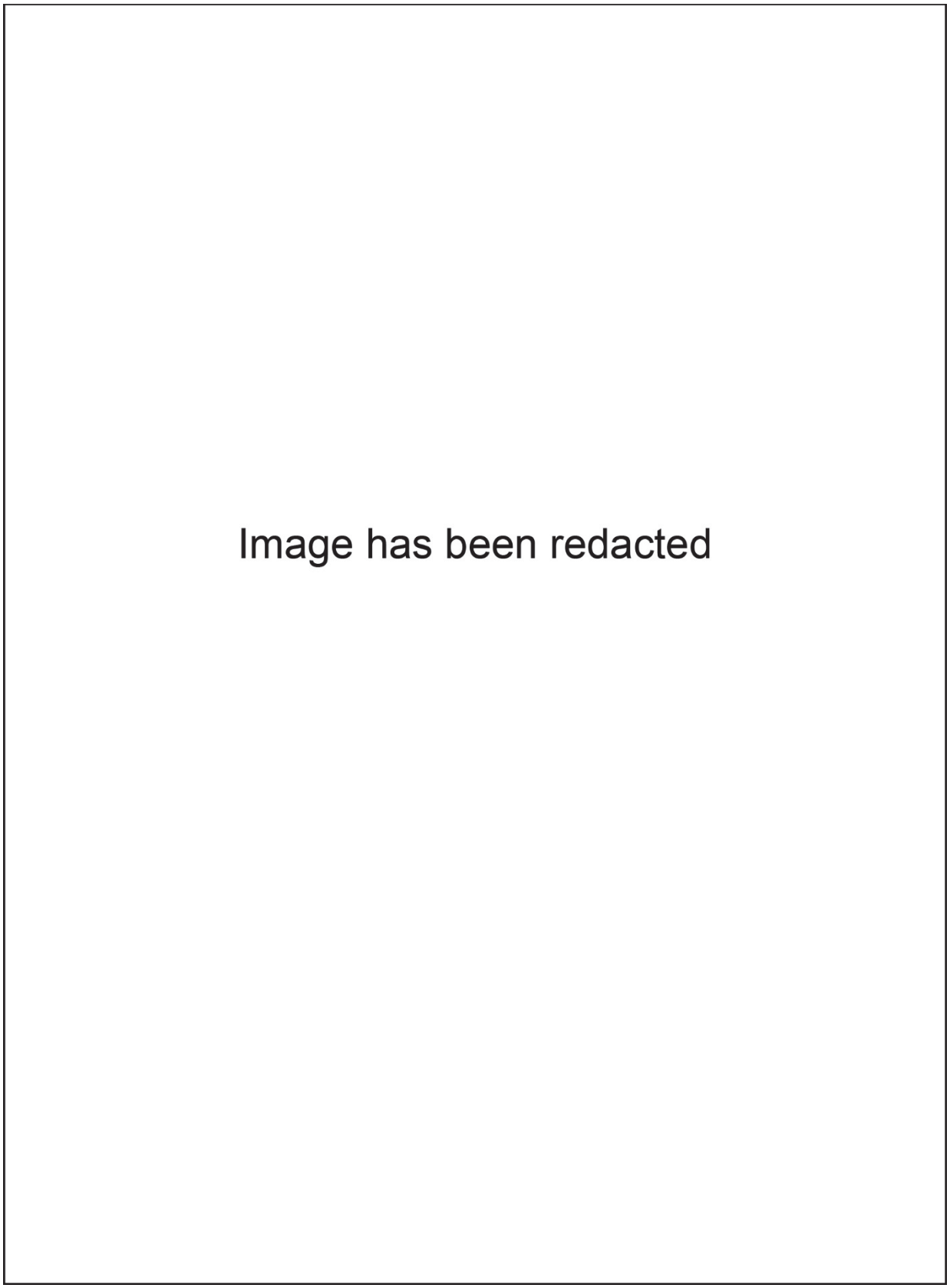


Figure 4.2-11. Fumaria Solar Project cultural and built environment resources, Map 6 of 7.

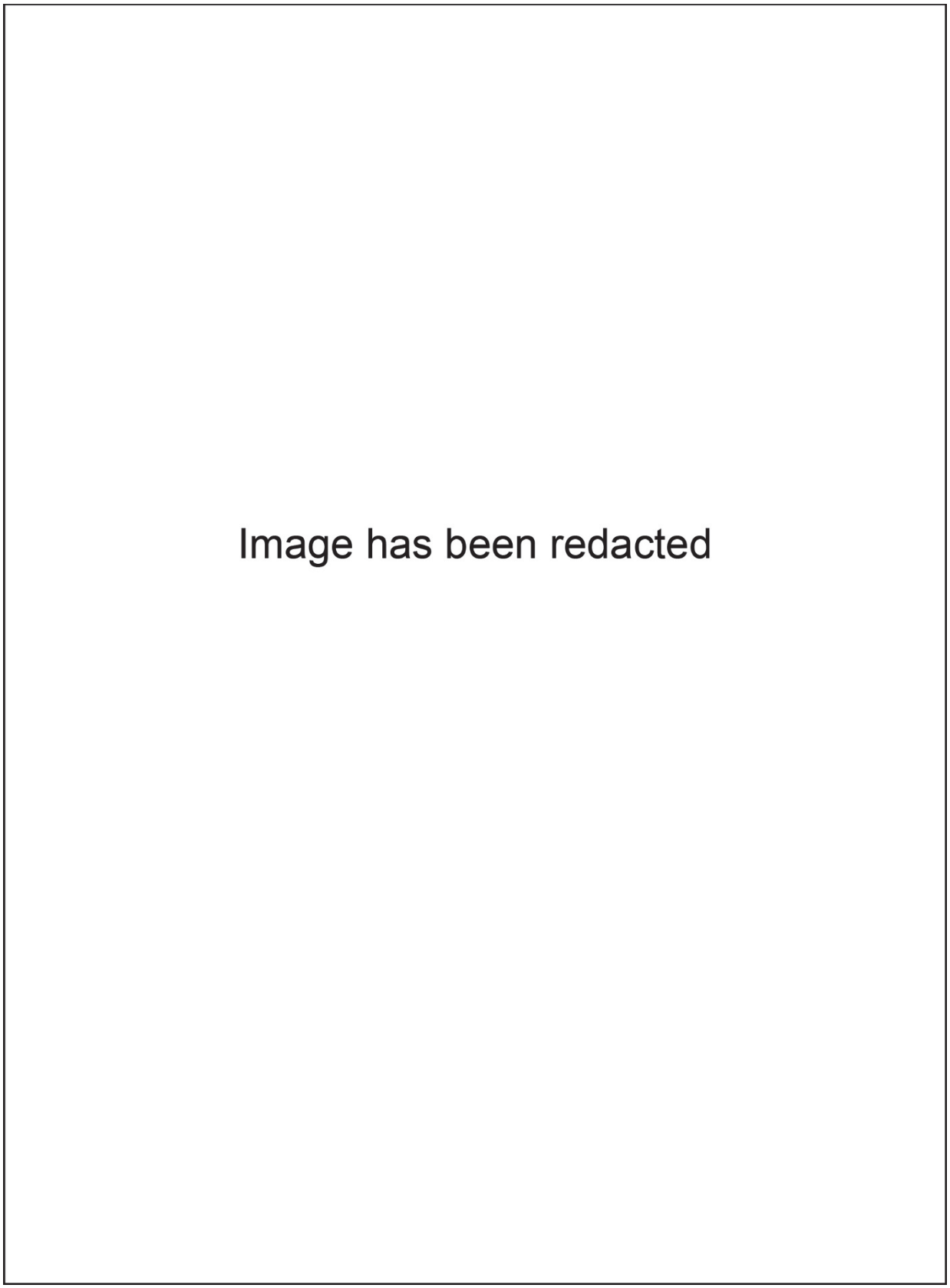


Figure 4.2-12. Fumaria Solar Project cultural and built environment resources, Map 7 of 7.

A broken bifacial thinning flake, designated 45KT4008, was found [redacted]. The flake is semi-translucent pink CCS and measures 2.1 × 1.0 × 0.5 cm.

A tertiary flake, designated 45KT4009, was found [redacted] cm below surface (cmbs). The flake is opaque white CCS and measures less than 1 cm.

The Cascade Canal, currently called the Cascade Irrigation District Canal, is 42 miles long. The section passing through the Fumaria Solar Project generation tie line corridor is unlined and approximately 20 feet across. The Cascade Canal Irrigation Company formed in 1902 as a successor firm to the Inter-Mountain Irrigation Association, proposing the construction of two canals: a lower canal with an intake on the Yakima River near Thorp, and an upper canal with a dam on Lake Kachess. Construction of the lower canal began in 1903 and water began flowing in the spring of the following year (Boening 1919:31–32). The Cascade Canal is one of the earliest canals built in Kittitas County and continues to be used more than 100 years later. It is recommended eligible for the NRHP under Criterion A for its contribution to the history of irrigation in the Pacific Northwest.

Crest Field Ditch Turnout is located at the north end of the Fumaria Solar Project site and appears to be infrequently maintained and not in regular use. The turnout is connected to underground pipes within the project site (the exact locations of these pipes are unknown) and is associated with an open, unlined field ditch that extends to the north through a pasture. The turnout is associated with a field ditch and lacks individual significance. This resource is recommended not eligible for the NRHP.

Lateral NB 7.7, which is part of the Kittitas Reclamation District (KRD) system, extends through a portion of the Fumaria Solar Project site and terminates in a spill end at the south end of the project site (KRD 2017). A small ditch extends from the end of this lateral on an east-west line to a retaining pond located outside of the project site. The lateral measures approximately 3 to 5 feet in width, with depth varying by terrain. The spill end consists of a series of poured concrete weirs with turnouts to direct water to a wastewater ditch that extends to the west, or to the retention pond to the east. This lateral is a minor component of a large and vastly complex irrigation network that may be eligible for the NRHP; however, the eligibility of the irrigation district was not evaluated as part of this solar project. This resource is not recommended individually eligible for the NRHP.

Penstemon Solar Project Site

Cartographic Review

The review of historical sources provides additional important information about the Penstemon Solar Project site. A Native American trail is shown [redacted] on a GLO map of T17N, R19E from 1884, and a Shooshooskin camp is shown [redacted] (GLO 1884b). Additional trails are mapped [redacted], such as the Squaw Creek Trail that ran [redacted].

Field Survey Findings

One multi-component site and one pre-contact isolate were identified during the survey for the Penstemon Solar Project site (Figure 4.2-13). No built environment resources were identified on the solar project site.

Site 45KT4012 is a historic debris scatter with two concentrations of artifacts located [redacted]. A total of 363 historic artifacts and one lithic artifact were observed at the archaeological site. The lithic artifact is a complete, secondary, freehand percussion flake made of fine-grained volcanic rock, displaying plow damage on the lateral margin.

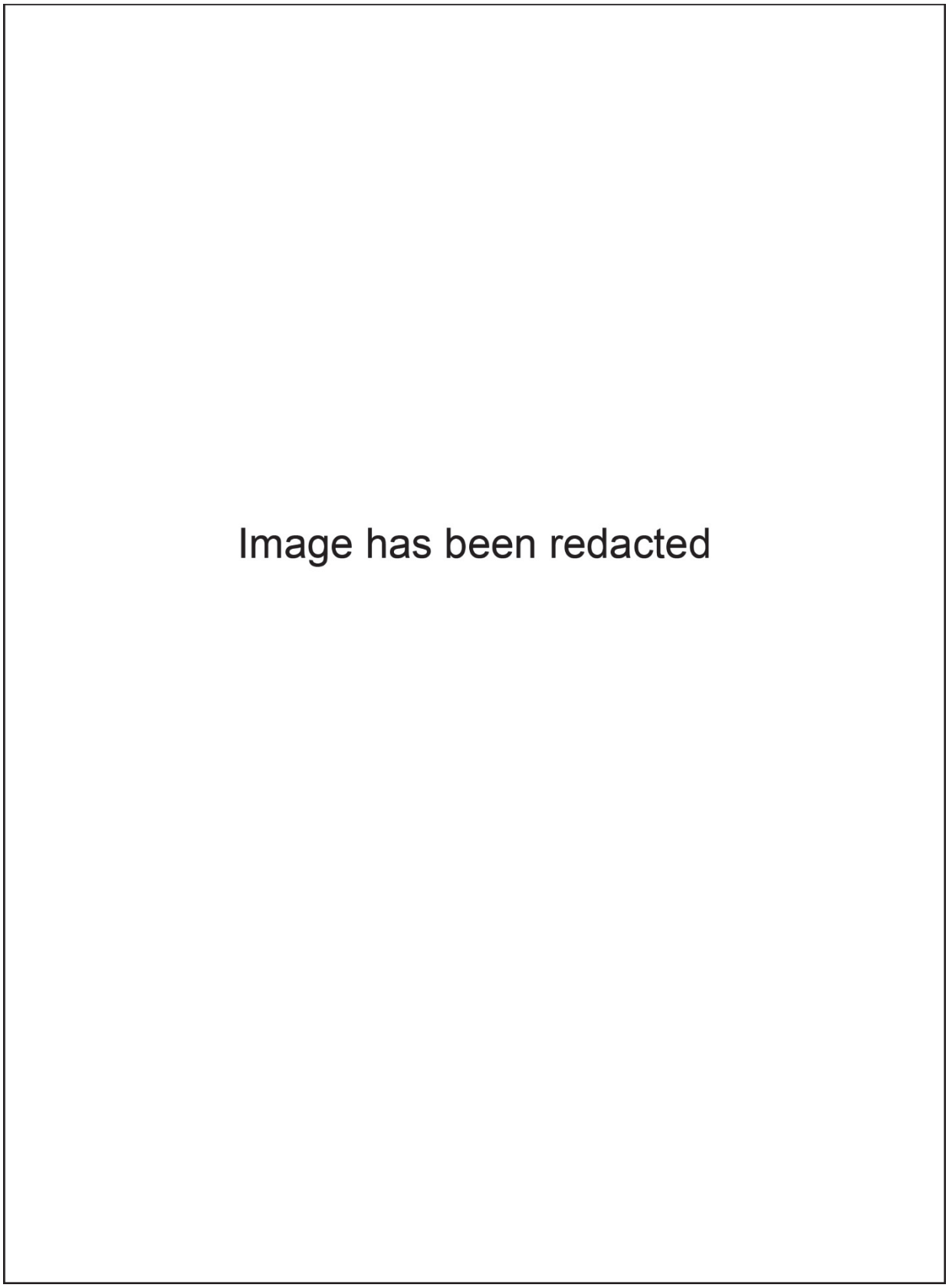


Figure 4.2-13. Penstemon Solar Project cultural and built environment resources.

The majority of artifacts were found [redacted] (n = 303) or [redacted] (n = 51). Artifacts observed [redacted] included many historic artifacts (e.g., agricultural implements, building materials, and domestic refuse) as well as one lithic artifact. Agricultural implements include a horseshoe, a harrow spike, and a horse bit. Building materials include both square and round nails, bricks, concrete pieces, and window glass fragments. Domestic refuse includes many fragments and diagnostic vessel elements of clear, green, aqua, and milk glass, as well as whiteware, other earthenware, and porcelain fragments. Diagnostic artifacts include ceramic and glass pieces with maker's marks, such as two refitting earthenware fragments of a plate produced by The Homer Laughlin China Company in 1925. These diagnostic artifacts suggest that the site was occupied during the 1920s. Several children's objects were also identified on the surface including three glass marbles, a small animal figurine, and a piece of a porcelain doll.

This archaeological site is recommended not eligible for the NRHP due to a lack of integrity. The site appears to be associated with domestic and agricultural activities and to date to the 1920s based on diagnostic artifacts observed. It cannot be associated with any people or events important in history. No remains of buildings or structures are present, and the site therefore possesses no distinctive characteristics of a type, period, or method of construction. Most artifacts are [redacted]. Although buildings or other structures may have stood at this location, no intact remains of them, such as foundations, were observed. The types of artifacts present and their lack of integrity give them little potential to yield information important to history beyond what can be obtained from the area's historical record.

A secondary, bipolar flake, designated 45KT4011, was found [redacted]. The flake is weathered, fine-grained volcanic material, and measures 5.5 × 5.7 × 2.0 cm. Cortex is present along one lateral margin, and there are four flake scars on the dorsal surface. Anvil crushing is visible on the distal end. As an isolate, it is recommended not eligible for the NRHP.

Typha Solar Project Site

Cartographic Review

The review of historical sources provides additional important information about the Typha Solar Project site. The closest known ethnographic Yakama village site is on [redacted] (Luttrell et al. 1999; Luttrell and McKenney 1999; Ray 1936). The Yakama followed well-established trails from their villages to important resource-gathering locales, such as fishing sites at Selah, Icicle Creek, and Priest Rapids (Flenniken and Trautman 2004; Hollenbeck and Carter 1986). A known crossing of the Yakima River was [redacted] (Luttrell et al. 1999; Luttrell and McKenney 1999). Because of the river crossing and proximity to an ethnographic village, this solar project site has heightened sensitivity for encountering pre-contact and ethnographic-period cultural materials.

According to the BLM, land in the Typha Solar Project site left public domain by Cash Entry in 1873 and Homestead Entry in 1888. The 1884 GLO map of T18N, R18E does not show any historical structures or trails in the immediate project vicinity (GLO 1884c). B.W. Frisby and R. Geddes may have farmed land south of the project site when the earliest maps of the vicinity were drawn (GLO 1884c). By 1956, land in the project site was owned by L. D. Peters and adjacent properties west of the river were owned by P. F. P. Young (Metsker Maps 1956). A golf course was present southeast of the project site by this time (Metsker Maps 1956). The property is currently owned by Douglas Dicken and is used for agricultural purposes. One mobile home that was built in 1979 and a few outbuildings that were built in 1910, 1960, 1980, 1982, and 1987 are present on the property, but these structures are located south of the project boundary.

Field Survey Findings

Six pre-contact isolates and two historic properties were identified during the survey for the Typha Solar Project site (Figures 4.2-14 and 4.2-15). As isolates, it is recommended that these resources are not eligible for the NRHP.

A lanceolate biface, designated 45KT4013, was found [redacted]. The artifact measures 90 × 35 × 0.8 mm, and is made from petrified wood with light gray, brown, and white longitudinal banding. The biface is broken at the base. One side exhibits more retouch than the other.

A tertiary, red jasper flake, designated 45KT4014, was recovered [redacted]. The flake measures 0.8 × 0.5 × 0.1 cm. It is triangular in shape with a longitudinal break and an irregular dorsal surface. [redacted]

A tertiary chalcedony flake, designated 45KT4015, was recovered [redacted] The flake measures 1.6 × 1.3 × 0.3 cm. It is triangular in shape with a longitudinal break and an irregular dorsal surface. [redacted]

A secondary jasper flake, designated 45KT4016, was recovered [redacted] The flake measures 1.0 × 1.0 × 0.3 cm. [redacted]

A complete, fine-grained volcanic secondary flake, designated 45KT4017, was recovered [redacted] The flake measures 7.7 × 4.8 × 2.3 cm. It has cortex along one lateral margin and a slightly lipped platform. [redacted]

A complete, fine-grained volcanic tertiary flake, designated 45KT4018, was recovered [redacted] The flake measures 1.5 × 1.0 × 0.2 cm. [redacted]

The Ellensburg Power Canal varies in width, measuring an average of 40 feet across, and is unlined along the Typha Solar Project generation tie line corridor and access road. A steel- and timber-deck bridge carries a farm driveway across the canal to provide access to a farm. A field ditch inlet on the east side of the canal, southeast of the farm bridge, indicates that in addition to power generation, the canal was also utilized for irrigation. The Ellensburg Power Canal was constructed in the first half of the twentieth century to divert water from the Yakima River for a power generation facility. This canal is recommended eligible for the NRHP under Criterion A for its contribution to the history of power generation in the region of Thorp and Ellensburg.

The Ellensburg Golf Club Cart Shed is single-story, shed-roofed building standing one bay deep and 17 bays wide, facing north toward a driving range. Each of the 17 bays is accessed through side-hinged doors. The building footprint has been expanded over time with two to three additions that have more than doubled the building size. The Ellensburg Golf Club existed on this property as early as 1956 (Metsker Maps 1956), but the age of the golf cart shed is unknown. The construction style of the building indicates that the shed could be 50 years old, but it is unlikely to predate the popular use of golf carts, which were still something of a novelty in the 1950s (Windsor 1956). This building lacks individual significance under the NRHP Criteria and has lost its integrity of design due to the construction of several additions. This building is recommended not eligible for the NRHP.

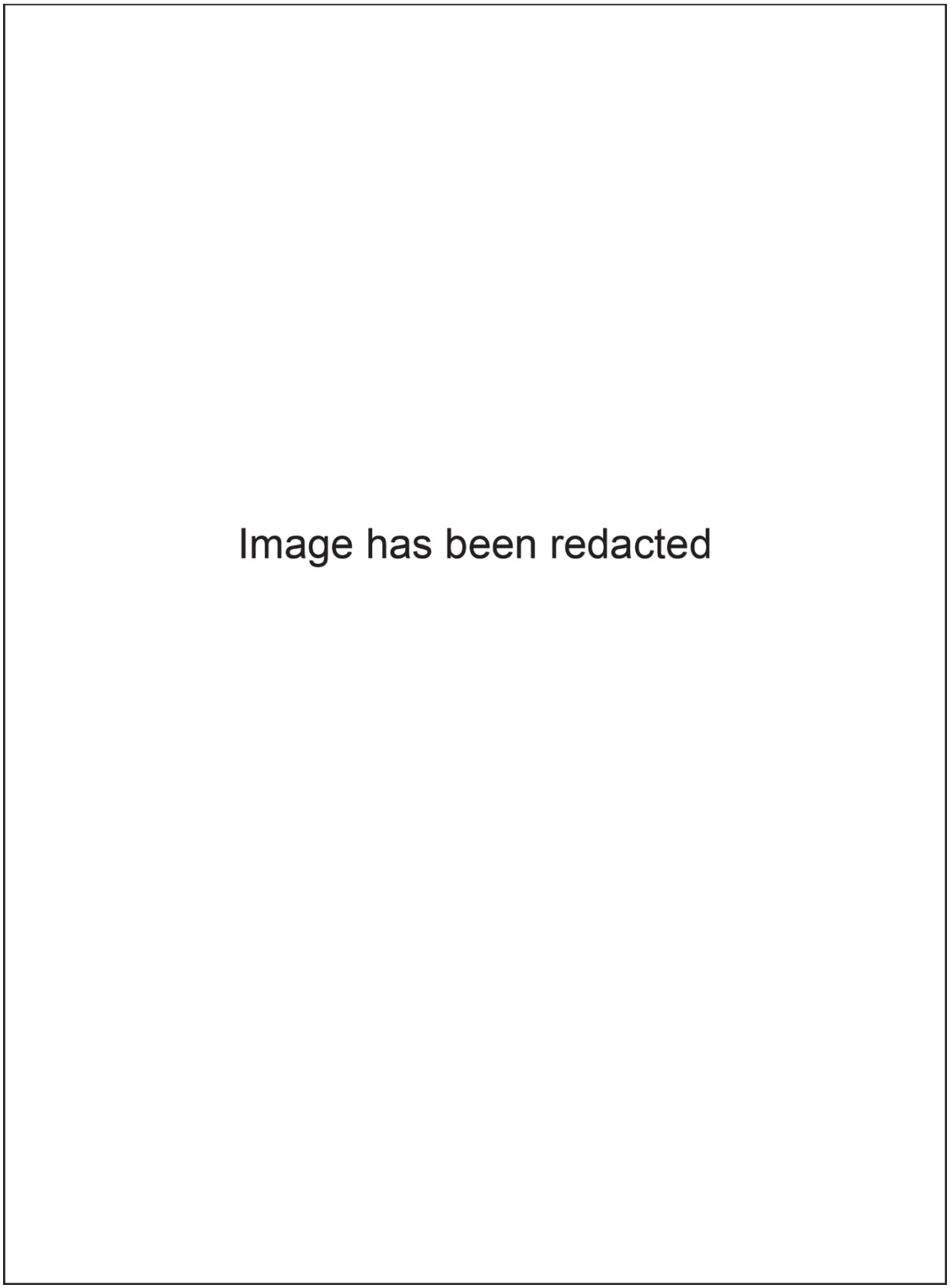


Figure 4.2-14. Typha Solar Project cultural and built environment resources, north portion.

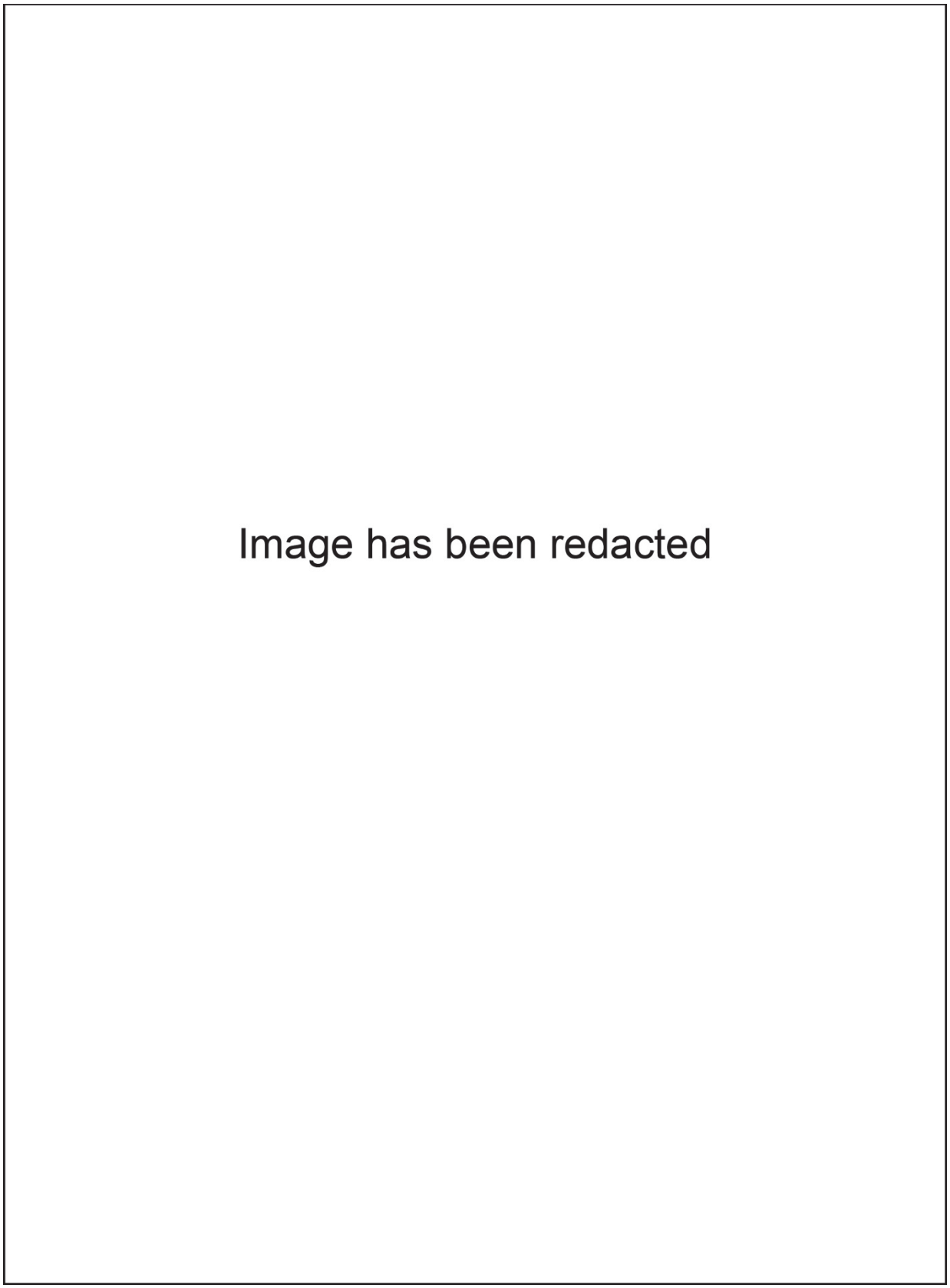


Figure 4.2-15. Typha Solar Project cultural and built environment resources, south portion.

Urtica Solar Project Site

Cartographic Review

The review of historical sources provides additional important information about the Urtica Solar Project site. According to the BLM, land in the project site left public domain in 1884 when Hiram H. Swasey claimed a homestead. The 1884 GLO map of T17N, R18E does not show any historic structures or trails in the immediate project vicinity (GLO 1884a). By 1956, land in the project site was farmed by Jeff Walters, Robert Kuhn, and Mare Bender (Metsker Maps 1956). A branch of the West Side Canal, the remnants of which are south of the current project and Manastash Road, flowed through Mr. Walter's property. Land in the project site is currently owned by Herbert J. Etux Snowden who continues to use the property for agriculture. Farm buildings and structures on Mr. Snowden's property (but not within the proposed solar project site) date to between 1984 and 1988, with updates as recently as 2011.

Field Survey Findings

One pre-contact site, one contact isolate, and three historic properties were identified during the survey for the Urtica Solar Project site (Figures 4.2-16 and 4.2-17).

Site 45KT4019 is a lithic scatter [redacted]. It was initially observed during the systematic shovel probe survey when 25 flakes were identified in a probe. Additional probes were excavated to delineate site boundaries, resulting in the identification of flakes in nine more probes. Artifacts are [redacted]

A total of 100 lithic artifacts were recovered from 10 shovel probes. These artifacts are mostly small (1–2 cm) tertiary flakes. A variety of material types are represented, including chert (white, gray, pink, and brown), jasper, agate, chalcedony, fine-grained volcanic rock, and obsidian. The majority (67%) of artifacts were recovered [redacted]. Five flakes are heat damaged, and 26 are broken. An obsidian tool was recovered from [redacted]. This tool exhibits use-wear along one edge. A flake, recovered from another shovel probe [redacted] also exhibits wear.

SWCA recommends this site not eligible for the NRHP. It is a relatively low-density scatter of non-diagnostic lithic debitage, with one obsidian tool, and the artifacts are not associated with datable material. Further, it has limited integrity because most of the artifacts observed are located [redacted], and because it has likely been impacted by the farm road [redacted].

A complete tertiary chalcedony flake, designated 45KT4020, was recovered from [redacted]. The flake measures 1 cm in length. As an isolate, it is recommended not eligible for the NRHP.

McCarl Creek is a waterway that has been straightened into a ditch and contains several remnants of concrete weirs. The waterway is marked on a 1956 map as a ditch. The alignment of McCarl Creek has changed since the mid-twentieth century (Metsker Maps 1956) and now extends roughly southwest to northeast across the solar project site, then turns north to parallel Umptanum Road. Although this resource contributes to the larger history of irrigation in Kittitas County, it has lost integrity of location and design due to the reorientation of this creek. This resource lacks individual significance and is recommended not eligible for the NRHP.

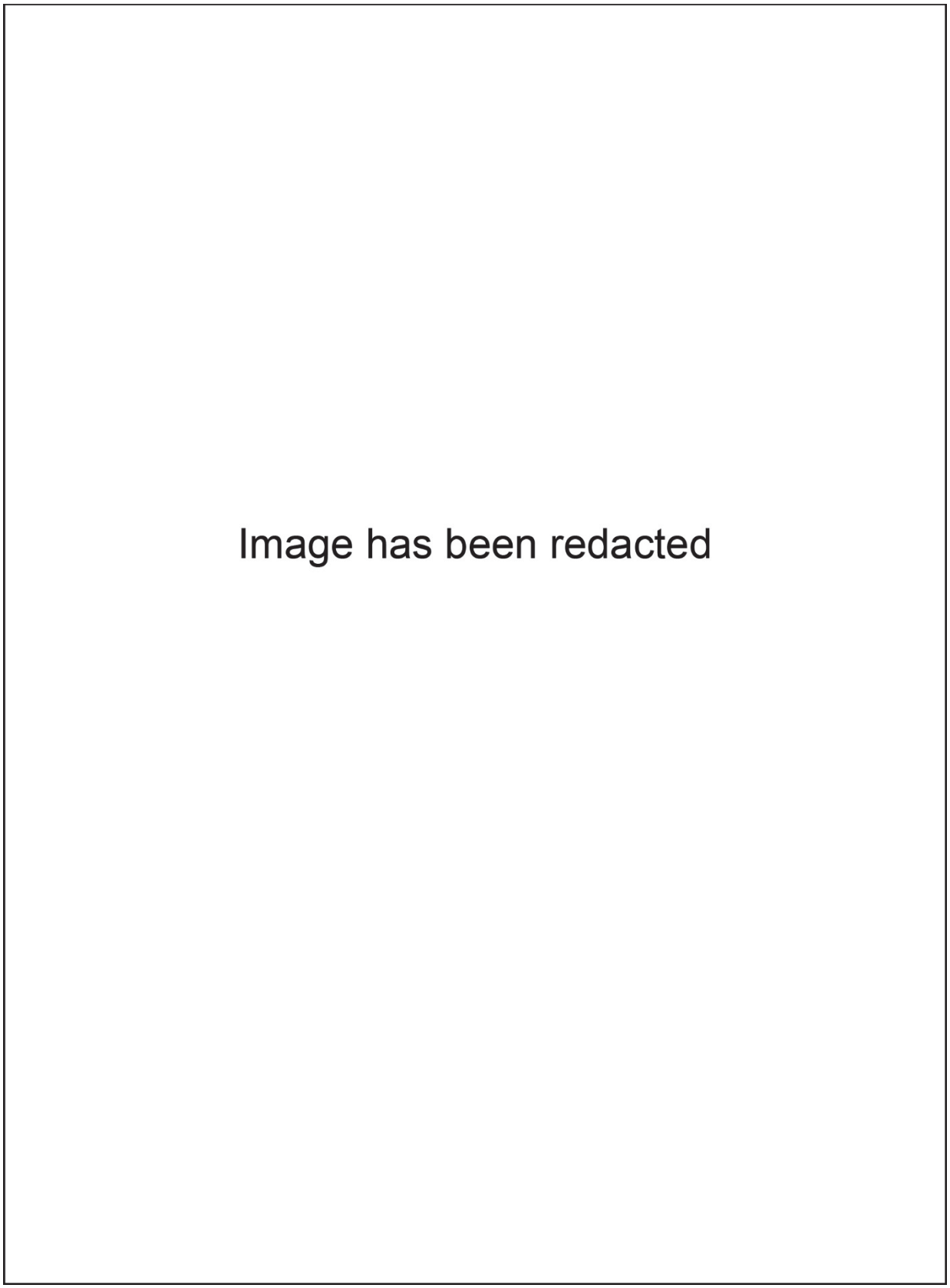


Figure 4.2-16. Urtica Solar Project cultural and built environment resources, east portion.

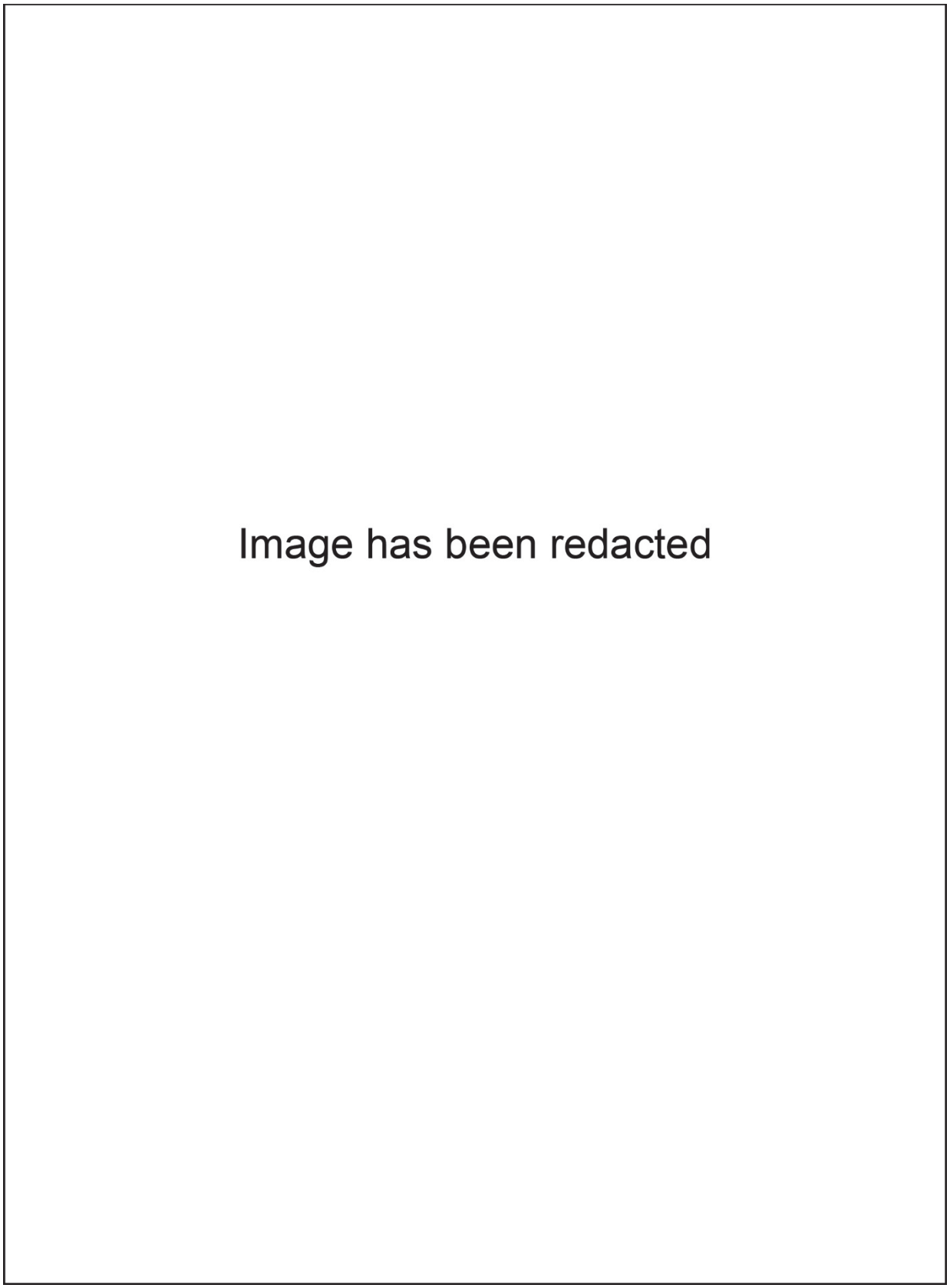


Figure 4.2-17. Urtica Solar Project cultural and built environment resources, west portion.

Walters Field Ditch is on the west edge of the Urtica Solar Project site, within a field owned in the 1950s by Jeff Walters (Metsker Maps 1956). The ditch is a V-shaped precast concrete ditch with steel tie rods across the top and steel field plates covering row turnouts. This ditch is a very common type of field ditch that can be seen in irrigated farmland throughout the region. It does not have individual significance under NRHP Criteria and is therefore recommended not eligible for the NRHP.

Walters Field Pipe Access Box is located at the southern edge of the Urtica Solar Project site. This poured-concrete box measures approximately 4 feet across and is set in the ground to provide access to turnouts for buried irrigation pipes. The field in which this pipe access box stands was owned in the 1950s by Jeff Walters (Metsker Maps 1956), but this feature was likely added at a later date, although the exact date of construction is unknown. Although this resource contributes to a broader history of irrigation in Kittitas County, it lacks individual significance under NRHP Criteria and is therefore recommended not eligible for the NRHP.

4.2.11 Impacts to Historic and Cultural Preservation

4.2.11.1 General County

There have been 56 cultural resource surveys completed within 1 mile (1.6 km) of the proposed solar project sites (see Table 4.2-5). The Camas, Fumaria, Typha, and Urtica Solar Project sites have not been subject to prior cultural resource investigations. One cultural resources survey was previously conducted along the north and east edges of the Penstemon Solar Project site, resulting in no newly recorded cultural resources.

Eight cultural resources have been recorded within 1 mile (1.6 km) of the proposed solar project sites (see Table 4.2-6). None of these resources are eligible or potentially eligible for listing in the NRHP. As a result, the proposed solar project sites would have no anticipated historic and cultural preservation impacts on the surrounding area. No mitigation measures are required.

4.2.11.2 Solar Project Sites

Camas Solar Project Site

Three cultural resources were recorded in the Camas Solar Project site: 45KT4010, an isolated pre-contact flake; the Paul Wipple Barn; and an irrigation lateral. SWCA recommends that none of the resources are eligible for the NRHP. Impacts to the resources would be minimal as all three would be fenced off from the solar facility. Construction impacts include vibration of machinery and lay-down areas (as yet identified). Similarly, operational impacts include vibration of machinery during maintenance and inspection of the solar facility and perimeter fence.

Fumaria Solar Project Site

Eight cultural resources were recorded in the Fumaria Solar Project survey area: 45KT4000, a pre-contact lithic scatter; four pre-contact isolates (45KT3592, 45KT4007, 45KT4008, and 45KT4009); the Cascade Canal; the Crest Field Ditch Turnout; and Lateral NB 7.7. Of these eight resources, only the Cascade Canal is recommended eligible for the NRHP. The canal is one of the earliest canals built in Kittitas County and continues to be used more than 100 years later. It is recommended eligible for the NRHP under Criterion A for its contribution to the history of irrigation in the Pacific Northwest.

The Cascade Canal is located along the proposed generation tie line for the Fumaria Solar project, which would originate from the southwestern site boundary corner and follow Clarke Road, to Faust Road, where it would parallel Faust Road south along existing transmission lines on the east side of the road

ROW. The transmission line would continue to Hungry Junction Road, to U.S. Highway 97, to McManamy Road, eventually connecting into an existing PSE substation. As the generation tie line would be located within an existing transmission right-of-way along the Cascade Canal, the project would result in no direct construction or operational impacts to the NRHP-eligible Cascade Canal.

Penstemon Solar Project Site

Two cultural resources were recorded in the Penstemon Solar Project site: 45KT4012, a historic debris scatter; and 45KT4011, a pre-contact isolate. SWCA recommends that neither of the resources are eligible for the NRHP. Both resources are located [redacted], and would be impacted by the construction of the solar panels, including grubbing, access roads, and use of lay-down areas (as yet identified). Operation impacts include vibration of heavy equipment during maintenance.

Typha Solar Project Site

Eight cultural resources were recorded in the Typha Solar Project survey area: six pre-contact isolates (45KT4013, 45KT4014, 45KT4015, 45KT4016, 45KT4017, and 45KT4018), the Ellensburg Power Canal, and the Ellensburg Golf Club Cart Shed. Of these eight resources, only the Ellensburg Power Canal is recommended eligible for the NRHP. It is recommended eligible for the NRHP under Criterion A for its contribution to the history of irrigation in the Pacific Northwest.

The generation tie line for the Typha Solar Project would originate from the southwestern site boundary and follow existing transmission lines to cross south along an existing access road, crossing the Ellensburg Power Canal three times, and passing through the Ellensburg Golf and Country Club to connect to the existing PSE distribution transmission line along Thorp Highway South. As the generation tie line would be located within an existing transmission right-of-way at the Ellensburg Power Canal intersections, the project would result in no direct construction or operational impacts to the NRHP-eligible Ellensburg Power Canal.

Urtica Solar Project Site

Five cultural resources were recorded in the Urtica Solar Project site: 45KT4019, a pre-contact lithic scatter; 45KT4020, an isolated pre-contact flake; McCarl Creek waterway; the Walters Field Ditch; and Walters Field Pipe Access Box. SWCA recommends that none of these resources are eligible for the NRHP. Impacts to the McCarl Creek waterway and Walters Field Ditch would be minimal as these resources would be fenced off from the solar facility. Construction impacts include vibration of machinery and lay-down areas (as yet identified). Similarly, operational impacts include vibration of machinery during maintenance and inspection of the solar facility and perimeter fence.

(c) Identify what mitigation will be required.

Monitoring and mitigation measures are prescribed to ensure avoidance of significant cultural resources because of unavoidable impacts resulting from a project's construction, operation, or decommissioning. Mitigation measures are designed to minimize the impact on any kind of significant cultural resource, whether an element of the built environment, an ethnographic property, or an archaeological site. Projects whose design cannot be changed to avoid known significant cultural resources would have mitigation activities.

SWCA recommends that an Inadvertent Discovery Plan be prepared for the solar project sites prior to project construction to inform construction personnel what to do in the event that previously unidentified cultural resources are discovered during excavation. In addition, it is understood that DAHP may recommend additional mitigation measures after reviewing the reports on the cultural resource surveys

conducted for the proposed solar projects, which they would do after EFSEC notifies them that this ASC has been received.

Camas Solar Project Site

The Camas Solar Project site plans include fencing off the Paul Wipple Barn and the irrigation lateral from the solar project site, and this would protect the resources from potential construction impacts. The pre-contact isolate (45KI4010) appears to lie [redacted]. No further mitigation measures are required for these non-NRHP-eligible resources.

Fumaria Solar Project Site

The Fumaria Solar Project site plans specifically offer protection to Lateral NB 7.7, which would be located outside of the perimeter fence. The Crest Field Ditch Turnout is in the fenced facility, and project plans state this feature would be maintained. Also located [redacted] is 45KT4000, and project plans do not include solar panels in this location. No further mitigation measures are required for these non-NRHP-eligible resources.

The Cascade Canal is eligible for the NRHP under Criterion A. Project plans include using the existing generation tie line to connect the solar facility with the existing PSE substation on McManamy Road. Use of the existing line would avoid direct impact to the Cascade Canal, and no further mitigation measures are required.

Portions of the proposed transmission line ROW alternatives have not undergone pedestrian inventory, and it is therefore recommended that the remaining accessible portions of the ROW undergo such survey prior to project construction. Further, because no subsurface probing was conducted for the proposed transmission line ROW, it is recommended that a Monitoring and Discovery Plan be prepared for the transmission line, and that all project excavation within or associated with the transmission line ROW be monitored by a professional archaeologist.

Penstemon Solar Project Site

The two cultural resources recorded in the Penstemon Solar Project site—45KT4011 and 45KT4012—are recommended not eligible for the NRHP and no further mitigation measures are required.

Typha Solar Project Site

The Typha Solar Project site plans include the use of the existing generation tie line near the Ellensburg Golf Club Cart Shed, and this feature would be avoided during construction. The six isolates are located [redacted] No further mitigation measures are required for these non-NRHP-eligible resources.

The Ellensburg Power Canal is eligible for the NRHP under Criterion A. Project plans include using the existing generation tie line to connect the solar facility with the existing PSE substation on Thorp Highway South. Use of the existing line would avoid direct impact to the Cascade Canal, and no further mitigation measures are required.

Because no subsurface probing was conducted for the proposed transmission line ROW, it is recommended that a Monitoring and Discovery Plan be prepared for the transmission line, and that all project excavation within or associated with the transmission line ROW be monitored by a professional archaeologist.

Urtica Solar Project Site

The Urtica Solar Project site plans include protection of the McCarl Creek waterway, and the Walters Field Ditch would be located outside of the solar facility. These measures would protect the resources from potential construction impacts. The remaining three resources are located within the solar project site. No further mitigation measures are required for these non-NRHP-eligible resources.

(6) Agricultural crops/animals. The application shall identify all agricultural crops and animals which could be affected by construction and/or operation of the facility and any operations, discharges, or wastes which could impact the adjoining agricultural community.

4.2.12 Affected Environment for Agriculture

The principal farm products in Kittitas County are hay, cereal grain, and livestock. Kittitas County is one of the leading producers of beef cattle and sheep in the State. In addition, timothy hay is an important crop in Kittitas County. Timothy hay is grown commercially on an estimated 25,000 to 35,000 acres and generates approximately $35 million annually to local growers. An estimated 90% of the hay is exported to Japan and other Pacific Rim countries, for use as cattle and racehorse feed. Apple and pear fruit orchards provide another cash crop. Additional agricultural details are provided below (Pless et al. 2015).

4.2.12.1 General County

According to the USDA 2012 Census of Agriculture, Kittitas County had 1,006 farms that accounted for 183,124 acres of agricultural land use. There were 68,314 acres of total croplands, of which 51,234 acres were harvested lands and 66,908 acres were irrigated lands. The market value of crops, including nursery and greenhouse crops, was $47,157,000 and the market value of livestock, poultry, and their products was $21,754,000. Table 4.2-7 provides additional agricultural information for Kittitas County and, for comparison purposes, the State of Washington (USDA 2012).

Average farm size was 182 acres, average land and building values were $804,841, and average of machinery and equipment values were $77,593. The average market value of agricultural products sold by each farm was $68,500 (USDA 2012).

A planned hay storage and compression facility is to be built on a 23.39-acre site. The building to be constructed at the site would be 158,400 square feet. The project would consist of three phases spanning over the next 5 years. Timothy hay would be the primary crop for the export business, with alfalfa as an alternative crop, and would be grown throughout eastern Washington. The compressed hay is intended to be exported overseas in containers, via the Seattle and Tacoma Ports, to the Middle East markets.

Table 4.2-7. Agricultural Characteristics for Kittitas County and Washington (2012)

Characteristic	Kittitas County	Washington
Farms (number)	1,006	37,249
Land in farms (acres):	183,124	14,748,107
• Average size of farm (acres)	182	396
• Median size of farm (acres)	25	24
Estimated market value of land and buildings:		
• Average per farm (dollars)	804,841	910,249
• Average per acre (dollars)	4,421	2,299
Estimated market value of all machinery and equipment ($1,000)	78,059	3,672,289

Characteristic	Kittitas County	Washington
• Average per farm (dollars)	77,593	98,588
Total cropland:		
• farms	615	25,045
• acres	68,314	7,526,742
Harvested cropland:		
• farms	525	20,846
• acres	51,234	4,342,904
Irrigated land:		
• farms	741	14,736
• acres	66,908	1,633,571
Market value of agricultural products sold ($1,000):	68,911	9,120,749
• Average per farm (dollars)	68,500	244,859
• Crops, including nursery and greenhouse crops ($1,000)	47,157	6,492,042
• Livestock, poultry, and their products ($1,000)	21,754	2,628,708

Sources: USDA (2012).

4.2.12.2 Solar Project Sites

Three of the proposed solar project sites are being actively farmed for alfalfa or hay production, and two sites are fallow. None of the sites are used for animal-based agriculture. The agricultural uses of each of the proposed solar facilities are identified below.

Camas Solar Project Site

The Camas Solar Project site is an actively farmed alfalfa field. Agricultural facilities such as a barn/equipment storage building are located on the property. Agriculture on the Camas Solar Project site and surrounding area is supplied with water through a canal that separates the 34.95-acre subject parcel from the 4.17-acre parcel. According to the Natural Resources Conservation Service's (NRCS's) Web Soil Survey's Kittitas County Area, Washington (WA637) map, the Camas site has three classifications of soil types (NRCS 2017). Of the three, Mitta ashy silt loam is considered prime farmland if irrigated (Class 4) and the Nosal ashy silt loam is considered prime farmland if irrigated and drained (Class 6). Therefore, the agricultural land use at the Camas Solar Project site is considered prime farmland. Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. Each soil designated as prime farmland is also assigned a number code designating the current quality of farmland and the management actions required to utilize it for adequate farmland. Generally, only prime farmland Codes 1 through 4 are considered adequate farmland, which are defined as 1) all areas are prime farmland, 2) prime farmland if drained, 3) prime farmland if protected from flooding or not frequently flooded during the growing season, and 4) prime farmland if irrigated.

Fumaria Solar Project Site

The Fumaria Solar Project site is fallow agricultural land (see Section 3.4.1.1 and 3.4.1.2 for additional details), currently used for grazing cattle. According to the NRCS Web Soil Survey's Kittitas County Area, Washington (WA637) map, the Fumaria Solar Project site has two predominant classifications of soil types (NRCS 2017). The Reeser-Reelow-Sketter complex accounts for approximately 98% of the project site, of which 94% is considered farmland of statewide importance. The Metmill loam classification accounts for approximately 2% of the solar project site and is considered prime farmland, if irrigated

(Class 4). Therefore, the agricultural land use at the Fumaria Solar Project site is considered prime farmland and farmland of statewide importance. Farmland of statewide importance is defined as nearly meeting the definition of prime farmland, and land that can economically produce high yields of crops when treated and managed according to acceptable farming methods. Often times, areas categorized as farmland of statewide importance do not meet the criteria for prime or unique farmland but are still considered potentially acceptable farmland as designated by state law. These areas are designated by the Washington State Department of Agriculture.

Penstemon Solar Project Site

The Penstemon Solar Project site is actively farmed alfalfa or hay agricultural land. According to the Natural Resources Conservation Services (NRCS) Web Soil Survey's Kittitas County Area, Washington (WA637) map, the Penstemon Solar Project site has three predominant classifications of soil types (NRCS 2017). The Mitta ashy silt loam is considered prime farmland if irrigated (Class 4). The Nack-Brickmill complex soil type is considered prime farmland if irrigated and drained (Class 6). The Deedale clay loam is considered farmland of statewide importance. Therefore, the agricultural land use at the Penstemon Solar Project site is considered prime farmland and farmland of statewide importance.

Typha Solar Project Site

The Typha Solar Project site is fallow agricultural land that is actively grazed (see Section 3.4.1.1 and 3.4.1.2 for additional details). According to the NRCS Web Soil Survey's Kittitas County Area, Washington (WA637) map, the Typha Solar Project site has four predominant classifications of soil types (NRCS 2017). The Weirman gravelly sandy loam is not considered prime farmland. The Mitta ashy silt loam, drained, is considered prime farmland if irrigated (Class 4). The Weirman-Kayak-Zillah complex and Nossal ashy silt loam soil types are considered prime farmland if irrigated and drained (Class 6). Therefore, a portion of the agricultural land use on the Typha Solar Project site is considered prime farmland.

Urtica Solar Project Site

The Urtica Solar Project site is actively farmed alfalfa agricultural land. According to the NRCS Web Soil Survey's Kittitas County Area, Washington (WA637) map, the Urtica Solar Project site has four classifications of soil types: Ackna loam, Brickmill loam, Brysill loam, and Nanum loam (NRCS 2017). All four soil classifications are considered prime farmland by the NRCS if irrigated (Class 4).

4.2.13 Impacts to Agriculture

None of the five Columbia Solar Projects would affect or be affected by any of the surrounding working farms during normal business operations. None of the projects would negatively impact or cause any changes in any existing, accepted farming practices, nor would they in any fashion cause or force changes in any farming operations or practices. Although some heavy construction equipment and materials would be hauled to the sites, there would be direct access to parking/staging areas on each solar project site and, thus, the equipment and materials should not have impacts on area roads and access. None of the surrounding farming activities would affect the solar projects.

Construction of the Columbia Solar Projects would represent a conversion of the roughly 232 acres of leased properties currently used for agricultural hay production and grazing, to use as solar electricity generation facilities for the approximately 30-year lives of the solar projects. Conversion of those 232 acres to solar facilities would represent only 0.13% of the total 183,124 acres of farmlands in Kittitas County, and 0.34% of the 68,314 acres of total croplands (USDA 2012). Because these conversions are extremely minimal, and unlike residential development, temporary (for the life of the facility), there would

be no significant impacts to agriculture in the county during construction or operation of the five Columbia Solar Projects.

4.3 Transportation 463-60-372

(1) Transportation systems. The application shall identify all permanent transportation facilities impacted by the construction and operation of the energy facilities, the nature of the impacts and the methods to mitigate impacts. Such impact identification, description, and mitigation shall, at least, take into account:

(a) Expected traffic volumes during construction, based on where the work force is expected to reside;

4.3.1 Construction Traffic Volumes

During the peak of construction, a typical day would include the transportation of workers, transportation of materials, and movement of heavy equipment. Vehicular trip generation for employees, delivery trucks, and heavy equipment would vary depending on the phase of construction for each of the five Columbia Solar Projects. As shown in Table 4.3-1, it is estimated that a total of approximately 1,500 trips would be made to each site during a 3-month construction period, with conservatively 25% of those trips (375) made by heavy vehicles. On average, approximately 25 trips would be made to each site each day during construction, again assuming that 25% (6) would be heavy vehicle trips. These heavy vehicle trips could haul materials and equipment from Ellensburg on state highways and county roads (see Section 4.3.2). But, depending upon where they are purchased and shipped from, deliveries could also be made from Seattle, Portland, the Tri-Cities, and other urban areas using the federal interstates and highways.

Table 4.3-1. Estimated Construction Vehicle Traffic Volumes

Type of Vehicle	Average Daily Trips (ADT)	Total Site Trips
Each Site Over About 3 Months		
Heavy Vehicles	6	375
Non-heavy Vehicles	19	1,125
Total	**25**	**1,500**
Maximum for All Five Sites Over 8 Months[1]		
Heavy Vehicles	30	1,875
Non-heavy Vehicles	95	5,625
Total	**125**	**7,500**

1. This assumes that all five solar projects would be constructed simultaneously and at peak, as a worst-case scenario. However, peak ADTs would not reach these levels because construction would be phased between all five sites over 8 months.

As described in Section 4.4.2, construction of the five Columbia Solar Projects would begin in the second quarter of 2018 and would end in the fourth quarter of 2018, occurring over about 8 months from April through November. Construction of the five solar projects would employ up to 100 workers per day during the peak construction period. Approximately 80 of the peak workforce would likely be hired locally, or would be provided by locally-contracted companies or businesses, and the remaining 20 non-local peak workforce might elect to commute to the Ellensburg area on a daily basis. However, if they elect not to commute, they are likely to either stay in a personal RV at a camp site or to rent a motel room in the Ellensburg area or Kittitas County for the duration of the construction period. These workers would commute daily to each project site individually, in pairs, or in small groups.

Table 4.3-2 lists the typical construction equipment commonly associated with the construction of solar facilities. Construction staging and material lay-down areas would be set up for each section of each Columbia Solar Project site, to allow for efficient distribution of components to different parts of each project site. These lay-down areas would be temporarily fenced and would cover approximately 1.5 acres each within the project boundaries.

Table 4.3-2. Construction Equipment

Type of Equipment	Construction Use
Heavy Vehicles	
Boom Truck/Truck Mounted Crane	Moving materials
Bore/Drill Rigs	Drilling holes into the ground
Concrete Mixing Trucks	Delivering concrete used for any slabs and foundations
Dump Trucks	Delivering and spreading aggregates
Excavators	Trenching and foundations
Graders	Access road and driveway leveling
Paving Equipment	Paving, if required
Pile/Vibratory Drivers	Driving structure posts
Rollers	Compacting access roads and driveways
Semi-Tractor Trailers	Moving materials and equipment
Non-heavy Vehicles	
Forklifts	Moving materials, loading and unloading of trucks
Personnel transport vehicles	Transporting workers
Other Material Handling Equipment	Moving materials
Service Trucks	Maintaining heavy equipment
Skid Steer Loaders	Light soil work for slabs and foundations
Sweepers/Scrubbers	Dust control on paved areas
Tractors/Loaders/Backhoes	Clearing and grubbing and moving soil
Trenchers	Light trench work
Water Trucks	Dust control
Other Equipment	
Disposal Containers	Disposing of and removing construction debris
Other General Industrial Equipment	Assembling structures
Plate Compactors/Jumping Jacks	Compacting soil under concrete slabs and foundations
Pressure Washers	Cleaning
Storage Containers	Storing on-site materials
Welders	Assembling structures

(b) Access routes for moving heavy loads, construction materials, or equipment;

4.3.2 Affected Environment for Transportation

4.3.2.1 General County Highways and Roads

The anticipated access routes for construction equipment, materials deliveries, and construction and operation crews to access each of the five Columbia Solar Project sites consist of the existing roads that are adjacent to the sites and the existing roads that would be used to access the nearest interstate and Ellensburg (Figure 4.3-1). The interstates and state highways that would be used to access the sites

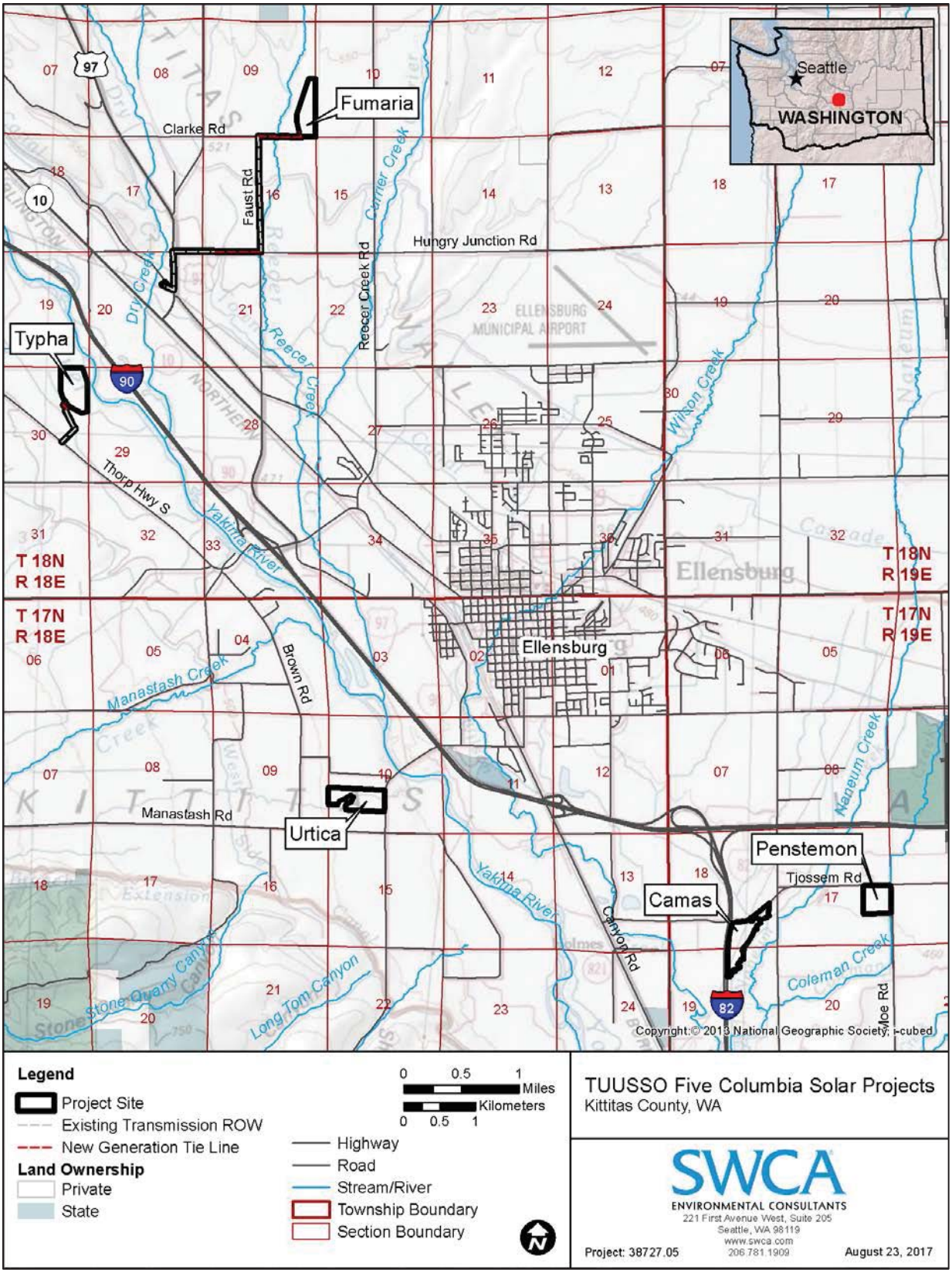


Figure 4.3-1. Columbia Solar Project locations, highways, and roads.

include I-82, I-90, State Route (SR) 821, and U.S. Route 97. I-90 and I-82 are four-lane divided highways with limited-access on- and off-ramps and average daily traffic (ADT) counts of 16,333 vehicles and 18,477 vehicles both ways, respectively. SR 821 and U.S. Route 97 are two-lane highways with 1,500 and 2,800 ADT, respectively. Table 4.3-3 below provides more detailed information on each road that would be used to access the sites, including jurisdiction, lanes, and average daily traffic (if available).

Table 4.3-3. Highway and Access Road Information for the Five Columbia Solar Project Sites

Access Highway/Road	Sites Involved	Number of Through-lanes	Jurisdiction	Average Daily Traffic
Interstate 82	Camas Penstemon	4	FHWA/WSDOT	18,477 (both ways)[1]
State Route 821	Camas Penstemon	2	WSDOT	1,500 (2016 estimate)[1]
Tjossem Road	Camas Penstemon	2	Kittitas County	634 at intersection with Road No. 6 (2017 count)[3]
Road No. 6	Camas Penstemon	2	Kittitas County	865 at intersection with Tjossem Road (2015 count)[3]
Interstate 90	Fumaria Typha Urtica	4	FHWA/WSDOT	16,333 (both ways)[1]
U.S. Route 97	Fumaria (generation tie line only)	2	FHWA/WSDOT	2,800 (2016 estimate)[1]
Clarke Road	Fumaria	2 (no centerline)	Kittitas County	66 near Faust Road (2016 count)[3]
Faust Road	Fumaria	2 (no centerline)	Kittitas County	201 south of Clark Road (2016 count)[3]
Hungry Junction Road	Fumaria	2	Kittitas County	271 at intersection with Faust Road (2016 count)[3]
Reecer Creek Road	Fumaria	2	Kittitas County	2,612 at intersection with West University Road (2016 count)[3]
Thorp Highway South	Typha	2	Kittitas County	579 at intersection with Cove Road (2016 count)[3]
West University Way	Typha	2	City of Ellensburg	3,648 at intersection with Reecer Creek Road (2016 count)[3]
Umptanum Road	Urtica	2	Kittitas County/City of Ellensburg	2,612 at intersection with Manastash Road (2016 count)[3]
Canyon Road	Urtica	4	City of Ellensburg	8,300 at intersection with Umptanum Road (2005 estimate)[2]

Note: Average Daily Traffic 2016 data for interstates is from the closest permanent traffic recorders used (R042 for I-90 and R048 for I-82).

Sources: 1. WSDOT (2016).
2. Kittitas County Public Works Department (2008).
3. Kittitas County Public Works Department (2017).

The major roads that are part of the Kittitas County's County Road System that would be used to access the sites include Tjossem Road, Road No. 6, Clarke Road, Faust Road, Hungry Junction Road, Reecer Creek Road, Thorp Highway South, and Umptanum Road. These are two-lane roads with ADTs ranging from 66 to 3,648 vehicles. The major streets within Ellensburg city limits that would be used to access the sites include West University Way (two lanes with 3,648 ADT), Umptanum Road (two lanes with 2,612 ADT), and Canyon Road (four lanes with 8,300 ADT).

4.3.2.2 Solar Project Site Driveways and Internal Access Roads

The points of access and associated construction methods vary for each project site and are described below in greater detail. Interior all-weather access roads within each site would be designed to provide access to the inverter pads from the site entrance. These all-weather access roads would be 12 feet wide, would consist of compacted soils or gravel to 90%, and a soil binder would then be sprayed or aggregate would be laid down to protect them from wind and water erosion to allow for continuous access. The soil binder would be reapplied annually to ensure the integrity of the access roads.

The remainder of the access roads throughout each solar project site would be unpaved vegetated drive roads, with slopes less than 4%. All access roads have been located to minimize grading, closely following the existing elevations.

4.3.3 Impacts to Transportation

4.3.3.1 Construction Impacts

General County

Table 4.3-4 shows the potential changes in traffic volumes as a result of construction of an individual solar project site. Most of the highways and roads would experience less than a 5% increase in average daily traffic volumes and, thus, transportation systems and volumes would not be impacted for four of the solar project sites (i.e., Camas, Penstemon, Typha, and Urtica).

Table 4.3-4. Potential Construction Vehicle Impacts for Columba Solar Project Sites

Access Highway/Road	Sites Involved	Existing Average Daily Traffic (ADT)	Construction ADT	Percent Change in ADT
Interstate 82	Camas Penstemon	18,477 (both ways)[1]	25	0.14
State Route 821	Camas Penstemon	1,500 (2016 estimate)[1]	25	1.67
Tjossem Road	Camas Penstemon	634 at intersection with Road No. 6 (2017 count)[3]	25	3.94
Road No. 6	Camas Penstemon	865 at intersection with Tjossem Road (2015 count)[3]	25	2.89
Interstate 90	Fumaria Typha Urtica	16,333 (both ways)[1]	25	0.15
U.S. Route 97	Fumaria (generation tie line only)	2,800 (2016 estimate)[1]	25	0.89
Clarke Road	Fumaria	66 near Faust Road (2016 count)[3]	25	37.88
Faust Road	Fumaria	201 south of Clark Road (2016 count)[3]	25	12.44

Access Highway/Road	Sites Involved	Existing Average Daily Traffic (ADT)	Construction ADT	Percent Change in ADT
Hungry Junction Road	Fumaria	271 at intersection with Faust Road (2016 count)[3]	25	9.23
Reecer Creek Road	Fumaria	2,612 at intersection with West University Road (2016 count)[3]	25	0.96
Thorp Highway South	Typha	579 at intersection with Cove Road (2016 count)[3]	25	4.32
W University Way	Typha	3,648 at intersection with Reecer Creek Road (2016 count)[3]	25	0.69
Umptanum Road	Urtica	2,612 at intersection with Manastash Road (2016 count)[3]	25	0.96
Canyon Road	Urtica	8,300 at intersection with Umptanum Road (2005 estimate)[2]	25	0.30

Note: Average Daily Traffic 2016 data for interstates is from the closest permanent traffic recorders used (R042 for I-90 and R048 for I-82).
Sources: 1. WSDOT (2016).
2. Kittitas County Public Works Department (2008).
3. Kittitas County Public Works Department (2017).

The exception would be three county roads accessing the Fumaria Solar Project site, with ADT increases on Clarke Road (37.88%), Faust Road (12.44%), and Hungry Junction Road (9.23%) for the 3-month construction period, representing minor to moderate temporary impacts.

Solar Project Sites

The anticipated routes for construction equipment, materials deliveries, and construction and operation crews to access each of the five Columbia Solar Project sites consist of the existing roads that are adjacent to the sites and the existing roads that would be used to access the nearest interstate and Ellensburg. No new roads would need to be constructed to access the five proposed solar project sites or the generation tie lines associated with the Fumaria and Typha Solar Project sites.

Camas Solar Project Site

The access roads to the Camas Solar Project site are from Tjossem Road, located immediately north of the project site. There would be a single point of access to Camas A from Tjossem Road, and a separate point of access to Camas B from Tjossem Road. The point of access to Camas A would use the existing 20-foot gravel road running to the entry gate, which would be widened slightly from current conditions between Tjossem Road and the existing culvert, and would provide emergency access as well as access for maintenance and operation purposes. The point of access to Camas B would comprise a new, short span of 20-foot gravel road off of Tjossem Road leading to the entry gate for Camas B.

Even though the Camas Solar Project would be adjacent to I-82 and within 1 mile of I-90, the closest access to the interstate system (I-82) is located 2.5 miles to the south via Road No. 6 and SR 821. By travelling north on Road No. 6 from the solar project site and crossing I-90, local roads can be accessed that lead to Ellensburg, approximately 4.5 miles to the northwest of the project area.

Fumaria Solar Project Site

TUUSSO may incorporate one of two paths for accessing the Fumaria Solar Project site. The first potential site access would be provided from the southwest on Clarke Road. This access route would use the existing 12-foot gravel and dirt road (up to the entry gates) to provide emergency access as well as access for maintenance and operation purposes. The second potential site access would be provided from the east on Reecer Creek Road. This access route would utilize a new 12 to 20-foot-wide, approximately 0.5-mile-long gravel road up to entry gates on the east boundary of the project site, to provide emergency access as well as access for maintenance and operation purposes.

The closest access to I-90 is located 5.5 miles south via Clarke Road, Faust Road, Hungry Junction Road, and Reecer Creek Road. This route also provides access to Ellensburg, approximately 6 miles to the southeast of the solar project site. From Hungry Junction Road, the generation tie line would parallel a 0.3-mile segment of U.S. Route 97.

Penstemon Solar Project Site

The access road to the Penstemon Solar Project site is Tjossem Road, located immediately north of the project site. The point of access would be a short paved or gravel driveway leading up to the entry gates from Tjossem Road, to provide emergency access as well as access for maintenance and operation purposes.

Even though the Penstemon Solar Project site is near I-82 and within 1 mile of I-90, the closest access to the interstate system is located 2.5 miles to the south via Road No. 6 and SR 821. By travelling north on Road No. 6 from the solar project site and crossing I-90, local roads can be accessed that lead to Ellensburg, approximately 4.5 miles to the northwest of the project site.

Typha Solar Project Site

The access road to the Typha Solar Project site is Thorp Highway South, located southwest of the project area, via a small private dirt road. This access route would use the existing 12-foot gravel and dirt road (up to the entry gates) to provide emergency access as well as access for maintenance and operations purposes. TUUSSO is in consultation with local fire authorities, and may widen the existing road to 20 feet based on the final requirements agreed to in consultation with such authorities. An existing bridge along this road over the Ellensburg Power Canal would also need to be improved in one of three ways: 1) reinforce, improve, and/or replace existing bridge supports to accommodate the truck traffic to the project site; 2) completely remove and replace the existing bridge with a new bridge; or 3) install a temporary bridge over the existing bridge during the construction period to accommodate the truck traffic.

The Typha Solar Project generation tie line route would generally follow the access roads to the solar facility. Thus, it would cross Thorp Highway South and traverse northeast across a field, before following along the private access road northwest to the site.

The closest access to I-90 is located 2.3 miles to the southeast via Thorp Highway South. Ellensburg is accessed by Thorp Highway South and West University Way, and is approximately 4 miles to the east of the project area.

Urtica Solar Project Site

Access to the Urtica Solar Project site is provided by Umptanum Road that serves as the eastern border of the site. TUUSSO would use the existing 12-foot gravel/dirt road to access much of the Urtica Solar Project site. The point of access would be a short paved or gravel driveway leading up to the entry gates

from Umptanum Road, to provide emergency access as well as access for maintenance and operation purposes.

Though I-90 is located 0.6 mile northeast of the Urtica Solar Project site, Umptanum Road does not provide access to the interstate. Canyon Road provides the closest access to I-90, approximately 1.8 miles east of the solar project site via Umptanum Road. This route also provides access to Ellensburg.

(c) Expected traffic volumes during normal operation of the facility;

4.3.3.2 Operation Impacts

None of the operational workforce is anticipated to permanently in-migrate or relocate into the Ellensburg area. The operational workforce for the five Columbia Solar Project sites would be relatively small and would typically be off-site. In addition, it is anticipated that four to five O&M personnel would make about two to three visits per year to each of the solar project sites to conduct the on-site O&M functions. These staff would likely use water trucks, utility vehicles, and pickup trucks to conduct maintenance activities. Because there would be minimal operational staff levels and vehicle trips, no positive or negative impacts are anticipated to transportation infrastructure or use levels in Kittitas County, in the Ellensburg area, or on roads accessing the individual solar project sites.

(d) For transmission facilities, anticipated maintenance access; and

The proposed generation tie line associated with the Fumaria Solar Project site would parallel and/or cross Clarke Road, Faust Road, Hungry Junction Road, U.S. Route 97, and McManamy Road between the proposed solar facility and the existing substation.

The Typha Solar Project generation tie line route would generally follow the access roads to the solar facility. Thus, it would cross Thorp Highway South and traverse northeast across a field, before following along the private access road northwest to the site.

(e) Consistency with local comprehensive transportation plans.

The last Kittitas County Long Range Transportation Plan was prepared in 2008 (Kittitas County Public Works Department 2008). That plan identified the primary factors affecting the county transportation system as being increased recreational traffic from the major urban areas and freight movement of container trucks taking timothy hay to the Seattle and Tacoma international ports. As a result, the three primary investments in the transportation system were anticipated to be maintaining the existing system, promoting safe and efficient travel, and adding the capacity needed for planned growth (Kittitas County Public Works Department 2008).

4.3.3.3 Bridges

At that time, the county identified the following bridges as requiring replacement (Kittitas County Public Works Department 2008):

- Clark Road, over Dry Creek (over 20 feet wide with a sufficiency rating of 66.50 in 2006)
- Hungry Junction Road, over Cascade Canal (under 20 feet wide with a sufficiency rating of 51.26 in 2005)
- No. 6 Road, over Town Ditch (under 20 feet wide with a sufficiency rating of 49.47 in 2006)
- Reecer Creek Road, over Highline Canal (over 20 feet wide with a sufficiency rating of 61.13 in 2006)

- Thorpe Highway South, over Westside Ditch (under 20 feet wide with a sufficiency rating of 49.31 in 2005)
- Tjossem Road, over Town Ditch (over 20 feet wide with a sufficiency rating of 79.90 in 2006)

That plan did not identify any of these roads as having inadequate load ratings and, therefore, not being able to handle normal truck traffic and permitted overweight loads.

4.3.3.4 Traffic Accidents and Safety

In Kittitas County, there were seven fatal collisions in 2006, 10 fatal collisions in 2005, and 12 fatal collisions in 2004. However, none of these fatalities occurred on county roadways. But many injury related accidents did occur on county roads. Project-related roads that were considered high-accident locations included (Kittitas County Public Works Department 2008):

- Reecer Creek Road – University Way – Old Highway Ten: 5 accidents with 1 involving an injury.
- Thorp Highway South from I-90 to Robinson Canyon Road: 6 accidents with 1 involving an injury.
- Umptanum Road: 10 accidents with 2 involving an injury.

4.3.3.5 Overall Kittitas County Transportation Assessment and Summary

Overall, the existing transportation network in Kittitas County was considered to be in good operating condition. Average daily traffic volumes on roadways ranged from less than 10 vehicles to 8,200 vehicles, very low traffic volumes compared to daily traffic volumes on typical arterial roads statewide (Kittitas County Public Works Department 2008).

Because none of the potential project access highways or roads had inadequate load ratings and, therefore, were not determined to be unable to handle normal truck traffic and permitted overweight loads; accident rates were low; and traffic volumes were low, the five Columbia Solar Projects would have no or minimal impacts on the planned transportation system outlined in the Kittitas County Long Range Transportation Plan during construction or operation.

(2) Vehicular traffic. The application shall describe existing roads, estimate volume, types, and routes of vehicular traffic which will arise from construction and operation of the facility. The applicant shall indicate the applicable standards to be utilized in improving existing roads and in constructing new permanent or temporary roads or access, and shall indicate the final disposition of new roads or access and identify who will maintain them.

The existing highway, road, and street systems that would provide access to the five Columbia Solar Project sites are described above in Section 4.3.3.1.

(3) Waterborne, rail, and air traffic. The application shall describe existing railroads and other transportation facilities and indicate what additional access, if any, will be needed during planned construction and operation. The applicant shall indicate the applicable standards to be utilized in improving existing transportation facilities and in constructing new permanent or temporary access facilities, and shall indicate the final disposition of new access facilities and identify who will maintain them.

4.3.4 Affected Environment for Waterborne, Rail, and Air Traffic

4.3.4.1 Waterways

Although Kittitas County is bordered on the east by the Columbia River, no waterway barging or shipping occurs in Kittitas County.

4.3.4.2 Railways

The Burlington Northern Santa Fe Railroad (BNSF) crosses Kittitas County and has an office at 608 W 3rd Avenue in Ellensburg; however, the railroad does not stop to load or unload freight in the city. The rail line begins in the southern part of Kittitas County north of Selah, crosses north and northwest through Pomona, then parallels SR 821 north and northwest on the same side or opposite side of the canyon, until it passes through Ellensburg, and then crosses northwest along U.S. Route 97, diverting from U.S. Route 97 and passing through Thorp, parallels the Yakima River on its eastern side, travels along SR 10 through Teanaway and Cle Elum, where it crosses under and then follows along the west/south side of I-90 through Easton, until nears Snoqualmie Pass.

4.3.4.3 Airports

Bowers Field Airport is located at the Bowers Field Airport's Aeronautical and Industrial Areas, in northeastern Ellensburg, and is managed by Kittitas County. The site is located on about 1,300 acres, is used by about 55,000 aircraft annually, and has the following features (Pless et al. 2015):

- Runway 07/25, 5,590 × 150 feet, asphalt
- Runway 11/29, 4,300 × 150 feet, asphalt
- 58,890-square-foot parking apron area
- 12 small publicly owned aircraft hangars
- 12 small privately owned aircraft hangars
- one large publicly owned aircraft hangar
- Bowers Field Hanger Building No. 404, built in 1997, 20,000 square feet
- Bowers Field T-Hanger, built in 1960, 12,500 square feet

Mid-State Aviation conducts day-to-day operations of the Aeronautical Area. Central Washington University (CWU) leases space at the airport for their contractor to provide flight training to CWU students. Improvements were made to the airport apron and tie-down areas in 2013. The airport has designed an extension of Runway 11/29, which is expected to begin construction in 2020 (Pless et al. 2015).

Cle Elum Municipal Airport is managed by the city of Cle Elum. It is located on 135 acres, is used by about 1,000 aircraft annually, and has the following features (Pless et al. 2015):

- Runway 07/25, 2,552 × 40 feet, asphalt
- 50,000-square-foot parking apron area

The Easton State Airfield is managed by WSDOT. It is located on 15 acres, was built in 1930s, is used by about 30 aircraft per month, and has one turf runway (09/27) measuring 2,640 × 100 feet (Pless et al. 2015).

There is also a privately owned airstrip, DeVere Field, that is owned by Jim DeVere. It is located on 50 acres, six single-engine aircraft are based there, and it has one asphalt runway (08/26) measuring 2,055 × 30 feet (Pless et al. 2015).

4.3.5 Impacts to Waterborne, Rail, and Air Traffic

The solar panels for the Columbia Solar Project sites would likely be shipped from China via normal shipping routes (likely waterborne); however, delivery of the panels would not affect any existing shipping routes. No other equipment or materials would be shipped to the five Columbia Solar Project sites via waterborne, rail, or air routes. Based on these reasons, there would be no impacts to those modes of travel as a result of construction or operation of the solar projects.

(4) Parking. The application shall identify existing and any additional parking areas or facilities which will be needed during construction and operation of the energy facility, and plans for maintenance and runoff control from the parking areas or facilities.

4.3.6 Affected Environment for Parking

Because the Columbia Solar Project sites are rural agricultural land, no formal parking spaces occur on the sites. However, informal parking is available within the fields, on access roads into the fields, and along roads that would be used for access.

4.3.7 Impacts to Parking

Construction staging and material lay-down areas would be set up for each Columbia Solar Project site, to allow for efficient distribution of components to different parts of each project site. These lay-down areas would be temporarily fenced and would cover approximately 1.5 acres each within the project boundaries. In addition, personal and utility vehicles would be parked on each solar project site, and thus not require parking along roads or in parking lots. Thus, because all vehicles would be parked on the leased project and construction sites, there would be no impacts to parking from construction or operation of the solar projects.

(5) Movement/circulation of people or goods. The application shall describe any change to the current movement or circulation of people or goods caused by construction or operation of the facility. The application shall indicate consideration of multipurpose utilization of rights of way and describe the measures to be employed to utilize, restore, or rehabilitate disturbed areas. The application shall describe the means proposed to ensure safe utilization of those areas under applicant's control where public access will be granted during project construction, operation, abandonment, termination, or when operations cease.

As indicated previously, access to the Camas, Penstemon, Typha, and Urtica Solar Project sites during construction would result in less than a 5% increase in average daily traffic volumes on area interstates, highways, and county roads accessing those sites. Thus, transportation volumes and movement/circulation of people and goods would not be impacted for those four solar project sites.

The exception would be three county roads accessing the Fumaria Solar Project site, with ADT increases on Clarke Road (37.88%), Faust Road (12.44%), and Hungry Junction Road (9.23%) for the 3-month construction period, representing potential minor to moderate temporary impacts to the movement/circulation of people and goods on those roads during the 3-month construction period.

(6) Traffic hazards. The application shall identify all hazards to traffic caused by construction or operation of the facility. Except where security restrictions are imposed by the federal government the applicant shall indicate the manner in which fuels and waste products are to be transported to and from the facility, including a designation of the specific routes to be utilized.

The routes to be used to transport construction equipment, materials, supplies, and fuels to and from the sites, as well as waste products from the sites are identified above in Section 4.3.2. Similarly, the types of vehicles that would traveling to and from the sites are identified in Section 4.3.1. In some cases, heavily-laden vehicles might move slower than other vehicles currently using the highway and road systems. But the number of slow moving trucks and the duration would be minimal, and in some cases might be similar to agriculture equipment movement occurring in the area, and thus should have minimal impacts on traffic hazards.

4.4 Socioeconomics 463-60-535

The application shall include a detailed socioeconomic impact analysis which identifies primary, secondary, positive as well as negative impacts on the socioeconomic environment in the area potentially affected by the project, with particular attention to the impact of the proposed facility on population, work force, property values, housing, health facilities and services, education facilities, governmental services, and local economy. The study area shall include the area that may be affected by employment within a one-hour commute distance of the project site. The analysis shall use the most recent data as published by the U.S. Census or state of Washington sources.

The five proposed Columbia Solar Project sites are located within unincorporated Kittitas County and are 1 to 6 miles away from Ellensburg. Demographic data for Kittitas County, the city of Ellensburg, and other smaller communities were analyzed to determine potential socioeconomic impacts (Figure 4.4.-1). The demographic data used in this analysis were from the U.S. Census Bureau's 2000 Census, 2010 Census (the most current 10-year period for the county and city), and the U.S. Census Bureau's 2011–2015 American Community Survey (ACS) 5-year Estimates.

(1) The analysis shall include:

(a) Population and growth rate data for the most current ten-year period for the county or counties and incorporated cities in the study area;

Table 4.4-1 summarizes population information for Kittitas County; the cities of Ellensburg, Kittitas, and Cle Elum; and the State of Washington for the years 2000, 2010, and 2015. Kittitas County had a population of 42,204 in 2015 and Ellensburg had a population of 18,637, comprising about 44% of the total county population. Both the county and Ellensburg have experienced very low annual population growth (0.5 to 0.6% annually) from 2010 to 2015, less than half the growth rate for the State of Washington (1.3%). The population level in Cle Elum was unchanged during this period, while Kittitas experienced a slight decline.

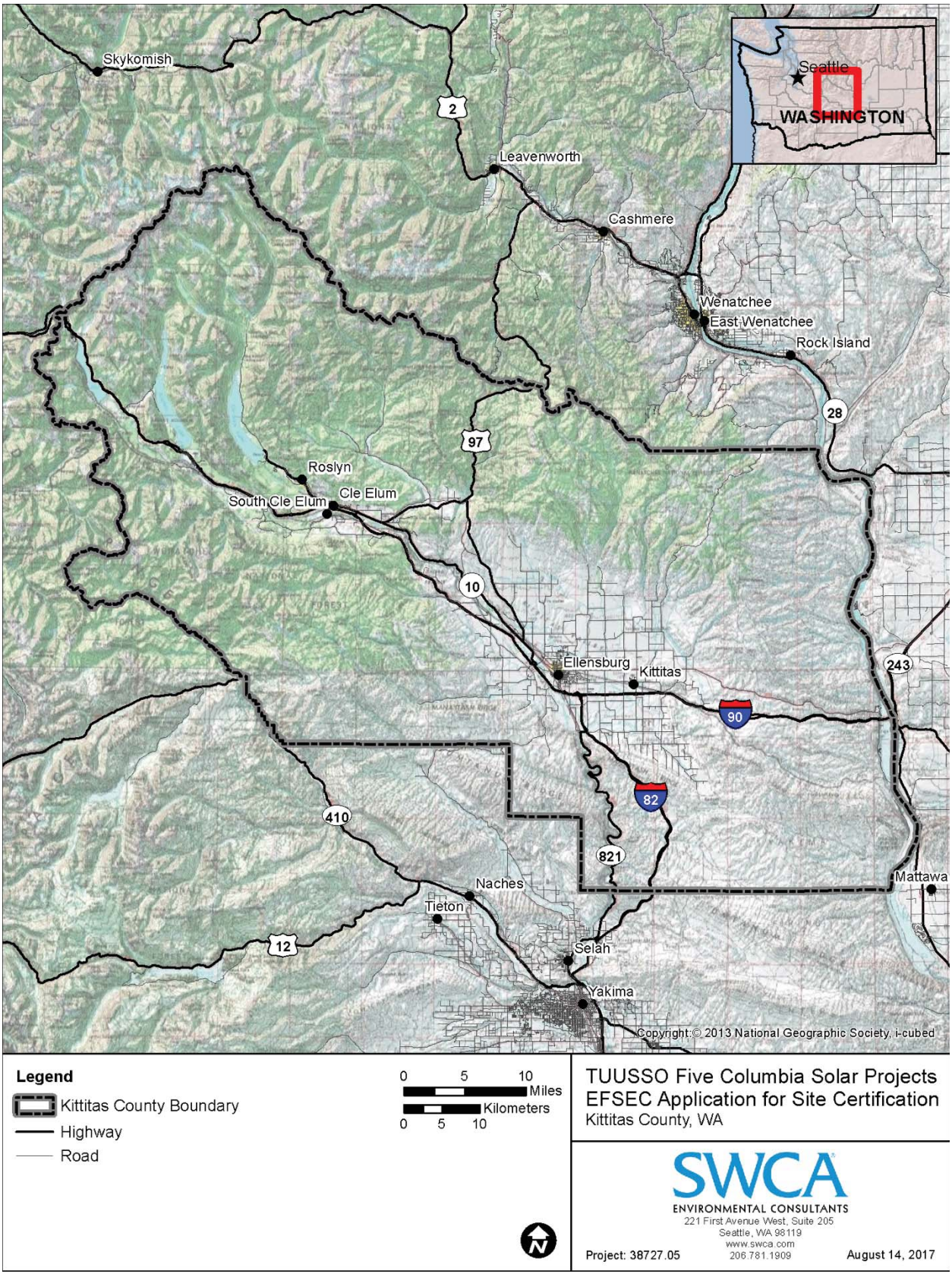


Figure 4.4-1. Kittitas County and cities overview map.

Table 4.4-1. Population and Growth Rate Data for Kittitas County, the Cities, and Washington (2000, 2010, and 2015)

Jurisdiction	2000 Census Population[1]	2010 Census Population[2]	2015 Estimated Population[3]	Population Change (2010–2015)	Percent Change per Year (2010–2015)
Kittitas County	33,362	40,915	42,204	1,289	0.6
City of Ellensburg	15,414	18,174	18,637	463	0.5
City of Kittitas	1,105	1,433	1,387	-46	-0.3
City of Cle Elum	1,755	2,545	2,544	-1	0.0
Washington	5,894,121	6,724,540	7,170,351	445,811	1.3

Sources: 1. U.S. Census Bureau (2000).
2. U.S. Census Bureau (2010).
3. U.S. Census Bureau (2015).

(b) Published forecast population figures for the study area for both the construction and operations periods;

The Washington State Office of Financial Management (WFO) provides high, medium, and low population forecasts for each county and incorporated city in the state. In 2005, the WFO's high population projection estimated that the Kittitas County population would be 52,810 people by the year 2025, an increase of 10,606 people and major growth at 2.5% annually from 2015 (the Kittitas County Conference of Governments adopted this high population projection for its planning purposes). When compared to the current estimated annual population growth rate of 0.6 percent between 2010 and 2015, the annual population growth rate would need to increase by more than four times the current estimated growth rate between 2015 and 2025 in order to meet the WFO's high population forecast for 2025.

The WFO high population growth projection estimated that the city of Ellensburg would have a total of 23,765 people by the year 2025, an increase of 5,128 people and major growth at 2.75% annually from 2015 (the city approved this projection for planning purposes in the Ellensburg Comprehensive Plan – 2006 Update, amended through 2014). This projection assumed that the city of Ellensburg would continue to comprise 45% of the Kittitas County total population. Similar to the WFO's high population growth forecast for Kittitas County, the city of Ellensburg has not recently experienced the high population growth that the WFO projected between 2010 and 2015. Instead, the Census Bureau's estimated annual population growth rate for this period was 0.5% (see Table 4.4-1).

(c) Numbers and percentages describing the race/ethnic composition of the cities and counties in the study area;

Table 4.4-2 identifies the percent non-white population levels in Kittitas County; the cities of Ellensburg, Kittitas, and Cle Elum; and for comparative purposes the State of Washington. The non-white population is calculated by subtracting the ACS percent of "Not Hispanic or Latino: White alone" from 100%. As shown in Table 4.4-2, non-white populations comprise 15.4% of Kittitas County and 20.6% of Ellensburg. Kittitas and Cle Elum have much lower non-white population levels, around 5%. The percent non-white populations in Kittitas County and Ellensburg are noticeably lower than the 29.3% non-white population in the State of Washington.

Table 4.4-2. Percent Minority Population in Kittitas County, the Cities, and Washington (2015)

Jurisdiction	Percent White Population[1]	Percent Non-white Population[2]
Kittitas County	84.6	15.4
City of Ellensburg	79.4	20.6
City of Kittitas	95.0	5.0
City of Cle Elum	94.2	4.8
Washington	70.7	29.3

Source: U.S. Census Bureau (2015).
1. U.S. Census Bureau category: Not Hispanic or Latino: White alone.
2. Total percent of non-white population, including Hispanic or Latino and race/ethnicity.

Hispanic or Latino populations, which can also include other races/ethnicities, make up the largest racial/ethnic population in Kittitas County and Ellensburg (8.5% and 10.5%, respectively), similar to the 12.0% for the State of Washington. The largest single racial group was the Asian population (2.2% and 3.5%, respectively), less than half the 7.6% composition for the State of Washington. The aggregate population of the racial/ethnic categories in Kittitas County and the city of Ellensburg are identified in Table 4.4-3.

Table 4.4-3. Population by Race/Ethnicity, Including Hispanic or Latino in Kittitas County, Ellensburg, and Washington (2015)

Race/Ethnicity	Race Population and Percent		
	Kittitas County	City of Ellensburg	Washington
Total Population	42,204	18,637	6,985,464
Not Hispanic or Latino:	38,629 (91.5%)	16,672 (89.5%)	6,149,976 (88.0%)
• White alone	35,720 (84.6%)	14,791 (79.4%)	4,943,228 (70.8%)
• Black or African American alone	398 (0.9%)	354 (1.9%)	243,786 (3.5%)
• American Indian and Alaska Native alone	334 (0.8%)	119 (0.6%)	80,838 (1.2%)
• Asian alone	948 (2.3%)	652 (3.5%)	530,928 (7.6%)
• Native Hawaiian and Other Pacific Islander alone	23 (0.05%)	23 (0.12%)	42,532 (0.6%)
• Some other race alone:	28 (0.07%)	0 (0.0%)	9,467 (0.14%)
• Two or more races	1,178 (2.8%)	733 (3.9%)	299,197 (4.3%)
Hispanic or Latino	3,575 (8.5%)	1,965 (10.5%)	835,488 (12.0%)

Source: U.S. Census Bureau (2015).

(d) Average per capita and household incomes, including the number and percentage of the population below the poverty level for the cities and counties within the study area;

Table 4.4-4 identifies the median household incomes, per capita household incomes, and the percentage of the population living below the poverty level for Kittitas County; the cities of Ellensburg, Kittitas, and Cle Elum; and for comparative purposes the State of Washington. While the median household income is similar for Kittitas County ($46,458) and Cle Elum ($45,324), Ellensburg and Kittitas have noticeably lower income levels ($29,952 and $39,803, respectively). However, all of these jurisdictions have significantly lower median incomes than the State of Washington overall ($61,062), including 24% lower for Kittitas County and 49% lower for Ellensburg. Those same patterns exist for per capita income levels,

with Kittitas County being 24% lower and Ellensburg being 53% lower than Washington per capita income.

The percentage of the population living below the poverty level is highest in Ellensburg (38.5%), followed by Kittitas County (22.2%), Cle Elum (21.8%), and Kittitas (17.4%). The percentage of population living below the poverty level in Kittitas County is approximately 1.7 times higher than in the state, and in Ellensburg is approximately 2.9 times higher than the state percent.

Table 4.4-4. Median Annual Household and Per Capita Incomes, and Percent of the Population Below the Poverty Level (2015)

Jurisdiction	Median Household Income	Per Capita Income	Population Below the Poverty Level	
			Number	Percent
Kittitas County	$46,458	$24,014	9,369	22.2
City of Ellensburg	$29,952	$18,004	7,176	38.5
City of Kittitas	$39,803	$19,526	241	17.4
City of Cle Elum	$45,324	$25,450	555	21.8
Washington	$61,062	$31,762	953,657	13.3

Source: U.S. Census Bureau (2015).

(e) A description of whether or not any minority or low-income populations would be displaced by this project or disproportionately impacted;

No residential or commercial facilities exist on any of the leased parcels for the five Columbia Solar Projects, and thus no non-white or low-income populations, or anyone else, would be displaced as a result of constructing or operating/maintaining the proposed solar facilities.

As described in Section 4.4.2.2, construction of the five Columbia Solar Projects would employ up to 100 workers per day during the peak construction period. It is estimated that approximately 80 of the workers would be hired locally, and could include individual hires as well as employees of existing construction-related firms and businesses that might be retained for various phases of construction. It is assumed these local workers would be hired from within Kittitas County, or a maximum commuting distance of 75 miles from Ellensburg such from as Yakima (36 miles away), Wenatchee (70 miles), or Moses Lake (71 miles).

The remaining 20 non-local hires might elect to commute to the Ellensburg area on a daily basis, or to stay in either a personal RV at a camp site, or to rent a motel room. Thus, it is not anticipated that construction of the solar projects would result in the permanent relocation or in-migration of any of the construction workforce. Thus, although the construction of the solar facilities might provide some temporary employment opportunities to low-income or minority residents, the levels would be minimal and there would be minimal beneficial impacts to employment.

As described in Section 4.4.2.3, it is anticipated that the workforce performing ongoing operations would be relatively small and would typically be off-site, and that an additional four to five maintenance personnel would make about two to three visits per year to each of the five Columbia Solar Project sites to conduct the on-site maintenance functions. This latter workforce would be comprised of general laborers for cleaning the PV panels and general landscaping; skilled electricians for visual inspections and performance testing of the inverters, transformers, and switchyard equipment; and skilled mechanics to inspect and maintain the mechanical portions of the tracking system. It is not anticipated that operation of the solar projects would result in the permanent relocation or in-migration of any operational workforce. Thus, although operation of the solar facilities might provide some long-term employment opportunities to

low-income or minority residents, the levels would be minimal and, thus, there would be no beneficial impacts to employment.

(f) The average annual work force size, total number of employed workers, and the number and percentage of unemployed workers including the year that data are most recently available. Employment numbers and percentage of the total work force should be provided for the primary employment sectors;

4.4.1 Overall Economy

Kittitas County's overall economy and employment is largely influenced by the government (including higher education), healthcare, agriculture/food processing, and tourism sectors (Pless et al. 2015). Additional information about agriculture can be found in Section 4.2.12, and about tourism/recreation in Section 4.2.6.

Wind farms have been a growing industry in Kittitas County, with four facilities generating 101 to 273 MW each. PSE operates the Wild Horse Wind and Solar Facility. Wild Horse Wind has 149 turbines that can generate up to 273 MW of electricity. Invenergy operates the Vantage Wind Power Project, which has 60 turbines that can generate up to 103.5 MW of electricity. The Kittitas Valley Wind Farm, owned by EDP (formerly Horizon Wind Energy), has 48 turbines that generate up to 100.8 MW. And finally, the Desert Claim Wind Farm, owned by EDF (formerly known as enXco), has been permitted through EFSEC for up to 95 turbines that can generate up to 190 MW, but has yet to be constructed (Pless et al. 2015).

4.4.2 Workforce, Employment, and Unemployment

4.4.2.1 Affected Environment

Table 4.4-5 identifies the annual workforce size (population 16 years old and over), the percent of the labor force that was employed, and the percent of the labor force that was unemployed in 2015. Kittitas County had a workforce of 35,450 people aged 16 years and older employed and Ellensburg had 16,243 employed. While the percentage employed was within the range of 54.7% to 59.4% for Kittitas County, most cities, and Washington State, Cle Elum had a much higher percentage of employed residents with 70.9%.

Unemployment rates were similar for Kittitas County (7.8% and 1,669 people) and Ellensburg (8.0% and 772 people), which were also similar to the 7.9% for the state. However, the city of Kittitas (5.3% and 57 people) and Cle Elum (4.8% and 100 people) had noticeably lower unemployment rates.

Table 4.4-6 identifies the employment type by industry for Kittitas County, the city of Ellensburg, and for comparative purposes the State of Washington in 2015. Primary employment industries in Kittitas County included educational services, healthcare, and social assistance (27.9%); arts, entertainment, recreation, and accommodation and food services (14.2%); and retail trade (13.5%). The primary employment industries in Ellensburg were the same with 33.4%, 16.7%, and 14.9%, respectively.

Table 4.4-5. Workforce, Employment, and Unemployment in Kittitas County, the Cities, and Washington (2015)

Jurisdiction	Workforce Population 16 Years Old and Over	Employed		Unemployed	
		Number	Percent	Number	Percent
Kittitas County	35,450	19,811	55.9	1,669	7.8
City of Ellensburg	16,243	8,888	54.7	772	8.0
City of Kittitas	1,076	582	59.4	57	5.3
City of Cle Elum	2,029	1,339	70.9	100	4.8
Washington	5,568,640	3,259,877	58.5	277,806	7.9

Source: U.S. Census Bureau (2015).

Table 4.4-6. Employment by Industry in Kittitas County, Ellensburg, and Washington (2015)

Industry	Kittitas County	City of Ellensburg	Washington
Total employed population 16 years and over	19,811	8,888	3,259,877
Agriculture, forestry, fishing and hunting, and mining	1,014 (5.1%)	156 (1.8%)	86,192 (2.6%)
Construction	1,345 (6.8%)	271 (3.0%)	198,176 (6.1%)
Manufacturing	988 (5.0%)	384 (4.3%)	340,891 (10.5%)
Wholesale trade	493 (2.5%)	116 (1.3%)	95,060 (2.9%)
Retail trade	2,683 (13.5%)	1,320 (14.9%)	385,279 (11.8%)
Transportation and warehousing, and utilities	1,030 (5.2%)	403 (4.5%)	169,356 (5.2%)
Information	248 (1.3%)	77 (0.9%)	74,949 (2.3%)
Finance and insurance, and real estate and rental and leasing	560 (2.8%)	185 (2.1%)	176,782 (5.4%)
Professional, scientific, and management, and administrative and waste management services	1,012 (5.1%)	518 (5.8%)	399,860 (12.3%)
Educational services, and healthcare and social assistance	5,529 (27.9%)	2,966 (33.4%)	700,729 (21.5%)
Arts, entertainment, and recreation, and accommodation and food services	2,807 (14.2%)	1,486 (16.7%)	301,829 (9.6%)
Other services, except public administration	968 (4.9%)	494 (5.6%)	156,614 (4.8%)
Public administration	1,134 (5.7%)	512 (5.8%)	174,160 (5.3%)

Source: U.S. Census Bureau (2015).

In general, industries employed at approximately the same rates in the county and city as they did in the state. A few notable differences between the employment by industry percentage rates were: 1) the county had higher employment in the “agriculture, forestry, fishing, hunting, and mining” industry than the city and the state, 2) the state had a higher employment rate in the “manufacturing” and “professional, scientific, and management, and administrative and waste management services” industries than the county and city, and 3) the city had a higher employment rate for the “educational services, and health care and social assistance” industry than the county and the state. Regarding employment from education, the city of Ellensburg is home to Central Washington University, which is one of the primary employers (33.4%) in the city and it had a larger comparative percent.

The top 10 employers in Kittitas County employed over 3,900 people in 2014, or about 18.5% of the total workforce. The greatest single employer in Kittitas County was Central Washington University, with about 1,450 employees (Table 4.4-7) (Pless et al. 2015).

Table 4.4-7. Top 10 Employers in Kittitas County (2014)

Employer	Employees	Rank	Percent of Total County Employment
Central Washington University	1,450	1	6.83
Kittitas Valley Community Hospital	500	2	2.35
Ellensburg School District	390	3	1.84
Anderson Hay Grain/Agriculture	315	4	1.48
Kittitas County	305	5	1.44
Fred Meyer	225	6	1.06
Elmview	200	7	0.94
Auvil Fruit Company	188	8	0.89
City of Ellensburg	179	9	0.84
Suncadia	170	10	0.80
Totals	**3,922**	**–**	**18.47**
Total County Working Population (2014)	21,240		
Total County Working Population (2005)	19,170		

Source: Pless et al. (2015).

(g) An estimate by month of the average size of the project construction, operational work force by trade, and work force peak periods;

4.4.2.2 Impacts to Employment

Construction Impacts

Construction Schedule and Phases

Table 4.4-8 provides the proposed schedule for construction and operation of the five Columbia Solar Projects. While the schedule might be modified due to the date of EFSEC's approval as well as other approvals/permits, this table illustrates the approximate duration of major project activities.

Construction of all five solar projects is anticipated to commence in the second quarter of 2018 and would require approximately 6 to 9 months to complete, but most likely occurring over about 8 months from April through November. Each solar project would require about 3 months to construct. When possible, specialized work crews would move from site to site to efficiently manage the construction phases on each project. Construction activities would occur between 7:00 a.m. and 10:00 p.m., Monday through Saturday.

Table 4.4-8. Columbia Solar Projects Construction Schedule

Project Activity	Schedule
Approval of all other required non-discretionary permits	1st quarter 2018
Approval of all administrative permits	1st quarter 2018
Approved Site Certification Agreements	March 2018
Construction begins	2nd quarter 2018
Completion of construction	4th quarter 2018
Projects operational	4th quarter 2018

Project construction would include several phases occurring simultaneously across the five Columbia Solar Project sites, including:

1. the grading and construction of a temporary gravel construction entrance/exit at the entry gates of each site;
2. the installation of silt fencing;
3. the pile driving of piers or posts and the placement of trackers on support piers;
4. the trenching and installation of the DC and AC collection system, including the installation of the inverter enclosures;
5. the installation of the PV panels;
6. the construction of electrical interconnection facilities, including the construction of the interconnection and generation tie lines;
7. the mowing, application of herbicide treatment, discing/tilling and planting of native plant species on the sites, as well as the planting of landscaping species (e.g., trees and bushes along certain boundaries of the sites); and
8. the grading, compaction, and placement of gravel (as necessary) for all-weather access roads.

Construction Workforce

As shown in Table 4.4-9, construction of the five Columbia Solar Projects would employ up to 100 workers per day during the peak construction period. Roughly 80% of the workforce would be non-craft laborers and 20% would be mixed craft laborers.

Based upon prior experience, approximately 80% of the workforce would be hired locally, and could include individual hires as well as employees of existing construction-related firms and businesses that might be retained for various phases of construction. It is assumed these local workers would be hired from within Kittitas County, or a maximum commuting distance of 75 miles from Ellensburg such from as Yakima (36 miles away), Wenatchee (70 miles), or Moses Lake (71 miles).

Table 4.4-9. Peak Construction Workforce Characteristics for the Five Columbia Solar Projects

Workforce Characteristics	Number of Workers	Percent of Workers
Type of Labor		
Mixed Craft Laborers	20	20
Non-craft Laborers	80	80
Location of Hire		
Non-local Hires	20	20
Local Hires	80	80
Total Peak Workforce	**100**	**100**

The remaining 20% of non-local hires might elect to commute to the Ellensburg area on a daily basis from urban areas such as the Tri-Cities (over 96 miles away), the eastern suburbs of Seattle such as Issaquah (91 miles) or North Bend (79 miles), or from the Seattle Metropolitan area (107 miles). However, if they elect not to commute, they are likely to either stay in either a personal RV at a camp site, or to rent a

motel room. Thus, it is not anticipated that construction of the solar projects would result in the permanent relocation or in-migration of any of the construction workforce.

For each solar project site, an individual solar project would host up to 50 workers per day during peak construction, representing only a portion of the anticipated 3-month individual solar project construction periods.

Operation Impacts

The five Columbia Solar Projects would begin operation in the fourth quarter of 2018, and would operate for approximately 30 years. PV facilities contain very few moving parts and have limited ongoing maintenance requirements. Thus, the workforce performing ongoing operations would be relatively small and would typically be located off-site. The facilities would be monitored remotely in real time. Skilled operations monitoring personnel would review the information provided by a Supervisory Control and Data Acquisition (SCADA) system. If a fault or an error occurs, an automatically generated email would be sent to alert monitoring personnel. The monitoring personnel would then assess the fault or error information to determine what corrective actions would be needed. In most cases with PV systems, the fault is auto-correctable and does not require reactive repair at the site.

It is anticipated that four to five maintenance personnel would make about two to three visits per year to each of the five Columbia Solar Project sites to conduct the on-site O&M functions. This workforce would be composed of general laborers for cleaning the PV panels; skilled electricians for visual inspections and performance testing of the inverters, transformers, and switchyard equipment; and skilled mechanics to inspect and maintain the mechanical portions of the tracking system. No major equipment would be required for maintenance of the solar projects, except as necessary for maintenance of the all-weather access roads.

Other than O&M, general landscape labor would perform vegetation maintenance based on the weather and vegetation growth, to mow/maintain ground covering, and for weed abatement and to remove unwanted vegetation. In addition, occasional dust control activities and all-weather access road maintenance would occur.

Because there would be minimal operational staff levels, no positive or negative impacts are anticipated on employment levels in Kittitas County overall, or in the Ellensburg area. Similarly, no permanent or temporary relocations are anticipated into the Ellensburg area.

(h) An analysis of whether or not the locally available work force would be sufficient to meet the anticipated demand for direct workers and an estimate of the number of construction and operation workers that would be hired from outside of the study area if the locally available work force would not meet the demand;

As shown in Table 4.4-5, there were 1,669 unemployed people in Kittitas County in 2015. Thus, this unemployed labor pool would significantly exceed and provide the estimated 80 people that could be individually, temporarily hired during peak construction of the five Columbia Soar Projects. This part of the workforce could also include employees of existing construction-related firms and businesses that might be retained for various phases of construction.

This unemployed labor pool would also be adequate to meet the need for four to five maintenance personnel that would make about two to three visits per year to conduct the on-site O&M functions at each of the five Columbia Solar Project sites during operation.

Because of the temporary nature of the 100-person peak construction workforce, the very limited number of operational workforce, and the 1,669 unemployed labor pool in Kittitas County, there would be no impacts on the available labor pool due to the five Columbia Solar Projects.

(i) A list of the required trades for the proposed project construction;

Trades required during the construction phase of each of the five Columbia Solar Projects would include:

- semi-tractor trailer, concrete mixing truck, dump truck, and water trucks drivers;
- heavy equipment operators for bore/drill rigs, boom/truck or truck-mounted cranes, pile/vibratory drivers, graders, trenchers, tractors/loaders/backhoes, excavators, skid steer loaders, paving equipment, sweepers/scrubbers, rollers, and fork lifts;
- form construction and cement workers;
- electricians;
- general laborers to operate plate compactors/jumping jacks, install fencing, pressure washers, and other material handling equipment; and
- general laborers to plant and maintain the shrubs and brush providing visual screening and on-site native plantings.

(j) An estimate of how many direct or indirect operation and maintenance workers (including family members and/or dependents) would temporarily relocate;

As indicated above for construction, the 20 non-local direct hires might elect to commute to the Ellensburg area on a daily basis from urban areas such as the Tri-Cities (over 96 miles away), the eastern suburbs of Seattle such as Issaquah (91 miles) or North Bend (79 miles), or from the Seattle Metropolitan area (107 miles). However, if they elect not to commute, they are likely to either stay in either a personal RV at a camp site, or to rent a motel room, and most likely in the Ellensburg area. Because of the relatively short 8-month construction period, the phasing of various parts of the work, and the estimated 20 non-local temporary hires, it is not anticipated that construction of the five Columbia Solar Projects would result in the temporary relocation or in-migration of any of the construction workforce into the Ellensburg area.

Because the construction workforce would only be in the Ellensburg area for about 8 months, it is assumed that they won't relocate their family members for that short period. Also, because there would only be 100 construction workers during the peak period, the amount of indirect employment generated by the five Columbia Solar Projects would be minimal, and would be available from the pool of 1,669 unemployed people in Kittitas County in 2015. Thus, there are not anticipated to be any relocations during construction of the solar projects.

Similarly, because there would be few off-site operational monitoring personnel and only four to five maintenance personnel that would make about two to three visits per year to each site, it is assumed that there would be no need relocate their family members to the Ellensburg area for the operational life of the five Columbia Solar Projects. Also, because there would be very few operational workers, the amount of indirect employment generated by the solar projects would be minimal and would not require relocation of any of the indirect workforce or their families.

(k) An estimate of how many workers would potentially commute on a daily basis and where they would originate.

Approximately 80 members of the construction workforce would be hired locally. It is assumed these local workers would be hired from within Kittitas County, most likely from the Ellensburg area, or a maximum

commuting distance of 75 miles from Ellensburg such from as Yakima (36 miles away), Wenatchee (70 miles), or Moses Lake (71 miles).

As indicated in the response to item (j) above, the 20 non-local hires might elect to commute to the Ellensburg area on a daily basis from more distant urban areas such as the Tri-Cities (over 96 miles away), the eastern suburbs of Seattle such as Issaquah (91 miles) or North Bend (79 miles), or from the Seattle Metropolitan area (107 miles), or to stay at local RV parks or motels.

(2) The application shall describe the potential impact on housing needs, costs, or availability due to the influx of workers for construction and operation of the facility and include the following:

(a) Housing data from the most recent ten-year period that data are available, including the total number of housing units in the study area, number of units occupied, number and percentage of units vacant, median home value, and median gross rent. A description of the available hotels, motels, bed and breakfasts, campgrounds or other recreational facilities;

4.4.3 Affected Environment for Housing

4.4.3.1 Housing Units

Table 4.4-10 summarizes the housing characteristics for Kittitas County; the cities of Ellensburg, Kittitas, and Cle Elum; and for comparative purposes the State of Washington for 2015. Table 4.4-11 provides similar information for 2000. Overall, Kittitas County had 22,364 total housing units, of which 16,953 were occupied and 5,411 (24.2%) were vacant. Ellensburg had a total of 7,921 housing units, of which 7,314 were occupied and 607 (7.7%) were vacant. Thus, Kittitas County had a higher number and over double the vacancy rate of housing units than the city of Ellensburg and the State of Washington.

Table 4.4-10. Housing Characteristics in Kittitas County, the Cities, and Washington (2015)

Jurisdiction	Total Number of Housing Units	Number of Units Occupied	Number and Percent of Units Vacant	Median Home Value (owner-occupied units)	Median Gross Rent
Kittitas County	22,364	16,953	5,411 (24.2%)	$242,900	$798/month
City of Ellensburg	7,921	7,314	607 (7.7%)	$195,000	$758/month
City of Kittitas	598	529	69 (11.5%)	$136,400	$1,000/month
City of Cle Elum	1,198	1,082	116 (9.7%)	$183,800	$772/month
Washington	2,942,127	2,668,912	273,215 (9.3%)	$259,500	$1,014/month

Source: U.S. Census Bureau (2015).

Table 4.4-11. Housing Characteristics in Kittitas County, the Cities, and Washington (2000)

Jurisdiction	Total Number of Housing Units	Number of Units Occupied	Number and Percent of Units Vacant	Median Home Value (owner-occupied units)	Median Gross Rent
Kittitas County	16,475	13,382	3,093 (18.8%)	$133,400	$497/month
City of Ellensburg	6,732	6,249	483 (7.2%)	$113,200	$489/month
City of Kittitas	510	443	67 (13.1%)	$92,200	$557/month
City of Cle Elum	956	792	164 (17.2%)	$103,000	$434/month
Washington	2,451,075	2,271,398	179,677 (7.3%)	$168,300	$663/month

Source: U.S. Census Bureau (2000).

The median home value in the county ($242,900) and Ellensburg ($195,000) in 2015 were 6.3 and 24.9% lower, respectively, than the state median home value of $259,500. The median gross monthly rent in 2015 was lower in the county ($798/month) and Ellensburg ($758/month); approximately 21.3% and 25.2% lower, respectively, than the state median gross rent of $1,014/month.

4.4.3.2 Hotels, Motels, and Bed and Breakfasts

In addition to the above available housing, Kittitas County and the city of Ellensburg have a variety of hotels, motels, and bed and breakfasts available for short-term rental. Twenty-five of these facilities are identified and summarized in Table 4.4-12. According to the Kittitas County Chamber of Commerce (2017a) list of lodging amenities, 15 hotels, motels, and bed and breakfasts are available in Ellensburg and the surrounding area. An additional 10 facilities are available about 25 miles further west in the Cle Elum area.

Reviews of websites that offer short-term rentals at private residences, such as Vacasa Rentals (2017) and Airbnb (2017), indicate that many short-term rental options are also available throughout the year in the city of Ellensburg.

Table 4.4-12. Representative Hotels, Motels, and Bed & Breakfasts in Kittitas County

Hotel/Motel/Bed and Breakfast	Location	Amenities
Ellensburg Area		
Best Western Plus Lincoln Inn and Suites	W Umptanum Road, Ellensburg	Business center, pool, fitness center, on-site parking
Econo Lodge Cedars Inn	N Dollarway Road, Ellensburg	Business center, on-site parking, laundry facilities, on-site parking
Comfort Inn	Canyon Road, Ellensburg	Business center, pool, laundry facilities, truck and bus parking
Days Inn	Berry Road, Ellensburg	Business center, pool, laundry facilities, bus/truck and RV parking
Guesthouse Ellensburg	N Main Street, Ellensburg	N/A
Hampton Inn	Triple L Loop, Ellensburg	Business center, pool, fitness center, laundry facilities, on-site parking
Holiday Inn Express	S Canyon Road, Ellensburg	Business center, pool, fitness center, on-site parking
Lazy F Camp and Retreat Center	Manastash Road, Ellensburg	N/A
Lodge at Canyon River Ranch	Canyon River Road, Ellensburg	Business center, pool, fitness center, restaurant, on-site parking
Motel 6	W University Way, Ellensburg	N/A
Nites Inn Motel & RV Park	S Ruby Street, Ellensburg	N/A
Red Lion Hotel and Conference Center	S Canyon Road, Ellensburg	Conference center, business center, fitness center, indoor pool, on-site parking
Rainbow Motel	W University Way, Ellensburg	N/A
Super 8	Canyon Road, Ellensburg	Business center, pool, laundry facilities, bus/truck and RV parking
Brew House Boarding	Main Street, Kittitas	N/A

Hotel/Motel/Bed and Breakfast	Location	Amenities
Cle Elum Area		
Aster Inn	E 1st Street, Cle Elum	N/A
Best Western Snowcap Lodge	W Davis Street, Cle Elum	Pool, on-site parking
Chalet Motel	E 1st Street, Cle Elum	N/A
Cle Elum Travelers Inn	E 1st Street, Cle Elum	N/A
Econo Lodge Cle Elum	E 1st Street, Cle Elum	Exercise room, on-site parking
Flying Horseshoe Ranch	Red Bridge Road, Cle Elum	N/A
Iron Horse Inn Bed and Breakfast	Marie Avenue, Cle Elum	N/A
Stewart Lodge	W 1st Street, Cle Elum	Business center, pool, spa, on-site parking
Suncadia Resort	Suncadia Trail, Cle Elum	Business center, swim and fitness center, coffee shop, restaurant, on-site parking
Timber Lodge Inn	W 1st Street, Cle Elum	Access to Roslyn Ridge Activity Center, business center, laundry facilities

Sources: Kittitas County Chamber of Commerce (2017a), Airbnb (2017), and Vacasa Rentals (2017).

4.4.3.3 RV Parks and Campgrounds

In addition to available housing, Kittitas County and Ellensburg also have a variety of RV parks and campgrounds. Eighteen representative RV and camping parks located in Kittitas County are summarized in Table 4.4-13. Six of those facilities with over 310 sites are located in the Ellensburg area, seven facilities with over 94 sites are in the Cle Elum area, and five facilities with over 434 sites are in the Easton area. A KOA campground, three RV parks, and two other facilities are located in or near the city of Ellensburg. Additional information about camping facilities is also provided in Section 4.2.6.

Table 4.4-13. Representative RV and Camping Parks in Kittitas County

RV and Camp Sites	Location	Spaces Available	Amenities
Ellensburg Area			
E & J RV Park	Berry Road Ellensburg	79	Pool, fitness center
Ellensburg Mobile Estates Park	S Ruby Street Ellensburg	N/A	N/A
KOA Campgrounds	Thorp Highway South Ellensburg	26 RV spaces, ~75 car camp sites, 4 cabins, and 19 tent sites	Pool, pavilion, recreation center, store
Rock'n'Tomahawk Ranch	Upper Green Canyon Road Ellensburg	N/A	N/A
Yakima River RV Park	Ringer Loop Road Ellensburg	36	Clubhouse
Vantage Riverstone Resort	Vantage	75	Laundry facilities
Cle Elum Area			
Cle Elum Trailer Corral RV Park	Cle Elum	22	N/A

RV and Camp Sites	Location	Spaces Available	Amenities
Eagle Valley Campground	Watson Cutoff Road Cle Elum	N/A	N/A
Mountain River Trails Camping	Cle Elum	N/A	Clubhouse, laundry facilities
Sun Country Golf Resort & RV Park	Saint Andrews Drive Cle Elum	14	Golf course
Tadpole RV Park	Bullfrog Road Cle Elum	N/A	N/A
Trailer Corral RV Park	Highway 970 Cle Elum	22	N/A
Whispering Pines RV Center	Cle Elum	35	Laundry facilities
Easton Area			
Lake Easton Resort	Easton	137	Clubhouse, pool, laundry facilities
RV Town	Easton	72	N/A
Silver Ridge Ranch	Easton	34 (tent sites)	Kitchen facilities
U Fish RV Park	U Fish Road Easton	20 RV spaces, 6 cabins, 30 camp sites	N/A
Ust Kaches Campground	Kaches Lake Road Easton	141	N/A

Sources: CountyOffice (2017) and RVParkStore (2017).

(b) How and where the direct construction and indirect work force would likely be housed. A description of the potential impacts on area hotels, motels, bed and breakfasts, campgrounds and recreational facilities;

4.4.4 Impacts on Housing, Motels, and Campgrounds

4.4.4.1 Construction Impacts

It is not anticipated that construction of the five Columbia Solar Projects would result in the permanent relocation or in-migration of any of the construction workforce. Thus, temporary employment of the up to 100 peak workforce (including 20 non-local workers) would not affect the current supplies of vacant and available permanent or rental housing (5,411 vacant units in Kittitas County and 607 vacant units in Ellensburg in 2015) in the Ellensburg area.

The 20 non-local hires might elect to commute to the Ellensburg area on a daily basis from urban areas such as the Tri-Cities (over 96 miles away), the eastern suburbs of Seattle such as Issaquah (91 miles) or North Bend (79 miles), or from the Seattle Metropolitan area (107 miles). However, if they elect not to commute, they are likely to either stay in a personal RV at a camp site, or to rent a motel room at the more than 25 motels in the area. Although there could be some competition for camping spaces during the busy summer recreational season, the over 310 sites at six facilities in the Ellensburg area, over 94 sites at seven facilities in the Cle Elum area, and over 434 sites at five facilities in the Easton area should be adequate to meet the needs of the 20 non-local temporary hires for construction of the five Columbia Solar Projects. Because there would be minimal additional uses of camp sites or motels in the Ellensburg area construction, there would be minimal impacts to RV parks and motels in Kittitas County or in the Ellensburg area.

4.4.4.2 Operation Impacts

Because there would be minimal direct operational staff levels and no in-migration or relocation into the Ellensburg area, no positive or negative impacts are anticipated on housing levels or availability in Kittitas County overall, or in the Ellensburg area. Similarly, no permanent or temporary relocations of family members or indirect operational employees are anticipated into the Ellensburg area, so there would be no impacts to the current supplies of permanent or rental housing, or to motels or RV parks.

(c) Whether or not meeting the direct construction and indirect work force's housing needs might constrain the housing market for existing residents and whether or not increased demand could lead to increased median housing values or median gross rents and/or new housing construction. Describe mitigation plans, if needed, to meet shortfalls in housing needs for these direct and indirect work forces.

Because of the minimal direct and indirect workforces' housing needs and impacts, as described above in Section 4.4.4, the construction and operational workforces of the five Columbia Solar Projects would result in no additional demand or constraints on area housing, no impacts on median housing values or median gross rents, and no new housing construction. Because there would be no housing impacts, no mitigation is proposed or needed.

(3) The application shall have an analysis of the economic factors including the following:

(a) The approximate average hourly wage that would likely be paid to construction and operational workers, how these wage levels vary from existing wage levels in the study area, and estimate the expendable income that direct workers would likely spend within the study area;

The U.S. Bureau of Labor Statistics (BLS) tracks employment, hourly wages, and annual salaries for a wide variety of occupations. Table 4.4-14 summarizes the potential Washington hourly wages and annual earnings for the most likely construction and operation occupations of employees for the five Columbia Solar Projects. Construction mean wages could range from $15.54/hour to $41.05/hour and mean annual wages could range from $32,330/year to $85,390/year. Operations mean wages could range from $17.34/hour to $41.75/hour and mean annual wages could range from $36,060/year to $86,850/year.

Because approximately 80 construction workers would be hired locally (i.e., within Kittitas County or the Ellensburg area), any additional wages/earnings derived from construction of the five Columbia Solar Projects would likely stay in the county, at proportions currently occurring for existing residents. For the 20 non-local hires that might elect to commute to the Ellensburg area on a daily basis from more distant urban areas such as the Tri-Cities (over 96 miles away), the eastern suburbs of Seattle such as Issaquah (91 miles) or North Bend (79 miles), or from the Seattle Metropolitan area (107 miles), their expenditures in the county would like be limited to food and fuel for their vehicles. For those non-local hires that would elect to stay at local RV parks or motels, they would make those additional expenditures locally. These local construction period expenditures would provide a very minimal additional economic benefit to Kittitas County or the Ellensburg area.

Table 4.4-14. Potential Columbia Solar Projects Construction and Operations Employees Washington State Occupational Wages (May 2016)

Occupation Code	Occupation Title	Median Hourly Wage	Mean Hourly Wage	Annual Mean Wage
Potential Construction Employees				
47-0000	Construction and Extraction Occupations	$25.58	$27.45	$57,090
47-1011	First-Line Supervisors of Construction Trades and Extraction Workers	$35.50	$36.41	$75,730
47-2031	Carpenters	$25.13	$26.96	$56,070
47-2051	Cement Masons and Concrete Finishers	$23.35	$25.41	$52,840
47-2061	Construction Laborers	$19.56	$22.00	$45,760
47-2071	Paving, Surfacing, and Tamping Equipment Operators	$23.67	$25.46	$52,950
47-2072	Pile-Driver Operators	$40.98	$37.56	$78,130
47-2073	Operating Engineers and Other Construction Equipment Operators	$28.38	$28.94	$60,190
47-2111	Electricians	$30.45	$31.37	$65,260
47-3011	Helpers--Brickmasons, Blockmasons, Stonemasons, and Tile and Marble Setters	$21.08	$23.02	$47,880
47-3012	Helpers--Carpenters	$14.63	$15.54	$32,330
47-3013	Helpers--Electricians	$22.70	$23.50	$48,890
47-3019	Helpers, Construction Trades, All Other	$18.97	$20.30	$42,230
49-9051	Electrical Power-Line Installers and Repairers	$43.76	$41.05	$85,390
49-9098	Helpers--Installation, Maintenance, and Repair Workers	$16.05	$17.34	$36,060
49-9099	Installation, Maintenance, and Repair Workers, All Other	$23.94	$24.90	$51,790
Potential Operations Employees				
51-8013	Power Plant Operators	$43.34	$41.75	$86,850
51-8099	Plant and System Operators, All Other	$31.73	$30.83	$64,120
47-2111	Electricians	$30.45	$31.37	$65,260
47-3013	Helpers--Electricians	$22.70	$23.50	$48,890
49-9051	Electrical Power-Line Installers and Repairers	$43.76	$41.05	$85,390
49-9098	Helpers--Installation, Maintenance, and Repair Workers	$16.05	$17.34	$36,060
49-9099	Installation, Maintenance, and Repair Workers, All Other	$23.94	$24.90	$51,790

Source: BLS (2016).

For the minimal Columbia Solar Project off-site operations workers, the expenditures of their wages would continue to occur where they now reside. The four to five additional maintenance workers would likely live in Kittitas County and, thus, any additional wages/earnings would likely stay in the county, at proportions

currently occurring for existing residents. These local operational period expenditures would not provide a perceptible economic benefit to Kittitas County or the Ellensburg area.

(b) How much, and what types of direct and indirect taxes would be paid during construction and operation of the project and which jurisdictions would receive those tax revenues;

4.4.5 Affected Environment for Tax Revenues

The following sections describe the applicable major tax rates assessed by the State of Washington, Kittitas County, and the City of Ellensburg.

4.4.5.1 Washington State

The State of Washington assesses a variety of business and excise taxes, depending upon the activity that would occur. The Washington State Business and Operation (B&O) tax rate for Services and Other Activities is 0.015% (Washington State Department of Revenue 2017b). The Washington Public Utility tax rate for Generation/Distribution of Electrical Power is 0.038734% (Washington State Department of Revenue 2017c). There are a number of other vehicle, utility, and other excise taxes that area also assessed.

4.4.5.2 Kittitas County

Kittitas County assesses property, sales and use, and other taxes, as described below.

Property Taxes

Kittitas County has a median property tax rate of 0.69% (Property Tax 101 2017). Table 4.4-15 summarizes the top 10 property tax payers in Kittitas County for 2015. The top 10 property tax payers had a total assessed value of $626,253,417 (comprising 11.2% of the total assessed values), and ranged from $15,314,760 to $256,512,283. The biggest property tax payers are PSE (the electric division) and Vantage Wind Energy, having 6.3% of the total assessed values in the county (Pless et al. 2015).

Table 4.4-15. Kittitas County Top 10 Property Tax Payers, 2014 Assessment for 2015 Tax

Tax Payer	Type of Business	Assessed Value ($)	Percent of Total Assessed Value
Puget Sound Energy/Electric	Electrical Utility	256,512,283	4.4362
Vantage Wind Energy, LLC	Wind Farm	109,511,373	1.8939
Sagebrush Power Partners, LLC	Wind Farm	64,912,011	1.1226
New Suncadia, LLC	Destination Resort	45,014,430	0.7785
Puget Sound Energy/Gas	Gas Utility	42,895,980	0.7419
BNSF Railway Co. – Tax Department	Railroad Transit	40,481,110	0.7001
Campus Crest at Ellensburg, LLC	Residential Condominium	19,145,440	0.7001
CNL Income Snoqualmie, LLC	Recreational Activities	16,270,510	0.2814
Ellensburg Telephone Co., Inc.	Telephone Company	16,195,520	0.2801
Auvil Fruit Co., Inc.	Food Production	15,314,760	0.2649
Totals	**–**	**626,253,417**	**11.1995**

Note: Based on Kittitas County Assessor TerraScan Report dated 02/23/2015.
Source: Pless et al. (2015).

Sales and Other Taxes

As shown in Table 4.4-16, the combined local and state sales tax rates for Kittitas County and the associated cities is the same at 1.5% (with Ellensburg being 0.002 higher; Washington State Department of Revenue 2017a).

Table 4.4-16. Sales Tax Rates in Kittitas County and the Cities, 3rd Quarter 2017

Jurisdiction	Local Rate	State Rate	Combined Rate
Kittitas County, unincorporated area	.015	.065	.080
City of Ellensburg	.017	.065	.082
City of Kittitas	.015	.065	.080
City of Cle Elum	.015	.065	.080

Source: Washington State Department of Revenue (2017a).

Other taxes levied by the County include (Pless et al. 2015):

- Excise taxes
- Special sales taxes
- Hotel motel/lodging receipts taxes – 4%
- Admissions taxes

4.4.5.3 City of Ellensburg

The City of Ellensburg assesses property, sales and use, hotel/motel, and utility taxes, as described below.

Property Taxes

Ellensburg's property tax rate was $2.301816 per $1,000 value, in 2014. It comprised $2.168009 for regular property taxes and $0.133807 for a Library Bond/Timber Tax (City of Ellensburg 2015).

Table 4.4-17 summarizes the top 10 property tax payers in the city of Ellensburg for 2015. The top 10 property tax payers had a total assessed value of $93,670,345 (comprising 7.8% of the total assessed values), and ranged from $6,297,340 to $13,335,870. The biggest property tax payers are Fred Meyer Stores and Fairway Investments, having 2.1% of the total assessed values in the county (City of Ellensburg 2015).

Table 4.4-17. City of Ellensburg Top 10 Property Tax Payers, 2014 Assessment for 2015 Tax

Tax Payer	Type of Business	Assessed Value ($)	Percent of Total Assessed Value
Fred Meyer Stores, Inc.	Retail	13,335,870	1.11
Fairway Investments, LLC	Multi-residential Property	11,520,470	0.96
Timothy Park, LLC	Multi-residential Property	10,942,860	0.91
Ellensburg Telephone Company, Inc.	Telephone Company	10,383,590	0.87
Twin City Foods, Inc.	Food Processing	9,990,930	0.84
Pautzke Bait Co., Inc,	Fish Bait Processing	9,421,790	0.79
Directv, LLC	Satellite Television	7,985,985	0.67
Sun Lakes Properties, LLC	Commercial Properties	6,969,610	0.58
Lakeside Town Center Assoc., LLC	Multi-residential Property	6,821,900	0.57
University Park Apts., LLC	Multi-residential Property	6,297,340	0.53
Totals		**93,670,345**	**7.83**

Note: Based on Kittitas County Assessor TerraScan Report dated 02/23/2015.
Source: City of Ellensburg (2015).

Sales and Other Taxes

As stated above, the City of Ellensburg has a combined 1.7% sales tax rate. In addition, the city assesses a number of other taxes, including a 4% Hotel/Motel tax on hospitality services and utility taxes that include (as of 2/13/2015) include (City of Ellensburg 2015):

- Electric – 6.0%
- Gas – 6.0%
- Garbage – 8.1%
- Water – 10.5%
- Sewer – 10.5%
- Telephone – 6.0%
- Cable – 1.75%
  (City Code 6.52.160, and 6.52.480)

4.4.6 Impacts to Tax Revenues

4.4.6.1 Construction Impacts

The state would likely realize the greatest benefits in sales tax revenues from construction of the five Columbia Solar Projects. The greatest share of the estimated $8 to $10 million in project construction costs (for a total of $40 to $50 million for all five projects) would be from the purchase of the solar panels, steel piles, tracker cross-beams/rails, inverters, transformers, switchgear, and above- and below-ground conductors. Construction of the solar projects would generate several hundred thousand dollars in state sales tax revenues.

Kittitas County Tax Payments

The county meanwhile would likely realize about one hundred thousand dollars in sales tax revenues from construction of the Columbia Solar Projects, and thus small beneficial impacts.

Ellensburg Tax Payments

Ellensburg might realize some minimal increased sales tax revenues, from a 1.7% city sales tax rate, as a result of materials and supplies purchases made during construction of the five Columbia Solar Projects. In addition, if the 20 non-local construction workers elect to stay in Ellensburg motels for the up to 6 days per week for the 8 months that they would work, there could be some additional city tax revenues generated from the 4% hotel/motel tax on hospitality services. Thus, the city would realize minimal tax revenue benefits.

4.4.6.2 Operation Impacts

Kittitas County Tax Payments

Initially, TUUSSO would make an estimated $117,300 lump sum back payment of taxes for converting the solar project sites from open space to the base tax rate. Then, TUUSSO would make annual property tax payments to Kittitas County for each of the five Columbia Solar Projects at the current tax rates. Table 4.4-18 summarizes the estimated tax payments for Years 1, 10, 20, and 30 of the approximately 30-year operations periods. These property tax payments would decrease somewhat annually because of depreciation of the values of each of the solar projects. As shown in the table, TUUSSO would pay property taxes totaling $376,200 in Year 1, $197,700 in Year 10, $99,100 in Year 20, and $61,700 in Year 30. In total, TUUSSO would pay an estimated $4,883,900 in property taxes over the approximately 30-year operational life of the five solar projects, a noticeable beneficial impact to Kittitas County revenues.

Table 4.4-18. Operational Kittitas County Property Tax Payments from the Five Columbia Solar Projects

Solar Project Site	Annual Property Tax Payments[1]				Total 30-year Payments
	Year 1	Year 10	Year 20	Year 30	
Camas Solar Project	$79,900	$42,000	$21,100	$13,100	$1,038,000
Fumaria Solar Project	$79,900	$42,000	$21,100	$13,100	$1,038,000
Penstemon Solar Project	$79,900	$42,000	$21,100	$13,100	$1,038,000
Typha Solar Project	$77,100	$40,500	$20,300	$12,600	$1,000,800
Urtica Solar Project	$59,200	$31,100	$15,600	$9,700	$769,300
Total Gross Taxes	**$376,200**	**$197,700**	**$99,100**	**$61,700**	**$4,883,900**

1 All numbers have been rounded, so the Total Gross Taxes might not exactly reflect the sum of the columns.

Because it is not likely that many purchases of materials or supplies would be made in Kittitas County during operation, the county is unlikely to realize noticeable sales tax revenues from its 1.5% county sales tax rate, or from excise taxes, special sales taxes, or hotel motel/lodging taxes.

Ellensburg Tax Payments

No project facilities would be located in Ellensburg and no in-migration of the operational workforce is anticipated for the five Columbia Solar Projects. Therefore, no new home construction would be required for the workforce, and thus no additional project-related property tax revenues would be realized by the city of Ellensburg.

Ellensburg might realize some minimal increased sales tax revenues, from a 1.7% city sales tax rate, as a result of materials purchases during operation of the five Columbia Solar Projects. However, because there would be no in-migration or new housing, there would be no generation of revenues from the 4% hotel/motel tax on hospitality services or from utility taxes such electric (6.0%), natural gas (6.0%), garbage (8.1%), water (10.5%), sewer (10.5%), telephone (6.0%), or cable (1.75%).

(c) The other overall economic benefits (including mitigation measures) and costs of the project on the economies of the county, the study area and the state, as appropriate, during both the construction and operational periods.

As described above, the greatest economic benefits from the five Columbia Solar Projects would be derived from Kittitas County operation property tax revenues, and the provision of up to 100 full-time peak construction jobs over the 8-month construction period. If solar panels, steel piles, tracker cross-beams/rails, inverters, transformers, switchgear, and above- and below-ground conductors are purchased in Washington, it could generate several hundred thousand dollars in state sales tax revenues. Also, Kittitas County would benefit from TUUSSO paying property taxes totaling $376,161 in Year 1, $197,741 in Year 10, $99,076 in Year 20, and $61,666 in Year 30. In total, TUUSSO would pay an estimated $4,883,924 in property taxes over the approximately 30-year operational life of the five solar projects. The majority of the remaining construction and operation economic impacts would either be non-existent or would have minor beneficial effects to the area economy and, thus, no mitigation is proposed.

(4) The application shall describe the impacts, relationships, and plans for utilizing or mitigating impacts caused by construction or operation of the facility to the following public facilities and services:

(a) Fire;

4.4.7 Affected Environment for Fire Protection and Safety Services

4.4.7.1 General County

Kittitas County provides fire and rescue services from its nine fire districts (see Table 4.4-19 for information about the eight applicable districts for the project area). Kittitas County Fire and Rescue has two full-time stations and nine volunteer stations. In total, these stations have 27 career firefighters, approximately 70 volunteer firefighters, 12 reserve firefighters, and nine resident firefighters (Kittitas Valley Fire & Rescue 2017).

The City of Ellensburg Fire Department merged with the Kittitas County Fire District No. 2 in 2007 and became Kittitas Valley Fire and Rescue. Fire District No. 2 has 10 stations, including Stations 21 through 29 and two satellite stations (Table 4.4-19) (Pless et al. 2015).

Table 4.4-19. Kittitas County Emergency Services Facilities

Facility	Service Provider	Description
Ellensburg Area		
Station 11, Thorp	Fire District No. 1	• 10700 N Thorp Highway, Thorp • all of the district's 43.5 square miles, serving 2,500 residences • built in 2000, remodeled in 2005 • 2 engines, 2 tenders, 1 aid unit, 1 mini pumper, 1 rescue, 1 support, and 1 MCI van
Station 12, Clark Flats	Fire District No. 1	• 10941 SR 10, Thorp • 2 buildings at site • 1 tender, 1 brush truck, and 1 engine
Station 21	Fire District 2 (Kittitas Valley Fire and Rescue)	• 2020 Vantage Highway • 280 square miles for all of District 2 • B-211, E-211, E-212, T-211, B-212, M-211, M-212 • Living Quarters – 1960s, Bay – late 1980s
Station 22	Fire District 2 (Kittitas Valley Fire and Rescue)	• 2671 Tjossem Road • E-221 – 1950s
Station 23	Fire District 2 (Kittitas Valley Fire and Rescue)	• 3301 Denmark Road • 1950s
Station 24	Fire District 2 (Kittitas Valley Fire and Rescue)	• 4901 – 4th Parallel Road • B-241, E-241, T-241 - 2004
Station 25	Fire District 2 (Kittitas Valley Fire and Rescue)	• Main Street, Kittitas • E-251 – 2010
Station 26	Fire District 2 (Kittitas Valley Fire and Rescue)	• 6651 Brick Mill Road • E-261 – 1940s
Station 26 Satellite	Fire District 2 (Kittitas Valley Fire and Rescue)	• 2380 Game Farm Road • E-262 – 1950s
Station 27	Fire District 2 (Kittitas Valley Fire and Rescue)	• 8800 Reecer Creek Road • E-271 – 1950s

Facility	Service Provider	Description
Station 28	Fire District 2 (Kittitas Valley Fire and Rescue)	• 5640 Cove Road • B-281, E-281, T-281 - 2002
Station 28 Satellite	Fire District 2 (Kittitas Valley Fire and Rescue)	• 51 Barnes Road • E-282 – 1960s
Station 29	Fire District 2 (Kittitas Valley Fire and Rescue)	• 102 N Pearl Street • M-291, M-292, M-293, R-291, B-291, E-291, L-291 - 1955
Vantage Station	Fire District No. 4 (Vantage)	• N/A
Western Kittitas County Area		
Ronald Station	Fire District No. 6 (Ronald/Lake Cle Elum)	• 7 square miles for all of District 6
South Cle Elum Fire Station	South Cle Elum	• 523 Lincoln Avenue, South Cle Elum • Serves a 0.5 mile area, with 580 people. Can handle twice that area. • 1 pumper and 1 utility truck
Easton Station	Fire District No. 3 (Easton)	• 180 Cabin Creek, P.O. Box 52, Easton, WA 98925 • 12 square miles for all of the district • 33,182-square-foot building, built in 1992 • 1 aid car, 1 engine, 2 tankers, 1 rescue truck
Station No. 1 Peoh Point Road	Fire District No. 7 (Upper County Area)	• 80 square miles for all of District 7 • 1 fire engine, 1 wild land brush truck, 1 water tender, 1 aid unit, and ambulance
Station No. 2	Fire District No. 7 (Upper County Area)	• SR 970 and Airport Road • N/A
Station No. 3	Fire District No. 7 (Upper County Area)	• Off I-90 at golf course, Exit 77 • N/A
Station No. 4	Fire District No. 7 (Upper County Area)	• Ballard Hill Road • N/A
Station No. 5	Fire District No. 7 (Upper County Area)	• Teanaway Valley, at Middle Fork Road • N/A
Station No. 81	Fire District No. 8 (Kachess)	• 13 square miles for all of District 8, located in Kachess Village • 1 engine 811, 1 command vehicle, 1 aid car, and 1 brush truck
Station No. 82	Fire District No. 8 (Kachess)	• located at the intersection of Kachess Lake and Via Kachess Roads • 1 wild land engine, 1 tender/pumper, and rescue snowmobiles and trailer
Station No. 83	Fire District No. 8 (Kachess)	• located at the intersection of Stampede Pass and Lost Lake Roads • 1 pumper/rescue truck, 1 tender, 1 brush truck, 1 aid car, and 1 support car
Snoqualmie Pass Station	Fire District No. 5/King FPD No. 51 (Snoqualmie Pass)	• 1211 SR 906, east of I-90, Exit 53 • built in 2011 • E-291, E-292, A-291, A-292, B-291, Brush291, and Snow291 (snowmobile trailer)

Source: Pless et al. (2015).

All fire districts have emergency medical equipment and extraction equipment for auto accidents. Most fire districts have minimal services (equipment and personnel) for search and rescue. Fire District No. 2/Kittitas Valley Fire and Rescue has Basic Life Support (BLS) services. All rural county fire districts have mutual aid agreements with neighboring districts and with Kittitas Valley Fire and Rescue (EFSEC 2007).

4.4.7.2 Solar Project Sites

Fire District No. 2/Kittitas Valley Fire and Rescue and Fire District No. 1 provide fire protection and emergency services to the five proposed Columbia Solar Project sites. Please refer to Table 4.4-19 for additional information about these districts.

4.4.8 Impacts to Fire Protection and Safety Services

4.4.8.1 Construction Impacts

As with any major developments, construction of the Columbia Solar Projects presents some minimal fire risks. Each of the project sites is currently farmed agricultural land, mostly for hay production or grazing. The Fumaria Solar Project site is the only fallow agricultural field (not recently grazed) at this time. Thus the predominant groundcover is non-native grasses and weed species, with the greatest fire risks being associated with grass fires during the hot, dry summer season. TUUSSO has initiated discussions with the Kittitas County Fire Marshal about potential fire issues, locations and dimensions of access gates and internal access roads, and other issues. A Fire Protection and Safety Plan would be developed and implemented prior to construction, in coordination with the Kittitas County Fire Marshal, Fire District No. 2/Kittitas Valley Fire and Rescue, Fire District No. 1, and other appropriate agencies. TUUSSO would coordinate with Fire District No. 2/Kittitas Valley Fire and Rescue and Fire District No. 1 to provide PV training to fire responders and construction staff.

Construction equipment would have spark-arresting mufflers, heat shields, and other protection measures to avoid starting fires. Fire extinguishers would be available in vehicles and on equipment, to quickly address any accidental fire issues. Work crews also would be trained about fire avoidance and response measures.

During construction, water would be used to suppress fugitive dust during grubbing, clearing, grading, trenching, and soil compaction. If a fire were to occur, that water could be diverted for firefighting purposes. For the Camas, Penstemon, Typha, and Urtica Solar Project sites the water sources are already available on-site. For the Fumaria Solar Project site, water would be trucked onto the site from the Ellensburg area.

As a result of the above fire avoidance measures and ability to respond on-site to potential fires, the risks of and potential impacts from on-site fires during construction of the five Columbia Solar Projects would be minimal.

4.4.8.2 Operation Impacts

Unlike thermal power plants, solar power projects pose a much smaller risk of accidental fires or explosions because there is no need to transport, store, or combust fossil fuels to generate electricity. The five Columbia Solar Projects also would be designed to comply with the National Electric Code (NEC) and the National Fire Protection Agency (NFPA) requirements, to avoid potential electrical fire risks. A strict Fire Prevention and Safety Plan would be developed and enforced during project operation, to reduce and address potential fire risks.

TUUSSO would coordinate with Fire District No. 2/Kittitas Valley Fire and Rescue and Fire District No. 1 to provide PV training to fire responders, and operation and maintenance staff. The intent of this training would be to familiarize both responders and workers with the codes, regulations, associated hazards, and mitigation processes related to solar electricity. This training would include techniques for fire suppression of PV systems.

Combustible vegetation on and around each of the five Columbia Solar Project boundaries would be maintained by TUUSSO and the landowner. Each solar project site would include fire breaks around the project boundary, in accordance with applicable state and/or county standards.

As a result of the above fire avoidance measures and ability to respond on-site to potential fires, the risks of and potential impacts from on-site fires during operation of the five Columbia Solar Projects would be minimal.

4.4.8.3 Solar Project Sites

The following discussions summarize access to each of the five Columbia Solar Project sites.

Camas Solar Project Site

The entrance gates to the Camas Solar Project site for the Camas A and Camas B parcels would be about 8 feet high, 12 feet wide, and set back from the edge of Tjossem Road, to allow for fire department and maintenance access without disrupting traffic flows.

Fumaria Solar Project Site

The entrance gates for the Fumaria Solar Project site would be about 8 feet high and 12 feet wide to allow for fire department and maintenance access.

Penstemon Solar Project Site

The entrance gates for the Penstemon Solar Project site would be about 8 feet high, 12 feet wide, and would be set back from the edge of Tjossem Road, to allow for fire department and maintenance access without disrupting traffic flow.

Typha Solar Project Site

The entrance gates for the Typha Solar Project site would be about 8 feet high and 12 feet wide, to allow for fire department and maintenance access.

Urtica Solar Project Site

The entrance gates for the Urtica Solar Project site would be about 8 feet high, 12 feet wide, and would be set back from the edge of Umptanum Road, to allow for fire department and maintenance access without disrupting traffic flow.

(b) Police;

4.4.9 Affected Environment for Police

The Kittitas County Sheriff's Department and the Washington State Patrol provide law enforcement services for the entire county, except for the cities of Ellensburg, Kittitas, Cle Elum, and Roslyn (covered by Cle Elum) that provide their own law enforcement. Law enforcement services provided by the Washington State Patrol, Kittitas County Sheriff's Office, and the Ellensburg Police Department are described below (EFSEC 2007).

4.4.9.1 Washington State Patrol

The Washington State Patrol (WSP) has offices at 291 Thorp Highway South near Ellensburg. Kittitas County lies within District 6 of the patrol, which also includes Chelan, Douglas, Grant, Okanogan, and the northeast corner of Adams counties. The district covers the largest geographical area of any district in the state, with a population of over 250,000 people in the five-plus county area. The main headquarters is located in Wenatchee, with additional detachment offices located in Okanogan and Moses Lake (WSP 2017).

WSP provides traffic enforcement on state highways, drug enforcement, Hazardous Materials Team (HAZMAT) oversight, and incident response. It patrols all federal and state highways and routes, including I-90, I-82, U.S. Route 97, SR 970, SR 10, and SR 821 (EFSEC 2007).

The Ecology facilities in Yakima, approximately 35 miles south of Ellensburg, provide a HAZMAT response team.

4.4.9.2 Kittitas County Sheriff's Department

The Kittitas County Sheriff's Department provides a wide variety of services and capabilities including law enforcement and civil division (e.g., traffic control, drug enforcement, and civil calls), corrections, a K9 unit, SWAT team, emergency management, search and rescue, and marine patrol (EFSEC 2007). The Kittitas County Sheriff and Corrections are located in the Kittitas County Public Safety Building, at 205 W 5th Avenue in Ellensburg. The building was originally built in 1985, was remodeled from 2010 to 2012, and is 33,209 square feet. The Sheriff's Administration Office is located at 307 Umptanum Road in Ellensburg, was built in 2009, and is 11,880 square feet (Pless et al. 2015).

The Kittitas County Courthouse is located at 205 W 5th Avenue in Ellensburg. It was built in 1958, is 47,691 square feet, and is the location of the Assessor, Auditor, Clerk, Commissioners, Lower District Court, Human Resources, Information Services, Juvenile Probation, Maintenance, Prosecutor, Superior Court, and Treasurer. The Kittitas County Juvenile Detention Holding Facility is also located at 205 W 5th Avenue in Ellensburg. Public Health and Misdemeanant Probation functions are housed in the Sorenson Building, located at 507 N Nanum Street in Ellensburg, built in 1942, and 17,648 square feet (Pless et al. 2015).

The Sheriff's Department also has the Vantage Marine Storage Building in Vantage. The building was constructed in 2014, is 70 square feet, and has an associated boat launch (Pless et al. 2015).

Kittitas County also has substation facilities in Cle Elum. The Upper County Sheriff Office is located at 4240 Bullfrog Road, Suite 1, in Cle Elum, and is a 440-square-foot leased suite. The Upper District Court Building is located at 700 E 1st Street in Cle Elum, it was remodeled in 2013, and it is 6,000 square feet (Pless et al. 2015).

4.4.9.3 City of Ellensburg Police Department

The Ellensburg Police Department provides law enforcement services within the city limits of Ellensburg. The department is located at 100 N Pearl Street, and the Animal Shelter is located at 1007 Industrial Way. The Ellensburg Police Department consists of Operations, which includes patrol, motorcycles, K9, the School Resource Officer and Reserves, and critical incident planning. The Administrative Division includes Criminal Investigations specializing in felony, crimes against persons, missing persons, and crime scene investigations, and anti-crime drug and narcotic investigations; Code Enforcement; Animal Control services; and evidence processing and evidence storage (City of Ellensburg 2015).

The police department has a total of 29 sworn full-time officers (27 full and two limited commissioned), or about one officer for every 627 citizens. The department has one police station and six patrol vehicles. The Animal Shelter has 16 dog kennels, 14 cat cages, and is the only shelter facility in Kittitas County (City of Ellensburg 2015).

Central Washington University also provides law enforcement services through the University Police and Parking Services Department. The department employs 17 law enforcement officers and other professionals for law enforcement services on campus.

4.4.10 Impacts to Police

4.4.10.1 Construction Impacts

Construction would have minimal impacts on state, county, or city law enforcement staff. The peak construction workforce would be 100 people, of which 80 would be hired locally and would be existing residents, and 20 would either commute to the Ellensburg area daily, or would stay at an RV park or motel. Thus, the size of the workforce should not result in any additional police calls and no impacts.

There might be minimal impacts if police have to respond to other potential project-related traffic issues, emergency medical calls, or if they would provide a coordination role in the unlikely event that a fire were to occur. These calls would be very infrequent and, thus, should not require the hiring of or additional shifts for state, county, or city law enforcement staff.

4.4.10.2 Operation Impacts

TUUSSO would take several measures (e.g., fencing, lighting, security cameras, and site security) to maintain security at the five Columbia Solar Project sites, and thus avoid placing additional burdens on state and county law enforcement. The solar project sites would be secured using 6- to 8-foot-high, perimeter, chain-link fencing, topped by razor wire, and surrounding the PV system and switchyard. The entrance gates for each of the solar sites would be about 8 feet high and 12 feet wide, to allow for fire department and maintenance access. “Warning High Voltage” signs would be placed on the fencing at about 100-foot intervals and at each gate.

In addition, lighting would be installed on metal poles, up to 20 feet tall, located around the periphery of each of the five Columbia Solar Project sites, as well as at the inverter pads, for nighttime security. Lighting would consist of modern, low-intensity, downward-shielded fixtures that are motion activated, and would be directed onto the immediate site. For each site, five to 10 lights would be installed and powered directly by buried underground electrical supply lines. TUUSSO might also install security cameras on those same light poles.

Finally, security staff may periodically drive along the site perimeter security fence. As a result of these measures, it is anticipated that operation of the five Columbia Solar Project sites should have no impacts on state or county law enforcement.

(c) Schools;

4.4.11 Affected Environment for Schools

Educational services in the vicinity of the five proposed solar project sites are provided by the Ellensburg School District, Kittitas School District, Thorp School District, Cle Elum/Roslyn School District, Easton School District, Central Washington University, and three private schools.

4.4.11.1 Primary and Secondary Education

The Ellensburg School District consists of three elementary schools, one middle school, one traditional high school, and one alternative high school, all located in Ellensburg (Table 4.4-20). The Ellensburg School District's 3,094 students attend Valley View, Mount Stuart, and Lincoln Elementary Schools (kindergarten through 5th grades); Morgan Middle School (6th to 8th grades); the Excel High School program (9th to 12th grades); Ellensburg High School (9th to 12th grades); and the Parent Partner Program (1st to 12th grades). The basic education offerings of the district are augmented by a Career and Technical Education (CTE) program, alternative programs, on-line credit retrieval, remediation programs, a Highly Capable program, and a special services department. Ellensburg School District also offers a full range of co-curricular programs including athletics, music, drama, and academic competitions (Pless et al. 2015).

The Damman Elementary School has 38 students and is located on Manastash Road south of Ellensburg.

Table 4.4-20. Public Education Facilities in the Ellensburg and Western Kittitas County Areas

Facility	Provider	Description	Size
Ellensburg Area			
Lincoln Elementary School	Ellensburg School District	• 200 S Sampson Street, Ellensburg • 26 classroom teachers	454 students
Mount Stuart Elementary School	Ellensburg School District	• 705 W 15th Avenue, Ellensburg • 27 classroom teachers	448 students
Valley View Elementary School	Ellensburg School District	• 1508 E 3rd Avenue, Ellensburg • 26 classroom teachers	450 students
Morgan Middle School	Ellensburg School District	• 400 E 1st Avenue, Ellensburg • 40 classroom teachers	690 students
Ellensburg High School	Ellensburg School District	• 1203 E Capitol Avenue, Ellensburg • 40 classroom teachers, of a total 67 professional staff	887 students
Damman Elementary School	Damman School District	• 3712 Umptanum Road, south of Ellensburg • Kindergarten to 6th grade • 1 school, 2 teachers	38 students
Kittitas Elementary School	Kittitas School District	• 7571 Kittitas Highway, Kittitas • Kindergarten to 5th grade	258 students
Kittitas High School	Kittitas School District	• 7571 Kittitas School Highway, Kittitas • 6th to 12th grades	282 students
Parke Creek Treatment Center	Kittitas School District	• 11042 Parke Creek Road	15 students
Western Kittitas County Area			
Thorp Elementary, Junior, and Senior High School	Thorp School District	• 10831 N Thorp Highway, Thorp • Kindergarten to 12th grade	164 students

Facility	Provider	Description	Size
Cle Elum/Roslyn High School	Cle Elum/Roslyn School District	• 2692 SR 903, Cle Elum • 9th to 12th grades	281 students
Cle Elum/Roslyn Elementary School	Cle Elum/Roslyn School District	• 2696 SR 903, Cle Elum • pre-school, and kindergarten to 5th grade	408 students
Cle Elum/Roslyn Alternative School	Cle Elum/Roslyn School District	• 200 W Oakes Street, Cle Elum • 3rd to 12th grades	38 students
Walter Strom Middle School	Cle Elum/Roslyn School District	• 2694 SR 903, Cle Elum • 6th to 8th grades	221 students
Easton Elementary, Junior, and Senior High School	Easton School District	• 1893 Railroad Street, Easton	127 students

Source: Pless et al. (2015).

The Kittitas School District has 555 students and consists of Kittitas Elementary and Kittitas Secondary School (high school). Both schools are located in the city of Kittitas. The Thorp School District has 164 students and consists of Thorp High School and is located in unincorporated Kittitas County (Pless et al. 2015).

Further west, the Cle Elum/Roslyn School District has 948 students and consists of Cle Elum/Roslyn Elementary School (Kindergarten to 5th grades), Cle Elum/Roslyn Alternative School (3rd to 12th grades), Walter Strom Middle School (6th to 8th grades), and Cle Elum/Roslyn High School (9th to 12th grades). Easton School District has 127 students in Easton Elementary, Junior, and Senior High School (Pless et al. 2015).

4.4.11.2 Post-Secondary Education

Central Washington University is located in Ellensburg and is the largest employer in Kittitas County (Pless et al. 2015). Enrollment at the university was 11,119 for the 2016–2017 school year, with over 8,000 students attending the Ellensburg campus and about 3,100 students as on-campus residents at any given time. It also has extended degree centers in Yakima, Wenatchee, Moses Lake, Lynnwood, Kent, Des Moines, and Pierce County (Pless et al. 2015 2015). The university offers more than 135 majors and university student housing includes 17 residence halls and five apartment complexes. Its continuing education department works with area businesses, schools, and interest groups to design workshops (Central Washington University 2017).

A local unit of the land-grant university in Washington State, Washington State University (WSU) Kittitas County Extension is a partnership of the U.S. Department of Agriculture (USDA), WSU, and Kittitas County. It has four county programs, including 4-H Youth Development, Agriculture, Gardening, and Forestry and Range (WSU Kittitas County Extension 2017).

4.4.11.3 Libraries

In addition to the schools in the county, there are four libraries available from which residents can obtain educational, reading, and other materials:

- Ellensburg Public Library – managed by the City of Ellensburg, located at 209 N Ruby Street, Ellensburg, and expanded in 2003
- Kittitas Public Library – managed by the City of Kittitas, and located at 2nd and Pierce Streets, Kittitas

- Cle Elum (Carpenter Memorial) Library – managed by Cle Elurn, and located at 302 Pennsylvania Avenue, Cle Elum
- Roslyn Public Library – managed by the City of Roslyn, located at 201 S First Street, Roslyn, and underwent a major to repair and update in 2009

4.4.12 Impacts to Schools

As discussed in Section 4.4.4, it is not anticipated that construction of the five Columbia Solar Projects would result in the permanent relocation or in-migration of any of the direct or indirect construction or operational workforces. Thus, there would be no impacts to schools in Kittitas County or the Ellensburg area.

(d) Parks or other recreational facilities;

For a detailed discussion about parks and recreational facilities in Kittitas County, Ellensburg, and other surrounding communities, please refer to Section 4.2.6, above.

4.4.13 Affected Environment for Parks and Other Recreational Facilities

4.4.13.1 General County

The Kittitas County Director of Public Works administers county-owned recreational facilities in Kittitas County, including Gladmar Park, Vantage Park, and Kid's Pond Park (Pless et al. 2015).

The Ellensburg Parks and Recreation Department operates and maintains 16 public parks, one public pool, and three recreation centers. Parks and recreation facilities that are in the vicinity of the proposed solar facilities are identified above in the recreation section (Section 4.2.6).

4.4.13.2 Solar Project Sites

As stated in Section 4.2.6, no recreational areas are located within or immediately adjacent to the proposed solar project sites. The recreation areas that are the nearest to each of the proposed solar project sites are identified below.

Camas Solar Project Site

The nearest designated potential recreation opportunity to the Camas Solar Project site is Olmstead Place State Park, located approximately 1.5 miles (“as the crow flies”) northeast of the solar project site.

Fumaria Solar Project Site

The nearest designated potential recreation opportunity to the Fumaria Solar Project site is the Iron Horse Trail, also known as the John Wayne Pioneer Trail. The proposed generation tie line associated with this site would parallel the trail, approximately 550 feet away between U.S. Route 97 and an existing substation.

Penstemon Solar Project Site

Similar to the Camas Solar Project site, the nearest designated potential recreation opportunity to the Penstemon Solar Project site is Olmstead Place State Park, located approximately 0.75 mile (“as the crow flies”) northeast of the solar project site.

Typha Solar Project Site

The closest recreation facility to the Typha Solar Project site is the Iron Horse Trail, across the Yakima River and I-90, approximately 1 mile ("as the crow flies") to the north of the proposed solar project site.

Urtica Solar Project Site

The closest recreation facility to the Urtica Solar Project site is Ellensburg's Irene Rinehart Riverside Park. The southernmost part of the park is located approximately 0.25 mile ("as the crow flies") northeast of the proposed solar project site, across the Yakima River on Umptanum Road.

4.4.14 Impacts to Parks and Other Recreational Facilities

As discussed in Section 4.2.6, overall there are no anticipated impacts on recreational facilities or dispersed recreational uses in Kittitas County or the Ellensburg area as a result of construction or operation of the five Columbia Solar Projects.

(e) Utilities;

4.4.15 Affected Environment for Utilities

The following sections describe the service providers for electricity and natural gas within Kittitas County and Ellensburg.

4.4.15.1 Kittitas County

Within Kittitas County, electricity services are provided by PSE and the Kittitas County PUD. PSE has been in business for 135 years and is headquartered in Bellevue, Washington. It serves approximately 4 million customers, including 1.1 million electric and 790,000 natural gas customers. Its service area includes about 6,000 square miles, primarily in the Puget Sound region of western Washington, and includes Kittitas (combined), Island (electric), King (combined), Kitsap (electric), Lewis (natural gas), Pierce (combined), Skagit (electric), Snohomish (natural gas), Thurston (combined), and Whatcom (electric) Counties. (PSE 2017a)

As shown in Table 4.4-21, PSE obtains equal amounts of its energy from hydroelectric and coal generation (36% and 35%, respectively), followed by natural gas generation (24%) (PSE 2017b).

Table 4.4-21. Puget Sound Energy 2014 Electricity Fuel Mix

Fuel Source	Percent
Hydroelectric	36
Coal	35
Natural Gas	24
Wind, Without Renewable Energy Credits (REC's)	3
Nuclear	1
Other[1]	1
Total	**100**

1. Biomass, landfill gas, petroleum, and waste.
Source: PSE (2017b).

The Kittitas County PUD is located at 1400 Vantage Highway in Ellensburg. As shown in Table 4.4-22, the PUD has over 4,500 electric customers using over 94,360,000 kilowatt hours (kWh) of electricity

annually. Residential customers account for 56.5% of the load and large commercial customers account for 25.2% of the load. As shown in Table 4.4-23, large hydroelectric generation makes up the vast majority (86.2%) of the PUD's generation sources. (Kittitas PUD 2016)

Table 4.4-22. Kittitas County PUD Electricity Use and Costs by Customer Class

Class of Service	Number of Customers	Total kWh by Class of Service	Revenue/kWh Rate ($)	Percent of Utility Load
Residential	3,717	53,327,394	0.1048	56.51
Residential Net Meters	61	583,901	0.1156	0.62
Small Commercial	315	6,781,698	0.1017	7.19
Large Commercial	14	23,766,291	0.0688	25.19
Irrigation	196	8,147,718	0.0962	8.63
Commercial Wind	1	1,716,500	0.0598	1.82
Street Lights	213	40,302	0.7756	0.04
Totals	**4,517**	**94,363,804**	**–**	**100.0**

Source: Kittitas PUD (2016).

Table 4.4-23. Kittitas County PUD Electric Generation by Fuel Source Mix

Fuel Source	Percent
Large Hydroelectric	86.21
Nuclear	10.08
Non-specified Purchases	2.25
Natural Gas	1.33
Biomass and Waste	0.13
Small Hydroelectric	0.00
Wind, Without Renewable Energy Credits (REC's)	0.00
Total	**100.0**

Source: Kittitas PUD (2016).

4.4.15.2 City of Ellensburg

The Ellensburg Energy Services Department, located at 501 N Anderson Street in Ellensburg, provides electricity and natural gas services. It is the only city in the State of Washington that has a municipal electric and gas utility. The department's Electric Utility Division was originally formed as a municipal electric utility in 1891, making it the oldest municipal electric utility in Washington State. The utility serves about 10,000 customers within the city limits, delivering approximately 25 average MW (aMW) annually over 50 miles of overhead conductor and 38 miles of underground cable. The utility purchases almost all of its power from the Bonneville Power Administration, and owns a small community renewable energy generation facility. The utility offers energy efficiency programs, including rebates to its customers (City of Ellensburg 2015).

The Natural Gas Utility Division serves about 5,000 customers, delivering approximately 7.4 million hundred cubic feet (CCF) annually over 115 miles of underground piping. The utility's service territory was established by the Washington Utilities and Transportation Commission (WUTC) and includes the city limits and surrounding areas. The utility purchases all of its natural gas supply from Shell Oil, using the Williams Pipeline. The utility offers energy efficiency programs, including rebates to its customers (City of Ellensburg 2015).

4.4.16 Impacts to Utilities

As discussed in Section 4.4.4, it is not anticipated that construction of the five Columbia Solar Projects would result in the permanent relocation or in-migration of any of the direct or indirect construction or operational workforces. Thus, there would be no impacts to utilities in Kittitas County or the Ellensburg area.

(f) Maintenance;

4.4.17 Affected Environment for Maintenance

The Kittitas County Public Works Department is located at 411 N Ruby Street in Ellensburg. It is one of Kittitas County's largest departments and maintains the county road system within unincorporated Kittitas County. The department is responsible for the engineering, construction, maintenance, and administration of the county road system, as defined in RCW 36.75–36.88. The county road system consists of approximately 565 miles of arterial roads and bridges (Kittitas County Public Works Department 2017).

The Ellensburg Public Works Department maintains approximately 80 miles of streets within city limits. The department has over 45 staff, including engineers, technicians, surveyors, draftsmen, heavy equipment operators, flaggers, mechanics, floodplain experts, traffic technicians, managers, accountants, planners, office assistants, and map specialists. For 2016, the department added a professional land surveyor (City of Ellensburg 2015).

4.4.18 Impacts to Maintenance

As discussed in Section 4.4.4, it is not anticipated that construction of the five Columbia Solar Projects would result in the permanent relocation or in-migration of any of the direct or indirect construction or operational workforces. Thus, there would be no impacts to maintenance in Kittitas County or the Ellensburg area.

(g) Communications;

Communications services provided in Kittitas County and Ellensburg are described below, including telephone, cell phone, television, and internet services.

4.4.19 Affected Environment for Communications

Fairpoint Communications supplies telephone services to approximately 1,149 square miles of the county, as well as DSL internet, pager, and alarm services (Kittitas County 2002). Charter Communications provides cable television services, DSL internet, and phone services. Cellular phone service is available from a variety of providers. Inland Internet provides phone services in Cle Elum, Roslyn, and Ronald (EFSEC 2007).

4.4.20 Impacts to Communications

As discussed in Section 4.4.4, it is not anticipated that construction of the five Columbia Solar Projects would result in the permanent relocation or in-migration of any of the direct or indirect construction or operational workforces. Thus, there would be no impacts to communications in Kittitas County or the Ellensburg area.

(h) Water/storm water;

4.4.21 Affected Environment for Water and Stormwater

4.4.21.1 Kittitas County

Table 4.4-24 summarizes the locations and characteristics of Group A water systems in Kittitas County. Five of those systems are in Ellensburg and the surrounding area, 14 systems are located in western Kittitas County, and two systems have unknown locations. However, the majority of water is provided by private wells for residential and agricultural uses throughout the county (Pless et al. 2015).

Table 4.4-24. Kittitas County Group A Water Systems

Facility	Provider	Description	Size
Ellensburg Area			
Grasslands Water System	Association Community Provider	• Eastern Ellensburg • Serves 260 residential persons with 75 total calculated connections • 81 total system connections • Effective system date of 1/1/1970	21,000 gallons
Millpond Mobile Manor	Investor Community Provider	• South of Ellensburg • Serves 245 residential persons with 105 total calculated connections • 105 total approved connections • Effective system date of 1/1/1970	N/A
Central Mobile Home Park	Private Community Provider	• Wilson Creek Road, north of Ellensburg • Serves 110 residential persons with 52 connections • 52 total approved connections • Effective since 1/1/1970	2,100 gallons
Vantage Water System	Investor Community Provider	• Serves 70 residential persons and 105 non-residential persons with 99 connections • 150 total approved connections • Effective since 1/1/1970	50,000 gallons
Thorp Water System	Kittitas County Water District No. 4, Special District Community Provider	• Serves 230 persons with 107 connections • 112 total approved connections • Effective since 7/1/1987	156,000 gallons
Western Kittitas County Area			
Evergreen Valley Water System	Evergreen Valley Utilities, Investor Community Provider	• Near or in Cle Elum • Serves 35 residential persons and 5 non-residential persons with 171 connections • 419 total approved connections • Effective since 3/2/2004	120,000 gallons
Elk Meadows Water System	Kittitas County Water District No. 5, Community Provider	• 141 Swallow Lane, Cle Elum • Serves 600 persons with 295 connections • 340 total approved connections • Effective since 1/1/1970	75,000 gallons
Sunlight Waters Water System	Kittitas County Water District No. 7, Special District Community Provider	• 1710 Sunlight Drive, Cle Elum • Serves 309 residential persons and 169 non-residential persons with 220 connections • 225 total approved connections • Effective since 1/1/1970	200,000 gallons

Facility	Provider	Description	Size
Reservoir Hill Water System	Reservoir Hill Maintenance Association, Private Community Provider	• South Cle Elum • Serves 33 residential persons with 21 connections • 25 total approved connections • Effective since 2/25/1999	20,000 gallons
Swiftwater Trailer Park	Private Community Provider	• South Cle Elum mobile home park • Serves 36 residential persons and 1 non-residential with 22 total calculated connections • 24 total approved connections • Effective system date of 1/1/1970	N/A
Sky Meadows Ranch Country Club WTR	Private Community Provider	• Southeast of Cle Elum • Serves 60 residential persons and 110 non-residential persons with 240 calculated connections • 360 total approved connections • Effective system date of 1/1/1970	160,000 gallons
Suncadia Resort	Investor Community Provider	• Northwest of Cle Elum and southwest of Ronald • Serves 70 residential persons and 903 non-residential persons with 666 total calculated connections • 3,785 total approved connections • Effective system date of 5/29/2008	1,070,000 gallons
Ronald Water System	Kittitas County Water District No. 2, Special District Community Provider	• Serves 225 persons with 117 connections • 150 total approved connections • Effective since 1/1/1970	125,000 gallons
Pine Loch Sun Beach Club Water System	Private Community Provider	• Northwest of Ronald • Serves 90 residential persons with 409 calculated connections • 439 total approved connections • Effective date of 1/1/1970	90,000 gallons
Driftwood Acres Maintenance Corporation	Association Community Provider	• Northwest of Ronald • Serves 60 residential persons with 117 total calculated connections • 120 total approved connections • Effective system date of 1/1/1970	100,000 gallons
Sun Island Maintenance Association	Association Community Provider	• Southeast of Easton • Serves 30 residential persons and 100 non-residential persons with 115 total calculated connections • an undetermined number of total connections • Effective system date of 1/1/1970	1,8000 gallons
Easton Water System	Easton Water District, Community Provider	• 141 Swallow Lane, Cle Elum • Serves 250 residential persons and 106 non-residential persons with 216 connections • 512 total approved connections • Effective since 1/1/1970	195,000 gallons
Snoqualmie Pass	Private – Snoqualmie Pass Utility District	• Well capacity of 385 gallons per minute • 3 reservoirs storing 565,000 gallons	1,361 acres

Facility	Provider	Description	Size
Sun Country Estates 1-2-3 Water System	Private Community Provider	• East of Yakima • Serves 215 residential persons and 16 non-residential persons with 215 total calculated connections • 300 total approved connections • Effective date of 1/1/1970	100,000 gallons
Location Unknown			
Grasslands Park	Private Community Provider	• Location Unknown • Serves 29 residential persons with 14 total calculated connections • 14 total approved connections • Effective system date of 12/20/2006	N/A
Wildwood 2 & 3 Water System	Private Community Provider	• Location unknown • Serves 45 residential persons and 48 non-residential persons with 37 total calculated connections • 78 total approved connections • Effective system date of 1/1/1970	45,000 gallons

Source: Pless et al. (2015).

Although it is not a publicly available water supply, the KRD provides water for agricultural irrigation throughout the Kittitas Valley, and its office is located in Ellensburg. Approximately two-thirds of all irrigated acreage in Kittitas County, approximately 60,000 acres, are serviced by the KRD's 330 miles of canals and laterals. It is the 6th largest irrigation district in Washington State. The canal starts at Lake Easton Dam and flows east to its terminus on the Turbine Ditch, where it spills to the Yakima River. Thirty siphons, the longest being 3,325 feet, and 11 tunnels help the canal keep as much elevation as possible. The KRD experienced major water shortfalls in 2001, 2005, and 2015. The KRD is funded by landowner assessments. Recently, more and more farmland has been subdivided for new houses, resulting in the number of landowners with KRD-assessed acres increasing over 30% in the last 10 years (KRD 2017a).

The Kittitas County Public Works Department provides flood control services throughout the county.

4.4.21.2 City of Ellensburg

The Ellensburg Public Works Department consists of the Engineering, Street, Water, Sewer, Stormwater, and Shop divisions. The Ellensburg Water Utility Division is located at 607 Industrial Way, in Ellensburg, and is responsible for monitoring, testing, repairing, and upgrading of the city's water sources and distribution system. The water utility serves over 4,700 customers, with 103 miles of underground pipe delivering over 1.4 billion gallons of water annually. The division maintains several deep wells and pump houses throughout the city and surrounding area. Reservoir facilities are located at Craig's Hill and the airport. Current capacity and plans for improvements would allow the city to accommodate future city water needs (City of Ellensburg 2015).

The Engineering and Stormwater Divisions are located at City Hall, 501 North Anderson Street, in Ellensburg. Stormwater is managed by approximately 2,400 catch basins and over 50 miles of underground pipe. The Ellensburg Stormwater Division/Utility permits the design and construction of public and private projects throughout the city, educates the public about water quality, performs maintenance on the public system, eliminates illicit discharges, holds public meetings, and meets the requirements of the National Pollutant Discharge Elimination System (NPDES) Stormwater Permit (City of Ellensburg 2015).

4.4.22 Impacts to Water and Stormwater

4.4.22.1 Water Use

Construction Impacts

During construction, water would be used to suppress fugitive dust during grubbing, clearing, grading, trenching, and soil compaction. In addition, non-toxic soil binding agents may be employed to help with soil stabilization during construction.

Construction activities for the five proposed Columbia Solar Projects are conservatively estimated to generate an average water demand of 100,000 gallons per day. The daily water demand estimate assumes that on an average construction day, 20 acres of the project sites are in active construction, requiring 10 continuous hours of water using five water trucks, assuming 4,000-gallon-capacity trucks. Construction time for the Columbia Solar Projects would require approximately 6 months, or 156 work days (Monday–Saturday), to complete. Based upon these parameters, the construction water demand for the proposed Columbia Solar Projects is very conservatively estimated to total 15.6 million gallons, or 47.87 acre-feet (1 acre-foot is equal to 325,851 gallons), or approximately 10 acre-feet per project.

TUUSSO has considered a number of water supply alternatives for construction purposes. Each of the solar project sites, except for the Fumaria Solar Project site, has on-site existing water allocations that TUUSSO may be able to use during construction. TUUSSO has also explored the use of greywater sources (including those in the Kittitas Valley) for construction, as water for construction activities can be of non-potable quality. However, greywater availability is limited in Kittitas County. Finally, TUUSSO has discussed with the City of Ellensburg the availability of municipal water for construction purposes. Based on this array of possible water sources, TUUSSO intends to use either on-site water or trucked in water from municipal water sources for all projects except the Fumaria Solar Project, and intends to truck in water for the Fumaria Solar Project from a municipal water source.

TUUSSO would also incorporate water conservation methods wherever possible. For example, water would not be used for concrete hydration on-site because the concrete is expected to be delivered to the site already hydrated. Less water-intensive methods of dust suppression are also under review, including use of soil stabilizers, tightly phasing construction activities, staging grading and other dust-creating activities, and/or compressing the entire construction schedule to reduce the time period over which dust-suppression measures would be required.

Operation Impacts

On an ongoing basis, water would be used for cleaning PV panels and controlling dust (less than 1 acre-foot per year per project site). Water would also be necessary to establish the tree/shrub visual buffers along portions of the Columbia Solar Projects, as well as the native vegetation throughout the project sites. Project landscaping would consist of native and drought-tolerant species. Once established, the species would not require ongoing irrigation. The irrigation needs for landscaping establishment are assumed to last for three consecutive years following installation.

Based on feedback from farmers familiar with growing conditions in Kittitas Valley (including landowners familiar with the conditions on the five Columbia Solar Project sites), assuming periodic irrigation for establishment purposes over a 3-year period, it is estimated that approximately 400 acre-feet of water per acre per year would be needed over this period to assure plant establishment on the project sites. These water needs are the same as the current water needs on the actively farmed project sites.

With respect to operational water supply, as with the construction water supply, TUUSSO has considered a number of alternatives. Each of the Columbia Solar Project sites, except for the Fumaria Solar Project site, has on-site existing water allocations that TUUSSO may be able to use during operation for irrigation purposes. Given the costs of trucking water from an external source to each of the sites, TUUSSO would likely only pursue such a water source for irrigation needs for the Fumaria Solar Project site. Given the limited water needed for cleaning PV panels, TUUSSO will likely truck in water from municipal water sources for all of the project sites for this purpose.

TUUSSO has incorporated water conservation methods into its operational water plan as well. Where feasible, TUUSSO would work with the current landowners to incorporate more efficient irrigation systems, such as drip lines, to water the trees and shrubs forming the visual buffers. TUUSSO has used native and drought tolerant species to ensure that the landscaping can be established quickly with water needs similar to current water usage, and once established, would not require any further watering except in extreme drought conditions. TUUSSO would also investigate using sprinkler systems on the Columbia Project sites to irrigate the native ground cover (instead of the current flood irrigation methods used on the project sites). Any water services, whether on-site or off-site, utilized for the operation of the Columbia Solar Project sites would provide sufficient capacity to provide legally certificated water for the use and purpose of these project, without compromise to other users.

4.4.22.2 Stormwater

Construction Impacts

Construction of the five Columbia Solar Projects has the potential to generate water pollutants during the construction phase unless best management practices (BMPs) are implemented. Stormwater runoff from the solar project sites could contain pollutants such as soils and sediments that are released during grading activities, as well as chemical and petroleum-related pollutants due to spills or leaks from heavy equipment and machinery. Other common pollutants that may result from construction activities include solid or liquid chemical spills; concrete and related cutting or curing residues; wastes from paints, sealants, solvents, detergents, glues, acids, lime, plaster, and cleaning agents; and heavy metals from equipment.

Hazardous materials (such as fuels, solvents, and coatings, among others) associated with the Columbia Solar Projects construction activities would be stored and used in accordance with the manufacturer's specifications and applicable hazardous material regulations. In addition, spill kits would be required for all construction equipment in order to immediately manage any spills from fueling or equipment breakdown. However, soil disturbances (from construction activities associated with the limited site grading, mounting of the solar panels, equipment installation, electrical conduit trenching, and scraping for the all-weather access roads) could cause soil erosion and the eventual release of sediment into stormwater runoff.

The preliminary Stormwater Pollution Prevention Plan (SWPPP) describes a number of BMPs to assure compliance with state water quality standards, including the following:

- Preserving natural vegetation.
- Establishing buffer zones to protect existing wetlands and to relieve potential downstream impacts.
- Providing a single, stabilized construction entrance to prevent soil and sediment from tracking off the site.
- Controlling flow rates leaving the site via full on-site dispersion.

- Installing a silt fence at all areas downslope of disturbed areas, and upslope of existing waterbodies.
- Stabilizing soils when necessary, including the use of plastic covering to protect soil stockpiles.
- If necessary, utilizing a wheel wash at the site exit if sediment may be tracked off-site.

The installed BMPs would be visually monitored at least once per week, and within 24 hours of any stormwater or non-stormwater discharge from the site. Turbidity sampling would also be required at least once per week as applicable to ensure that the Columbia Solar Projects do not exceed 25 nephelometric turbidity units and a transparency of less than 33 cm.

Obtaining coverage under, and ensuring compliance with, the Construction General Permit requirements (including implementation of appropriate BMPs and consistent record keeping of the SWPPP) would ensure that temporary water quality impacts associated with construction activities would not cause any significant downstream or off-site impacts.

Operation Impacts

Operation of the five proposed Columbia Solar Projects would include infrequent site visits for inspection and maintenance. Maintenance activities would include washing the PV panels to remove accumulated airborne dust and debris using a truck with a water tank and sprayer, and mowing or otherwise managing the native vegetation to maintain buffers around the site and vegetation height within the site. Panel washing would occur one to four times per year, depending on the accumulation of dust on the surfaces of the panels, and vegetation management would occur at a similar frequency based on rainfall and yearly plant growth.

Due to annual maintenance activities, pollutants such as pesticides, trash, and oil/grease are anticipated to be generated from project operation. However, because the project sites would be unmanned and would only be subject to maintenance a couple of times per year, the potential for pollutants would be greatly reduced when compared to a typical commercial or industrial land use. No Columbia Solar Projects–generated pollutants are expected to impact downstream receiving waters, and project flows would not discharge to any receiving waterbody that is listed for water quality impairment.

As the five Columbia Solar Projects would not generate any pollutants of concern, impacts would be less than significant. However, BMPs are incorporated into the projects to address water quality impacts on site and at downstream receiving waters. The five proposed solar projects would include vegetation throughout the sites, such that full dispersion and infiltration would treat and control the runoff for the area within the panel arrays.

Other water quality BMPs include: 1) protecting slopes and channels through the preservation of existing site drainage patterns; 2) the absence of chemical storage and pollution generating surfaces on-site; 3) maintaining BMPs regularly, including annual inspections of the entire site and maintenance of inspection records; 4) regular maintenance of any bare soil or gravel surfaces, such as the all-weather access roads, to ensure that they are properly stabilized; and 5) training for Columbia Solar Projects operators and contractors, and the provision of educational materials for project personnel, regarding housekeeping practices that prevent pollutant loading in on-site runoff and BMP maintenance.

Further, any cleaning agents or additives used to clean the PV panels would be biodegradable, non-toxic, and non-hazardous to plants, animals, and groundwater. Therefore, the use of water to clean the PV panels would have a less than significant impact on surface water and groundwater quality.

(i) Sewer/solid waste;

4.4.23 Affected Environment for Sewer and Solid Waste

This section describes the sanitary sewer and solid waste facilities in Kittitas County and Ellensburg.

4.4.23.1 Sanitary Sewer

Kittitas County

As shown in Table 4.4-25, there are three central sanitary sewer facilities in Kittitas County, one each in Vantage, Ronald, and Snoqualmie (Pless et al. 2015). However, most of the residential and other sewerage is treated on-site with private septic systems.

Table 4.4-25. Kittitas County Sanitary Sewer Facilities

Facility	Provider	Description	Size
Vantage Wastewater Collection and Treatment System	Vantage Water District No. 6	• Serves Vantage LAMIRD, wastewater collection and treatment system • capacity of about 87,000 gallons per day • Major upgrades completed in 2013	80 residences
Ronald Treatment Facilities	Kittitas County Water District No. 2	• Single lift station that conveys wastewater flows from the Water District area to the City of Roslyn sewer system	37 acres
Snoqualmie Pass Utility District .	Snoqualmie Pass Utility District	• Average daily flow approximately 0.18 million gallons per day (mgd) • Permitted treatment and discharge capacity of 0.868 mgd • Storage of excess flows of about 30 million gallons	1,361 acres

Source: Pless et al. (2015).

City of Ellensburg

The Ellensburg Public Works Department provides sewer and solid waste services within city limits. The Wastewater Utility Division is responsible for processing, testing, and final discharge of wastewater produced within Ellensburg and serves over 3,900 customers. Approximately 3.85 million gallons per day of sewer and wastewater are delivered via 79 miles of underground pipe within the city. A wastewater treatment plant is located at 2415 Canyon Road, in Ellensburg. The plant has a lab, which maintains compliance with all Ecology regulations. Current capacity and plans for improvements would allow the city accommodate future sanitary sewer needs (City of Ellensburg 2015).

4.4.23.2 Solid Waste and Recycling

Table 4.4-26 summarizes the solid waste and recycling facilities and services that are provided by Kittitas County Solid Waste, Waste Management of Ellensburg, and the city of Kittitas Solid Waste Service. Kittitas County Solid Waste provides solid waste services for unincorporated areas within the county. It operates several transfer stations, a construction and demolition debris landfill (CDL), and has one closed landfill (Pless et al. 2015).

Kittitas County manages Ryegrass Landfill, the only municipal landfill in the county located on a 640-acre parcel approximately 18 miles east of Ellensburg. Ryegrass Landfill does not accept general solid waste, only construction and demolition debris. Municipal solid waste is transferred from the county transfer

stations to the Greater Wenatchee Regional Landfill, a privately owned and operated facility located in East Wenatchee in Douglas County (EFSEC 2007).

Table 4.4-27 summarizes the quantities of waste and recyclables managed in the county in 2014. Ellensburg facilities managed 21,823 tons of solid waste in 2014 and Cle Elum facilities managed 6,681 tons (Pless et al. 2015).

In 2009, Kittitas County started yard waste and compost facility operations. Yard waste is accepted at each of the county-owned transfer stations, at a reduced fee if the yard waste is separated from other wastes. This material is then ground up and placed into wind rolls. After heat, moisture, and microorganisms break down the organic material into compost, the compost is screened and ready for use as a fertilizer and soil amendment (Pless et al. 2015).

Table 4.4-26. Kittitas County Waste and Recycling Facilities (2014)

Facility	Location
Ellensburg Area	
Ellensburg Scale House (Storage)	801 Industrial Way, Ellensburg
Transfer Station:	
• Transfer Station Building	1001 Industrial Way, Ellensburg
• Scale House Building	1001 Industrial Way, Ellensburg
Ellensburg Transfer Station and Compost Facility:	
• Transfer Station Office	925 Industrial Way, Ellensburg
• Transfer Station Shop	925 Industrial Way, Ellensburg
Solid Waste Buildings:	
• Ryegrass Equipment Storage	25900 Vantage Highway, Ellensburg
• SW 400-square-foot building	25900 Vantage Highway, Ellensburg
Cle Elum Area	
Solid Waste Buildings:	
• Cle Elum Scale House	Highway 903, Cle Elum
• Cle Elum Bunker Building	Highway 903, Cle Elum
• Cle Elum Storage	Highway 903, Cle Elum
Transfer Station – Cle Elum:	
• MRW – Cle Elum	50 No. 5 Mine Road, Cle Elum
• MRW – Ellensburg	50 No. 5 Mine Road, Cle Elum
• Office/Administration Building	50 No. 5 Mine Road, Cle Elum
• Cle Elum Scale House	50 No. 5 Mine Road, Cle Elum
Construction and Demolition Debris	
Ellensburg CDL	
Cle Elum CDL	
Ryegrass CDL	
Yard Waste	
Ellensburg Yard Waste	
Cle Elum Yard Waste	

Source: Pless et al. (2015).

Table 4.4-27. Kittitas County Waste and Recycling Facilities and Quantities (2014)

Type of Facility	Units Managed	Unit of Measurement
Solid Waste		
Ellensburg Garbage	21,823	Tons
Cle Elum Garbage	6,681	Tons
Construction and Demolition Debris		
Ellensburg CDL	1,529	Tons
Cle Elum CDL	1,125	Tons
Ryegrass CDL	9,779	Cubic Yards
Yard Waste and Other		
Ellensburg Yard Waste	1,847	Tons
Cle Elum Yard Waste	276	Tons
Compost Sold	1,125	Tons
Septage	375,398	Gallons

Source: Pless et al. (2015).

4.4.24 Impacts to Sewer and Solid Waste

None of the five Columbia Solar Project facilities would have on-site toilet and septic or sewer system connections. The projects would follow the applicable state and/or county guidelines with respect to relief stations for employees, when employees are on-site, via the use of portable lavatories.

As discussed in Section 4.4.4, it is not anticipated that construction of the five Columbia Solar Projects would result in the permanent relocation or in-migration of any of the direct or indirect construction or operational workforces. Thus, there would be no impacts to sewer or solid waste in Kittitas County or the Ellensburg area.

(j) Other governmental services.

Other governmental services described below include hospitals and other medical centers, and other general county and city governmental services.

4.4.25 Affected Environment for Other Governmental Services

4.4.25.1 Hospitals and Health Care

Kittitas Valley Community Hospital is located at 603 South Chestnut Street and East Manitoba, in Ellensburg, and is managed by Hospital District No. 1. It provides Level IV trauma service, with a limited number of specialists available, and 24-hour emergency care (Pless et al. 2015). Patients with head injuries, severe burns, or trauma are transported to other facilities, such as Harborview Medical Center in Seattle. Victims of less severe accidents may be transported to Yakima, to Virginia Mason Memorial (formerly Yakima Valley Memorial Hospital) or Yakima Regional Medical Center (a 214-bed facility), for hospitalization and treatment. A heliport is located on the roof of the hospital, and a helicopter is available for emergency responses (EFSEC 2007).

The hospital has 25 beds and over 250 full-time equivalent staff, including (Hospital-Data 2017):

- Physicians – 8.50
- Registered professional nurses – 60.00
- Nurse practitioners – 2.00

- Physician assistants – 2.25
- Diagnostic radiology technicians – 7.70
- Medical laboratory technologists – 6.45
- Dieticians – 10.00
- Physical therapists – 4.00
- Registered pharmacists – 2.00
- Respiratory therapists – 4.70
- Other salaried personnel – 142.00
- Miscellaneous other staff positions

Kittitas Valley Healthcare (KVH) Urgent Care – Cle Elum (also known as the Cle Elum Medical Center and Urgent Care Facility) is located at 201 Alpha Way, in Cle Elum. It is managed by KVH, with support from Kittitas County Public Hospital District No. 2. The urgent care center is staffed by licensed clinicians that provide the following non-emergency healthcare services on a walk-in basis (Pless et al. 2015; KVH 2017):

- Fever, earache, sore throat
- Flu-like symptoms, colds
- Vomiting, nausea, diarrhea
- Simple or suspected bone fractures, strains, and sprains
- Cuts that may need stitches, other simple wounds
- Rashes, minor allergic reactions
- Painful or burning urination
- Non-severe asthma attacks

4.4.25.2 Other Governmental Services

Kittitas County provides governmental services additional to those described above, including and assessor's office, community development services, coroner (including prosecutor and public defender), courts, noxious weed control, other administrative functions (e.g., human resources and information technology), and public health. The county also has an emergency animal shelter at 901 East 7th Avenue, in Ellensburg. The shelter is managed by the county Facilities and Maintenance Department (Pless et al. 2015). As described previously, Kittitas County also manages the Kittitas County Fair that is held annually on Labor Day weekend.

In addition to the city of Ellensburg governmental services identified above, the city also provides community development and other, finance, and human resources services.

4.4.26 Impacts to Other Governmental Services

During construction, there could be some injuries of the types that commonly occur on construction sites. Such injuries could require visits to the hospital for treatment. Because of the size and type of construction, it is assumed that the number of injuries would be small and easily treated with existing emergency response teams and hospitals and, thus, that there would be no impacts to emergency and medical services.

As discussed in Section 4.4.4, it is not anticipated that construction of the five Columbia Solar Projects would result in the permanent relocation or in-migration of any of the direct or indirect construction or operational workforces. Thus, there would be no impacts to other governmental services in Kittitas County or the Ellensburg area.

(5) The application shall compare local government revenues generated by the project (e.g., property tax, sales tax, business and occupation tax, payroll taxes) with their additional service expenditures resulting from the project; and identify any potential gaps in expenditures and revenues during both construction and operation of the project. This discussion should also address potential temporal gaps in revenues and expenditures.

4.4.27 Affected Environment for Local Government Revenues

The following sections summarize the overall budgets, including revenues and expenditures, for Kittitas County and Ellensburg. The types and rates of taxation are described above in Section 4.4.5.

4.4.27.1 Kittitas County Annual Budget

The total Kittitas County budget was $91,778,331 for 2016. The two biggest funds were the General Fund with $31,843,159 (35%) and County Roads with $25,623,120 (32%) (Pless et al. 2015).

As shown in Table 4.4-28, the biggest source of revenues in the county are taxes, at $21,733,363 or 24% of the total county budget. The next biggest revenue source was Intergovernmental Revenues at $13,845,040 or 15% of the total budget. The Intergovernmental Revenues are funds received from other governments for grants, charges for services, and payment in lieu of taxes (Pless et al. 2015).

The total Kittitas County expense budget was 27% or $25,183,661 Personnel Services, which are salary and benefits for county employees in the entire county. The Services and Charges was 25% of the budget or $23,027,370 (Pless et al. 2015).

Table 4.4-28. Kittitas County 2016 Annual Budget Summary

	General Fund	Special Revenue Funds	Debt Service Funds	Capital Project Funds	Proprietary Funds	Trust Funds	Totals
Beginning Fund Balance	9,882,217	22,454,097	323,427	500,000	6,341,243	7,175	39,508,159
Plus Operating Revenue							
• Taxes	13,106,215	8,027,148	–	600,000	–	–	21,733,363
• Licenses and Permits	142,500	454,551	–	–	1,223,000	–	1,820,051
• Intergovernmental	3,354,057	9,576,716	–	–	914,267	–	13,845,040
• Charges and Fees	1,974,333	1,320,300	–	–	4,067,801	–	7,362,434
• Fines and Penalties	1,563,400	20,000	–	–	10,000	–	1,593,400
• Miscellaneous	1,638,937	386,434	1,000	500	2,073,535	3	4,100,409
Total Operating Revenue	**21,779,442**	**19,785,149**	**1,000**	**600,500**	**8,288,603**	**3**	**50,454,697**
Less Operating Expenses							
• Personnel Services	14,791,944	8,160,823	–	–	2,230,894	–	25,183,661
• Supplies	936,287	3,279,289	–	–	889,793	500	5,105,869
• Services	5,045,304	13,326,465	–	–	4,655,601	–	23,027,370
• Intergovernmental	443,251	2,337,370	–	–	22,861	–	2,803,482
• Capital Outlay	529,915	541,869	–	–	1,584,000	–	2,655,784

	General Fund	Special Revenue Funds	Debt Service Funds	Capital Project Funds	Proprietary Funds	Trust Funds	Totals
Total Operating Expenses	**21,746,701**	**27,645,816**	**–**	**–**	**9,383,149**	**500**	**58,776,166**
Plus Non-Operating Revenues	181,500	596,642	722,333	–	315,000	–	1,815,475
Less Non-Operating Expenses	1,907,805	523,255	822,833	513,595	627,574	–	4,395,062
Ending Fund Balance	8,188,653	14,666,817	223,927	586,905	4,934,123	6,678	28,607,103

Source: Pless et al. (2015).

As shown in Table 4.4-29, the Kittitas County General Fund is made up of 36 different departments. Most of those departments are not self-supporting (i.e., they don't generate enough income to cover their expenses).

Table 4.4-29. Kittitas County General Fund – Revenue by Department (2016)

Account/Department	2016 Adopted Budget ($)	Percent of General Fund Total
0 Fund Balance	9,882,217	31.0
10 Assessor	195	0.0
11 Auditor	546,975	1.7
12 Board of Equalization	–	0.0
13 Fire Marshal	164,020	0.5
15 Clerk	245,195	0.8
16 Commissioners	6,775	0.0
17 Information Technology	1,327	0.0
18 WSU Extension	505	0.0
20 Communications	102,000	0.3
21 Judge – Superior Court	44,255	0.1
22 Juvenile	125,220	0.4
23 Law Library	13,900	0.0
24 Lower District Court	1,014,850	3.2
25 Facilities Maintenance	333,437	1.0
26 Non-Departmental	848,939	2.7
27 Coroner	15,210	0.0
29 Prosecutor	232,837	0.7
30 Sheriff	698,937	2.2
31 Treasurer	14,183,179	44.5
32 Upper District Court	654,203	2.1
33 Pest and Disease Control	45,000	0.1
34 Conference of Governments	150	0.0
35 Flood Control	–	0.0
37 Emergency Management Services	67,301	0.2
38 Human Resources	5,100	0.0

Account/Department	2016 Adopted Budget ($)	Percent of General Fund Total
39 Admissions Tax	100,000	0.3
40 Criminal Justice/Law Justice-	1,658,235	5.2
43 Declaration of Emergency	–	0.0
45 Historical Document Program	11,404	0.0
46 Current Use (Open Space)	1,600	0.0
47 Upper County Groundwater Study	–	0.0
60 Computer Equipment Replacement	–	0.0
109 Event Center	840,193	2.6
Totals	**31,843,159**	**100.0**

Source: Pless et al. (2015).

4.4.27.2 City of Ellensburg Biennial Budget

The Ellensburg's total budget was $102,136,167 in 2015 and $86,433,266 in 2016. Excluding the fund balance, Ellensburg's 2015–2016 biennial budget totaled $76,496,321 for 2015 and $62,918,697 for 2016. As shown in Table 4.4-30, the greatest sources of revenue in 2016 were charges for services ($38,562,972), taxes ($11,644,406), and miscellaneous ($4,004,422). The greatest sources of expenditures were supplies ($15,219,063), services ($12,856,451), and salaries ($11,900,118). However, combined salaries and benefits totaled $17,420,119 (City of Ellensburg 2015).

Table 4.4-30. City of Ellensburg 2016 Annual Budget Summary

Revenues and Expenditures	Totals
Revenues:	
• Taxes	11,644,406
• Licenses and Permits	380,750
• Intergovernmental	824,629
• Charges for Services	38,562,972
• Fines and Penalties	289,400
• Miscellaneous	4,004,422
Total Revenues	**55,706,579**
Expenditures:	
• Salaries	11,900,118
• Benefits	5,520,001
• Supplies	15,219,063
• Services	12,856,451
• Intergovernmental	1,452,668
• Capital Outlay	3,841,022
• Debt Services	2,424,545
• Interfund Payments	5,556,988
Total Expenditures	**58,770,856**
Total Other Sources (Uses)	$939,000
Total Sources Less Uses	-2,125,277

Source: City of Ellensburg (2015).

Table 4.4-31 summarizes the city budget by fund for 2016. The funds with the highest budgets included the Lights Division with $22,319,153 or 25.8% of the total budget, the General Fund with $15,943,266 or 18.4%, and the Natural Gas Utility Division with $9,904,400 or 11.5% of the budget (City of Ellensburg 2015).

Table 4.4-31. City of Ellensburg City Budget by Fund (2016)

Fund	2016 Adopted Budget ($)	Percent of Total Budget
General Fund	15,943,266	18.4
Street Fund	1,926,189	2.2
Arterial Street	1,313,059	1.5
Traffic Impact	228,700	0.3
Ellensburg Transit	253,954	0.3
Criminal Justice	985,679	1.1
Drug Fund	9,745	0.0
Sales Tax	4,634,383	5.4
CATV Operations	127,536	0.1
CATV Capital	47,603	0.1
Police Equipment	57,077	0.1
Park Acquisition	231,205	0.3
Lodging Taxes	756,913	0.9
Geddis	142,979	0.2
Special Projects	4,205	0.0
Maintenance Debt	255,555	0.3
Library Bond	201,084	0.2
LID Guarantee	45,497	0.1
2010 Maintenance Bond	50	0.0
Capital Projects	33,471	0.0
Sidewalk	451,659	0.5
Stormwater	1,095,701	1.3
Telecommunications	216,426	0.3
Gas	9,904,400	11.5
Light	22,319,153	25.8
Water	5,927,371	6.9
Sewer	6,573,944	7.6
Shop	6,705,920	7.8
IT	1,390,049	1.6
Health Insurance	2,780,550	3.2
Risk Management	1,156,122	1.3
Library Trust	295,849	0.3
Hal Holmes	0	0.0
Fire Relief and Pension	417,972	0.5
Totals	**86,433,266**	**100.0**

Source: City of Ellensburg (2015).

Ellensburg's General Fund revenues were projected to increase slightly from 2014, including up to $14,603,822 for 2015 and $13,213,933 for 2016. Total projected tax revenues (e.g., property taxes, sales taxes, business and occupation taxes, and utility taxes) in the General Fund were $6,223,288 for 2015

and $6,386,684 for 2016. Combined with the projected carryover from 2014, the total available resources in the General Fund were projected to be $17,610,524 for 2015 and $15,943,266 for 2016 (City of Ellensburg 2015).

(6) To the degree that a project will have a primary or secondary negative impact on any element of the socioeconomic environment, the applicant is encouraged to work with local governments to avoid, minimize, or compensate for the negative impact. The term "local government" is defined to include cities, counties, school districts, fire districts, sewer districts, water districts, irrigation districts, or other special purpose districts.

4.4.28 Impacts to Local Government Revenues

Impacts to tax revenues are discussed in Section 4.4.6. Because of the benign nature of solar project facilities, they do not impose noticeable additional demands on local government services. Thus, property, sales, and other tax revenues generated by the five Columbia Solar Projects would meet or exceed any additional demands that the projects would put on government services in Kittitas County or the Ellensburg area and there would be no impacts.

As discussed in Section 4.4.4, it is not anticipated that construction of the five Columbia Solar Projects would result in the permanent relocation or in-migration of any of the direct or indirect construction or operational workforces. Thus, there would be no impacts to local government revenues in Kittitas County or the Ellensburg area.

4.5 References – Chapter 4

Airbnb. 2017. Available at: www.airbnb.com. Accessed July 2017.

Akers, John, and Fennelle Miller. 2008. Washington Archaeological Site Inventory Form, 45KT2866, [redacted]. On file, Washington State Department of Archaeology and Historic Preservation, Olympia, Washington.

Amara, Mark. 2004a. *EQIP Projects in Kittitas County, Washington: OAHP Log no: 102003-23-NRCS (Graaff, Hanson), OAHP Log no: 022304-08-NRCS (Mellegaard, Brunson)*. U. S. Department of Agriculture, Natural Resources Conservation Service.

———. 2004b. *EQIP Projects in Kittitas County, Washington: Katzele; Laub Farm; Jack Wheatley/Level Best Farms; Cooke Coleman LLC, Gardinier, Kayser, and Morgan; Davis, Duncan, Hunter & Titus; Anderson, Edwards, Gregerich, Mason, Mihelich and Poulsens*. OAHP Log Nos: 102003-23-NRCS, 042S04-0S-NRCS, 050704-09-NRCS, 022304-08-NRCS, 060304-06-NRCS, 062404-0-NRCS. Natural Resources Conservation Service.

———. 2005a. *NRCS Don Rinehart EQIP 2005 Site Identification Survey in Kittitas County, Ellensburg, Washington*. NRCS EQIP Contract No: 7405465A141. Natural Resources Conservation Service.

———. 2005b. *NRCS Extreme Farms LLC EQIP 2005 Cultural Resources Site Identification Survey in Kittitas County, Washington*. NRCS Contract No: 7405463A116. Natural Resources Conservation Service.

———. 2005c. *NRCS John Smith EQIP 2005 Site Identification Survey in Kittitas County, Washington*. NRCS Contract No: 7405465A052. Natural Resources Conservation Service.

———. 2006a. *NRCS Jeff Brunson Farm EQIP 2006 Cultural Resources Site Identification Survey in Kittitas County, Ellensburg, Washington.* U. S. Department of Agriculture, Natural Resources Conservation Service.

———. 2006b. *NRCS Double DJ Farms EQIP 2006 Cultural Resources Site Identification Survey in Kittitas County, Washington*. NRCS EQIP Contract No: 7405466A105. Natural Resources Conservation Service.

———. 2015. *NRCS Bland Environmental Quality Incentives Program Cultural Resources Site Identification Survey in Kittitas County, Washington*. NRCS EQIP Contract No: 740546150VS. Natural Resources Conservation Service.

———. 2016. *KCCD Three Bar G Ranch Sprinkler Conversion Cultural Resources Site Identification Survey in Kittitas County, Washington*. DAHP Number: 121415-08-WSCC. Natural Resources Conservation Service.

Ames, K. M., D. E. Dumond, L. R. Galm, and R. Minor. 1998. Prehistory of the Southern Plateau. In *Handbook of North American Indians*, *Volume 12: Plateau*, edited by Deward E. Walker, pp. 103–119. Washington, D.C.: Smithsonian Institute.

Ames, Kenneth M., and Alan G. Marshall. 1980–1981. Villages, Demography and Subsistence Intensification on the Southern Columbia Plateau. *North American Archaeologist* 2:25–52.

Anderson, Frederick C., and Bill R. Roulette. 2008. *Letter Report: Results of an Archaeological Survey of the Ellensburg-Columbia No.1 Transmission Line, Kittitas County, Washington*. Report No. 692b. Prepared for Bonneville Power Administration. Portland, Oregon: Applied Archaeological Research, Inc.

Babcock, William, Timothy E. Eckert, and Gary D. Williams. 1986. *Yakima River Basin Water Enhancement Project Historical Resource Survey (Class I); Volume I: Overview and Management Recommendations, Volume II: Site and Survey Compilation*. Prepared for U.S. Department of the Interior. Missoula, Montana: Heritage Research Center.

Becker, Anisa Q., and Emily K. Ragsdale. 2010. *Results of Archaeological Investigations of the Wenatchee Facilities Modification Project – Plymouth to Zillah and Yakima to Wenatchee, Yakima, Benton, Kittitas, and Chelan Counties, Washington.* Prepared for Williams Gas Pipeline. Historical Research Associates, Inc.

Becker, Paula. 2005. Kittitas County -- Thumbnail History. HistoryLink.org Essay 7484. Available at: http://www.historylink.org/index.cfm?displaypage=output.cfm&file_id=7484. Accessed March 2017.

Bicchieri, Barbara. 1994. *Olmstead Place State Park Survey Report*. Ellensburg, Washington: Central Washington University.

Binford, Lewis R. 1980. Willow Smoke and Dogs' Tails: Hunter-Gatherer Settlement Systems and Archaeological Site Formation. *American Antiquity* 45:4–20.

Boening, Rose M. 1919. History of Irrigation in Washington State: The State Epoch of Canal Building. *Washington Historical Quarterly* 10(1):21–45.

Bowden, Bradley, and Derek Shaw. 2009. *Olmstead Place State Park Pioneer Cabin Site Archaeological Investigation: Addendum to the Olmstead Place State Park Pioneer Cabin Historic Structures Report*. Prepared for Washington State Parks and Recreation Commission. Seattle, Washington: Historical Research Associates, Inc.

Central Washington University. 2017. Quick Facts. Available at: http://www.cwu.edu/about/quick-facts. Accessed August 14, 2017.

Chapman, Judith S., and John L. Fagan. 1999. *Cultural Resources Survey of Irrigation Features Within the Proposed Level 3 Fiber Optic Line in Kittitas and Yakima Counties, Washington*. Letter Report No. 326. Prepared for Parsons Brinckerhoff Quade & Douglas, Inc. Portland, Oregon: Archaeological Investigations Northwest, Inc.

City of Ellensburg. 2015. 2015 – 2016 Biennial Budget, City of Ellensburg, Washington. Available at: https://ci.ellensburg.wa.us/DocumentCenter/View/4329. January 30.

Cleveland, Greg, and Hank Fraser. 2000. *Safe Access for Salmonids on Lower Wilson Creek*. Toppenish, Washington: Yakama Nation Department of Natural Resources and Yakama Nation Fisheries Program.

Cohen, Fay G. 1986. *Treaties on Trial: The Continuing Controversy over Northwest Indian Fishing Rights.* Seattle: University of Washington Press.

CountyOffice. 2017. Kittitas County RV Parks. Available at: http://www.countyoffice.org/wa-kittitas-county-rv-park/. Accessed May 24, 2017.

Curtis, Edward S. 1911. *The North American Indian*. Vol. 7. Norwood, Massachusetts: Plimpton Press.

Daugherty, Richard. 1956. Archaeology of the Lind Coulee Site, Washington. *Proceedings of the American Philosophical Society* 100(3):374–386.

DePuydt, Raymond. 1990. *A Cultural Resources Survey Along Puget Sound Power and Light's Proposed Upgrade of the Wanapum-Hyak Electrical Transmission Line.* Eastern Washington University Reports in Archaeology and History 100-73. Cheney, Washington: Archaeological and Historical Services, Eastern Washington University.

Emerson, Stephen. 1995. *Cultural Resources Surveys of Nine Yakima Fish Production Project Phase II Fish Screen Sites, Kittitas and Yakima Counties, Washington*. Short Report 502. Prepared for Bonneville Power Administration. Cheney, Washington: Archaeological and Historical Services, Eastern Washington University.

———. 2014. *Cultural Resources Survey for the Kittitas County No. 6 Road Improvements Project, Kittitas County, Washington*. Short Report 1207. Prepared for J-U-B Engineers. Cheney, Washington: Archaeological and Historical Services, Eastern Washington University.

Fagan, John L., Terry L. Ozbun, Julie Schablitsky, Judith S. Chapman, Jo Reese, David A. Ball, and Bonnie J. Mills. 1999. *Cultural Resources Survey of Level 3's Proposed Fiber Optic Line from Seattle to Boise: Washington Segment, Non-Federal Lands*. Report No. 172. Prepared for Parsons Brinckerhoff Quade & Douglas Inc. Portland, Oregon: Archaeological Investigations Northwest, Inc.

Flenniken, J. Jeffrey, and Pam Trautman. 2004. *Archaeological Survey of the Wild Horse Wind Project Area, Kittitas County, Washington*. Prepared for Sagebrush Power Partners, Inc. Pullman, Washington: Lithic Analysts.

Galm, Jerry R., and Stan Gough. 2000. Site 45KT1362, a c. 10,000 Yr BP Occupation in Central Washington. *Current Research in the Pleistocene* 17:29–31.

Galm, Jerry R., Glenn D. Hartmann, Ruth A. Masten, and Garry Owen Stephenson. 1981. *A Cultural Resources Overview of the Bonneville Power Administration's Mid-Columbia Project, Central Washington*. Bonneville Cultural Resources Group, Eastern Washington University Reports in Archaeology and History 100-16. Cheney, Washington: Archaeological and Historical Services, Eastern Washington University.

General Land Office (GLO). 1884. *Township 17 North, Range 18 East, Willamette Meridian, Cadastral Survey*. Washington, D.C.: Bureau of Land Management, United Stated Department of the Interior.

———. 1884. *Township 17 North, Range 19 East, Willamette Meridian, Cadastral Survey*. Washington, D.C.: Bureau of Land Management, United Stated Department of the Interior.

———. 1884. *Township 18 North, Range 18 East, Willamette Meridian, Cadastral Survey*. Washington, D.C.: Bureau of Land Management, United Stated Department of the Interior.

GolfNow. 2017. Suncadia Resort - Rope Rider Golf Course. Website. https://www.golfnow.com/courses/1504475-suncadia-resort-rope-rider-golf-course-details. Accessed June 20, 2017.

Grant County Public Utility District (PUD). 2017. Vantage Boat Launch. Available at: http://www.grantpud.org/recreation/river-access/vantage. Accessed June 20, 2017.

Green, Kellie. 2007. *NRCS Taylor Ranches LLC Environmental Quality Incentives Program EQIP 2005 Site Identification Survey in Kittitas County, Washington*. NRCS Contract No. 7405465A609. Natural Resources Conservation Service.

Hartmann, Glenn D. 1997. *Cultural Resources Surveys of the Fogarty Fishscreen and John Cox Fishscreen Facilities, Kittitas and Yakima Counties, Washington*. Short Report 577. Prepared for Bonneville Power Administration. Cheney, Washington: Archaeological and Historical Services, Eastern Washington University.

Hartt, Jack. 1989. *Olmstead Place State Park Interpretive Master Plan*. Olympia, Washington: Washington State Parks and Recreation Commission.

Hollenbeck, Jan L., and Susan L. Carter. 1986. *A Cultural Resource Overview: Prehistory and Ethnography, Wenatchee National Forest*. U.S. Department of Agriculture, Wenatchee National Forest, Wenatchee, Washington.

Holstine, Craig (editor). 1994. *An Historical Overview of the Wenatchee National Forest, Washington.* Report Number: 100-80. Prepared for Wenatchee National Forest. Cheney, Washington: Archaeological and Historical Services, Eastern Washington University.

Hospital-Data. 2017. Kittitas Valley Community Hospital - Ellensburg, WA. Available at: http://www.hospital-data.com/hospitals/KITTITAS-VALLEY-COMMUNITY-HOSPITAL-E396.html. Accessed June 24, 2017.

Hoyt, Bryan, Katherine F. Wilson, and Paula Johnson. 2011. *City of Ellensburg Hayward and Route 10 Water Wells Cultural Resources Assessment Project, Kittitas County, Washington*. Prepared for City of Ellensburg. Seattle, Washington: Paragon Research Associates.

International Organization for Standardization (ISO). 1996. ISO 9613-2: Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation. December 2006.

Juell, Kenneth. 2000. *Cultural Resources Inventory of the proposed Washington Light Lanes Project Regeneration Station Surveys Associated with the Route 3 Backbone (I-90) and the Route 4 Backbone (I-82).* Project WA00-3. Prepared for Universal Communications Networks, Inc. and David Evans and Associates. Seattle, Washington: Northwest Archaeological Associates, Inc.

Kittitas County. 2002. Kittitas County Comprehensive Plan. December.

———. 2016. Kittitas County Comprehensive Plan, December 2016. Adopted by Ordinance No. 2016-023. Available at: https://www.co.kittitas.wa.us/uploads/documents/cds/comp-plan/2016/2016%201206%20Comp%20Plan%20per%20Kittitas%20Co%20Ord%202016-023.pdf.

———. 2017. Kittitas Valley Event Center, Kittitas County Fair, Labor Day Weekend. Available at: https://www.co.kittitas.wa.us/kvec/fair.aspx. Accessed May 24, 2017.

Kittitas County Chamber of Commerce. 2017a. Live Life in Color, Hotels / Motels. Available at: http://www.centralwashingtoncolor.com/stay/hotels-motels/. Accessed May 24, 2017.

———. 2017b. Live Life in Color, Parks. Available at: http://www.centralwashingtoncolor.com/things-to-do/parks/. Accessed May 24, 2017.

Kittitas County Public Utility District. 2015. Customer Information Report 2016. Available at: http://www.kittitaspud.com/DocumentCenter/View/664. Accessed June 9, 2017.

Kittitas County Public Works Department. 2008. Kittitas County Long Range Transportation. Available at: https://www.co.kittitas.wa.us/public-works/engineering/longRangeTP/Kittitas%20County%20Long%20Range%20Transportation%20Plan.pdf. Accessed July 28, 2017.

———. 2017. Kittitas County Road Average Daily Traffic Counts: 2015–2017. Provided by Kelee Hodges, Kittitas County Public Works, to Joy Potter, Potter Consulting Group, LLC., July 18, 2017.

Kittitas Reclamation District (KRD). 2017a. Kittitas Reclamation District. Available at: http://krdistrict.org/. Accessed June 23, 2017.

———. 2017b. Maps of the District. Available at: http://krdistrict.org/maps.htm. Accessed May 2017.

Kittitas Valley Fire & Rescue (KVFR). 2017. About Kittitas Valley Fire & Rescue. Website: http://kvfr.org/About_KVFR.aspx. Accessed August 14, 2017.

Kittitas Valley Healthcare (KVH). 2017. KVH Urgent Care - Cle Elum. Available at: http://www.kvhealthcare.org/clinics-and-specialty-services/kvh-urgent-care-cle-elum/. Accessed June 24, 2017.

Landreau, Christopher. 2008. *An Archaeological Review and Inventory of the Proposed Gregerich Rill Irrigation Modification Project, Kittitas County, Washington*. Report 2008-136-26. Prepared for Kittitas County Conservation District. Yakima, Washington: Reiss-Landreau Research.

———. 2009. *A Section 106 Archaeological Review and Inventory of Six Proposed Installation/Upgrade Irrigation Sites Along the Menastash Ditch, Kittitas County, Washington*. Report 2008-2009-148-07. Prepared for Kittitas County Conservation District. Yakima, Washington: Reiss-Landreau Research.

———. 2014. *A 05-05 Archaeological Review and Inventory of the Bland Family Farm Sprinkler Conversion Project, Kittitas County, Washington*. Report 2014-335-32. Prepared for Kittitas County Conservation District. Yakima, Washington: Reiss-Landreau Research.

———. 2015. *A Section 106 Archaeological Review and Inventory of the David Rinehart Sprinkler Conversion Project, Kittitas County, Washington*. Report No. 2015-344-01. Prepared for Kittitas County Conservation District. Yakima, Washington: Reiss-Landreau Research LLC.

———. 2016a. *A Section 106 Archaeological Review and Inventory of the Naneum Creek-Valley Land Company Diversion and Fish Screen project, Kittitas County, Washington*. Report No. 2012-265-30. Prepared for Kittitas County Conservation District and Bonneville Power Administration. Yakima, Washington: Reiss-Landreau Research.

———. 2016b. *An Archaeological Review and Inventory of the Broadmoor Farm, Berry Road Sprinkler Conversion Project, Kittitas County, Washington*. Report No. 2016-370-11. Prepared for Kittitas County Conservation District. Yakima, Washington: Reiss-Landreau Research LLC.

———. 2016c. Washington Archaeological Isolate Inventory Form, 45KT3808. On file, Washington State Department of Archaeology and Historic Preservation, Olympia, Washington.

Landreau, Christopher, Joel Geffen, and Ian Cain. 2007. *An Archaeological Review and Inventory of the Proposed Coleman and Cherry Creek Irrigation Projects, Kittitas County, Washington*. Prepared for Kittitas County Conservation District. Yakima, Washington: Reiss-Landreau Research.

Landreau, Christopher, and William D. Schroeder. 2012. *Section 106 Archaeological Review and Inventory of the Mellergaard Sprinkler Conversion Project, Kittitas County, Washington*. Report 2012-241-06. Prepared for Kittitas County Conservation District. Yakima, Washington: Reiss-Landreau Research.

———. 2014. *Archaeological Review and Inventory of the Circle Lazy H Sprinkler Conversion #2 Project, Kittitas County, Washington*. Report 2014-308-05. Prepared for Kittitas County Conservation District. Yakima, Washington: Reiss-Landreau Research.

Leonhardy, Frank, and David G. Rice. 1970. A Proposed Culture Typology for the Lower Snake River Region, Southeastern Washington. *Northwest Anthropological Research Notes* 4:1–29.

Luttrell, Charles T. 2009. *Letter Report: Olmstead Place State Park - Coleman Creek Bridge Removal Project Letter Report, Kittitas County, Washington*. Prepared for Department of Archaeology and Historic Preservation, Olympia, Washington. Olympia, Washington: Washington State Parks and Recreation Commission.

———. 2011a. State of Washington Archaeological Site Inventory Form, 45KT543, [redacted]. On file, Department of Archaeology and Historic Preservation, Olympia, Washington.

———. 2011b. *Letter Report: Olmstead Place State Park – Culvert Replacement Project, Kittitas County, Washington*. Olympia, Washington: Washington State Parks and Recreation Commission.

———. 2011c. *Letter Report: Olmstead Place State Park – Coleman Creek Increased Riparian Buffer Project, Kittitas County, Washington*. Prepared for Department of Archaeology and Historic Preservation. Olympia, Washington: Washington State Parks and Recreation Commission.

Luttrell, Charles, Stan Gough, and Stephen Emerson. 1999. *An Archaeological and Historical Overview for the Washington State Parks and Recreation Commission's John Wayne Pioneer Trail Project, Kittitas and King Counties, Washington, Volume I.* Short Report 620. Prepared for Washington State Parks and Recreation Commission. Cheney, Washington: Archaeological and Historical Services, Eastern Washington University.

Luttrell, Charles, and Pamela McKenney. 1999. *An Archaeological and Historical Overview for the Washington State Parks and Recreation Commission's John Wayne Pioneer Trail Project, Kittitas and King Counties, Washington, Volume II.* Short Report 620. Prepared for Washington State Parks and Recreation Commission. Cheney, Washington: Archaeological and Historical Services, Eastern Washington University.

McFarland, D. P., J. D. Ferry, D. J. Sheldon, and J. E. Brown. 2015. *Cultural Resources Review for the Non-Bureau of Reclamation Owned Portion of the Schaake Property Habitat Improvement Project, Kittitas County, Washington*. CH2M.

McLean, Jamy, Michael Pitts, and William Schroeder. 2010. State of Washington Archaeological Site Inventory Form, 45KT3515. On file, Washington State Department of Archaeology and Historic Preservation, Olympia, Washington.

Mehringer, Peter J., Jr. 1989 . *Age of the Clovis Cache at East Wenatchee, Washington*. Prepared for Washington State Historic Preservation Office for Studies. Pullman, Washington: Department of Anthropology, Washington State University.

Metsker Maps. 1956. Metskers Atlas of Kittitas County, Washington. Seattle, Washington: Metsker Map Company.

Middleton, Jessica, and Steve Hackenberger. 2004a. *Coleman Creek – Hernandez/Ringer Project Archaeological Monitoring Report*. Ellensburg, Washington: Central Washington University.

———. 2004b. *Cultural Resource Pedestrian Survey for Ludwick Diversion Replacement/Redesign Project, Kittitas County, Washington*. Prepared for Kittitas County Conservation District. Ellensburg, Washington: Central Washington University.

———. 2005. *Naneum Creek/Bull Canal Project Archaeological Monitoring Report*. Prepared for Kittitas County Conservation District. Ellensburg, Washington: Central Washington University.

Miller, Fennelle, and Flo Lentz. 2002. *From Native American Trails to the Inland Empire Highway: A Cultural Resources Inventory of Tile Canyon Road Improvement Project, Kittitas County, Washington*. Prepared for Kittitas County Public Works. Ellensburg, Washington: Fennell deforest Miller Archaeological Consultants and Florence K. Lentz Cultural Resource Consulting.

Miller, Fennelle. 2003. *Archaeological and Historic Resources Inventory of Kittitas County's Proposed Faust Road Improvement Project Kittitas County, Washington*. Prepared for Kittitas County Public Works. Ellensburg, Washington: Fennelle deForest Miller Archaeological Consultants.

MyEllensburg. 2017. MyEllensburg.com: Golf. Available at: https://www.myellensburg.com/play/outdoor-activities/golf/. Accessed May 24, 2017.

Natural Resources Conservation Service (NRCS). 2017. Web Soil Survey. Available at: http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx. Accessed July 26, 2017.

Nesbit, Robert C., and Charles M. Gates. 1946. Agriculture in Eastern Washington, 1890-1910. *Pacific Northwest Quarterly* 37:279–302.

Oliphant, J. O. 1932 . The Cattle Trade From the Far Northwest to Montana. *Agricultural History* 6:69–83.

Orvald, Tucker O., and Bryan R. Hoyt. 2006. *Cultural Resource Inventory for Bonneville Power Administration's Proposed Lyle Creek Barrier Removal and Restoration Project, Kittitas County, Washington*. Prepared for Bonneville Power Administration. Ellensburg, Washington: Anthropology Department, Central Washington University.

Orvald, Tucker. 2003a. *Dry/Cabin Creek Fish Access and Protection Project Kittitas County, Washington*. Ellensburg, Washington: Earth Imaging Associates Inc.

———. 2003b. State of Washington Archaeological Site Inventory Form, 45KT2318, [redacted]. On file, Washington State Department of Archaeology and Historic Preservation, Olympia, Washington.

———. 2005. *Cultural Resource Inventory for Proposed Fogarty Ditch Diversion Redesign Project, Kittitas County, Washington*. Prepared for Bonneville Power Administration. Ellensburg, Washington: Anthropology Department, Central Washington University.

———. 2006. *Cultural Resource Inventory for the Proposed Durand-Fagalde Diversion Redesign Project, Lower Reecer Creek, Kittitas County, Washington*. Prepared for Kittitas County Conservation District, Ellensburg, Washington and Bonneville Power Administration. Ellensburg, Washington: Anthropology Department, Central Washington University.

Pitts, Michael. 2012a. State of Washington Archaeological Site Inventory Form, 45KT3514. On file, Washington State Department of Archaeology and Historic Preservation, Olympia, Washington.

———. 2012b. State of Washington Archaeological Site Inventory Form, 45KT3516. On file, Washington State Department of Archaeology and Historic Preservation, Olympia, Washington.

Pless, Judy, Dora Van Epps, Heidi Childs, Kay Kresge, Lisa Bugni, and Sue Patterson. 2015. Kittitas County, Washington, 2016 Annual Budget. Prepared for Jerald V. Pettit, Kittitas County Auditor. Kittitas County. Available at: http://www.co.kittitas.wa.us/uploads/auditor/accounting/budget/annual-budget/2016%20Annual%20Budget.pdf. Accessed July 28, 2017

Property Tax 101. 2017. Kittitas County Washington Property Tax. Available at: https://www.propertytax101.org/washington/kittitascounty. Accessed August 15, 2017.

Puget Sound Energy (PSE). 2017a. PSE Primer. Available at: https://pse.com/aboutpse/CorporateInfo/Pages/PSE-Primer.aspx. Accessed June 9, 2017.

———. 2017b. Electric Supply. Available at: https://pse.com/aboutpse/EnergySupply/Pages/Electric-Supply.aspx. Accessed June 9, 2017.

———. 2017c. Wild Horse Wind and Solar Facility & Renewable Energy Center. Available at: https://pse.com/inyourcommunity/ToursandRecreation/WildHorse/Pages/default.aspx. Accessed June 20, 2017.

Ray, V. F. 1936. Native Villages and Groupings of the Columbia Basin. *Pacific Northwest Quarterly* 27:99–152.

Reid, Kenneth C. 1991. *An Overview of Cultural Resources in the Snake River Basin: Prehistory and Paleoenvironments.* Project Report No. 13. Pullman, Washington: Center for Northwest Anthropology, Washington State University.

Responsive Management. 2012. Results of General Population Survey in Support of the Development of the Washington State Comprehensive Outdoor Recreation Plan. Conducted for the Washington Recreation and Conservation Office. Available at: https://data.wa.gov/api/assets/DFA7D6A8-43F4-4D90-A933-15B4FF955FB1?download=true.

Rudeen, Ralph H. 1970. National Register of Historic Places Inventory - Nomination Form, 45KT543, Olmstead Place State Park. On file, Department of Archaeology and Historic Preservation, Olympia, Washington.

Rutan, Pam, and Rebecca Stevens. 1982. *A Survey for Cultural Resources at Quarry Site QS-S-234 and Pit Site PS-S-226, Kittitas County, Washington (F-520)*. Prepared for Washington State Department of Transportation. Cheney, Washington: Archaeological and Historical Services, Eastern Washington University.

RVParkStore. 2017. RV Parks, Campgrounds, Marinas, and Resorts in Kittitas County, WA. Available at: http://www.rvparkstore.com/rv-park-directory/washington/county/kittitas. Accessed May 24, 2017.

Schablitsky, Julie, Judith S. Chapman, David A. Ball, Bonnie J. Mills, and John L. Fagan. 1999. *Cultural Resources Survey of Route Modifications and Shovel Testing of Sites for Level 3's Proposed Fiber Optic Line from Seattle to Boise: Washington Segment, Non-Federal Lands, Addendum*. Report No. 325. Prepared for Parsons Brinckerhoff Quade & Douglas Inc. Portland, Oregon: Archaeological Investigations Northwest, Inc.

Schalk, Randall (editor). 1990. *Cultural Resources Reconnaissance in Washington State Parks Biennial Summary for 1987–1989.* Prepared for Washington State Parks and Recreation Commission. Pullman, Washington: Center for Northwest Anthropology, Washington State University.

Schroeder, William D. 2013. *A Section 106 Archaeological Review and Inventory of the Cherry Creek Tributaries Sprinkler Conversion, Fish Screening and Passage Project, Kittitas County, Washington.* Prepared for Kittitas County Conservation District and Bonneville Power Administration. Yakima, Washington: Reiss-Landreau Research.

Schroeder, William D., and Christopher Landreau. 2013a. *A Section 106 Archaeological Review and Inventory of the YTAHP–Coleman Creek Poulsen/Hanson Project, Kittitas County, Washington*. Prepared for Kittitas County Conservation District and Bonneville Power Administration. Yakima, Washington: Reiss-Landreau Research.

———. 2013b. *A Section 106 Archaeological Review and Inventory of the Bland Sprinkler Conversion Project, Kittitas County, Washington*. Report 2013-299-31. Prepared for Kittitas County Conservation District Ellensburg, Washington. Yakima, Washington: Reiss-Landreau Research.

Schuster, Helen H. 1990. *The Yakima*. New York: Chelsea House Publishers.

———. 1998. Yakima and Neighboring Groups. In *Handbook of North American Indians*, *Volume 12: Plateau*, edited by Deward E. Walker, pp. 327–351. Washington D.C.: Smithsonian Institute.

Sharley, Ann. 2005. *A Cultural Resources Survey of the Bonneville Power Administration's Proposed Fogarty Ditch Fish Screen Project, Kittitas County, Washington*. Short Report 847. Prepared for Bonneville Power Administration. Cheney, Washington: Archaeological and Historical Services, Eastern Washington University.

Spier, L. 1936. *Tribal Distribution in Washington*. General Studies in Anthropology No.3. Menasha, Wisconsin.

SunCountry Golf. 2017. Sun Country Golf Course. Available at: https://www.golfsuncountry.com/. Accessed June 20, 2017.

U.S. Air Force. 2011. *Final Environmental Assessment Outgrant for Construction and Operation of a Solar Photovoltaic System in Area I, Nellis Air Force Base, Clark County, Nevada*. Available at: http://energy.nv.gov/uploadedFiles/energynvgov/content/Programs/NV%20Energy%20Attachment%203-%20Nellis%20Final%20Environmental%20Assessment.pdf. Accessed August 4, 2017.

U.S. Bureau of Labor Statistics (BLS). 2016. May 2016 State Occupational Employment and Wage Estimates in Washington. Available at: https://www.bls.gov/oes/current/oes_wa.htm. Accessed August 16, 2017.

U.S. Census Bureau. 2000. 2000 Decennial, Census Profile of General Demographic Characteristics: 2000, Census 2000 Summary File 1 (SF 1) 100-Percent Data. Available at: https://www.census.gov/census2000/sumfile1.html.

U.S. Census Bureau. 2015. American FactFinder, 2011-2015 American Community Survey 5-Year Estimates 2011-2015 American Community Survey 5-year Estimates. Available at: https://www.census.gov/acs/www/data/data-tables-and-tools/data-profiles/2015/.

U.S. Census Bureau. 2010. 2010 Census. Available at: https://www.census.gov/2010census/. Accessed July 28, 2017.

U.S. Department of Agriculture. 2012. U.S. Census of Agriculture, Washington County Summary Highlights. , National Agricultural Statistics Service. Available at: https://www.agcensus.usda.gov/Publications/2012/Full_Report/Volume_1,_Chapter_2_County_Level/Washington/st53_2_001_001.pdf.

U.S. Environmental Protection Agency (EPA). 1974. Information on levels of environmental noise requisite to protect public health and welfare with an adequate margin of safety. Available at: http://www.nonoise.org/library/levels/levels.htm#levelsof. Accessed August 4, 2017.

Vacasa Rentals. 2017. Available at: www.vacasa.com. Accessed July 28, 2017.

Valentine, Nicholas. 1998. *U.S. Fish and Wildlife Service Archaeological and Historical Resources Identification Report: Naneum Creek*. U.S. Fish and Wildlife Service.

Vaughn, Kevin, and William Schroeder. 2012. *2012 Pedestrian Survey and Subsurface Reconnaissance of the Schaake Parcels, Kittitas County*. Prepared for United States Bureau of Reclamation and Washington State Department of Archaeology and Historic Preservation. Ellensburg, Washington: Central Washington University, Office of Continuing Education.

Waitt, R. B., and D. B. Swanson. 1987. Geomorphic Evolution of the Columbia Plain and River. In *Geomorphic Systems of North America,* edited by William L. Graf, pp. 403–416. Boulder, Colorado: Geological Society of America.

Walker, Deward E. (editor). 1990. *Handbook of North American Indians, Volume 12: Plateau*. Washington, D.C.: Smithsonian Institute.

Washington Energy Facility Site Evaluation Council (EFSEC). 2007. Kittitas Valley Wind Power Project Final EIS, Section 3.13 Public Services and Utilities. Available at: http://www.efsec.wa.gov/kittitaswind/FEIS/Vol%201%20Text/3.13%20Public%20Services%20final.pdf. February.

Washington State Department of Revenue. 2017a. Local Sales and Use Tax Rates by City/County Tax Rates, Effective July 1 - September 30, 2017. Available at: http://dor.wa.gov/Docs/forms/ExcsTx/LocSalUseTx/LocalSlsUseFlyer_17_Q3_alpha.pdf. May 4.

———. 2017b. Major Business and Occupation (B&O) Tax Rate Classifications. Available at: http://dor.wa.gov/Content/FindTaxesAndRates/BAndOTax/BandOrates.aspx. Accessed June 22, 2017.

———. 2017c. Public Utility Tax Rates. Available at: http://dor.wa.gov/Content/FindTaxesAndRates/OtherTaxes/tax_pubutil.aspx. Accessed June 22, 2017.

Washington State Department of Transportation (WSDOT). 2016. Annual Traffic Report 2016. Available at: https://www.wsdot.wa.gov/mapsdata/travel/pdf/Annual_Traffic_Report_2016.pdf. Accessed July 28, 2017.

Washington State Horse Park. 2017. Washington State Horse Park Facilities. Available at: http://www.wahorsepark.org/p/getconnected/281. Accessed June 20, 2017.

Washington State Parks. 2017a. Olmstead Place Historical State Park. Available at: http://parks.state.wa.us/556/Olmstead-Place. Accessed June 20, 2017.

———. 2017b. Lake Easton State Park. Available at: http://parks.state.wa.us/532/Lake-Easton. Accessed June 20, 2017.

———. 2017c. Ginkgo Petrified Forest State Park / Wanapum Recreation Area. Available at: http://parks.state.wa.us/288/Ginkgo-Petrified-Forest. Accessed June 20, 2017.

Washington State Patrol. 2017. Washington State Patrol Field Operations - District 6. Available at: http://www.wsp.wa.gov/traveler/district6.htm. Accessed June 23, 2017.

Washington State University (WSU) Kittitas County Extension. 2017. Washington State University - Kittitas County. Available at: http://extension.wsu.edu/kittitas/. Accessed June 23, 2017.

Whitley, Edward C. 1949 . Agricultural Geography of the Kittitas Valley. Master's Thesis. University of Washington, Seattle, Washington.

Windsor, H. H. 1956. Golfers Mobilize. *Popular Mechanics Magazine* 105(4):103.

Woody, Dave. 2014. *Cultural Resources Identification Survey of the Lynn Brown 2014 NRCS EQIP Project*. NRCS EQIP Contract No: 740546140P4. Natural Resources Conservation Service.

———. 2015a. *Cultural Resources Identification Survey of the Circle Lazy H Farm 2015 NRCS EQIP Project*. NRCS EQIP Contract No: 7405461407X. Natural Resources Conservation Service.

———. 2015b. State of Washington Archaeological Site Inventory Form, 45KT3786, Lazy H Historic Debris. On file, Washington State Department of Archaeology and Historic Preservation, Olympia, Washington.

5 APPLICATIONS FOR PERMITS AND AUTHORIZATIONS

5.1 Air Emissions Permits and Authorizations 463-60-536

(1) The application for site certification shall include a completed prevention of significant deterioration permit (PSD) application and a notice of construction application pursuant to the requirements of chapter 463-78 WAC.

Per Washington Administrative Code (WAC) 463-60-536, a Prevention of Significant Deterioration (PSD) Permit application is required to be submitted with the Washington Energy Facility Site Evaluation Council (EFSEC) Application for Site Certification (ASC). However, the proposed Columbia Solar Projects would only have minimal dust and vehicular air emissions during construction, and no air emissions during operation. Therefore, the potential air emissions can be adequately addressed in the EFSEC ASC and the Washington State Environmental Policy Act Environmental Checklist, and that a PSD Permit will not be required as part of the EFSEC ASC.

Per WAC 173-400-110 a notice of construction application must be submitted for new and stationary sources of air emissions. WAC 173-400-110(4) exempts certain emission units and activities from new source review and the filing of a notice of construction application. Construction activities that do not result in new or modified stationary sources or portable stationary sources are one of the exemptions (WAC 173-400-110[4][x]). The five proposed Columbia Solar Projects would only have minimal dust and vehicular air emissions during construction, and no air emissions during operation. Thus, the Columbia Solar Projects would not result in new sources of air emissions. Per WAC 173-400-110(4)(x), the projects are exempt from new source review and filing a notice of construction application.

(2) The application shall include requests for authorization for any emissions otherwise regulated by local air agencies as identified in WAC 463-60-297 Pertinent federal, state and local requirements.

The five proposed Columbia Solar Projects would only have minimal dust and vehicular air emissions during construction, and no air emissions during operation. No air permit authorizations are required for the proposed solar projects.

5.2 Wastewater/Stormwater Discharge Permit Applications 463-60-537

The application for site certification shall include:

(1) A completed National Pollutant Discharge Elimination System (NPDES) permit application, for any proposed discharge to surface waters of the state of Washington, pursuant to the requirements of WAC 463-76-031; or

Per WAC 463-60-537, a National Pollutant Discharge Elimination System (NPDES) Permit application for any proposed discharge to surface waters and a State of Washington Application for General Permit to Discharge Stormwater Associated with Construction Activity has been included with this application. The EFSEC stormwater pollution control program is based, in part, on federal regulations and the implementation of the federal Clean Water Act. The goals of these federal regulations are to reduce or eliminate stormwater pollution from construction activity. Because TUUSSO Energy, LLC (TUUSSO), plans to clear, grade, or excavate 1 or more acres as part of the development of the five proposed

Columbia Solar Project sites, TUUSSO is required to seek coverage under an NPDES permit and the state general permit. A stormwater pollution prevention plan (SWPPP) has been developed as part of this permitting process.

NPDES permit applications and notice of intents (NOIs) have been included in Appendices G through K for each site. TUUSSO would adhere to all requirements under WAC 463-76-031.

(2) For any proposed discharge to publicly owned treatment works (POTW) and/or groundwater of the state of Washington, a state waste discharge application;

No waste discharge is proposed either on-site or off-site for any of the Columbia Solar Projects.

(3) A notice of intent to be covered under any applicable statewide general permit for storm water discharge.

Per response to Item (1) above, NPDES permit applications and NOIs are include for each site in Appendices G through K.

APPENDICES AND ATTACHMENTS

Appendix A: Washington SEPA Environmental Checklist

Appendix B: Vegetation Management Plan

Appendix C: Habitat, Vegetation, Fish, and Wildlife Assessment Report

Appendix D: Visual/Aesthetic Assessment Report

Appendix E: Solar Glare Hazard Analysis Report

Appendix F: Decommissioning Plan

Appendix G: Camas Solar Project Site Reports and Permit Applications

G-1: Camas Solar Project Critical Areas Report

G-2: Camas Solar Project Cultural Resources Report

G-3: Camas Solar Project Permit Applications

G-4: Camas Solar Project Geotechnical Engineering Study

G-5: Camas Solar Project Drainage Report

Appendix H: Fumaria Solar Project Site Reports and Permit Applications

H-1: Fumaria Solar Project Critical Areas Report

H-2: Fumaria Solar Project Cultural Resources Report

H-3: Fumaria Solar Project Permit Applications

H-4: Fumaria Solar Project Geotechnical Engineering Study

H-5: Fumaria Solar Project Drainage Report

Appendix I: Penstemon Solar Project Site Reports and Permit Applications

I-1: Penstemon Solar Project Critical Areas Report

I-2: Penstemon Solar Project Cultural Resources Report

I-3: Penstemon Solar Project Permit Applications

I-4: Penstemon Solar Project Geotechnical Engineering Study

I-5: Penstemon Solar Project Drainage Report

Appendix J: Typha Solar Project Site Reports and Permit Applications

J-1: Typha Solar Project Critical Areas Report

J-2: Typha Solar Project Cultural Resources Report

J-3: Typha Permit Applications

J-4: Typha Solar Project Geotechnical Engineering Study

J-5: Typha Solar Project Drainage Report

Appendix K: Urtica Solar Project Site Reports and Permit Applications

K-1: Urtica Solar Project Critical Areas Report

K-2: Urtica Solar Project Cultural Resources Report

K-3: Urtica Solar Project Permit Applications

K-4: Urtica Solar Project Geotechnical Engineering Study

K-5: Urtica Solar Project Drainage Report

Appendix L: TUUSSO Solar Project Site Plans and Designs

Appendix A: Washington SEPA Environmental Checklist

Washington State Environmental Policy Act (SEPA)
Environmental Checklist
WAC 197-11-960

A. BACKGROUND

1. Name of proposed project, if applicable:

TUUSSO Energy Columbia Solar Projects

2. Name of applicant:

TUUSSO Energy, LLC

3. Address and phone number of applicant and contact person:

Jason Evans
General Counsel and Vice President of Business Development
500 Yale Avenue North
Seattle, WA 98109
(206) 303-0198

4. Date checklist prepared:

October 16, 2017

5. Agency requesting checklist:

Washington Energy Facility Site Evaluation Council
Utilities and Transportation Commission
1300 S Evergreen Park Drive SW
Olympia, WA 98504-3172

6. Proposed timing or schedule (including phasing, if applicable):

Construction of the five Columbia Solar Projects is anticipated to commence in second quarter 2018 and would require approximately 6 to 9 months to complete (Table 1). For each project, approximately 3 months of actual construction time would be needed. However, when possible, specialized work crews would be moved from site to site to efficiently move through and manage the phases of construction on each project. The following table provides the proposed schedule for the projects' construction.

Table 1. Columbia Solar Projects Construction Schedule

Project Activity	Schedule
Approval of all other required non-discretionary permits	1st quarter 2018
Approval of all administrative permits	1st quarter 2018
Approved Site Certification Agreements	March 2018
Construction begins	2nd quarter 2018
Completion of construction	4th quarter 2018
Projects operational	4th quarter 2018

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.

TUUSSO Energy, LLC (TUUSSO), does not plan for any further additions, expansions, or further activities upon or contiguous to the sites used for the Columbia Solar Projects.

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.

Natural resources field surveys were conducted from April 3 to 12, 2017, to document flora and fauna in the vicinity of each of the five Columbia Solar Project sites, as well as different vegetation communities and habitat.

Each solar project site was surveyed for wetlands from April 3 to 12, 2017, in accordance with the current methodology of the U.S. Army Corps of Engineers' (USACE's) 2008 *Arid West Regional Supplement* (Version 2) and the *Wetlands Delineation Manual*.

Archaeological fieldwork was conducted on each of the five proposed Columbia Solar Project sites from April 4 to 17, 2017, by a team of 11 SWCA Environmental Consultants (SWCA) archaeologists. The parcels were surveyed with pedestrian transects spaced at approximately 20-meter intervals. The survey was supplemented by about 900 shovel probes measuring between 35 and 40 centimeters in diameter.

These and other field studies led to the preparation of the following reports for each site in support of the Washington Energy Facility Site Evaluation Council (EFSEC) Application for Site Certification (ASC), and are attached as appendices to the ASC:

- Vegetation Management Plan
- Habitat, Vegetation, Fish, and Wildlife Assessment Report
- Visual/Aesthetic Assessment Report
- Solar Glare Hazard Analysis Report
- Decommissioning Plan
- Critical Areas Reports (5)
- Cultural Resources Reports (5)
- Permit Applications (11)
- Stormwater Pollution Prevention Plans (5)
- Geotechnical Engineering Studies (5)
- Drainage Reports (5)
- Solar Project Site Plans and Designs

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.

No other development proposals and associated applications have been submitted to or are awaiting approval from federal, state, or local governmental organizations for the five Columbia Solar Project sites.

10. List any government approvals or permits that will be needed for your proposal, if known.

The following permits or regulatory approvals would be needed for the five Columbia Solar Projects:

- EFSEC Site Certificate - EFSEC Site Certificate to include all local and state permits, authorizations and approvals
- Joint Aquatic Resource Permit Application (JARPA) - U.S. Army Corps of Engineers (USACE) – Seattle District and Washington Department of Ecology (Ecology)
- Application for General Permit to Discharge Stormwater Associated with Construction Activity (Notice of Intent) – Ecology
- Electrical Construction Permit - Washington Department of Labor and Industries
- General Application for Construction – Kittitas County Community Development Services (potentially issued by EFSEC)
- Access Permit Application to Perform Utility work on County Right-of-Way - Kittitas County Department of Public Works

This list will be updated, as needed, as discussions about the Columbia Solar Projects continue to occur with EFSEC and federal, state, and county agencies.

11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)

TUUSSO Energy, LLC's five Columbia Solar Projects would be located in unincorporated Kittitas County, east of the Cascade Range, within the Kittitas Valley, outside of the city of Ellensburg, but relatively close to the northwest, southwest, and southeast of the city (see Figure 1, and below for additional details). Each of the five projects is proposed on agricultural lands, and not on native habitat. Refer to the *Habitat, Vegetation, Fish, and Wildlife Assessment Report* attached to the ASC for site specific details on land use and surrounding habitat.

Camas Solar Project Site

TUUSSO is proposing to construct a new Camas Solar Project photovoltaic (PV) facility on approximately 51.21 acres of private agricultural land, which would connect into the existing Puget Sound Energy (PSE) distribution transmission line along Tjossem Road, located southeast of Ellensburg, in unincorporated Kittitas County, Washington. The Camas Solar Project is intended to provide up to 5 MW of solar energy to PSE for use within their service area.

Fumaria Solar Project Site

TUUSSO is proposing to construct a new Fumaria Solar Project PV facility on approximately 35.24 acres of fallow pasture land, including the construction of a switchyard with a short (2.56-mile-long, ~25.4-acre of right-of-way) generation tie line into an existing PSE substation, located northwest of Ellensburg, in incorporated Kittitas County, Washington. The Fumaria Solar Project is intended to provide up to 5 MW of solar energy to PSE for use within their service area.

Penstemon Solar Project Site

TUUSSO is proposing to construct a new Penstemon Solar Project PV facility on approximately 39.38 acres of private agricultural land, which would connect into the existing PSE distribution transmission line along Tjossem Road, located southeast of Ellensburg, in unincorporated Kittitas County, Washington. The Penstemon Solar Project is intended to provide up to 5 MW of solar energy to PSE for use within their service area.

Typha Solar Project Site

TUUSSO is proposing to construct a new Typha Solar Project PV facility on approximately 54.29 acres of private agricultural land, including the construction of a switchyard with a short (0.45-mile-long, 4.4-acre) generation tie line into an existing PSE distribution transmission line, located northwest of Ellensburg, in unincorporated Kittitas County, Washington. The Typha Solar Project is intended to provide up to 5 MW of solar energy to PSE for use within their service area.

Urtica Solar Project Site

TUUSSO is proposing to construct a new Urtica Solar Project PV facility on approximately 51.94 acres of private agricultural land, which would connect into the existing PSE distribution transmission line along Umptanum Road, located southwest of Ellensburg, in unincorporated Kittitas County, Washington. The Urtica Solar Project is intended to provide up to 5 MW of solar energy to PSE for use within their service area.

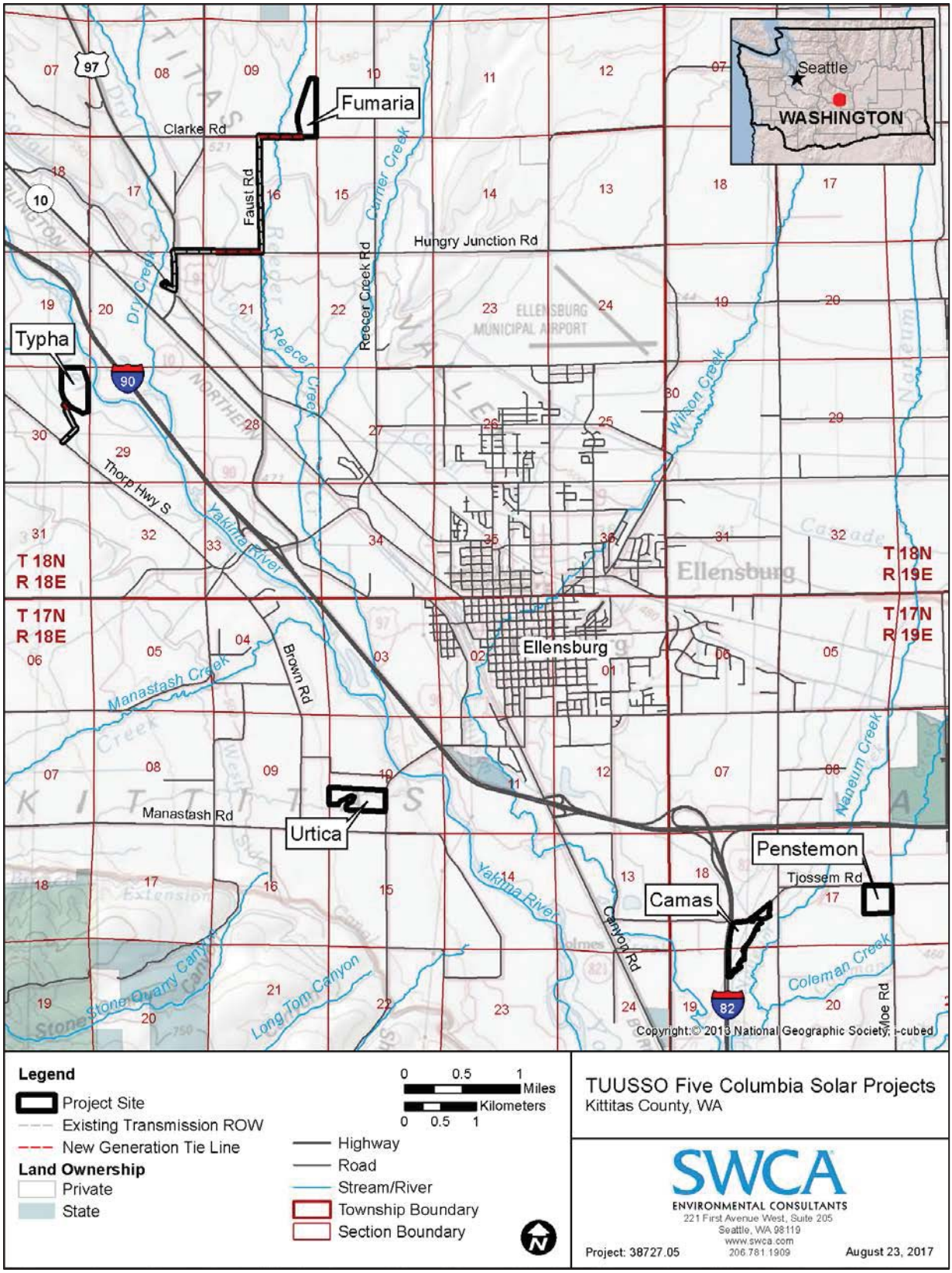


Figure 1. Columbia Solar Project site locations.

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.

The following descriptions provide an overview of the five Columbia Solar Project locations, followed by their legal descriptions.

Solar Project Location Overview

Camas Solar Project Site

The Camas Solar Project site is located immediately southeast of the intersection of Tjossem Road and Interstate 82 (I-82), Ellensburg, WA, 98926. It is active agricultural land, growing alfalfa. The project would be located approximately 2.25 miles southeast of the Ellensburg city center, in Sections 18 and 19 of Township (T) 17 North (N), Range (R) 19 East (E), Willamette Meridian. Topography of the site is fairly flat and slopes to the south toward Little Naneum Creek, with surface elevations ranging from 1,465 to 1,455 feet above mean sea level (amsl).

The Camas Solar Project site would be located on land zoned as Commercial Agriculture, and would be a permitted conditional use under Kittitas County Code (KCC) 17.15.050.01.

Fumaria Solar Project Site

The Fumaria Solar Project site is located approximately 1.5 miles northwest of the intersection of Hungry Junction Road and Reecer Creek Road, in Sections 9, 16, 17, and 20, T18N, R18E, Willamette Meridian in Ellensburg, WA, 98926. It primarily consists of fallow pasture land. The generation tie line would originate from the southwestern site boundary corner and follow Clarke Road, along one of two proposed alignments, to Faust Road, where it would parallel Faust Road south along an existing transmission corridor (sharing poles with an existing distribution line) on the east side of the road right-of-way (ROW) to Hungry Junction Road, where it would turn west and travel along the north side of the road ROW for roughly 2,000 feet, and then continue to travel along the north side of the road ROW within an existing transmission corridor (sharing poles with an existing distribution line) to U.S. Highway 97, where it would travel south along the west side of the road ROW down to just south of McManamy Road, where it would turn northwest to connect into an existing PSE substation (a total of 2.6 miles). The two proposed alignments along Clarke Road comprise one that follows the north side of the road (ROW A), and one that follows the south side of the road (ROW B).

Topography of the project site is generally flat, generally sloping to the south toward the Cascade Irrigation District Canal. Surface elevation within the whole study area (which includes the generation tie line path) ranges from 1,750 to 1,600 feet amsl, the lowest elevation being along the southern study area boundary near the existing PSE substation and the highest elevation being at the northern end of the solar site.

The Fumaria Solar Project site would be located on land zoned as Rural Working – Agriculture 20, and would be a permitted conditional use under KCC 17.15.060.1.

Penstemon Solar Project Site

The Penstemon Solar Project site is located immediately southwest of the intersection of Tjossem Road and Moe Road in Ellensburg, WA, 98926. It is active agricultural land, for growing export hay products (such as timothy and alfalfa). The project would be located approximately 4 miles southeast of the Ellensburg city center, in Section 17, T17N, R19E, Willamette Meridian. Topography of the site is generally flat, sloping to the south, with surface elevations ranging from 1,498 to 1,509 feet amsl.

The Penstemon Solar Project site would be located on land zoned as Commercial Agriculture, and would be a permitted conditional use under KCC 17.15.050.01.

Typha Solar Project Site

The Typha Solar Project site is located approximately 1.1 miles east of the intersection of Thorp Highway South and Cove Road, in Section 30, T18N, R18E, Willamette Meridian in Ellensburg, WA, 98926. It primarily consists of agricultural land (irrigated and grazed pasture) located just west of the Yakima River and north of Thorp Highway South. The generation tie line would originate from the southwestern site boundary and follow existing transmission lines to cross south along an existing access road, crossing the Ellensburg Power (EP) Canal three times, and passing through the Ellensburg Golf and Country Club to connect to the existing PSE distribution transmission line along Thorp Highway South. Topography of the site generally slopes to the east toward the Yakima River. Surface elevation within the study area ranges from 1,570 to 1,614 feet amsl, the lowest elevation being along the eastern site boundary closest to the Yakima River and the highest elevation being at the southern end of the generation tie line near Thorp Highway South.

The Typha Solar Project site would be located on land zoned as Commercial Agriculture, and would be a permitted conditional use under KCC 17.15.050.01.

Urtica Solar Project Site

The Urtica Solar Project site is located approximately 0.2 mile north of the intersection of Umptanum Road and Manastash Road, in Section 10, T17N, R18E, Willamette Meridian in Ellensburg, WA, 98926. It primarily consists of active agricultural land, growing common timothy, located on the west side of Umptanum Road and approximately 0.2 mile southwest of the Yakima River, with McCarl Creek flowing through the site from west to east. Topography of the site generally slopes to the east toward Umptanum Road and toward McCarl Creek, which flows through the site. Surface elevation within the project area ranges from 1,539 to 1,575 feet amsl, the lowest elevation being within the eastern portion of the McCarl Creek channel along Umptanum Road and the highest elevation being along the western site boundary.

The Urtica Solar Project site would be located on land zoned as Rural Working – Agriculture 20, and would be a permitted conditional use under KCC 17.15.060.1.

Legal Descriptions

Camas Solar Project Site Legal Description

TRACT A:

THAT PORTION OF PARCEL 1D OF THAT CERTAIN SURVEY AS RECORDED JUNE 15, 1994 IN BOOK 20 OF SURVEYS AT PAGE 60, UNDER AUDITOR'S FILE NO. 571789, RECORDS OF KITTITAS COUNTY, WASHINGTON, WHICH LIES SOUTHWESTERLY OF THE BULL DITCH RIGHT OF WAY; BEING A PORTION OF PARCEL 1B OF THAT CERTAIN SURVEY AS RECORDED APRIL 29, 1993 IN BOOK 19 OF SURVEYS AT PAGE 74, UNDER AUDITOR'S FILE NO. 559059, RECORDS

OF KITTITAS COUNTY, WASHINGTON; LOCATED IN THE SOUTHEAST QUARTER OF SECTION 18, TOWNSHIP 17 NORTH, RANGE 19 EAST, W.M., KITTITAS COUNTY, WASHINGTON.

AND

THAT PORTION OF PARCEL 1C OF THAT CERTAIN SURVEY AS RECORDED JUNE 15, 1994 IN BOOK 20 OF SURVEYS AT PAGE 60, UNDER AUDITOR'S FILE NO. 571789, RECORDS OF KITTITAS COUNTY, WASHINGTON, WHICH LIES SOUTHWESTERLY OF THE BULL DITCH RIGHT OF WAY; BEING A PORTION OF PARCEL 1B OF THAT CERTAIN SURVEY AS RECORDED APRIL 29, 1993 IN BOOK 19 OF SURVEYS AT PAGE 74, UNDER AUDITOR'S FILE NO. 559059, RECORDS OF KITTITAS COUNTY, WASHINGTON; LOCATED IN THE SOUTHEAST QUARTER OF SECTION 18, TOWNSHIP 17 NORTH, RANGE 19 EAST, W.M., KITTITAS COUNTY, WASHINGTON.

TRACT B:

THAT PORTION OF THE NORTH HALF OF THE THE NORTHEAST QUARTER OF SECTION 19, TOWNSHIP 17 NORTH, RANGE 19 EAST, W.M., IN THE COUNTY OF KITTITAS, STATE OF WASHINGTON, WHICH IS BOUNDED BY A LINE DESCRIBED AS FOLLOWS:

BEGINNING AT THE NORTHWEST CORNER OF PARCEL A OF THAT CERTAIN SURVEY RECORDED APRIL 22, 1993, IN BOOK 19 OF SURVEYS, PAGE 73, UNDER AUDITOR'S FILE NO. 558819. WHICH IS THE TRUE POINT OF BEGINNING FOR SAID DESCRIBED LINE;

THENCE SOUTHERLY, ALONG THE WEST BOUNDARY OF SAID PARCEL A, WHICH IS ALSO THE EAST RIGHT OF WAY BOUNDARY OF 1-82, TO THE SOUTH BOUNDARY OF SAID NORTH HALF OF THE NORTHEAST QUARTER; THENCE NORTH 87°58'34" EAST, ALONG SAID SOUTH BOUNDARY OF SAID NORTH HALF OF THE NORTHEAST QUARTER, 60.81 FEET TO THE CENTERLINE OF NANEUM CREEK; THENCE NORTHEASTERLY, ALONG SAID NANEUM CREEK CENTERLINE, TO THE NORTH BOUNDARY OF SAID NORTH HALF OF THE NORTHEAST QUARTER; THENCE SOUTH 87°42'10" WEST, ALONG SAID NORTH BOUNDARY, 763.52 FEET TO THE TRUE POINT OF BEGINNING FOR SAID DESCRIBED LINE.

(SAID TRACT BEING A PORTION OF PARCEL A OF THAT CERTAIN SURVEY RECORDED APRIL 22, 1993, IN BOOK 19 OF SURVEYS, PAGE 73, UNDER AUDITOR'S FILE NO. 558819 AND OF LOT 1, OF REDD SHORT PLAT, KITTITAS COUNTY SHORT PLAT NO. SP-93-14, AS RECORDED JANUARY 19, 1994 IN BOOK D OF SHORT PLATS, PAGE 89 AND 90, UNDER AUDITOR'S FILE NO. 567251, RECORDS OF KITTITAS COUNTY, STATE OF WASHINGTON.)

TRACT C:

THAT PORTION OF PARCELS 1C AND 1D OF THAT CERTAIN SURVEY AS RECORDED JUNE 15, 1994 IN BOOK 20 OF SURVEYS AT PAGE 60, UNDER AUDITOR'S FILE NO. 571789, RECORDS OF KITTITAS COUNTY, WASHINGTON, WHICH LIES NORTHERLY OF THE BULL DITCH RIGHT OF WAY AND NORTHWESTERLY OF THE CENTERLINE OF THE BRANCH OF NANEUM CREEK WHICH FLOWS THROUGH SAID PARCEL 1C; BEING A PORTION OF PARCEL 1B OF THAT CERTAIN SURVEY AS RECORDED APRIL 29, 1993 IN BOOK 19 OF SURVEYS AT PAGE 74, UNDER AUDITOR'S FILE NO. 559059, RECORDS OF KITTITAS COUNTY, WASHINGTON; LOCATED IN THE SOUTHEAST QUARTER OF SECTION 18, TOWNSHIP 17 NORTH, RANGE 19 EAST, W.M., KITTITAS COUNTY, WASHINGTON.

CONTAINS 51.21 ACRES.

Fumaria Solar Project Site Legal Description

A TRACT OF LAND SITUATED IN THE SOUTHEAST QUARTER OF SECTION 9, TOWNSHIP 18 NORTH, RANGE 18 EAST, W.M., KITTITAS COUNTY, STATE OF WASHINGTON, BEING A PORTION OF PARCEL E OF THAT CERTAIN SURVEY AS

RECORDED DECEMBER 22, 1998 IN BOOK 23 OF SURVEYS, AT PAGES 249 THROUGH 251, UNDER AUDITOR'S FILE NO. 199912220015, RECORDS OF SAID COUNTY, WHICH IS BOUNDED BY A LINE DESCRIBED AS FOLLOWS:

COMMENCING AT THE NORTHEAST CORNER OF SAID SOUTHEAST QUARTER OF SAID SECTION 9;

THENCE SOUTH 00°06'44" EAST ALONG THE EAST BOUNDARY LINE OF SAID SOUTHEAST QUARTER OF SAID SECTION 9, 60.76 FEET TO THE TRUE POINT OF BEGINNING OF SAID LINE;
THENCE CONTINUING SOUTH 00°06'44" EAST, ALONG SAID EAST BOUNDARY LINE OF SAID SOUTHEAST QUARTER, 2384.88 FEET;
THENCE SOUTH 89°36'01" WEST, 41.02 FEET;
THENCE SOUTH 71°56'57" WEST, 18.75 FEET;
THENCE SOUTH 68°28'25" WEST, 25.60 FEET;
THENCE SOUTH 59°52'18" WEST, 21.39 FEET;
THENCE SOUTH 55°35'54" WEST, 165.95 FEET;
THENCE NORTH 16°08'33" WEST, 159.35 FEET;
THENCE NORTH 04°55'17" WEST, 37.25 FEET;
THENCE SOUTH 86°43'54" WEST, 105.98 FEET;
THENCE NORTH 77°47'27" WEST, 339.61 FEET;
THENCE NORTH 88°06'56" WEST, 37.07 FEET;
THENCE SOUTH 69°10'09" WEST, 24.70 FEET;
THENCE NORTH 17°18'53" WEST, 22.35 FEET;
THENCE NORTH 02°14'53" WEST, 143.64 FEET;
THENCE NORTH 02°27'39" WEST, 389.33 FEET;
THENCE NORTH 19°22'16" EAST, 1646.02 FEET
THENCE SOUTH 89°13'18" EAST, 298.08 FEET TO THE TRUE POINT OF BEGINNING AND THE TERMINUS OF SAID LINE.

CONTAINS 35.24 ACRES.

Penstemon Solar Project Site Legal Description

THE NORTHEAST QUARTER OF THE SOUTHEAST QUARTER OF SECTION 17, TOWNSHIP 17 NORTH, RANGE 19 EAST, W.M., IN THE COUNTY OF KITTITAS, STATE OF WASHINGTON;

EXCEPT:

RIGHT OF WAY OF TJOSSEM AND MOE COUNTY ROADS.

CONTAINS 39.38 ACRES.

Typha Solar Project Site Legal Description

A TRACT OF LAND SITUATED IN THE EAST HALF OF THE NORTHEAST QUARTER OF SECTION 30, TOWNSHIP 18 NORTH, RANGE 18 EAST, W.M., KITTITAS COUNTY, STATE OF WASHINGTON, WHICH IS BOUNDED BY A LINE DESCRIBED AS FOLLOWS:

COMMENCING AT THE NORTHWEST CORNER OF SAID NORTHEAST QUARTER; THENCE SOUTH 89°16'48" EAST ALONG THE NORTH BOUNDARY LINE OF SAID NORTHEAST QUARTER, 1314.14 FEET TO THE TRUE POINT OF BEGINNING OF SAID LINE;

THENCE CONTINUING SOUTH 89°16'48" EAST ALONG SAID NORTH BOUNDARY LINE, 1134.53 FEET;
THENCE SOUTH 05°04'50" EAST, 98.92 FEET;

THENCE SOUTH 14°06’00” EAST, 80.70 FEET;
THENCE SOUTH 08°58’08” EAST, 174.50 FEET;
THENCE SOUTH 19°32’43” EAST, 160.93 FEET;
THENCE SOUTH 15°40’01” EAST, 143.68 FEET;
THENCE SOUTH 20°06’14” EAST, 124.44 FEET TO A POINT ON THE EAST BOUNDARY LINE OF SAID NORTHEAST QUARTER;
THENCE SOUTH 00°52’11” EAST, ALONG THE EAST BOUNDARY LINE OF SAID NORTHEAST QUARTER, 1262.44 FEET;
THENCE SOUTH 63°35’36” WEST, 47.38 FEET;
THENCE SOUTH 69°41’30” WEST, 117.32 FEET;
THENCE SOUTH 69°54’58” WEST, 101.62 FEET;
THENCE SOUTH 83°42’43” WEST, 36.85 FEET;
THENCE NORTH 15°17’56” WEST, 24.03 FEET;
THENCE SOUTH 74°30’43” WEST, 56.36 FEET;
THENCE NORTH 74°37’20” WEST, 75.56 FEET;
THENCE NORTH 69°50’05” WEST, 53.25 FEET;
THENCE NORTH 60°06’51” WEST, 195.24 FEET;
THENCE NORTH 60°42’51” WEST, 100.56 FEET;
THENCE NORTH 55°37’02” WEST, 226.49 FEET;
THENCE NORTH 40°07’35” WEST, 65.17 FEET;
THENCE NORTH 36°07’05” WEST, 135.85 FEET;
THENCE NORTH 22°37’59” WEST, 58.56 FEET;
THENCE NORTH 51°24’40” WEST, 47.40 FEET;
THENCE NORTH 36°10’00” WEST, 75.75 FEET;
THENCE NORTH 34°20’25” WEST, 72.58 FEET;
THENCE NORTH 26°34’08” WEST, 60.13 FEET;
THENCE NORTH 04°10’07” WEST, 55.08 FEET;
THENCE NORTH 81°36’17” EAST, 30.19 FEET;
THENCE NORTH 04°17’30” EAST, 33.02 FEET;
THENCE NORTH 38°49’40” WEST, 25.43 FEET;
THENCE SOUTH 66°22’39” WEST, 53.58 FEET;
THENCE NORTH 30°46’47” WEST, 93.84 FEET;
THENCE NORTH 21°54’36” WEST, 39.86 FEET;
THENCE NORTH 14°45’26” EAST, 20.96 FEET;
THENCE SOUTH 89°23’14” WEST, 31.77 FEET TO A POINT ON THE WEST BOUNDARY LINE OF SAID EAST HALF OF SAID NORTHEAST QUARTER;

THENCE NORTH 00°36’46” WEST ALONG SAID WEST BOUNDARY LINE OF SAID EAST HALF OF SAID NORTHEAST QUARTER, TO A POINT ON THE NORTH LINE OF SAID NORTHEAST QUARTER, 1166.28 FEET TO THE TRUE POINT OF BEGINNING AND TERMINUS OF SAID LINE.

CONTAINS 54.29 ACRES.

Urtica Solar Project Site Legal Description

A TRACT OF LAND SITUATED IN THE SOUTHWEST QUARTER OF SECTION 10, TOWNSHIP 17 NORTH, RANGE 18 EAST, W.M., KITTITAS COUNTY, STATE OF WASHINGTON, BEING A PORTION OF LOTS 1, 2, 3 AND 4, AND ALL OF LOTS 7, 8, 9, 10, 11, AND 12 OF THAT CERTAIN SURVEY, AS RECORDED IN BOOK 32 OF SURVEYS, PAGE 71, UNDER AUDITOR’S FILE NO. 200602280020, RECORDS OF SAID COUNTY, WHICH IS BOUNDED BY A LINE DESCRIBED AS FOLLOWS:

A. COMMENCING AT THE SOUTHEAST CORNER OF SAID SOUTHWEST QUARTER; THENCE NORTH 01°15’25” EAST ALONG THE EAST BOUNDARY LINE OF SAID SOUTHWEST QUARTER, 1023.64 FEET; THENCE NORTH 88°44’35” WEST, 29.10 FEET TO THE TRUE POINT OF BEGINNING OF SAID LINE;

THENCE NORTH 89°14’26” WEST, 453.87 FEET;
THENCE NORTH 87°05’29” WEST, 1325.35 FEET;
THENCE NORTH 04°10’29” WEST, 211.33 FEET;
THENCE NORTH 61°45’24” EAST, 261.93 FEET;
THENCE NORTH 42°39’06” EAST, 113.46 FEET;
THENCE NORTH 31°25’35” EAST, 123.63 FEET;
THENCE NORTH 40°11’01” WEST, 121.12 FEET;
THENCE NORTH 87°43’34” WEST, 128.38 FEET;
THENCE SOUTH 56°41’46” WEST, 155.23 FEET;
THENCE SOUTH 28°15’58” WEST, 100.76 FEET;
THENCE NORTH 87°36’58” WEST, 96.74 FEET;
THENCE SOUTH 63°15’03” WEST, 170.80 FEET;
THENCE SOUTH 33°19’00” WEST, 161.55 FEET;
THENCE SOUTH 88°58’40” WEST, 447.52 FEET TO A POINT ON THE WEST BOUNDARY LINE OF SAID SOUTHWEST QUARTER;
THENCE NORTH 01°17’45” EAST ALONG SAID WEST BOUNDARY LINE OF SAID SOUTHWEST QUARTER, 801.99 FEET;
THENCE SOUTH 86°51’18” EAST, 1320.00 FEET;
THENCE NORTH 01°17’45” EAST, 7.60 FEET;
THENCE SOUTH 86°50’25” EAST, 1277.79 FEET TO A POINT ON THE EAST BOUNDARY LINE OF SAID SOUTHWEST QUARTER;
THENCE SOUTH 01°18’25” WEST ALONG SAID EAST BOUNDARY LINE OF SAID SOUTHWEST QUARTER, 971.53 FEET TO THE TRUE POINT OF BEGINNING AND TERMINUS OF SAID LINE.

CONTAINS 51.94 ACRES.

B. ENVIRONMENTAL ELEMENTS

1. Earth

a. General description of the site (circle one): Flat, rolling, hilly, steep slopes, mountainous, other.....

Site Description

General County

The Columbia Solar Project sites are all relatively flat. Kittitas Valley is at the eastern margin of the Yakima River Valley in a structural basin between the Cascade Mountains and the Columbia Plateau.

Solar Project Sites

Camas Solar Project Site
The Camas Solar Project site is sloped gently from north to south with an overall inclination of about 0.5%. Surface geology in the project site vicinity consists of Holocene river and creek alluvium and windblown loess of the Palouse Formation overlying Pleistocene Thorp Gravels. Recent alluvium

deposited by Naneum and Wilson Creeks covers most of the project area, except the northeast corner where an older alluvial terrace of the ancestral Yakima River is present.

Fumaria Solar Project Site
The Fumaria Solar Project site is sloped gently north to south with an overall inclination of about 2%. The project site is within the Kittitas Valley on the east side of the river on a Pliocene epoch gravel deposit called the Thorp Gravels.

Fumaria Solar Project Generation Tie Line
The Fumaria Solar Project generation tie line crosses several adjacent landforms, including ridges of Pleistocene epoch alpine glacial sediment of the Kittitas Drift (Swauk Prairie and Indian John subdrifts) and the Lakedale Drift (Bullfrog subdrift). Quaternary creek alluvium is mapped in the swales between the glacial ridges and at the point of intersection of the generation tie line with the existing grid.

Penstemon Solar Project Site
The Penstemon Solar Project site is flat with a very slight inclination from north to south. Surface geology in the project site vicinity consists of Holocene creek alluvium and wind-blown loess of the Palouse Formation overlying Pleistocene Thorp Gravels. Alluvium deposited by Coleman Creek covers most of the project site.

Typha Solar Project Site
The Typha Solar Project site is irregularly shaped with the north and east site boundaries defined by the Yakima River. The site surface is irregular with an overall topography change of about 10 feet. This area appears to be ancient floodplain, and old meanders and oxbows are visible across the project site. Surface geology in the project site vicinity consists of Holocene river alluvium and wind-blown loess overlying older Pleistocene gravels. Recent alluvium deposited by the Yakima River and its major local tributary Robinson Creek covers most of the project site, and Thorp Highway South follows an older alluvial terrace southwest of the project.

Typha Solar Project Generation Tie Line
The generation tie line would originate from the southwestern corner of the Typha Solar Project site and share wooden poles with existing electric distribution lines that cross south along an existing access road, crossing the EP Canal three times, passing through the Ellensburg Golf and Country Club, to connect to the existing PSE distribution line along Thorp Highway South. The surface geology of the approximately 0.5-mile path is described above for the Typha Solar Project Site.

Urtica Solar Project Site
The Urtica Solar Project site slopes gently from north to south. Surface geology in the project site vicinity consists of Pleistocene-aged wind-blown loess and ash on top of Holocene-aged, water-lain alluvium, both overlying older glacial and pre-glacial gravels. Quaternary terraced sediments that include glacial sediment, older alluvium, and uplifted, partially lithified coastal marine and estuarine deposits form the substrate of the project site. Flows of the Middle Miocene Grande Ronde Basalt make up the hills just south of the project site and younger alluvium is in the valley floor to the north.

b. What is the steepest slope on the site (approximate percent slope)?

Steepest Slope

As indicate above, the parts of the project sites where solar facilities would be located are relatively flat, however there are other parts of some of the sites where slopes are greater. Table 2 indicates the range of slopes at each of the Columbia Solar Project sites, as well as the average slope for each site. The sites

are mostly flat, but there are relatively steep areas that are minimal compared to the rest of the site. Overall the project sites provide favorable areas for construction.

Table 2. Approximate Steepest Percent Slope at each of the Columbia Solar Project Sites

Site Name	Maximum Slope (%)	Average Slope (%)	Range of Slopes (%)
Camas Solar Project Site	23.43	2.81	0.04 – 23.43
Fumaria Solar Project Site	18.00	2.90	0.34 – 18.00
Penstemon Solar Project Site	25.60	1.63	0.10 – 25.60
Typha Solar Project Site	29.02	1.17	0.02 – 29.02
Urtica Solar Project Site	34.00	3.73	0.12 – 34.00

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any agricultural land of long-term commercial significance and whether the proposal results in removing any of these soils.

Soils, including Agricultural Lands

General County

The Columbia Solar Project sites and surrounding area are underlain by Qs (Quaternary Alluvium, Sidestream Facies) soil which is characterized as downstream aggradation deposits with their source being upstream glacial moraines located in the west and northwest areas of the Kittitas Valley. These deposits consist primarily of basaltic gravels and sands with varying amounts of silt and clay minerals. The gravel varies from fine to coarse. These undifferentiated sandy gravel deposits are overlain by varying thicknesses of topsoil, weathered sandy gravel horizons, and loessal (wind) deposits that comprise silty sand and sandy silt units observed from the surface down to the relatively un-weathered, partially cemented gravel. The gravel deposits consistently displayed some level of cementation that is most likely caused by breakdown of the basaltic rock to silt and clay minerals and then subsequent relithification under normal loading. Most soils in the vicinity of the Columbia Solar Project sites have a cemented zone at depth, commonly called caliche, and a blanket of loess and volcanic ash across the surface. The soils observed in the April 2017 borings drilled at the sites were consistent with this mapping.

Solar Project Sites

Camas Solar Project Site

The Camas Solar Project site is an actively farmed alfalfa field. Agricultural facilities such as a barn/equipment storage building are located on the property. Agriculture on the project site and surrounding area is supplied with water through a canal. According to the Natural Resources Conservation Service's (NRCS's) Web Soil Survey's Kittitas County Area, Washington (WA637) map, the Camas site has three classifications of soil types: Mitta ashy silt loam, Nosal ashy silt loam, and Opnish ashy loam that form on floodplains and alluvial fan landforms within alluvium mixed with volcanic ash. Of the three, Mitta ashy silt loam is considered prime farmland if irrigated (Class 4) and the Nosal ashy silt loam is considered prime farmland if irrigated and drained (Class 6). Therefore, the agricultural land use at the Camas Solar Project site is considered prime farmland. Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics

for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. Each soil designated as prime farmland is also assigned a number code designating the current quality of farmland and the management actions required to utilize it for adequate farmland. Generally, only prime farmland codes 1 through 4 are considered adequate farmland, which are defined as 1) all areas are prime farmland, 2) prime farmland if drained, 3) prime farmland if protected from flooding or not frequently flooded during the growing season, and 4) prime farmland if irrigated.

Fumaria Solar Project Site

The Fumaria Solar Project site is fallow agricultural land (see section B.4 for additional details). According to the NRCS Web Soil Survey's Kittitas County Area, Washington (WA637) map, the project site has two predominant classifications of soil types. The Reeser-Reelow-Sketter complex accounts for approximately 98% of the project site, of which 94% is considered farmland of statewide importance. Soils of the Reeser-Reelow-Sketter complex form in alluvium and glacial drift with an influence of loess and volcanic ash on remnant alluvial fan landforms and typically extend to 1.8 feet below the surface. The Metmill loam classification accounts for approximately 2% of the solar project site and is considered prime farmland, if irrigated (Class 4). Therefore, the agricultural land use at the Fumaria Solar Project site is considered prime farmland and farmland of statewide importance. Farmland of statewide importance is defined as nearly meeting the definition of prime farmland, and land that can economically produce high yields of crops when treated and managed according to acceptable farming methods. Often times, areas categorized as farmland of statewide importance do not meet the criteria for prime or unique farmland but are still considered potentially acceptable farmland as designated by state law. These areas are designated by the Washington State Department of Agriculture.

Fumaria Solar Project Generation Tie Line

Soils mapped along the proposed generation tie line include Nanum, Manastash, Durtash, Metmill, and Brysill soils that form in alluvium mixed with ash on remnant alluvial fan and old terrace landforms. Soils mapped at the Reecer and Dry Creek crossings include Ackna, Brickmill, Manastash, Metmill, Nanum, Nosal, and Reeser soils that form in alluvium mixed with loess and ash on alluvial fan and terrace landforms, as well as soils of the Weirman-Kayak-Zillhah complex that form in alluvium on floodplains. The alluvial soils extend from 1.3 to 3.7 feet below the modern surface.

Penstemon Solar Project Site

The Penstemon Solar Project site is actively farmed Sudangrass or hay agricultural land. According to the NRCS Web Soil Survey's Kittitas County Area, Washington (WA637) map, the project site has three predominant classifications of soil types. Soil in the west third of the project site is mapped as the Nack-Brickmill complex. Soil in the middle of project area is mapped as Mitta ashy silt loam. Soil in the east third of project area is mapped as Deedale clay loam. These soils form in alluvium mixed with volcanic ash on alluvial fan landforms and floodplain landforms. The Mitta ashy silt loam is considered prime farmland if irrigated (Class 4). The Nack-Brickmill complex soil type is considered prime farmland if irrigated and drained (Class 6). The Deedale clay loam is considered farmland of statewide importance. Therefore, the agricultural land use at the Penstemon Solar Project site is considered prime farmland and farmland of statewide importance.

Typha Solar Project Site

The Typha Solar Project site is fallow agricultural land that is actively grazed (see Section B.4 for additional details). According to the NRCS Web Soil Survey's Kittitas County Area, Washington (WA637) map, the project site has four predominant classifications of soil types: Nosal ashy silt loam, Weirman gravelly sandy loam, Mitta ashy silt loam, and soils of the Weirman-Kayak-Zillah complex that form in alluvium on flood plain landforms. The Weirman gravelly sandy loam is not considered prime farmland. The Mitta ashy silt loam, drained, is considered prime farmland if irrigated (Class 4). The Weirman-Kayak-

Zillah complex and Nossal ashy silt loam soil types are considered prime farmland if irrigated and drained (Class 6). Therefore, a portion of the agricultural land use on the Typha Solar Project site is considered prime farmland.

Urtica Solar Project Site

The Urtica Solar Project site is actively farmed alfalfa agricultural land. According to the NRCS Web Soil Survey's Kittitas County Area, Washington (WA637) map, the Urtica Solar Project site has four classifications of soil types: Ackna loam, Brickmill loam, Brysill loam, and Nanum loam. All four soil classifications are considered prime farmland by the NRCS if irrigated (Class 4).

Impacts to Solar Project Site Agricultural Lands

Construction of the Columbia Solar Project sites would represent a conversion of the roughly 232 acres of leased properties currently used for agricultural hay production and grazing, to use as solar electricity generation facilities for the approximately 30-year lives of the solar projects. Conversion of those 232 acres to solar facilities would represent only 0.13% of the total 183,124 acres of farmlands in Kittitas County, and 0.34% of the 68,314 acres of total croplands. Because these conversions are extremely minimal, and unlike residential development, temporary (for the life of the facility), there would be no significant impacts to agriculture in the county during construction or operation of the five Columbia Solar Projects.

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.

Unstable Soils

There are no surface indications, or history of, unstable soils in the immediate vicinity of the Columbia Solar Project sites or their associated generation tie lines. The April 2017 geotechnical survey reported that upper-level soils at the sites are moisture sensitive. Best management practices (BMPs) would be used during the wet season to avoid erosion issues at site entrance locations and protect moisture-sensitive topsoil.

e. Describe the purpose, type, total area, and approximate quantities and total affected area of any filling, excavation, and grading proposed. Indicate source of fill.

Grading and Fill

General County

Grading for each of the five Columbia Solar Projects would be minimal and would be isolated to the all-weather access roads (as needed), inverter pads, and switchyard pads to accommodate interconnection equipment. The all-weather access roads would be relatively flat and would be graded to match existing conditions to minimize earthwork. Inverter pads would be placed throughout each solar project site, each of which would be approximately 15 by 30 feet and 1 to 2 feet thick. Each of these pads would be graded, but as with the switchyard pads, the proposed elevation would be set to minimize earthwork. The switchyard and inverter pads would require a minimum of 90% relative compaction. Other property improvements that would have only moderate impact/disturbance to in situ conditions would involve roadbed stabilization for the all-weather access roads.

No export of soil is anticipated for any of the five Columbia Solar Project sites. At the conclusion of construction, all disturbed areas surrounding graded areas would be remediated through reseeding with native, low-cover vegetation.

Minimal grading and ground disturbance would occur as part of the proposed Columbia Solar Projects. The portion of the solar panel array installation that actually disturbs the ground is also very minimal. Because of this, existing topography and drainage patterns would remain relatively undisturbed.

Solar Project Sites

In addition to the general grading/leveling discussed above for all of the project sites, the sites specifically described below would have other sources of grading.

Camas Solar Project Site
In addition to the general grading/leveling discussed above for all of the solar project sites, TUUSSO is proposing to re-site an existing overhead distribution line owned by PSE that passes through the northeast quadrant of Camas A. TUUSSO would pursue one of three options for this distribution line: 1) direct burial of the line from the northern boundary of Camas A to the eastern boundary of Camas A, staying within the current ROW, 2) modifying the ROW slightly to cause the path of the distribution line to travel more directly north-south through Camas A, or 3) modifying the ROW and path of the current overhead distribution line to instead closely follow Bull Ditch and Little Naneum Creek such that the line skirts the northeast boundary of Camas A. Option 1 would have minimal impact to the current site conditions, simply providing for the burial of the PSE distribution line where it passes through Camas A. Option 2 would comprise the construction of up to 4 additional monopoles (typically wood) to support the more north-south path through the project site. Option 3 would comprise the construction of up to around 10 monopoles (typically wood) to support the conduit along the northeast boundary of Camas A.

Typha Solar Project Site
The additional grading/earth moving expected on the Typha Solar Project site would be associated with: 1) the improvement of the existing land bridge near the entrance to the site (e.g., by excavation of 8 to 12 inches of topsoil, placement of geotextile fabric in the excavation, and filling the excavation with quarry spalls) or construction of a small culvert at the location of the existing land bridge; 2) the filling of a small on-site watering pond; and 3) improvement/widening of the existing gravel road leading from Thorp Highway South to the gated site entrance.

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.

Construction Erosion

As described in Section B.1.a., the Columbia Solar Project sites are all relatively flat. Minimal grading and ground disturbance would occur as part of the proposed solar projects (see Section B.1.e). However, soil disturbances (from construction activities associated with the limited site grading, mounting of the solar panels, equipment installation, electrical conduit trenching, and scraping for the all-weather access roads) could cause soil erosion and the eventual release of sediment into stormwater runoff. Obtaining coverage under, and ensuring compliance with, the National Pollutant Discharge Elimination System (NPDES) Construction General Permit requirements (including implementation of appropriate BMPs and consistent record keeping of the Stormwater Pollution Prevention Plan [SWPPP]) would ensure that temporary water quality impacts associated with construction activities would not cause any significant downstream or off-site impacts.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?

Impervious Surfaces

As show in Table 3, conservatively 3% to 5% of impervious surfaces would be added to each Columbia Solar Project site. Impervious surfaces at the sites would include access roads, concrete pads for the electrical infrastructure, and solar tracker posts.

Table 3. Percent of Solar Project Site Covered with Impervious Surfaces after Project Construction

Site Name	Impervious Surfaces Added (Acres)	Total Project Site Area (Acres)	% of Project Site
Camas Solar Project Site	2.00	50.83	4%
Fumaria Solar Project Site	1.71	35.24	5%
Fumaria Solar Project Generation Tie Line	1.50	30.05	5%
Penstemon Solar Project Site	1.31	39.38	3%
Typha Solar Project Site	1.40	54.29	3%
Typha Solar Project Generation Tie Line	0.21	4.27	5%
Urtica Solar Project Site	1.65	51.94	3%

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:

Erosion Control Measures

The following mitigation measures would be used:

- Planned BMPs include those from stormwater management guidelines applicable to Eastern Washington.
- If excavated site soils are to be used as structural fill, they would be protected from moisture while stockpiled.
- Stockpiled topsoil would not be mixed with structural fill, if it is planned for use in non-structural areas.
- Temporary construction ingress and egress would be completed prior to the start of ongoing construction traffic at the solar project sites. A temporary construction entrance would be constructed of 8 to 12 inches of quarry spalls. If the soils in the entrance locations are soft, a layer of geotextile fabric would be laid down as a barrier prior to placement of quarry spalls. The quarry spalls would provide a stable entrance/exit to the sites and would limit tracking of mud onto the existing public and private roads during and after wet weather.
- Infiltration and Temporary Erosion and Sedimentation Control (TESC) measures would consist of installation of silt fencing as needed around the site entrances, around the perimeter of the low side of the sites, and at discharge points where sediment-laden surface water might enter off-site drainage features. Because the solar project sites are flat and slope very gently to the south, silt fencing would probably not be necessary at the southern perimeters.

The preliminary SWPPP describes a number of BMPs to assure compliance with state water quality standards, including the following:

- Preserving natural vegetation.
- Establishing buffer zones to protect existing wetlands and to relieve potential downstream impacts.
- Providing a single, stabilized construction entrance to prevent soil and sediment from tracking off the site.
- Controlling flow rates leaving the site via full on-site dispersion.
- Installing a silt fence at all areas downslope of disturbed areas, and upslope of existing waterbodies.
- Stabilizing soils when necessary, including the use of plastic covering to protect soil stockpiles.
- If necessary, utilizing a wheel wash at the site exit if sediment may be tracked off-site.

2. Air

a. What types of emissions to the air would result from the proposal during construction, operation, and maintenance when the project is completed? If any, generally describe and give approximate quantities if known.

The proposed Columbia Solar Projects are photovoltaic facilities that would only have minimal dust and vehicular air emissions during construction (Table 4). There would be no air emissions during operation.

Conservatively, maintenance-related emissions for the proposed solar projects could consist of monthly maintenance inspections by workers in a single pick-up truck. Thus, maintenance emissions would be minimal.

Table 4. Construction-Related Emissions in Tons Resulting from the Proposed Solar Project (Per Project Site)

Source	CO	NO_X	SO_X [1]	PM_{10}	$PM_{2.5}$	VOCs	HAPs	CO_2e [2]
Off-Road Construction Equipment	3.42	5.53	0.01	0.25	0.23	0.76	0.08	744
Commuting/On-Road Equipment/Material Delivery	0.39	0.11	0.00	1.20	0.14	0.05	0.00	84
Fugitive Dust From Construction Operations	–	–	–	0.03	0.00	–	–	–
Total	**3.81**	**5.63**	**0.01**	**1.48**	**0.37**	**0.81**	**0.08**	**828**
Percent of Total Kittitas County Emissions	***0.01%***	***0.12%***	***< 0.01%***	***0.03%***	***0.01%***	***< 0.01%***	***< 0.01%***	***N/A*** [3]

Note: CO_2e = Carbon dioxide equivalent.
1. All oxides of sulfur (including SO_2). For purposes of comparison, SO_2 emissions reported in the county inventory are assumed to be equal to SO_X.
2. CO_2e emissions are reported in metric tons.
3. CO_2e emissions are not reported for all sources in the county inventory. Therefore, CO_2e emissions are not compared to the county inventory.

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.

The general project area is designated as in attainment for all pollutants. The area consists of residential and commercial developments. The Columbia Solar Project sites would not be expected to be affected by any off-site sources of emissions or odor.

c. Proposed measures to reduce or control emissions or other impacts to air, if any:

The five proposed Columbia Solar Projects would only have minimal dust and vehicular air emissions during construction, and no air emissions during operation. Dust generated by excavation and grading on the five Columbia Solar Projects would be short term. Dust from access roads would be controlled by applying gravel or watering, as necessary.

3. Water

a. Surface:

1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.

Surface Waters

Non-wetland waters

Streams identified within the five Columbia Solar Project sites were classified according to the Washington Administrative Code (WAC) water typing system (WAC 222-16-030). The streams were categorized based on the stream reaches within each of the five solar project sites; reaches downstream of the solar project sites may be rated higher.

A total of one river, the Yakima River (Typha Solar Project site); five streams, including Little Naneum Creek (Camas Solar Project site), Reecer Creek (Fumaria Solar Project generation tie line), an unnamed stream (Fumaria Solar Project generation tie line), Coleman Creek (Penstemon Solar Project site), and McCarl Creek (Urtica Solar Project site); four canals, including Bull Ditch (Camas Solar Project site), the Cascade Irrigation District Canal (Fumaria Solar Project generation tie line), Town Ditch (Fumaria Solar Project generation tie line), and the EP Canal (Typha Solar Project generation tie line); one pond (Urtica Solar Project site); and various ditches were delineated throughout all of the five project sites.

Table 5 summarizes the water types found within the Columbia Solar Project sites. Most delineated waters would fall under the jurisdiction of the USACE, Ecology, and Kittitas County. Some ditches and canals may not be considered jurisdictional based on their connectivity to jurisdictional features; however, this is determined on a case-by-case basis and can only be determined by the applicable regulatory agency. Detailed descriptions of, and more information regarding, each water feature within the solar project sites are provided in the Critical Areas Wetland and Waters Delineation Reports for each site.

A summary of all non-wetland waters and their buffers documented within the Columbia Solar Project sites is provided in Table 5. KCC guidance (Chapter 17A.07.010) defines minimum protection buffers of 40 feet for Type S waters and 20 feet for Type F waters. KCC guidance does not define protection buffers for irrigation canals and ditches, because they do not qualify as streams. In addition, KCC guidance specifies that no protection buffer is needed for Type Ns waters.

Table 5. Summary of Water Features within and near the Columbia Solar Project Sites

Stream Name	Tributary to	Water Typing[1]	USACE Jurisdiction[2]	Kittitas County Minimum Buffer Distance (feet)[3]	Total Size of Water Feature Within the Project Site (acres)[4]
Camas Solar Project Site					
Little Naneum Creek	Naneum Creek	F	RPW	20	0.69
Bull Ditch (CS02)	N/A	N/A	N/A	None	0.22
Fumaria Solar Project Site					
Ephemeral ditch (FS01)	Reecer Creek	N/A	N/A	None	0.00
Ephemeral ditch (FS02)	FS01	N/A	N/A	None	0.00
Fumaria Solar Project Generation Tie Line					
Reecer Creek	Yakima River	F	RPW	20	0.12
Ephemeral ditch (FS01)	Reecer Creek	N/A	N/A	None	0.25
Ephemeral ditch (FS02)	FS01	N/A	N/A	None	0.01
Cascade Irrigation District Canal (FS03)	Yakima River	N/A	N/A	None	0.03
Unnamed stream (FS04)	Town Ditch	Ns	NRPW	None	0.01
Town Ditch (FS05)	Yakima River	N/A	N/A	None	0.04
Roadside ditches	Varies	N/A	N/A	None	0.18
Penstemon Solar Project Site					
Coleman Creek	Naneum Creek	F	RPW	20	0.47
Unnamed Ephemeral Ditch	Coleman Creek	N/A	NRPW	None	0.00
Typha Solar Project Site					
Yakima River	Columbia River	S	RPW	40	0.05
Typha Solar Project Generation Tie Line					
EP Canal (TS01)	Naneum Creek	F	RPW	None	0.44
Unnamed Ephemeral Ditch 1	Yakima River	N/A	RPW	None	0.02
Unnamed Ephemeral Ditch 2	EP Canal	N/A	NRPW		
Urtica Solar Project Site					
McCarl Creek (US01)	Yakima River	F	RPW	20	0.27
UOW01 (western pond)	McCarl Creek	F	RPW	None	0.05
Unnamed Ephemeral Ditch	McCarl Creek	N/A	NRPW	None	0.02

1. S = shoreline of the state (WAC 222-16-030), F = fish-bearing stream (WAC 222-16-030), Ns = non-fish-bearing (WAC 222-16-030), N/A = not applicable, due to ditches and canals being excluded from the WAC typing system.
2. RPW = relatively permanent water, NRPW = non-relatively permanent water, N/A = not applicable, due to exclusion from jurisdiction.
3. Only minimum buffer distances are depicted on maps.
4. Does not include buffer areas.

Wetlands

Wetlands within each of the five Columbia Solar Project sites were rated using the *Washington State Wetland Rating System for Eastern Washington, 2014 Update*. A total of 16 wetlands were delineated within the Columbia Solar Project sites, one on the Camas Solar Project site, six on the Fumaria Solar Project site (one on the solar project site and five along the generation tie line), one on the Penstemon Solar Project site, five on the Typha Solar Project site (three only on the solar project site, one only on the generation tie line, and one on both), and three on the Urtica Solar Project site. These wetlands were rated using field observations and desktop analysis to determine the wetland rating category for each wetland area.

All of the wetlands within the five Columbia Solar Project sites are classified as either Palustrine Emergent (PEM) or Palustrine Scrub-shrub (PSS) wetlands based on the *Classification of Wetlands and Deepwater Habitats of the United States*. In addition, wetlands within the five Columbia Solar Project sites were classified as either Riverine, Slope, or Depressional based on the *Hydrogeomorphic (HGM) Wetland Classification System: An Overview and Modification to Better Meet the Needs of the Natural Resources Conservation Service*. All delineated wetlands would fall under the jurisdiction of the USACE, Ecology, and Kittitas County. Detailed descriptions of each wetland within the solar project sites are provided in the Critical Areas Wetland and Waters Delineation Reports for each site, which also include a list of vegetation observed within each project site, maps of delineated wetlands and their buffers, wetland delineation data sheets, ground-level site photographs, and wetland rating forms.

Table 6 summarizes the size, wetland rating category, minimum wetland protection buffer size (according to guidance in KCC 17A.04.020), and Cowardin classification, and HGM classification of wetlands found within each of five Columbia Solar Project sites.

Table 6. Wetland Size, Rating, Buffer, and Classifications for Wetlands within the Study Areas for Each Columbia Solar Project Site

Wetland Name	Delineated Area within the Project (Wetland Rating Unit Size)[1] (acres)	Wetland Rating[2]	Kittitas County Minimum Buffer Distance (feet)[3]	Cowardin Classification	Hydrogeomorphic Classification
Camas Solar Project Site					
CW01	0.97 (1.72)	III	20	PEM	Riverine
Fumaria Solar Project Site					
FW01	0.00 (estimated 5.57)	III	20	PEM	Slope
Fumaria Solar Project Generation Tie Line					
FW02	0.24 (estimated 2.15)	II	25	PEM	Riverine
FW03	0.03 (estimated 0.58)	III	20	PEM	Depressional
FW04	0.03 (estimated 0.23)	III	0[4]	PEM/PSS	Riverine
FW05	0.20 (estimated 1.67)	IV	0[4]	PEM	Riverine
FW06	0.005 (0.005)	IV	0[4]	PEM	Depressional
Penstemon Solar Project Site					
PW01	0.00 (0.14)	III	0[4]	PEM	Depressional
Typha Solar Project Site					

Wetland Name	Delineated Area within the Project (Wetland Rating Unit Size)[1] (acres)	Wetland Rating[2]	Kittitas County Minimum Buffer Distance (feet)[3]	Cowardin Classification	Hydrogeomorphic Classification
TW01	0.07 (estimated 0.33)	II	25	PEM/PSS	Riverine
TW02	0.42 (estimated 0.68)	II	25	PEM	Riverine
TW03	0.80 (estimated 8.45)	II	25	PEM/PSS	Riverine
TW04	0.05 (0.05)	III	0[4]	PEM	Depressional
Typha Solar Project Generation Tie Line					
TW03	0.06 (estimated 8.45)	II	25	PEM/PSS	Riverine
TW05	0.03 (estimated 0.47)	III	20	PEM	Riverine
Urtica Solar Project Site					
UW01	0.05 (0.05)	III	0[4]	PEM	Depressional
UW02	0.13 (0.97)	III	20	PEM	Depressional
UW03	0.01 (1.19)	III	20	PEM	Depressional

1. Wetland rating unit size is the total area of wetland delineated or estimated based on aerial photograph interpretation and field reconnaissance. Area of delineated portions of the wetlands is based on SWCA survey data. Does not include buffer areas.
2. II = Category II, III = Category III, IV = Category IV.
3. Minimum buffer distances are depicted on maps (Refer to the Critical Areas reports for each project site for maps).
4. No Kittitas County buffer is defined because the wetland area is below the minimum size threshold for protection or is rated as a Category IV; however, building setbacks may be required based on zoning lot line setbacks, but would not exceed 25 feet.

2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.

Impacts to Surface Waters – Non-wetland Waters

General County

TUUSSO has made every effort to avoid impacts to water resources throughout all of the Columbia Solar Project sites, which would be achieved through avoidance measures in project design and utilization of BMPs. Impacts to water resources at each solar project site and along each associated generation tie line are described below.

Impacts to water resources at each solar project site and along each associated generation tie line are described below.

Solar Project Sites

All Solar Project Sites and Generation Tie Lines
No impacts are proposed to any water resources within the Camas, Fumaria, Penstemon, Typha, and Urtica Solar Project sites. Internal access roads and site access would be located in upland areas or on existing access roads. For the Fumaria and Typha Generation Tie Lines, all water resources would be spanned by power poles, and existing roads adjacent to the proposed line would be utilized for installation of new lines or power poles. All impacts to water resources would be avoided through project design.

Fumaria Solar Project Site
If the proposed western site access route is used, it would be via Clarke Road and would cross Reecer Creek. The current road edge is eroding on the southern side of the road. TUUSSO would either install spanning structures to avoid impacts to the Reecer Creek crossing (such as using road plates and gravel) or improve and reinforce the current bridge infrastructure, which could result in minor impacts to Reecer Creek. If impacts to Reecer Creek are proposed, then TUUSSO would prepare and submit a Joint Aquatic Resource Permit Application (JARPA) for review by USACE and Ecology. If the eastern access route is used, it would come from Reecer Creek Road and traverse westerly across private property to the eastern border of the Fumaria Solar Project site, which would not result in any impacts to water resources.

Typha Solar Project Site
For site access, existing roads would be utilized as much as possible; however, the existing bridge crossing of the EP Canal would need to be improved in one of three ways: 1) reinforce, improve, and/or replace existing bridge supports to accommodate the truck traffic to the project site; 2) completely remove and replace the existing bridge with a new bridge; or 3) install a temporary bridge over the existing bridge during the construction period to accommodate the truck traffic. Based on the current project design, all impacts to jurisdictional water resources would be avoided through project design. If TUUSSO alters the project design to where the EP Canal would be impacted, then TUUSSO would coordinate with EFSEC, USACE, Ecology, and Kittitas County to comply with all new permitting requirements.

Impacts to Surface Waters – Wetlands

General County

TUUSSO has made every effort to avoid impacts to wetlands throughout all of the Columbia Solar Project sites, which would be achieved through avoidance measures in project design and utilization of BMPs. There are minimal proposed impacts to wetlands within the solar project sites.

Solar Project Sites

Typha Solar Project Site
The Typha Solar Project site has one proposed wetland crossing. This crossing is for an internal access road that enters the site at the southern site boundary at an existing land bridge. The land bridge is periodically flooded by wetland TW03 due to a clogged or crushed culvert that prevents adequate flow through, which has resulted in wetland characteristics developing in the road crossing. TUUSSO is proposing either: 1) an improvement of the existing land bridge (e.g., by excavation of 8 to 12 inches of topsoil, placement of geotextile fabric in the excavation, and filling the excavation with quarry spalls), or 2) construction of a small culvert at the location of the existing land bridge. This would result in a minimal impact to TW03 of less than 0.01 acre. Additional coordination with EFSEC, USACE, Ecology, and Kittitas County would occur as needed if the proposed wetland crossing is altered during project design.

All Other Project Sites and Generation Tie Lines
No impacts are proposed to any wetlands within the Camas, Fumaria, Penstemon, and Urtica Solar Project sites or along the Fumaria and Typha Generation Tie Lines. All impacts to wetlands within and adjacent to these projects would be avoided through project design.

3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.

Fill in Waters or Wetlands

Non-wetland Waters

No fill is proposed in non-wetland waters for the Columbia Solar Project sites. All waters within and adjacent to the project sites and along generation tie lines would be avoided through project design. Existing adequate water crossings would be utilized for site access. At inadequate water crossings, spanning structures would be utilized, where applicable, to avoid impacts to non-wetland waters.

Wetlands

Current plans for development of the Columbia Solar Projects would result in partially filling one wetland, TW03, on the Typha Solar Project site for a proposed internal access road that enters the site at the southern site boundary at an existing land bridge. The fill would comprise native soil and structural fill for road construction from a local quarry, with the amounts to be determined during final engineering design. The fill area would be less than 1,000 square feet, which would not require mitigation.

4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.

Surface Water Withdrawals or Diversions

None of the five Columbia Solar Projects would require or use water intake or conveyance structures. If the projects use existing on-site water resources, they would be conveyed using existing piping systems or would be trucked from such systems.

Construction Water Use

During construction, water would be used to suppress fugitive dust during grubbing, clearing, grading, trenching, and soil compaction. In addition, non-toxic soil binding agents may be employed to help with soil stabilization during construction.

Construction activities for the five proposed Columbia Solar Projects are conservatively estimated to generate an average water demand of 100,000 gallons per day. The daily water demand estimate assumes that on an average construction day, 20 acres of the solar project sites are in active construction, requiring 10 continuous hours of water using five water trucks, assuming 4,000-gallon-capacity trucks. Construction time for the Columbia Solar Projects would require approximately 6 months, or 156 work days (Monday to Saturday), to complete. Based upon these parameters, the construction water demand for the proposed Columbia Solar Projects is very conservatively estimated to total 15.6 million gallons, or 47.87 acre-feet (1 acre-foot is equal to 325,851 gallons), or approximately 10 acre-feet per solar project.

TUUSSO has considered a number of water supply alternatives for construction purposes. Each of the solar project sites, except for the Fumaria Solar Project site, has on-site existing water allocations that TUUSSO may be able to use during construction. TUUSSO has also explored the use of greywater sources (including those in the Kittitas Valley) for construction, as water for construction activities can be of non-potable quality. However, greywater availability is limited in Kittitas County. Finally, TUUSSO has

discussed with the City of Ellensburg the availability of municipal water for construction purposes. Based on this array of possible water sources, TUUSSO intends to use either on-site water or trucked in water from municipal water sources for all projects except the Fumaria Solar Project, and intends to truck in water for the Fumaria Solar Project from a municipal water source.

Operational Water Use

On an ongoing basis, water would be used for cleaning PV panels and controlling dust (less than 1 acre-foot per year per project site). Some water would also be necessary to establish the tree/shrub visual buffers along portions of the Columbia Solar Project sites, as well as the native plants throughout the solar project sites. Project landscaping would consist of native and drought-tolerant species. Once established, the species would not require ongoing irrigation. The irrigation needs for landscaping establishment are assumed to last for 3 consecutive years following installation.

Based on feedback from farmers familiar with growing conditions in Kittitas Valley (including landowners familiar with the conditions on the five Columbia Solar Project sites), assuming periodic irrigation for establishment purposes over a 3-year period, it is estimated that approximately 400 acre-feet of water per acre per year would be needed over this period to ensure plant establishment on the solar project sites. These water needs are the same as the current water needs on the actively farmed project sites.

With respect to operational water supply, as with the construction water supply, TUUSSO has considered a number of alternatives. Each of the Columbia Solar Project sites, except for the Fumaria Solar Project site, has on-site existing water allocations that TUUSSO may be able to use during operation for irrigation purposes. Given the costs of trucking water from an external source to each of the sites, TUUSSO would likely only pursue such a water source for irrigation needs for the Fumaria Solar Project site. Given the limited water needed for cleaning PV panels, TUUSSO will likely truck in water from municipal water sources for all of the project sites for this purpose.

5) Does the proposal lie within a 100-year flood plain? If so, note location on the site plan.

Impacts to Floodplains

General County

TUUSSO utilized avoidance measures during the project design to avoid, reduce, or eliminate impacts to the 100-year floodplain. Minor encroachment into the FEMA-mapped 100-year floodplain would be unavoidable based on the current project design and would occur over a total of 7.94 acres across all of the Columbia Solar Project sites. However, actual fill in the solar project sites would be limited to solar panel footings, inverters, and access road installation, with all other areas remaining at the current site elevation. Impacts to the FEMA-mapped 100-year floodplain would be limited to 1.80 acres across all of the solar project sites. All inverters would be located outside of the FEMA-mapped 100-year floodplain.

Solar Project Sites

Table 7 summarizes the total area of FEMA-mapped 100-year floodplain within the solar project sites, average distance from the edge of the floodplain boundary to the nearest project disturbance, total 100-year floodplain encroachment, and total impacts to the 100-year floodplain within each of the solar project sites. Impacts to the FEMA-mapped 100-year floodplain along the Fumaria and Typha Solar Project generation tie lines would be avoided by using existing power poles and spanning all floodplain areas; therefore, the generation tie lines are excluded from Table 7.

Table 7. FEMA-Mapped 100-year Floodplain Project Encroachment and Impacts within Each Columbia Solar Project Site

Project Site	Total Area of 100-year Floodplain within Project (acres)[1]	Average Distance from Floodplain Boundary Edge to Project Disturbance (feet)	Total 100-year Floodplain Encroachment (acres)	Total Impacts to 100-year Floodplain (acres)
Camas Solar Project Site	12.41	10	6.78	0.19
Fumaria Solar Project Site	0.00	626	0.00	0.00
Penstemon Solar Project Site	1.96	9	0.00	0.00
Typha Solar Project Site	0.53	60	0.00	0.00
Urtica Solar Project Site	6.09	30	1.16	0.38

1. 100-year floodplain mapping is based on the FEMA-mapped floodplains depicted on Flood Insurance Rate Maps.

Camas Solar Project Site

Encroachment of the Camas Solar Project area into the FEMA-mapped 100-year floodplain would be approximately 6.78 acres based on the current design plans. Proposed impacts to the FEMA-mapped 100-year floodplain were avoided to the extent possible through project design to reduce possible fill in these areas. The total proposed project impacts to the FEMA-mapped 100-year floodplain would be approximately 0.19 acre, which includes less than 0.01 acre of fill from the solar panel footings and 0.18 acre of fill from access road installation. The number and placement of panel footings have not been determined in the project design but would not be expected to exceed 0.01 acre within the FEMA-mapped 100-year floodplain. Therefore, the project would result in minimal impacts to floodplains.

Urtica Solar Project Site

Encroachment of the Urtica Solar Project area into the FEMA-mapped 100-year floodplain would be approximately 1.16 acres based on the current design plans. Proposed impacts to the FEMA-mapped 100-year floodplain were avoided to the extent possible through project design to reduce possible fill in these areas. The total proposed project impacts to the FEMA-mapped 100-year floodplain would be 0.38 acre, which includes less than 0.01 acre of fill from the solar panel modules and 0.37 acre of fill from access road installation. The number and placement of panel footings have not been determined in the project design but would not be expected to exceed 0.01 acre within the FEMA-mapped 100-year floodplain. Therefore, the project would result in minimal impacts to floodplains.

All Other Project Sites and Generation Tie Lines

No impacts are proposed to any FEMA-mapped 100-year floodplain areas within the Fumaria, Penstemon, and Typha Solar Project sites or along the Fumaria and Typha Solar Project generation tie lines. All impacts to floodplains within and adjacent to these projects would be avoided through project design.

6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.

Surface Wastewater Discharge

The five Columbia Solar Projects do not, by design, require wastewater treatment systems. Thus, this section does not apply to them.

b. Ground:

Ground Water Resources

General County

The Columbia Solar Project sites are located within the Upper Yakima sub-basin of the Yakima groundwater basin. Basaltic rocks beneath most of the Yakima River basin are part of the larger Columbia River Basalt Group (CRBG). The CRBG comprises more than 300 individual basalt flows, and multiple aquifers reside within them. Reported “depth to water” levels are as shallow as 10 feet below ground surface (bgs) near river valley bottoms, to more than 200 feet bgs. Well yields are generally less than 100 gallons per minute. Groundwater flows in the basin converge toward the Yakima River.

Groundwater quality in the Yakima basin is generally good; most issues are related to the impacts of agricultural operations on drinking water wells. Water quality issues involve excess nitrate levels and bacterial contamination, particularly in the lower portions of the Yakima basin.

Nearby impaired waters are located either cross-gradient or up-gradient on different local drainage systems that are not connected to any of the Columbia Solar Project sites and would not be impacted by the project.

Solar Project Sites

Fumaria Solar Project Site
Well registry data identified one well on the Fumaria Solar Project site (Well Log ID 339775), which had a recorded depth of 120 feet bgs. No depth to water or pump capacity data were available. Other wells within 1 mile of the project site had depths of 80 to 170 feet bgs. Minor seepage was observed at Boring F-2 on the Fumaria Solar Project site. Groundwater may be present during wetter parts of the year.

Typha Solar Project Site
Well registry data identified one well on the Typha Solar Project site (Well Log ID 339775), which had a recorded depth of 120 feet bgs. No depth to water or pump capacity data were available. Other wells within 1 mile of the project site had recorded water depths of 80 to 170 feet bgs. At 4.5 to 5 feet below grade, there was a 6-inch silty sand seam with perched groundwater seepage on the Typha Solar Project site. The seepage was not continuous. Additional groundwater flow may be observed during the wetter winter months.

Urtica Solar Project Site
Well registry data identified one well on the Urtica Solar Project site (Well Log ID 339775), which had a recorded depth of 172 feet below bgs. No depth to water or pump capacity data were available. Other wells within 1 mile of the project site had depths of 15 to 290 feet bgs. No seepage was observed in either boring at the Urtica Solar Project site.

Camas and Penstemon Solar Project Sites
Well registry data identified no wells on the Camas and Penstemon Solar Project sites. Other wells within 1 mile of these project sites ranged in depth from 12 to 335 feet bgs.

1) Will groundwater be withdrawn from a well for drinking water or other purposes? If so, give a general description of the well, proposed uses and approximate quantities withdrawn from the well? Will water be discharged to groundwater? Give general description, purpose, and approximate quantities if known.

Withdrawals from or Discharges to Ground Water

No points of groundwater withdrawal, associated with water supplies to the Columbia Solar Projects, are planned. No changes to groundwater movement, quantity, quality, or supply uses would result from project construction or operation of the solar projects. If grading and/or construction is carried out during the winter or spring months, groundwater seepage might be present. Appreciable amounts of seepage are not anticipated during excavation. However, during the rainy winter months, seepage in excavations at any of the Columbia Solar Project sites could occur and groundwater control measures would be on-site or readily available, including trash pumps, sumps, and discharge ditches.

2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals...; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.

Ground Wastewater Discharge

The five Columbia Solar Projects do not, by design, require ground wastewater discharge, nor treatment systems. Thus, this section does not apply to them.

c. Water Runoff (including storm water):

1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.

Runoff Source and Receiving Waters

General County

All of the Columbia Solar Project sites are relatively flat and generally slope from north to south. Minimal grading and ground disturbance would occur as part of the proposed projects. The proposed projects include at least 20-foot setbacks from wetlands, streams, and the Yakima River. Additionally, sediment and erosion control measures would be implemented to avoid water quality impacts to adjacent wetlands, streams, and the Yakima River. As a result, there would be no impacts to water quality. The access roads, concrete pads for the inverters and transformers, and solar tracker posts are the only impervious surfaces proposed. Because of this, existing topography and drainage patterns would remain relatively undisturbed, and the proposed drainage basins would encompass the same area as the existing drainage basins. The estimated infiltration rates for the Columbia Solar Project sites are 1.02 inches/hour for the upper, silty sand unit and 0.27 inch/hour for the underlying sandy gravel. The solar project sites are located in Climate Region 2 – Central Basin and receive an average of about 8 inches of precipitation per year, some of it in the form of snow. Because less than 5% of impervious surface would be added to each project site, hydrologic modeling was conducted. The modeled increased runoff can be handled by full dispersion throughout each project site, as a majority of the existing vegetation at the sites would be protected. The increased runoff is also considered negligible, due to the reduction of flood irrigation that

would accompany each of the Columbia Solar Projects. The Columbia Solar Projects would not impact the surface water quality and there would be minor permanent impacts to the surface water movement and quantity. No impacts are expected to occur in waters downstream of the solar project sites.

Solar Project Sites

Camas Solar Project Site
The Camas Solar Project site gently slopes south and is currently an open field used to make hay using flood irrigation methods. The surface water that does not infiltrate flows to the south. The western edge of the site is bordered by an irrigation ditch (CW01) flowing to the south, while Little Naneum Creek flows southwest along the southeastern edge of the site. These surface waters meet at the southwest corner of the site before crossing under I-82 in existing irrigation infrastructure. Bull Ditch runs southeast through the northern portion of the site. These ditches are maintained by the landowner. The project site is made up of two drainage basins. All of the runoff is either infiltrated on-site or flows to the south/southwest.

Conservatively estimated, the Camas Solar Project would convert 2.00 acres into impervious surfaces. The modelling calculations showed that the runoff generated from a 2-year storm increased by 0.02 feet per second (cfs) for Basin 1 while it did not increase for Basin 2. Runoff generated from a 25-year storm increased 0.07 cfs for Basin 1 and 0.01 cfs Basin 2.

Fumaria Solar Project Site
The overall topography of the Fumaria Solar Project site gently slopes to the south. The surface water that does not infiltrate flows to the south. Runoff to the west is captured by an existing irrigation ditch that flows south along the western border of the site (FS01). Runoff to the south is captured in the southern portion of the ditch where it discharges to an existing detention pond just off the southeast corner of the property. Since all runoff is either infiltrated on-site or captured in the existing irrigation pond, the project site is a single drainage basin represented by two sub-basins.

Basin 1B would remain undisturbed throughout the Fumaria Solar Project, with no appreciable impervious surface added. The project would convert 1.71 acres into impervious surfaces in Basin 1A. The modelling calculations showed that the runoff generated from a 2-year storm increased 0.04 cfs. Runoff generated from a 25-year storm increased 0.11 cfs.

Penstemon Solar Project Site
The overall topography of the Penstemon Solar Project site gently slopes to the south. The surface water that does not infiltrate flows to the south. This runoff is captured in an irrigation ditch along the southern property line. The ditch flows to the east and into Coleman Creek at the southeast corner of the site. Since all runoff is either infiltrated or captured in the existing irrigation ditch at the southern border of the project site, the site is a single drainage basin.

The Penstemon Solar Project would convert 1.31 acres into impervious surfaces. The modelling calculations showed that the runoff generated from 2-year and 25-year storms would remain the same as under the existing condition.

Typha Solar Project Site
The overall topography of the Typha Solar Project site gently slopes to the south. The surface water that does not infiltrate flows to the south. There are two narrow wetlands that run west to east through the site and capture surface runoff and slowly discharge it to the east. The Typha Solar Project site is made up of three drainage basins. Drainage Basin 1 is made up of the northwest portion of the site. Drainage from this area flows south and into the northern wetland (TW01) on the site. Drainage Basin 2 is the largest drainage basin on the site and encompasses the northeast portion of the site. Drainage from Basin 2

flows south into the existing northern wetland (TW02), which then carries the flow to the east. Drainage from Basin 3 flows south into the wetland (TW03) which borders the southern portion of the site and is the more major wetland of the two on site. The runoff slowly flows to the east via the wetland. The two wetlands (TW02 and TW03), both make their way to the east. The southern wetland becomes a more defined irrigation channel after leaving the site and continues to convey water to the east for approximately 0.75 mile before discharging into the Yakima River.

The Typha Solar Project would convert 1.40 acres into impervious surfaces. The modelling calculations showed that the runoff generated from a 2-year storm would increase 0.01 cfs for Basin 1 and remain the same as under the existing condition for Basins 2 and 3. Runoff generated from a 25-year storm increased 0.02 cfs for Basin 1 and 0.01 cfs for Basin 3, while Basin 2 remained unchanged.

Urtica Solar Project Site
The overall topography of the Urtica Solar Project site gently slopes to the east. The surface water that does not infiltrate flows to the east. Two ponds are located near the middle of the site and discharge into an existing irrigation ditch that runs west to east through the site. The project site is made up of two drainage basins. The majority of the project site drains to the east into the irrigation ponds and/or irrigation ditch (US01, McCarl Creek) that flows west to east through the site.

The Urtica Solar Project would convert 1.65 acres into impervious surfaces. The modelling calculations showed that the runoff generated from a 2-year storm increased 0.02 cfs for Basin 1 while it did not increase for Basin 2. Runoff generated from the 25-year storm increased 0.01 cfs for Basin 1 and 0.02 cfs for Basin 2.

2) Could waste materials enter ground or surface waters? If so, generally describe.

Wastewater Discharge

The five Columbia Solar Projects do not, by design, require wastewater treatment systems. No discharge of water or contaminants is proposed for the construction and operation of the solar project sites. No export of soils is anticipated for any of the five Columbia Solar Project sites. During site construction, open soil exposure would be minimized through minimization of grading activities, and erosion from runoff would be reduced or eliminated by the utilization of BMPs. At the conclusion of construction, all disturbed areas would be reseeded with native, low-cover vegetation. No ditches or outfall pipes would be installed as part of the proposed solar projects. Therefore, all water in the project impact areas would either be absorbed through infiltration or runoff through overland flow at very low velocities that are unlikely to cause excessive erosion.

During construction, the projects would have a SWPPP defining BMPs that would be used to avoid storm water runoff affecting receiving waters' water quality. Also, measures to prevent and contain any accidental spills resulting from fuel storage and use during construction and operation are described in detail in those phases' Spill Prevention, Control, and Countermeasure (SPCC) Plans.

3) Does the proposal alter or otherwise affect drainage patterns in the vicinity of the site? If so, describe.

Drainage

Construction of the solar arrays at the Columbia Solar Project sites could create a minor increase in the total and effective impervious area of the sites that is equivalent to the area of the solar panel footings and associated infrastructure, including the gravel access roads.

Infiltration into the upper, topsoil-like silty sand/sandy silt soils at the Columbia Solar Project sites is feasible and ongoing. The soils are capable of infiltrating storm water during an average year. Given the relatively low precipitation in the area, combined with the natural permeability of the upper soil horizon, infiltration of normal storm water amounts would occur on the solar project sites and normal levels of storm water would not be concentrated to a significant extent.

Appreciable amounts of seepage are not anticipated during excavation of the Columbia Solar Project sites; however, during the rainy winter months, it is prudent to anticipate seepage in excavations and groundwater control measures would be on-site or readily available. The solar project sites would be graded such that surface water would be directed away from structures and slopes and not allowed to pond near the tops or toes of slopes.

d. Proposed measures to reduce or control surface, ground, runoff water, and drainage pattern impacts, if any:

Water Quality Protection Measures

The following mitigation measures would be used:

- Off-site flows have been calculated for the Columbia Solar Project sites, and would bypass the sites via the existing flow paths, which run throughout the sites in poorly defined flow paths. The solar project sites have been laid out to minimize the area that would encroach into the flow paths. Any grading of the solar project sites would direct surface water away from structures and slopes.
- Surface water would not be allowed to pond near the tops or toes of slopes of the solar project sites.
- Stormwater discharge BMPs would be implemented to control runoff from each of the solar project sites.
- Sediment-laden surface water would be treated such that water discharged from each of the solar project sites meets all water quality standards.
- Stormwater would not be discharged over the project site slopes to the north of each solar project site.
- Groundwater control measures would be on-site or readily available, including trash pumps, sumps, and discharge ditches.

4. Plants

a. Check the types of vegetation found on the site:

Vegetation Types

The types of vegetation observed at the Columbia Solar Project sites were (see those that are “X” and underlined):

X Deciduous tree: Alder, maple, aspen (quaking aspen), other: cottonwood, crack willow, balsam poplar

X Evergreen tree: Fir (grand fir), cedar, pine (ponderosa pine), other: none

X Shrubs

X Grass

X Pasture

X Crop or grain: alfalfa, Sudangrass, timothy hay

_ Orchards, vineyards or other permanent crops

X Wet soil plants: cattail (aka bullrush), buttercup, skunk cabbage, other: lamp rush, yellow iris

X Water plants: Water lily, eelgrass, milfoil, other: duckweed

X Other types of vegetation: see also Section B.4.e regarding noxious weed species observed

The Vegetation Management Plan includes detailed revegetation plans following construction of the proposed Columbia Solar Project sites.

b. What kind and amount of vegetation will be removed or altered?

Analysis Areas

General County

For this discussion, the solar project sites are defined as the footprint of each of the five proposed Columbia Solar Project sites, and the generation tie line corridors associated with two of the sites. To provide a baseline for analysis of potential impacts to biological resources from the proposed solar projects, two analysis areas were evaluated, a project-scale and a landscape-scale analysis area. The project-scale analysis areas include each Columbia Solar Project site and an associated surrounding 500-meter buffer. The landscape-scale analysis area includes all five of the project-scale analysis areas, as well as the surrounding sub-watersheds.

Vegetation Altered: Construction Activities and Long-term Fencing

The construction of the Columbia Solar Projects would impact a total of 223 fenced-in acres (not the entire 232 leased acres), a majority of which would be currently in agricultural production (138 acres). The area of each habitat type removed would be less than 1% of that available in the landscape-scale analysis area, except for three habitat types: fallow – vegetated (some native vegetation, but mostly non-native plant species), fallow (recently grazed), and willow-rose shrub thicket. The impacts to these areas relative to that available in the landscape-scale analysis area is large (49%, 41%, and 34%, respectively) because there is a small area of each of these habitat types available prior to project construction (in the base mapping, although these habitat types may occur in areas base-mapped as the “Other” habitat type). As a result, there would be minor temporary impacts to vegetation and habitats.

Solar Project Sites

Camas Solar Project Site
The Camas Solar Project project-scale analysis area is 82% alfalfa agriculture, but has other species encroaching into the crops in the space between plantings. In addition, the analysis area may go through periods during the production lifecycle in which it is unvegetated, with exposed soil. Along the edges of the area being farmed, more weedy species dominate. The other major habitats are developed and fallow – recently grazed, representing 9% and 5%, respectively, of the analysis area. These habitats also occur in the analysis area: fallow – vegetated, wetlands, and Little Naneum Creek’s open water and riparian corridor.

The Camas Solar Project would primarily impact habitat that is currently under agricultural production. The project site has been designed to avoid impacts on Little Naneum Creek, and the facility incorporates a 40-foot setback from the edge of the creek for any electrical generation equipment. The solar project has also been designed to avoid impacts to the wetland habitat along the western boundary of the project site with a 20-foot setback from the edge of the wetland to the electrical generation equipment.

Fumaria Solar Project Site

With eight habitat types represented in its project-scale analysis area, the Fumaria Solar Project site has the most wildlife habitat diversity of the five proposed Columbia Solar Project sites. The most prevalent habitat type is the surrounding agricultural production, occupying 46% of the analysis area. The surrounding sagebrush-bitter-brush scrub habitat represents 36% of the analysis area, and 2% of the analysis area is developed. The project site is principally fallow – vegetated, (some native vegetation, but mostly non-native plant species; 7% of the analysis area). National Wetland Inventory (NWI)-mapped wetlands are present in the Reecer Creek floodplain (northwest and southwest of the proposed solar project site) and within 500 meters of the substation. These NWI-mapped wetlands total 8% of the available habitat in the analysis area. Open water habitat is present southeast of the project site and willow-rose shrub thicket habitat occurs along the project site borders.

The most prevalent habitat type in the Fumaria Solar Project generation tie line project-scale analysis area is agricultural production, occupying 88% of the analysis area. Developed and riparian corridor habitats each both comprise 4% of the analysis area. The riparian corridor habitat is located along Reecer Creek and within 500 meters of the substation. NWI-mapped wetlands, open water, and sagebrush-bitter-brush scrub habitats comprise the remaining 4% of the analysis area. NWI-mapped wetlands are present within 500 meters of the substation. Open water habitat is present within the 500-meter buffer of the entire generation tie line corridor.

The Fumaria Solar Project site would primarily impact habitat that is currently fallow – vegetated with some native vegetation, but mostly non-native plant species. The associated generation tie line would primarily impact habitat that is currently under agricultural production. The project site layout has been designed to avoid impacts on Reecer Creek. The solar project has also been designed to avoid impacts to the existing drainage ditch along the southwestern boundary of the project site, and the facility incorporates a 60-foot setback from the edge of the wetland on the site to the electrical generation equipment.

Penstemon Solar Project Site

The Penstemon Solar Project project-scale analysis area is 93% Sudangrass agricultural production. The other major habitat is developed, representing 4% of the analysis area. These habitats also occur in the analysis area: fallow – vegetated, a small wetland, and Coleman Creek's open water and riparian corridor.

The Penstemon Solar Project would primarily impact habitat that is currently under agricultural production. The project site has been designed to avoid impacts to Coleman Creek, and the facility incorporates a 60-foot minimum setback from the edge of the creek for any electrical generation equipment, and an average 115-foot setback along the majority of the creek.

Typha Solar Project Site

The portion of the Yakima River adjacent to the northeast corner of the Typha Solar Project site is designated as a shoreline of the state. Because of the Typha Solar Project site's proximity to the Yakima River, the habitat in the project-scale analysis area is important for fish and wildlife. The most prevalent habitat type is the surrounding agricultural production, occupying 52% of the analysis area; this includes

the Ellensburg Golf Course east of the proposed solar project site. The other main habitats in the analysis area are open water (the Yakima River), fallow – recently grazed, and riparian corridor, occupying 14%, 14%, and 11% of the analysis area, respectively. Five percent of the analysis area is developed. Some wetlands were field-delineated, while along the Yakima River there are also NWI-mapped wetlands within 500 meters of the project site. Wetlands habitat totals 4% of the analysis area. Some willow-rose shrub thicket habitat occurs along the Yakima River (northeast of the project site) and the EP Canal (south of the project site).

The most prevalent habitat type in the Typha Solar Project generation tie line project-scale analysis area is the surrounding agricultural production, occupying 90% of the analysis area; this includes the Ellensburg Golf Course to the south. The other main habitat in the analysis area is developed, occupying another 10% of the analysis area. The EP Canal provides open water habitat.

The Typha Solar Project site would primarily impact the fallow – recently grazed habitat. The associated generation tie line would primarily impact habitat that is currently under agricultural production and developed. The project site has been designed to avoid impacts to the Yakima River, including a greater than 100-foot setback from the Yakima River to any electrical generation equipment, and a 30-foot setback from the wetlands located within the site to any electrical generation equipment.

Urtica Solar Project Site
The Urtica Solar Project project-scale analysis area is 84% timothy hay agricultural production. The other major habitat is developed, representing 9% of the analysis area. McCarl Creek, which functions as an irrigation ditch and includes human-made ponds, flows through the center of the project site, making 6% of the analysis area open water and riparian corridor habitats. The analysis area also provides wetlands habitat.

The Urtica Solar Project site would primarily impact habitat that is currently under agricultural production. The project site has been designed to avoid impacts to McCarl Creek, and the facility incorporates a 40-foot minimum setback from the edge of the creek for any electrical generation equipment.

Vegetation Removed: Long-term Impervious Surfaces

A total of 9.78 acres of the five solar projects would be converted to impervious surfaces, rendering it permanently unusable for plants or wildlife for the life of the projects. A majority of the impacted habitat is currently under agricultural production (6.01 acres). The area of each habitat type removed would be 2% or less than that available in the landscape-scale analysis area. As a result, there would be minor permanent impacts to vegetation and habitat.

c. List threatened and endangered species known to be on or near the site.

Threatened and Endangered Plant Species

No sensitive or special-status plant species occur on any of the Columbia Solar Project sites.

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:

Vegetation Preservation or Enhancement

The Columbia Solar Projects designs include retaining as much of the existing vegetation on each project site as possible. Proposed landscaping is also part of the project design at all of the sites (Table 8).

Table 8. Acres of Proposed Landscaping at each of the Columbia Solar Project sites

Site Name	Acres
Camas Solar Project Site	0.13
Fumaria Solar Project Site	0.10
Penstemon Solar Project Site	0.39
Typha Solar Project Site	0.15
Urtica Solar Project Site	0.18

Additionally, TUUSSO prepared a Vegetation Management Plan that incorporates native species planting, through coordination with the landowners, WDFW, and Kittitas County.

e. List all noxious weeds and invasive species known to be on or near the site.

Noxious Weeds and Invasive Plant Species

The Washington State Noxious Weed Control Board has produced a noxious weed list for the state that categorizes weeds into three classes: A, B, and C. Eleven noxious weeds have been identified in the Columbia Solar Projects project-scale analysis areas, all B- or C-Listed species. A list of noxious weeds identified in the project-scale analysis areas, and a ranking of their relative prevalence at each site, is provided in Table 9.

Table 9. Noxious Weeds Documented in the Columbia Solar Projects Project-scale Analysis Areas

Common Name	Scientific Name	Status	Weed Class	Habitat Type Where Observed[1]	Weed Relative Prevalence at Each Solar Project Site (1 = low, 5 = high)				
					Camas	Fumaria	Penstemon	Typha	Urtica
Canadian thistle	*Cirsium arvense*	Invasive, noxious	C	AP, FG, FN, RIP	2	1	2	3	1
Chufa (yellow nutsedge)	*Cyperus esculentus*	Native, noxious	B	WET		1		1	
False mayweed	*Tripleurospermum maritimum*	Non-native, noxious	C	AP, FG	1			1	
Field sow-thistle	*Sonchus arvensis*	Non-native, noxious	C	FN, RIP		1			
Fuller's teasel	*Dipsacus fullonum*	Invasive, noxious	C	RIP, WET	1	1	1	1	2
Hairy cat's-ear	*Hypochaeris radicata*	Non-native, noxious	C	AP, FG, FN	3	3	1	3	3
Pale-yellow iris	*Iris pseudacorus*	Noxious	C	WET	2				
Queen Anne's lace	*Daucus carota*	Non-native	C	AP					1
Reed canary grass	*Phalaris arundinacea*	Invasive, noxious	C	RIP, WET	3	1	2	2	3
Scotch thistle	*Onopordum acanthium*	Noxious	B	FG, RIP	1			3	1
Spotted knapweed	*Centaurea stoebe*	Noxious	B	AP, FN		1			1

1. AP = Agricultural production; DEV = Developed; FG = Fallow, recently grazed; FV = Fallow, vegetated; RIP = Riparian corridor; SBB = Sagebrush-bitter-brush shrub; WRS = Willow–rose shrub thicket; OW = Open water; WET = Wetlands; OTH = Other.

5. Animals

a. List any birds and other animals which have been observed on or near the site or are known to be on or near the site.

Affected Environment for Fish and Wildlife

General County

Evaluation of Special-status Species with the potential to occur in the Camas Solar Project project-scale analysis area is provided below.

In all, 39 bird species were documented in the Columbia Solar Project project-scale analysis areas during field surveys conducted from April 3 to 12, 2017, including raptors, passerines, near-passerines, and water birds. Of the 39 bird species documented in the project-scale analysis areas, 35 are protected under the Migratory Bird Treaty Act (MBTA) (16 United States Code [USC] 703-711). Habitats within the analysis areas provide nesting and foraging habitat for these MBTA-protected species. These species include ground-nesters, birds that nest in tall grass or shrubs, cavity nesters, and birds that build nests in trees.

Non-listed fish species were observed in some irrigation ditches and wetlands during the April 2017 field surveys. Fish species listed under the federal Endangered Species Act (ESA) of 1973 (as amended) also occur in streams and the Yakima River adjacent to the Columbia Solar Project sites and are briefly listed in Table 10. The ESA-listed threatened and endangered species are further discussed in Section B.5.b below.

Columbia spotted frog (*Rana lutreveinus*) egg masses and Pacific tree frogs (*Pseudacris regilla*) were documented in the Columbia Solar Projects project-scale analysis areas.

Signs of several mammals, including of mule deer (*Odocoileus hemionus*), raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), and Virginia opossum (*Didelphis virginiana*), were observed throughout the Columbia Solar Projects project-scale analysis areas. Several burrows likely associated with American badger (*Taxidea taxus*) were observed, but the exact source of the burrows could not be identified. When vegetated, the habitats at all of the solar project sites and generation tie line corridors support small rodents (e.g., mice and voles) that are a prey source for raptors, great blue herons (*Ardea herodias*), and coyotes (*Canis latrans*). The sites are all within approximately 2.5 miles of the Yakima River and 3.5 miles of the nearest areas only minimally inhabited by humans (for example foothills, draws, canyons, and mountains). Migratory species, such as mule deer and coyote, are known to occupy and travel through all of these sites. Some were directly observed during the April 2017 field surveys, sign (i.e., tracks and scat) was observed, and landowners confirmed that these species occur at the solar project sites.

To evaluate the potential Columbia Solar Projects impacts on fish and wildlife habitat, a list of representative species known or suspected to occur in the analysis areas was compiled and their preferred habitat was compared to the habitat types available in the analysis areas. The results of this evaluation are shown in Table 10. Of the bird species documented in the project-scale analysis areas, four are currently being monitored by the State of Washington: great blue heron, prairie falcon (*Falco mexicanus*), osprey (*Pandion haliaetus*), and turkey vulture (*Cathartes aura*). The Columbia spotted frog is a state candidate for listing, and the American badger is also being monitored by the State of Washington.

Solar Project Sites

Camas Solar Project Site

Fourteen bird species were observed at the Camas Solar Project site during the April 2017 field survey. The majority of the species were observed in the open water, riparian corridor, and wetland habitats. During the field survey, an active red-tailed hawk (*Buteo jamaicensis*) nest was observed in a large willow along Little Naneum Creek. Additionally, the floor of the barn in the northeast part of the site was littered with owl pellets and the rafters contained whitewash.

During the April 2017 field survey of the Camas Solar Project site, dace, likely speckled dace (*Rinichthys osculus*), were observed in the wetland (CW01) that flows north to south along the west side of the solar project site, into Little Naneum Creek. A Pacific treefrog was also observed in CW01.

There was evidence of beaver (*Castor canadensis*) activity along Little Naneum Creek. A burrow—which could potentially have been created by an American badger—was observed in the Little Naneum riparian corridor, in the northeast portion of the Camas Solar Project site, south of the Bull Ditch. The Yakima River is located 1.32 miles west of the project site, and the nearest area that is only minimally inhabited by humans is 2.10 miles south of the project site. Because of the site's proximity to these less-inhabited areas, migratory species (e.g., deer and coyote) forage or hunt on and travel through the project site.

Fumaria Solar Project Site

The diversity of habitats at the Fumaria Solar Project site supports at least 21 bird species, all observed during the April 2017 field survey.

Dace were observed in the irrigation ditches south of the Fumaria Solar Project site during the April 2017 field survey. Reecer Creek is known to be fish bearing, containing rainbow trout (*Oncorhynchus mykiss*), a non-anadromous form of steelhead. In the past, the landowner has stocked the ponds (southeast of the site) with triploid rainbow trout. Pacific treefrogs were observed throughout the site in the fallow – vegetated habitat, as well as the open water in the irrigation ditches.

A burrow—which could potentially have been created by an American badger—was observed near the southwestern access entrance to the Fumaria Solar Project site. The Yakima River is located 0.86 mile southwest of the project site, and the nearest area that is only minimally-inhabited by humans is 1.07 miles east of the project site. Because of the site's proximity to these less-inhabited areas, migratory species (e.g., deer and coyote) forage or hunt on and travel through the project site.

Fumaria Solar Project Generation Tie Line

Twenty-one bird species were observed along the Fumaria Solar Project generation tie line during the April 2017 field survey. The majority of the species were observed in the open water, riparian corridor, sagebrush-bitter-brush scrub, and wetland habitats.

East of the Fumaria Solar Project generation tie line (along North Faust Road), two active raptor nests were observed along the Reecer Creek riparian corridor, belonging to a red-tailed hawk and great horned owl (*Bubo virginianus*).

During the April 2017 field survey, dace were observed in the irrigation ditches that are south of the site and are connected to Reecer Creek. Reecer Creek is known to be fish bearing, containing rainbow trout.

The Yakima River is located 0.86 mile west of the western end of the Fumaria Solar Project generation tie line, and the nearest area that is only minimally inhabited by humans is 1.19 miles east of the eastern end of the generation tie line.

Table 10. Representative Species Observed or Likely to Occur in the Columbia Solar Project Analysis Areas

Common Name	Scientific Name	Management Category	Habitat Description	Habitat Types Used[1]										Acres Available in LSAA[2]
				AP	DEV	FG	FN	RIP	SBB	WRS	OW	WET	OTH	
Birds														
Bald eagle	*Haliaeetus leucocephalus*	MBTA, BGEPA, and Federal Species of Concern	Habitat generalist, associated with most aquatic habitats. Prefer rivers, lakes, and reservoirs with lots of fish and surrounding forests.					X				X	X	8,116
Canada goose	*Branta canadensis*	MBTA	Habitat generalist that occurs near water, grassy fields, and grain fields. Always nests near water and winters where feeding areas are within short distances of water.	X	X	X	X	X		X	X	X	X	129,395
Great blue heron	*Ardea herodias*	MBTA, State Monitored	Found in a wide variety of habitats, including sheltered, shallow bays and inlets, sloughs, marshes, wet meadows, shores of lakes, and rivers. Nesting colonies are typically found in mature forests, on islands, or near mudflats, and do best when they are free of human disturbance and have foraging areas close by.	X		X	X	X			X	X	X	124,586
Great horned owl	*Bubo virginianus*	MBTA	Prefers secondary-growth woodlands, swamps, orchards, and agricultural areas, but are found in a wide variety of deciduous, coniferous, or mixed forests. Home range usually includes some open habitats, such as fields, wetlands, pastures, or croplands, in addition to forested areas.	X		X	X	X				X	X	123,339
Killdeer	*Charadrius vociferus*	MBTA	Inhabits open areas such as sandbars, mudflats, and grazed fields with vegetation generally no taller than 1 inch. Often found near water, but also common in dry areas.	X	X	X	X	X	X		X	X	X	129,833
Northern Harrier	*Circus cyaneus*	MBTA	Breeds in freshwater and brackish marshes, lightly grazed meadows, old fields, tundra, dry upland prairies, drained marshlands, high-desert shrub-steppe, and riverside woodlands. Winter habitat includes areas with low vegetation, including deserts, coastal sand dunes, pasturelands, croplands, dry plains, grasslands, old fields, estuaries, open floodplains, and marshes.	X		X	X	X	X			X	X	123,781

Common Name	Scientific Name	Management Category	Habitat Description	Habitat Types Used[1]										Acres Available in LSAA[2]
				AP	DEV	FG	FN	RIP	SBB	WRS	OW	WET	OTH	
Red-tailed hawk	*Buteo jamaicensis*	MBTA	Occupies most open habitat, including desert, scrublands, grasslands, roadsides, fields and pastures, parks, broken woodland, and (in Mexico) tropical rainforest.	X	X	X	X		X				X	120,470
Sandhill Crane	*Grus canadensis*	MBTA, State Endangered	Prefers open shallow waters along river channels, on alluvial islands of braided rivers, or in natural basin wetlands, but can sometimes occur in fields and agricultural lands during feeding and resting. They typically avoid visual obstructions, such as houses and bridges, and paved or gravel roads.	X		X	X	X			X	X		124,586
Fish														
Bull trout	*Salvelinus confluentus*	Federal Threatened; State Candidate	Both resident or migratory varieties, with migratory bull trout spawning in tributary streams where juvenile fish rear for 1 to 4 years before migrating to either a larger river (fluvial) or lake (adfluvial) as adults. Successful egg incubation and survival requires very cold, clear, well-oxygenated waters, as found in pristine headwater stream habitats.								X			1,247
Dace species	*Rhinichthys* spp.	None	Occurs in many types of aquatic habitats, ranging from cool to warm waters. Typically young are observed in shallow edges.								X	X		6,562
Spring chinook (Upper Columbia River)	*Oncorhynchus tshawytscha*	Federal Endangered; State Candidate	Requires sufficient invertebrate organisms for food; cool, flowing waters free of pollutants; high dissolved oxygen concentrations in rearing and incubation habitats; water of low sediment content during the growing season (for visual feeding); clean gravel substrate for reproduction; and unimpeded migratory access to and from spawning and rearing areas.								X			1,247

Common Name	Scientific Name	Management Category	Habitat Description	Habitat Types Used[1]										Acres Available in LSAA[2]
				AP	DEV	FG	FN	RIP	SBB	WRS	OW	WET	OTH	
Steelhead (Middle Columbia River)	*Oncorhynchus mykiss*	Federal Threatened; State Candidate	Requires sufficient invertebrate organisms for food; cool, flowing waters free of pollutants; high dissolved oxygen concentrations in rearing and incubation habitats; water of low sediment content during the growing season (for visual feeding); clean gravel substrate for reproduction; and unimpeded migratory access to and from spawning and rearing areas.								X			1,247
Summer steelhead (Upper Columbia River)	*Oncorhynchus mykiss*	Federal Threatened; State Candidate	Requires sufficient invertebrate organisms for food; cool, flowing waters free of pollutants; high dissolved oxygen concentrations in rearing and incubation habitats; water of low sediment content during the growing season (for visual feeding); clean gravel substrate for reproduction; and unimpeded migratory access to and from spawning and rearing areas.								X			1,247
Herptiles														
Columbia spotted frog	*Rana luteiventris*	State Candidate	Occurs in a variety of still-water habitats, as well as in some streams and creeks. Breeding habitat includes seasonally flooded margins of wetlands, ponds, and lakes, and even some flooded pools and still-water edges of creeks. Most often found in association with wetland plant communities consisting primarily of non-woody plants, such as sedges, rushes, and grasses.					X			X	X		9,363
Pacific treefrog	*Pseudacris regilla*	None	Found in wetlands, meadows, woodlands, and brushy areas. Breeds in shallow ponds, slow moving streams, seasonal pools, watering tanks, and roadside ditches, and spends the rest of the year in surrounding upland areas.	X			X	X		X	X	X		124,496
Sharp-tailed snake	*Contia tenuis*	State Candidate	Prefers forest openings dominated by Garry oak, particularly with rock accumulations, and riparian deciduous woodlands with accumulations of decaying down woody logs within ponderosa pine, oak, or shrub-steppe.					X				X	X	8,116

Common Name	Scientific Name	Management Category	Habitat Description	Habitat Types Used[1]										Acres Available in LSAA[2]
				AP	DEV	FG	FN	RIP	SBB	WRS	OW	WET	OTH	
Mammals														
American badger	*Taxidea taxus*	State Monitored	Found in open habitats including semi-desert, sagebrush, grasslands, and meadows. Also found in forested areas with grassy cover.	X		X	X		X				X	115,665
Coyote	*Canis latrans*	None	Habitat generalists found in desert, scrub, grassland, foothills, populated neighborhoods, and urban environments.	X	X	X	X	X	X				X	123,271
Mule deer	*Odocoileus hemionus*	Big game	Uses dense conifer forests with sufficient cover for thermal regulation and resting. Also may be found in pockets of dense brush or trees and rugged, broken terrain. Seasonal migration occurs.	X		X	X	X		X			X	118,028
Raccoon	*Procyon lotor*	None	Habitat generalist that traditionally prefers heavily wooded areas with access to trees, water, and vegetation. Often found in urban and suburban environments.		X			X		X		X	X	129,925
Small rodents (mice, voles, etc.)	Various	None	Large group of small mammals that are habitat generalists and provide prey for other species such as raptors, great blue heron, and badger.	X	X	X	X	X	X	X		X	X	128,590
Striped skunk	*Mephitis mephitis*	None	Habitat generalists, particularly associated with open areas with a mix of habitats such as wooded areas, grasslands, or meadows. Usually in close proximity to a source of water.		X		X	X		X			X	7,682
Virginia opossum	*Didelphis virginiana*	None	Habitat generalist, ranging from wooded areas to open fields. Prefers environments near streams or wetlands. Shelters in burrows of other animals, tree cavities, brush piles, or other cover.		X			X		X		X	X	12,925

1. AP = Agricultural production; DEV = Developed; FG = Fallow, recently grazed; FV = Fallow vegetated; RIP = Riparian corridor; SBB = Sagebrush-bitter-brush shrub; WRS = Willow–rose shrub thicket; OW = Open water; WET = Wetlands; OTH = Other
2. LSAA = Landscape-scale analysis area. Not including “Other.” The Other habitat category was removed from the species habitats because it includes such a wide range of habitats that it is not valuable for the analysis.

Penstemon Solar Project Site
Twelve bird species were observed at the Penstemon Solar Project site during the April 2017 field survey. The majority of the species were observed in the riparian corridor habitat. An active red-tailed hawk nest was observed southeast of the southeast site corner, in a cottonwood tree along Coleman Creek.

The Yakima River is located 2.54 miles west of the Penstemon Solar Project site, and the nearest area that is only minimally inhabited by humans is 3.31 miles south of the project site. Of all the solar project sites, the Penstemon Solar Project site is furthest from less-inhabited areas, but migratory species (e.g., deer and coyote) still forage or hunt on and travel through the project site.

Typha Solar Project Site
Twenty-two bird species were observed at the Typha Solar Project site during the April 2017 field survey. The majority of the species were observed in the open water, riparian corridor, and wetland habitats. A documented great blue heron breeding area is 224 feet east of the site, on a landform within the Yakima River. The floor of the barn, located south of the southwest corner of the site, was littered with owl pellets and the rafters contained whitewash.

The Yakima River, located adjacent to the northeast corner of the Typha Solar Project site, is a fish-bearing stream containing coho salmon (*Oncorhynchus kisutch*), mountain sucker (*Catostomus platyrhyncus*), rainbow trout, and Westslope cutthroat trout (*O. clarki lewisi*).

The Yakima River is located directly east of the Typha Solar Project site, and the nearest area that is only minimally inhabited by humans is 2.57 miles southwest of the project site. Because of the site's proximity to these less-inhabited areas, migratory species (e.g., deer and coyote) forage or hunt on and travel through the project site.

Typha Solar Project Generation Tie Line
The same bird species were observed along the Typha Solar Project generation tie line during the April 2017 field survey as were observed at the Typha Solar Project site.

The Yakima River is located 0.25 mile east of the Typha Solar Project generation tie line, and the nearest area that is only minimally inhabited by humans is 2.35 miles southwest of the tie line.

Urtica Solar Project Site
Eighteen bird species were observed at the Urtica Solar Project site during the April 2017 field survey. The majority of the species were observed in the open water, riparian corridor, and wetland habitats.

During an April 12, 2017, site visit, WDFW biologists stated that McCarl Creek is likely fish bearing. In the past, the landowner has stocked the ponds with triploid rainbow trout. A Canada goose was observed nesting near the ponds.

The Yakima River is located 0.19 mile northeast of the Urtica Solar Project site, and the nearest area that is only minimally inhabited by humans is 1.02 miles southwest of the project. Because of the site's proximity to these less-inhabited areas, migratory species (e.g., deer and coyote) forage or hunt on and travel through the project site.

Construction Impacts to Fish and Wildlife

General County

Potential impacts to fish and wildlife may result from construction of the five Columbia Solar Projects. Ground disturbance, vegetation clearing, and noise could result in temporary displacement of wildlife

species present in the project-scale analysis areas during construction. Some species, such as small rodents, snakes, and insects, could be affected by the ground-disturbing activities due to temporary habitat alteration and could suffer mortalities from direct contact with construction equipment. More commonly, wildlife would be displaced to adjacent habitat areas. The effects from ground disturbances during construction would be considered low, with respect to common wildlife species, all of which can be expected to have robust populations that would be minimally affected by the temporary and localized construction activities associated with the solar projects. Section B.5.d below details the proposed Columbia Solar Projects' BMPs and mitigation measures that would reduce or minimize the potential for impacts to vegetation, fish, and wildlife.

Table 10 shows the types of habitats used by the representative species analyzed for the Columbia Solar Projects. Table 11 shows the amount of representative habitat used by these species (within the landscape-scale analysis area) that would be impacted by the fenced and impervious areas of the Columbia Solar Projects (all sites combined). These species were chosen to represent wildlife that are likely to occur in the project-scale analysis areas. Not all species listed in Table 10 are listed here (the bald eagle and Columbia spotted frog are discussed below in Impacts to Special-status Species). For most species, up to 1% of the available habitat used by that species (within the landscape-scale analysis area) would be affected from solar project fencing or conversion to impervious areas. As a result, there would no impacts to fish (because of setbacks from water bodies), and there would be minor permanent impacts to wildlife.

Table 11. Acres of Representative Species Habitat (in the Landscape-scale Analysis Area) Impacted by Fencing and Conversion to an Impervious Area of the Columbia Solar Projects

Representative Species	Habitat Available in Landscape-scale Analysis Area[1]	Fenced Area		Impervious Area	
		Acres	Percent of Available Habitat	Acres	Percent of Available Habitat
Birds					
Canada goose	129,395	223	<1%	11	<1%
Great blue heron	124,586	214	<1%	10	<1%
Great horned owl	123,339	213	<1%	10	<1%
Killdeer	129,833	222	<1%	12	<1%
Northern Harrier	123,781	214	<1%	11	<1%
Red-tailed hawk	120,470	219	<1%	12	<1%
Sandhill Crane	124,586	214	<1%	10	<1%
Fish					
Bull trout	1,247	1	<1%	0	<1%
Dace species	6,562	2	<1%	0	<1%
Spring chinook (Upper Columbia River)	1,247	1	<1%	0	<1%
Steelhead (Middle Columbia River)	1,247	1	<1%	0	<1%
Summer steelhead (Upper Columbia River)	1,247	1	<1%	0	<1%
Herptiles					
Pacific treefrog	124,496	177	<1%	9	<1%
Sharp-tailed snake	8,116	2	<1%	0	<1%
Mammals					
American badger	115,665	212	<1%	11	<1%
Coyote	123,271	221	<1%	12	<1%

Representative Species	Habitat Available in Landscape-scale Analysis Area[1]	Fenced Area		Impervious Area	
		Acres	Percent of Available Habitat	Acres	Percent of Available Habitat
Mule deer	118,028	214	<1%	10	<1%
Raccoon	129,925	11	<1%	1	<1%
Small rodents (mice, voles, etc.)	128,590	223	<1%	12	<1%
Striped skunk	7,682	45	<1%	3	1%
Virginia opossum	12,925	11	<1%	1	<1%

1. The "Other" habitat category was removed from the species habitats because it includes such a wide range of habitats that it is not valuable for the analysis.

Solar Project Sites

Camas Solar Project Site
If nesting activity is observed at the red-tailed hawk nest or the barn (used by owls), then a 0.25-mile seasonal construction avoidance buffer may be requested by WDFW until the young have fledged.

Fumaria Solar Project Generation Tie Line
If nesting activity is observed at the red-tailed hawk and a great horned owl nests, then a 0.25-mile seasonal construction avoidance buffer may be requested by WDFW until the young have fledged.

Penstemon Solar Project Site
If nesting activity is observed at the red-tailed hawk nest, then a 0.25-mile seasonal construction avoidance buffer may be requested by WDFW until the young have fledged.

Typha Solar Project Site
The great blue heron nesting season is February through September. WDFW may request a seasonal avoidance buffer during the first half of the season, i.e., February through May. If owl nesting activity is observed at the barn, then a 0.25-mile seasonal construction avoidance buffer may be requested by WDFW until the young have fledged.

Urtica Solar Project Site
No nests were documented in the Urtica Solar Project project-scale analysis area, but a Canada goose was displaying nesting behavior. If construction occurs between March 1 and August 1, nest surveys would take place to ensure new nests have not been built.

Operation Impacts to Fish and Wildlife

Potential impacts to fish and wildlife may result from operation of the five Columbia Solar Projects. Long-term effects of the solar projects would be limited to the long-term modification of habitat in each project-scale analysis area (i.e., fencing or conversion of habitat to impervious surfaces). Table 11 summarizes the acres of habitat for representative species that may be affected by the long-term operation of the Columbia Solar Projects (i.e., from fencing and conversion to impervious areas). Each site would be visited minimally by humans for maintenance, resulting in permanent minimal impacts due to human noise and activity.

Cumulative Impacts to Fish and Wildlife

Historically, Kittitas County land use has been dominated by agriculture. Renewable energy facilities (i.e., wind and solar) have recently been built and proposed. Currently there are two existing solar farms and four completed wind farms in the county. Three additional solar farms and two wind farms are in the

proposal/approval process. Most of these facilities are generally located along the Interstate 90 (I-90) corridor.

Impacts cumulative with other energy facilities include a landscape-scale pattern of habitat removal and fragmentation. This pattern displaces wildlife into other areas that may be of lesser quality, such as developed areas. Fragmentation can disrupt movement patterns, whether on a migratory or local scale.

Post-construction restoration and noxious weed control for the Columbia Solar Projects would replace a weedy vegetation cover type with native plant species in all temporarily disturbed areas (see Table 9 for noxious weed prevalence at each site; all sites currently are principally vegetated by noxious and non-native plant species). These areas would be reseeded with an appropriate mix of native plant species as soon as possible after construction is completed, minimizing the amount of habitat that is permanently removed and thereby reducing cumulative habitat removal.

Fragmentation to riparian corridors would be avoided by the designed inclusion of the waterbody setback distances. Additional fragmentation would be minimized by constructing as few new access roads as possible for the Columbia Solar Projects. Instead, existing roads and trails would be improved and used.

Affected Environment for Special-status Species

General County

See Section B.5.b below for further discussion of threatened and endangered species. The WDFW PHS mapper, which lists sensitive wildlife species and habitats within the five proposed Columbia Solar Project sites, was accessed. Table 12 lists state-listed species that have the potential to occur in the proposed solar project sites, and is followed by a brief discussion of each one. As the PHS mapper is dependent on existing records of species, other sensitive species may occur in the vicinity of the solar project sites, if suitable habitat is present. Based on the existing condition of the sites as developed agricultural lands, it is unlikely that other sensitive species occur in the project-scale analysis areas.

Table 12. Special-status Species with Potential to Occur in the Columbia Solar Project Project-scale Analysis Areas

Common Name	Scientific Name	Status	Sites with Potential Occurrence	Likelihood to Occur in Project-scale Analysis Areas
Birds				
Bald eagle	*Haliaeetus leucocephalus*	Federal Candidate; MBTA and BGEPA Protected	Fumaria	High
Greater sage-grouse	*Centrocercus urophasianus*	Federal Candidate, State Threatened	Camas, Penstemon	Low
Sandhill crane	*Grus canadensis*	State Endangered	Camas, Fumaria, Penstemon, Urtica	Low

Common Name	Scientific Name	Status	Sites with Potential Occurrence	Likelihood to Occur in Project-scale Analysis Areas
Fish				
Bull trout	*Salvelinus confluentus*	Federal Threatened	Typha	None
Spring Chinook salmon (Upper Columbia River)	*Oncorhynchus tshawytscha*	Federal Endangered	Penstemon	None
Steelhead (Middle Columbia River)	*Oncorhynchus mykiss*	Federal Threatened	Typha	None
Summer Steelhead (Upper Columbia River)	*Oncorhynchus mykiss*	Federal Threatened	Penstemon	None
Herptiles				
Columbia spotted frog	*Rana luteiventris*	State Candidate	Camas, Penstemon	High
Sharp-tailed snake	*Contia tenuis*	State Candidate	Camas, Fumaria	Low
Invertebrates				
Giant Palouse earthworm	*Driloleirus americanus*	State Candidate		Low

Bald Eagle

The bald eagle is a Federal Species of Concern, in addition to being Bald and Golden Eagle Protection Act (BGEPA)- and MBTA-protected. They are habitat generalists, typically associated with aquatic habitats, preferring forested areas that surround fish-bearing lakes and rivers. The PHS mapper did not document any bald eagle occurrences in the Columbia Solar Project analysis areas, but eagles were observed during the field survey at the Fumaria and Penstemon Solar Project sites. Both sites are within 3 miles of the Yakima River (potential nesting habitat). Bald eagles are also scavengers, and calves were observed near both sites; it is likely that the observed eagles were scavenging afterbirth in the vicinity of these sites.

Greater Sage-grouse

The greater sage-grouse (*Centrocercus urophasianus*) is classified as a Federal Candidate by U.S. Fish and Wildlife Service (USFWS) and a State Threatened species by WDFW. According to the PHS mapper, an occurrence of this species was recorded within the township that includes the entire area of the proposed Camas and Penstemon Solar Project sites. However, the proposed sites do not fit the description for this species' preferred habitat. Therefore, it is unlikely that this species occurs within these two sites.

Sandhill Crane

The sandhill crane (*Grus canadensis*) is classified as a State Endangered species by WDFW. Klickitat and Yakima Counties hold the primary breeding grounds within the State of Washington for sandhill cranes.

Bull Trout

The bull trout (*Salvelinus confluentus*) is classified as a Federally Threatened species by USFWS. The bull trout has been documented in the Yakima River by PHS, SalmonScape, and StreamNet. In addition,

the part of the Yakima River that is adjacent to the Typha Solar Project site contains designated critical habitat for bull trout.

Chinook Salmon and Steelhead
The Upper Columbia River Spring Chinook and Summer Steelhead are classified as Federally Endangered and Federally Threatened, respectively, by the National Marine Fisheries Service (NMFS). Both the Upper Columbia River Spring Chinook and Upper Columbia River Summer Steelhead have been documented in Coleman Creek along the eastern boundary of the Penstemon Solar Project site, by PHS, SalmonScape, and StreamNet. In addition, the part of Coleman Creek adjacent to the Penstemon Solar Project site contains designated critical habitat for the Upper Columbia River Steelhead. The Middle Columbia River Steelhead has been documented in the Yakima River by PHS, SalmonScape, and StreamNet. In addition, the part of the Yakima River that is adjacent to the Typha Solar Project site contains designated critical habitat for Middle Columbia River Steelhead.

Columbia Spotted Frog
The Columbia spotted frog is classified as a State Candidate species by WDFW. According to the PHS mapper, an occurrence of this species was recorded within 300 feet of the proposed Camas Solar Project site in a waterway to the northeast, and within 1 mile of the proposed Penstemon Solar Project site in a waterway to the southeast. Egg masses from this species were observed at the Typha and Penstemon Solar Project sites during the April 3 to 12, 2017, field surveys. A pre-construction clearance survey may be recommended by WDFW for developments in or near potential spotted frog habitat, but since current plans are to buffer and avoid water bodies, this is unlikely to be necessary.

Sharp-Tailed Snake
The sharp-tailed snake is classified as a State Candidate species by WDFW. According to the PHS mapper, an occurrence of this species was recorded within the quarter-township that includes the entire area of the proposed Camas and Fumaria Solar Project sites (WDFW 2017a). However, the proposed sites do not fit the description for this species' preferred habitat. Therefore, it is unlikely that this species occurs within these two project sites.

Giant Palouse Earthworm
The only special-status invertebrate species known to occur in Kittitas County is the giant Palouse earthworm (*Driloleirus americanus*), a State Candidate species. Known habitats for this species include deep, loamy soils characteristic of the Palouse bunchgrass prairies, and gravelly sandy loam or other rocky soils in forested areas. They have been observed in open forest, shrub-steppe, and prairie habitats and are typically associated with native vegetation.

Solar Project Sites

Camas Solar Project Site
During a site visit to the Camas Solar Project site on April 12, 2017, WDFW biologists stated that Little Naneum Creek could provide anadromous salmon and steelhead habitat.

A review of the PHS database showed that the Camas Solar Project site is located within a township known to support greater sage-grouse, a State Threatened and Federal Candidate species. Greater sage-grouse are closely associated with large uninterrupted areas of sagebrush, native bunchgrasses, wildflowers, and wet meadows. Because the site does not provide this type of habitat, greater sage-grouse are unlikely to occur in this project-scale analysis area.

The Camas Solar Project site also has historic habitat for Columbia spotted frog, a State Candidate species.

Fumaria Solar Project Site
Also observed during the April 12 WDFW site visit, a bald eagle, a federal species of concern, was perched in the riparian habitat along Reecer Creek, within the 500-meter Fumaria Solar Project project-scale analysis area (at the generation tie line northernmost crossing of Reecer Creek).

Reecer Creek is known to be fish bearing, containing rainbow trout.

A review of the PHS database showed that the Fumaria Solar Project site is located within a quarter-township known to support sharp-tailed snake, a State Candidate species. Sharp-tailed snake can occur in a wide variety of habitats, but are most commonly associated with wetter soils in coniferous or mixed woodland forests. Because this site does not provide this type of habitat, sharp-tailed snake are unlikely to occur in this project-scale analysis area.

Fumaria Solar Project Generation Tie Line
Reecer Creek, which is crossed several times by the Fumaria Solar Project generation tie line, is known to be fish bearing, containing rainbow trout.

Penstemon Solar Project Site
A review of the PHS database showed that the Penstemon Solar Project site is located within a township known to support greater sage-grouse, a State Threatened and Federal Candidate species. Greater sage-grouse are closely associated with large uninterrupted areas of sagebrush, native bunchgrasses, wildflowers, and wet meadows. Because the site does not provide adequate greater sage-grouse habitat, they are unlikely to occur in this project-scale analysis area. A bald eagle, a federal species of concern, flew over the project site during the April 2017 field survey, likely traveling to the Yakima River.

Coleman Creek is known to be fish bearing, containing anadromous steelhead and Chinook salmon, and resident rainbow trout.

Additionally, several egg masses, thought to be from Columbia spotted frog, were observed in an irrigation ditch that connects with Coleman Creek south of the southeast corner of the Penstemon Solar Project site.

Typha Solar Project Site
The Yakima River contains four ESA-listed species: bull trout, Spring Chinook (Upper Columbia River), Steelhead (Middle Columbia River), and Summer Steelhead (Upper Columbia River).

Two egg masses, thought to be from Columbia spotted frog, were observed in TW04, a wetland located along the southern boundary of the Typha Solar Project site.

Typha Solar Project Generation Tie Line
No special-status species occurrences, other than those discussed for the Typha Solar Project site, are known within the project-scale analysis area for the Typha Solar Project generation tie line.

Urtica Solar Project Site
During a site visit to the Urtica Solar Project site on April 12, 2017, WDFW biologists stated that McCarl Creek could provide anadromous salmon and steelhead habitat.

Construction Impacts to Special-status Species

The proposed Columbia Solar Projects have the potential to minimally impact the following special-status wildlife species:

- Bald eagle (BGEPA- and MBTA-protected; Federal Species of Concern)
- Columbia spotted frog (Washington State Candidate)

No other special-status species described above has the potential to be impacted by the Columbia Solar Projects.

Bald eagles were incidentally observed during ground surveys near the Fumaria and Penstemon Solar Project sites, and are likely present throughout the project-scale analysis areas. If nests are present in the project vicinity, they have the potential to be affected by noise and visual disturbances during construction. No bald eagle nests have been identified near the solar project sites; if nests are identified near the sites, construction outside of the critical use period (January 1–May 31) is recommended. If construction near active bald eagle nests might occur during the critical use period, local USFWS biologists would be consulted. No aerial nest surveys were conducted.

Columbia spotted frog is known to occur near the Typha, Camas, and Penstemon Solar Project sites, and could be affected by construction and operation in and around ponds and canals that provide breeding habitat. To avoid impacts to aquatic and semi-aquatic species, setback distances from aquatic habitats would be incorporated into the site plans, and appropriate erosion and sediment control measures would be implemented to protect wetlands and streams from sediment and other contaminants.

Recommended mitigation measures for special-status species are described below in Section B.5.d.

Operation Impacts to Special-status Species

For all sites combined, approximately 2 acres of bald eagle habitat and 3 acres of Columbia spotted frog habitat would be fenced (a minor temporary impact, due to the construction activity that would occur within this habitat). Except for the 9.78 acres of impervious surfaces that would remove 0.07 acre and 0.11 acre of available bald eagle and Columbia spotted frog habitat (a minor permanent impact), respectively, no long-term operational impacts to special-status species would occur from the five Columbia Solar Projects.

b. List any threatened and endangered species known to be on or near the site.

Threatened and Endangered Animal Species

Federal and state online databases were accessed to obtain current lists of sensitive species that may occur in or near the Columbia Solar Projects project-scale analysis areas, including the USFWS Information for Planning and Consultation (IPaC) system. The USFWS IPaC database provides county-level lists of ESA-listed species, including species proposed or candidates for listing, and designated critical habitat within a defined project area. No ESA-listed species are anticipated to be affected by the proposed solar projects. No state- or federally listed threatened or endangered species were observed in the Columbia Solar Projects project-scale analysis areas during the April 2017 field survey.

c. Is the site part of a migration route? If so, explain.

Migration Routes

The five Columbia Solar Projects would not affect any identified big game migratory corridors or migratory flyways.

The Columbia Solar Project sites are within 2.5 miles of the Yakima River and 3.5 miles of areas that are only minimally inhabited by humans. Because all of the sites are near these less-inhabited areas, migratory species (e.g., deer and coyote) forage or hunt on and travel through the sites. From initiation of construction (with its associated human activity and noise) through long-term operation (with the planned fencing of the sites), 223 fenced-in acres (not the entire 232 leased acres) comprising the solar project sites would no longer be available to migratory species such as deer (coyote may still use the sites). However, there are 317,997 acres within the landscape-scale analysis area that would still be available to these migratory species, so this would not be a significant impact.

The potential impacts to migratory species from the proposed Fumaria and Typha Solar Project generation tie lines would be the temporary disturbance and the species' avoidance of the human noise and activity during construction of the proposed lines. This would not be a significant impact because these species could use the remainder of the landscape-scale analysis area during this temporary construction season (estimated at 8 months). There would be no long-term impacts to migratory species from the presence of the proposed generation tie lines.

d. Proposed measures to preserve or enhance wildlife, if any:

Wildlife Protection Measures

Throughout this section, the term "mitigation" refers to avoidance and minimization measures. No compensatory mitigation is proposed for this project, as impacts are not expected to be significant. Mitigation would remain consistent with the WDFW POL-M5002.

Water body setbacks are listed by solar project site in Section 4.b, Vegetation Altered.

Buffers and Seasonal Timing

Migratory Birds and Bald and Golden Eagles
To ensure compliance with MBTA, vegetation clearing would ideally be undertaken from August 1 through the end of February. If construction or vegetation clearing is required between March 1 and August 1, nest surveys would be required in the proposed area of disturbance. If active migratory bird nests are encountered during the surveys, land-disturbing construction activities should be avoided while the birds are allowed to fledge. An appropriate species avoidance buffer, as determined in conjunction with WDFW and local agencies, would apply to all active nests for migratory bird species.

The project-scale analysis areas have the potential to provide nesting habitat to raptors and bald and golden eagles. All raptor species are protected under the MBTA, and bald and golden eagles are additionally protected under the BGEPA. If active raptor nests occur within 0.25 mile of the solar project construction activities, noise and construction activities could disturb nesting and fledgling raptors, potentially causing nest abandonment. Based on WDFW guidance, a nest survey within 0.25 mile of construction activities would be conducted within the same year that construction is scheduled, to determine whether nests could be occupied during construction. The nesting seasons vary by species as shown in Table 13. WDFW's 0.25-mile buffer is inclusive of the distance recommended by the National Bald Eagle Management Guidelines), which specifies a 660-foot (0.125-mile) buffer of active eagle nests.

If active raptor nests are observed, then TUUSSO would coordinate with WDFW to determine approaches to minimize disturbance to the nesting raptors. Buffer distances and timing restrictions would collaboratively be developed by WDFW and TUUSSO, dependent upon the sound levels produced by the construction equipment and the sensitivity of the nesting raptors.

Table 13. Nesting Seasons for Raptor Species Likely to Occur in the Analysis Areas

Species	Nesting Season
Bald eagle	January 1–August 31
Golden eagle	January 1–August 31
Red-tailed hawk	March 15–June 30
Great horned owl	February 1–May 15
Swainson's hawk	April 15–July 31

Source: Personal communication with Scott Downes, WDFW Habitat Biologist, 2017.

Riparian Corridors

Rivers and streams in Kittitas County are classified according to the Washington State stream typing system, as defined in WAC 222-16-030. Ecology and the Washington Department of Natural Resources (DNR) recognize the WAC stream typing system. Kittitas County has established riparian habitat buffer ranges for each stream type to reflect the impact of certain intense land uses on riparian habitat functions and values. The performance standard buffers are defined in KCC 17A.070.010.

Table 5 shows the surface waters that were identified in the project-scale analysis areas, their DNR stream type, and the applicable buffers. See Table 6 for recommended buffer and setback distances from the wetlands identified within the sites.

To additionally protect riparian corridors and habitats, it is recommended that peak construction activities be conducted during the dry season as much as possible, to minimize erosion, sedimentation, and soil compaction. If any in-water work is required for construction of access roads, construction in fish-bearing streams would need to occur during agency-approved work windows.

Noise

Most construction activities would take place between the hours of 7 a.m. and 10 p.m. and be conducted in accordance with local noise ordinances, including but not limited to KCC 9.45.010: Public Disturbance noises. Additionally, all noise generating construction activities would be conducted between the hours of 7 a.m. and 10 p.m., in accordance with WAC 173-60-050. These practices would avoid night-time noise disturbances to wildlife species. Construction noise is exempt from regulation under the statewide noise standards, WAC 173-60.

Other Mitigation Measures

Additional mitigation measures and BMPs to protect fish and wildlife in the project-scale analysis areas could include the following:

Design and Construction Techniques

- Avoid, when possible, construction in sensitive areas such as riparian zones and wetlands.
- Flag sensitive habitat areas (e.g., raptor nests, wetlands, etc.) near proposed areas of construction activity, and designate such areas as off limits to all construction personnel.
- During the nesting season, monitor raptor nests within 0.25 mile of the sites for nesting activity; coordinate construction timing and activities with WDFW to avoid impacts to nesting raptors.

- Minimize new road construction by improving and using existing roads and trails, instead of constructing new roads.
- Develop and implement a Fire Control Plan, in coordination with local fire districts, to minimize the risk of accidental fires during construction, and respond effectively to any fire that does occur.
- Designate an environmental monitor during construction to monitor construction activities and ensure compliance with mitigation measures.
- Implement a trenching protocol during the installation of underground electrical facilities, to allow for conservation of surface soils.
- Require construction personnel to avoid driving over or otherwise disturbing areas outside of the designated construction areas.
- Properly store and manage all wastes generated during construction.
- Use certified weed-free straw bales during construction to avoid introduction of noxious or invasive weeds.
- There would be one straight row of barbed wire, not circular barbed wire, at the top of the perimeter fence. This would avoid birds becoming trapped in circular barbed wire.
- For poles installed by TUUSSO, when feasible:
    - equip overhead power lines with raptor perch guards to minimize risks to raptors and
    - space overhead power line conductors to minimize potential for raptor electrocution.

Erosion and Sediment Control

- Use BMPs to minimize construction-related surface water runoff and soil erosion.
- Implement temporary erosion and sediment control measures, as appropriate, both during and after construction.
- Flag sensitive habitat areas (e.g., riparian zones, wetlands, etc.) near proposed areas of construction activity, and designate such areas as off limits to all construction personnel.
- Limit disturbances to the minimum necessary when working in or near waterbodies and install stakes or flagging to restrict vehicles and equipment to designated routes and areas.
- Delineate construction limits within 200 feet of waterbodies, as specified in the SWPPP, with a sediment fence, straw wattles, or similarly approved methods to eliminate sediment discharge into waterways and wetlands, minimize the size of construction disturbance areas, and minimize removal of vegetation, to the greatest extent possible.

Restoration and Noxious Weed Control

- Quickly revegetate habitats temporarily disturbed during construction with native plant species.
- Reseed all temporarily disturbed areas with an appropriate mix of native plant species as soon as possible after construction is completed, to accelerate the revegetation of these areas and to prevent the spread of noxious weeds.

Wildlife Habitat Enhancement Measures

Restoration and Noxious Weed Control

- Consult with WDFW regarding the appropriate native seed mixes to include in the Vegetation Management Plan for revegetation of the solar project sites.
- As further detailed in the Vegetation Management Plan, implement noxious weed control measures.
- Develop a noxious weed control plan prior to construction, and implement the plan over the life of the project. Herbicide application could be a noxious weed control method used.

e. List any invasive animal species known to be on or near the site.

Invasive Animal Species

Information regarding the State's 50 priority invasive species was reviewed to determine whether invasive animal species have the potential to occur on or near the Columbia Solar Project sites. None of the priority terrestrial and aquatic animals listed were observed on or near the project sites. Bullfrog (*Rana catesbeiana*) could occur in the vicinity of the project sites. Nutria (*Myocastor coypu*) and African clawed frog (*Xenopus laevis*) may occur, but it is unlikely. It is possible that all of the infectious animal diseases are present in the vicinity of the project sites; these include amphibian and fish diseases and white nose syndrome which affects bats. Because the proposed project avoids impacts to aquatic habitats, it would not lead to further spread of these invasive aquatic animal species and infectious amphibian and fish diseases. Because the proposed project infrastructure would not contribute to white nose syndrome, it would not contribute to the spread of this disease.

6. Energy and Natural Resources

a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.

Minimal amounts of electricity, natural gas or propane, and gasoline or diesel fuel, readily available from commercial businesses in Ellensburg, would be used during construction of the Columbia Solar Projects. Thus, no impacts are anticipated to the demand on or supplies of those energy sources in the Ellensburg area.

Because the Columbia Solar Projects would generate up to 5 MW each during operation (for a total of 25 MW), no electricity would be used and no impacts would occur. Gasoline and diesel fuel used for operational vehicles would be purchased from local gas stations. Lubricating oils, grease, and hydraulic fluids used for maintenance would be purchased from distributors of such materials. In all cases, quantities would be minimal and readily available from existing commercial businesses in the Ellensburg area so there would be no impacts on the availability of these resources.

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.

Because the five Columbia Solar Projects are solar PV facilities using a typical design for such facilities, they not only would not affect any potential use of solar energy on adjacent properties, they would be compatible with development of any other potential solar facilities.

c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any:

Because the Columbia Solar Projects would use minimal sources of energy (e.g., electricity, natural gas or propane, and gasoline or diesel fuel) during construction, and would generate electricity during operation, no energy conservation or mitigation measures are proposed.

7. Environmental Health

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste that could occur as a result of this proposal? If so, describe.

Because there would be minimal amounts of fossil fuels transported, stored, or used to operate equipment during construction, there would be no potential impacts from explosions.

Unlike thermal power plants, solar power projects pose a much smaller risk of accidental fires or explosions because there is no need to transport, store, or combust fossil fuels to generate electricity. The Columbia Solar Projects also would be designed to comply with the National Electric Code (NEC) and the National Fire Protection Agency (NFPA) requirements, to avoid potential electrical fire risks. A strict Fire Prevention and Safety Plan would be developed and enforced during project construction and operation, to reduce and address potential fire risks.

As with any major developments, construction of the Columbia Solar Projects presents some minimal fire risks. Each of the project sites is currently farmed agricultural land, mostly for hay production or grazing. Fumaria is the only fallow agricultural field (not recently grazed) at this time. Thus the predominant groundcover is non-native grasses and weeds, with the greatest fire risks being associated with grass fires during the hot, dry summer season. TUUSSO would maintain the vegetation at or below 12 inches in height to mitigate the risk of fire. TUUSSO has also initiated discussions with the Kittitas County Fire Marshal about potential fire issues, locations and dimensions of access gates and internal access roads, and other issues. A Fire Protection and Safety Plan would be developed and implemented prior to construction, in coordination with the Kittitas County Fire Marshal and other appropriate agencies.

1) Describe any known or possible contamination at the site from present or past uses.

Phase I environmental site assessments were conducted for each of the five Columbia Solar Project sites in February 2017. These assessments revealed that there was no evidence of contamination or recognized environmental conditions in connection with any of the five solar project properties.

2) Describe existing hazardous chemicals/conditions that might affect project development and design. This includes underground hazardous liquid and gas transmission pipelines located within the project area and in the vicinity.

The Fumaria, Penstemon, Typha, and Urtica Solar Project sites do not have any existing hazardous chemicals/conditions, including underground hazardous liquid or natural gas transmission pipelines, that might affect project development and design. The Camas Solar Project site has an underground natural gas pipeline crossing from northeast to southwest across the site. TUUSSO has coordinated with the pipeline owner, and the Camas Solar Project has been designed with appropriate buffers to avoid impacts to that pipeline.

3) Describe any toxic or hazardous chemicals that might be stored, used, or produced during the project's development or construction, or at any time during the operating life of the project.

Minimal amounts of petroleum fuels (e.g., gasoline and diesel) and lubricating oils would be transported, stored, or used to operate equipment during construction and operation on the five Columbia Solar Project sites.

4) Describe special emergency services that might be required.

A Fire Protection and Safety Plan would be developed and implemented prior to construction, in coordination with the Kittitas County Fire Marshal, Fire District No. 2/Kittitas Valley Fire and Rescue, Fire District No. 1, and other appropriate agencies. TUUSSO would coordinate with Fire District No. 2/Kittitas Valley Fire and Rescue and Fire District No. 1 to provide PV training to fire responders and construction staff. The intent of this training would be to familiarize both responders and workers with the codes, regulations, associated hazards, and mitigation processes related to solar electricity. This training also would include techniques for fire suppression of PV systems.

5) Proposed measures to reduce or control environmental health hazards, if any:

Construction equipment would have spark-arresting mufflers, heat shields, and other protection measures to avoid starting fires. Fire extinguishers would be available in vehicles and on equipment, to quickly address any accidental fire issues. Work crews also would be trained about fire avoidance and response measures.

If a fire were to occur, water would be available on-site that could be applied to the fire. For the Camas, Penstemon, Typha, and Urtica Solar Project sites the water sources are already available on-site. For the Fumaria Solar Project site, water would be trucked onto the site from the Ellensburg area.

As a result of the above fire avoidance measures and ability to respond on-site to potential fires, the risks of and potential impacts from on-site fires during construction and operation of the five Columbia Solar Projects would be minimal.

b. Noise

1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?

Types of noise in the area includes vehicular traffic from I-90, airplanes traveling to the nearby Bowers Field airport, and farm equipment (e.g., tractors) used to grow and harvest crops and to raise cattle and other farm animals.

2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site.

The long-term operational noise for the Columbia Solar Project would primarily be generated by the SGI 500XTM inverters at each site. The SGI 500XTM inverter has a sound level rating of 67 A-weighted decibels (dBA) at 10 meters. There would be about ten SGI 500XTM inverters on each project site. The facilities would not emit any noise at night.

Construction noise would consist of the operation of various on- and off-road construction equipment. The maximum noise levels for common construction equipment are given in Table 14.

Table 14. Maximum Noise Levels for Common Construction Equipment

Equipment Type	Typical Maximum Noise Levels at 10 Feet (dBA)	Typical Maximum Noise Levels at 50 Feet (dBA)
Backhoes	92	78
Bulldozers	96	82
Crane	95	81
Concrete Mixer Truck	93	79
Drill Rig	98	84
Drum Rollers	94	80
Dump Trucks	91	77
Graders	99	85
Excavators	95	81
Construction Pickup/Water/Fuel Truck	89	75
Delivery Truck	88	74
Tractor	98	84
Vibratory Pile Driver	115	101

3) Proposed measures to reduce or control noise impacts, if any:

Construction would take place within the hours of 7:00 a.m. to 10:00 p.m.

Preliminary estimations of the operational noise levels at the Camas Solar Project property boundary exceed the Washington State Noise Maximum. Post-construction noise monitoring would be conducted at the Camas Solar Project site and any further mitigation, such as installing a noise-mitigating barrier, would be completed to comply with the noise standard.

8. Land and Shoreline Use

a. What is the current use of the site and adjacent properties? Will the proposal affect current land uses on nearby or adjacent properties? If so, describe.

Each of the Columbia Solar Project sites is existing farmland, and is surrounded by other farmland. The size, use, and potential land use impacts of each site are described below.

Camas Solar Project Site

The Camas Solar Project site is 51.21 acres of active agricultural land, growing alfalfa, and representing 0.02% of the 291,614 acres of lands specifically designated as Commercial Agricultural land uses in the county's comprehensive plan. Because of the minimal percentages of effect and the fact that it would be an allowed conditional use, the Camas Solar Project would have no construction or operational impacts to land use in the county.

Fumaria Solar Project Site

The Fumaria Solar Project site is 35.24 acres of fallow agricultural land, representing 0.01% of the 329,982 acres of lands specifically designated as Rural Working land uses in the county's comprehensive plan. Because of the minimal percentages of effect and the fact that it would be an allowed conditional

use, the Fumaria Solar Project would have no construction or operational impacts to land use in the county.

Penstemon Solar Project Site

The Penstemon Solar Project site is 39.38 acres of active agricultural land, growing Sudangrass, and representing 0.01% of the 291,614 acres of lands specifically designated as Commercial Agricultural land uses in the county's comprehensive plan. Because of the minimal percentages of effect and the fact that it would be an allowed conditional use, the Penstemon Solar Project would have no construction or operational impacts to land use in the county.

Typha Solar Project Site

The Typha Solar Project site is 54.29 acres, primarily consisting of irrigated agricultural land being used for grazing pasture, and representing 0.02% of the 291,614 acres of lands specifically designated as Commercial Agricultural land uses in the county's comprehensive plan. Because of the minimal percentages of effect and the fact that it would be an allowed conditional use, the Typha Solar Project would have no construction or operational impacts to land use in the county.

Urtica Solar Project Site

The Urtica Solar Project site is 51.94 acres, primarily consisting of active agricultural land growing common timothy hay, and representing 0.02% of the 329,982 acres of lands specifically designated as Rural Working land uses in the county's comprehensive plan. Because of the minimal percentages of effect and the fact that it would be an allowed conditional use, the Urtica Solar Project would have no construction or operational impacts to land use in the county.

b. Has the project site been used as working farmlands or working forest lands? If so, describe. How much agricultural or forest land of long-term commercial significance will be converted to other uses as a result of the proposal, if any? If resource lands have not been designated, how many acres in farmland or forest land tax status will be converted to nonfarm or nonforest use?

Construction of the Columbia Solar Projects would represent a conversion of the roughly 232 acres of leased properties currently used for agricultural hay production and grazing, to use as solar electricity generation facilities for the approximate 30-year lives of the solar projects. Of that total, 144.9 acres are designated as Commercial Agricultural land uses and 87.2 acres are designated as Rural Working land uses. Conversion of those lands to solar facilities would represent only:

- 0.05% of the 291,614 acres of lands specifically designated as Commercial Agricultural land uses in the county's comprehensive plan;
- 0.03% of the 329,982 acres of lands specifically designated as Rural Working land uses in the county's comprehensive plan;
- 0.13% of the total 183,124 acres of farmlands in Kittitas County; and
- 0.34% of the 68,314 acres of total croplands in Kittitas County.

Because of the minimal percentages of effects and the fact that they would be allowed conditional uses, the five Columbia Solar Projects would have no construction impacts to land uses in the county.

1) Will the proposal affect or be affected by surrounding working farm or forest land normal business operations, such as oversize equipment access, the application of pesticides, tilling, and harvesting? If so, how:

None of the five Columbia Solar Projects would affect or be affected by any of the surrounding working farms during normal business operations. None of the projects would negatively impact or cause any changes in any existing, accepted farming practices, nor would they in any fashion cause or force changes in any farming operations or practices. Although some heavy construction equipment and materials would be hauled to the sites, they would have direct access to parking/staging areas on each solar project site and, thus, should not have impacts on area roads and access. None of the surrounding farming activities would affect the solar projects.

c. Describe any structures on the site.

The Fumaria, Penstemon, Typha, and Urtica Solar Project sites do not have any structures on them. The Camas Solar Project site has a barn on the northeastern part of the site and, because the solar project has been designed around the barn, it would not be affected by construction or operation of the project.

d. Will any structures be demolished? If so, what?

No structures would be demolished on any of the Columbia Solar Project sites.

e. What is the current zoning classification of the site?

The Kittitas County Comprehensive Plan established the policy framework for Kittitas County's legislative actions designating the land use zones for the five proposed Columbia Solar Project sites. The five sites would be located on lands zoned as either Commercial Agriculture or Rural Working – Agriculture 20. Within these zones, Kittitas County allows many non-agricultural land uses, including solar PV facilities, as permitted conditional uses of the land, subject to criteria that are intended to identify local, site-specific impacts that can be addressed through conditioned permits. These zones are described below.

Commercial Agriculture Land Use Zone

Per the Kittitas County Comprehensive Plan, the Commercial Agriculture land use zone "is an area wherein farming and ranching are the priority." The purpose of this zoning classification "is to preserve fertile farmland from encroachment by nonagricultural land uses and protect the rights of those engaged in agriculture." The Commercial Agriculture zone only allows for agricultural land use with no more than two residential dwellings per 20 acres. According to KCC 17.15.050.01, utilities, including "solar farms" as defined by KCC 17.61, are a permitted conditional use of a Commercial Agriculture zone.

Rural Working – Agriculture 20 Land Use Zone

Per the Kittitas County Comprehensive Plan, the Rural Working general land use designation "generally encourages farming, ranching and storage of agriculture products, and some commercial and industrial uses compatible with rural environment and supporting agriculture and/or forest activities." The purposes of the Rural Working designation are to:

- Provide preservation of agriculture activities where producers can live and work on their own lands separate from resource lands.
- Support the continuation, whenever possible, of agriculture, timber and mineral uses on lands not designated for long-term commercial significance.
- Provide some buffer between rural residential lands and resource lands.

- Provide areas of low intensity land use activities within the agriculture and forest activities.

Within the Rural Working general land use designation, the project sites are zoned Agriculture 20 (A-20). According to KCC 17.29.10, the A-20 zone "is an area wherein farming, ranching and rural life styles are dominant characteristics. The intent of this zoning classification is to preserve fertile farmland from encroachment by nonagricultural land uses; and protect the rights and traditions of those engaged in agriculture." According to KCC 17.15.060.1, utilities, including "solar farms" as defined by County Code 17.61, are a permitted conditional use within an A-20 zone.

Solar Project Sites

Camas Solar Project Site

The site would be located on land with a Commercial Agriculture land use designation, also zoned as Commercial Agriculture, and would be an allowed conditional use in that zone.

Fumaria Solar Project Site

The site would be located on land with a Rural Working land use designation, zoned as Agriculture 20 (i.e., Rural Working – Agriculture 20), and would be an allowed conditional use in that zone.

Penstemon Solar Project Site

The site would be located on land with a Commercial Agriculture land use designation, also zoned as Commercial Agriculture, and would be an allowed conditional use in that zone.

Typha Solar Project Site

The site would be located on land with a Commercial Agriculture land use designation, also zoned as Commercial Agriculture, and would be an allowed conditional use in that zone.

Urtica Solar Project Site

The site would be located on land with a Rural Working land use designation, zoned as Agriculture 20 (i.e., Rural Working – Agriculture 20), and would be an allowed conditional use in that zone.

f. What is the current comprehensive plan designation of the site?

Please refer to the responses to items a. and e., above, for the land use designations.

g. If applicable, what is the current shoreline master program designation of the site?

The nearest Shoreline of the State is located along the Yakima River within 200 feet of the Typha Solar Project eastern site boundary. The western edge of the Yakima River ordinary high water mark (OHWM) is between 35 feet and 200 feet from the eastern edge of the site boundary. All portions of the site within 200 feet of the OHWM of the Yakima River and within the NWI-mapped emergent wetland that extends into the southern portion of the site have a Shoreline Environment Designation (SED) of Rural Conservancy. This SED area partially overlaps wetlands TW01 and TW02, which would be avoided through project design, as well as areas delineated as uplands that would be within the Typha Solar Project area. The proposed project would overlap areas within the Shoreline of the State jurisdiction in two areas. The nearest project impact occurring within 200 feet of the Yakima River shoreline would overlap this shoreline area by only 0.19 acre and would consist of fence installations located at least 144

feet from the OHWM of the Yakima River and solar arrays located at least 154 feet from the OHWM of the Yakima River. The second area of overlap would be located at an existing access road crossing of wetland TW03, an associated wetland of the Yakima River that would be considered within Shoreline of the State jurisdiction, where a culvert replacement would result in approximately 0.01 acre of wetland fill. The Kittitas County Shoreline Master Program (SMP) designates an area that overlaps approximately 6.61 acres of the proposed project area as part of the Shoreline of the State based on NWI mapping; however, SWCA performed a professional wetland delineation throughout the entire site and found that wetlands associated with the Yakima River shoreline only occur in areas delineated as wetlands TW01, TW02, and TW03. Both wetlands TW01 and TW02 would be avoided through project design, and impacts to wetland TW03 would be limited to only 0.01 acre for the proposed culvert replacement for site access. In addition, the vegetation adjacent to the Yakima River would not be altered, and all of the areas of the project within 200 feet of the Yakima River shoreline would be planted with low-growing native plant species. Therefore, the proposed project would have minimal adverse effects on the shoreline of the Yakima River and would preserve the natural character of the shoreline. In addition, any adverse effects associated with the proposed project would be minimal and would not substantially affect the ecology and resources of the Yakima River shoreline.

The proposed Typha Solar Project would add less than 3% impervious surfaces to the property, including less than 10 square feet (based on approximately 16 solar array footings of 6- by 8-inch cross-section) for solar array footings and less than 700 square feet for the access road fill within wetland TW03 in areas within Shoreline of the State jurisdiction. These areas and the overall project would not result in a substantial increase in runoff. No shoreline protection work is proposed nor would be necessary to stabilize the shoreline for project purposes. The location of the proposed Typha Solar Project is on private land located west of a segment of the Yakima River that is not visible from properties immediately to the west of the site. The solar arrays on the proposed site would not exceed 8 feet in height and would not block any views of the Yakima River from adjoining properties. In addition, the associated generation tie line would be predominately located along existing power lines and would not substantially alter the current views nearby.

Solar generation facilities are an allowed conditional use on lands zoned Commercial Agriculture. As described in Section 1.16 of the ASC, the Typha Solar Project would be consistent with the Kittitas County Comprehensive Plan. The proposed project would limit grading activities as much as possible, utilizing existing site contours with limited ground disturbance. The project would operate under a maximum 41-year lease with the current landowner, after which the site may return to its current agricultural land use. In addition, the generation tie line would be located predominantly along existing power lines and would not affect any existing land uses along its route. The proposed Typha Solar Project is located on private land that currently does not allow public access to the Yakima River shoreline. Therefore, public access to the shoreline of the Yakima River and public recreational opportunities would not be affected by the proposed project.

Finally, based on the project design and impacts described above, the proposed Typha Solar Project would not destroy or obstruct scenic views of the Yakima River shoreline because of the private location of the property and topography of the surrounding landscape. In addition, the project would meet the no-net-loss standards of the Kittitas County SMP because the small areas of impact are either below the threshold for mitigation, in the case of the 0.01 acre of wetland fill, or would have a negligible impact with an improvement in vegetation quality, in the case of the 0.19 acre at least 144 feet from the OHWM of the Yakima River. Therefore, the proposed project meets the Kittitas County SMP 6.19.B.12 requirement.

The Typha Solar Project would be a conditionally permitted use for areas within the SED of Rural Conservation under the Kittitas County SMP. KCC 17B.07.0030(I) provides that “any project with a

certification from the governor pursuant to RCW Chapter 80.50" is exempt from shoreline permit requirements. The Typha Solar Project site would nevertheless be consistent with all of the policies specified in RCW 90.58.020 and the Kittitas County SMP, but is subject to EFSEC jurisdiction and authorization. A Shoreline Conditional Use Permit application is attached to the ASC.

h. Has any part of the site been classified as a critical area by the city or county? If so, specify.

Critical Areas

Several Critical Areas, as defined by the KCC 17A Critical Areas Ordinance (CAO), were recorded during field observations within some of the Columbia Solar Project sites. The following Critical Areas defined in the KCC CAO occur on some or all of the Columbia Solar Project sites:

- Wetlands (addressed in Section B.3.a.1)
- Floodplains (addressed in Section B.3.a.5)
- Riparian habitats (addressed with streams and rivers)
- Streams and rivers (addressed in Section B.3.a.1)

The above Critical Areas were addressed in previous sections of this report. Based on the current project design, there would be minimal to no impacts on wetlands, floodplains, riparian habitats, and streams and rivers Critical Areas. All other Critical Areas defined in the KCC CAO do not occur on any of the Columbia Solar Project sites. Therefore, all other Critical Areas would be avoided and would not be impacted by the project.

i. Approximately how many people would reside or work in the completed project?

No one would reside on the five Columbia Solar Project sites.

j. Approximately how many people would the completed project displace?

Because no one resides on the five Columbia Solar Project sites, no one would be displaced by the solar projects.

k. Proposed measures to avoid or reduce displacement impacts, if any:

Because no one resides on or would be displaced by the five Columbia Solar Project sites, no mitigation measures are proposed.

l. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:

Because all five of the Columbia Solar Projects are allowed conditional uses and would not affect existing or projected land uses and plans, no mitigation measures are proposed.

m. Proposed measures to reduce or control impacts to agricultural and forest lands of long-term commercial significance, if any:

Because all five of the Columbia Solar Projects would have minimal effects on agricultural lands, compared to those available in the county, no mitigation measures are proposed.

9. Housing

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.

No housing units would be required from construction or operation of the Columbia Solar Projects because adequate housing would already be available, as described below.

Construction Impacts

It is not anticipated that construction of the five Columbia Solar Projects would result in the permanent relocation or in-migration of any of the construction workforce. Thus, temporary employment of the up to 100 peak workforce (including 20 non-local workers) would not affect the current supplies of vacant and available permanent or rental housing (5,411 vacant units in Kittitas County and 607 vacant units in Ellensburg in 2015) in the Ellensburg area.

The 20 non-local hires might elect to commute to the Ellensburg area on a daily basis from urban areas such as the Tri-Cities (over 96 miles away), the eastern suburbs of Seattle such as Issaquah (91 miles) or North Bend (79 miles), or from the Seattle Metropolitan area (107 miles). However, if they elect not to commute, they are likely to either stay in a personal recreational vehicle (RV) at a camp site, or to rent a motel room at the more than 25 motels in the area. Although there could be some competition for camping spaces during the busy summer recreational season, the over 310 sites at six facilities in the Ellensburg area, over 94 sites at seven facilities in the Cle Elum area, and over 434 sites at five facilities in the Easton area should be adequate to meet the needs of the 20 non-local temporary hires for construction of the five Columbia Solar Projects. Because there would be minimal additional uses of camp sites or motels in the Ellensburg area construction, there would be minimal impacts to RV parks and motels in Kittitas County or in the Ellensburg area.

Operation Impacts

Because there would be minimal direct operational staff levels and no in-migration or relocation into the Ellensburg area, no positive or negative impacts are anticipated on housing levels or availability in Kittitas County overall, or in the Ellensburg area. Similarly, no permanent or temporary relocations of family members or indirect operational employees are anticipated into the Ellensburg area, so there would be no impacts to the current supplies of permanent or rental housing, or to motels or RV parks.

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.

No housing units exist on the five Columbia Solar Projects and, thus, none would be eliminated by development of the solar projects.

c. Proposed measures to reduce or control housing impacts, if any:

Because no impacts would occur to housing from the five Columbia Solar Projects, no mitigation measures are proposed.

10. Aesthetics

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?

The tallest structure of the Columbia Solar Projects is 55 feet, located at the Typha and Fumaria Solar Project sites. These tallest structures are the replacement transmission line poles. The perimeter fencing is 8 feet tall and the panels/inverters are 6 to 8 feet tall at each site.

The principal exterior building material for the sites is galvanized steel (treatment/coating to be determined during final design), comprising the perimeter fence, gates, meteorological data collector, communications and grid-protection equipment, Supervisory Control and Data Acquisition (SCADA) monitoring equipment, interconnection transformers, collection and inverter system, and solar panel support structures. The principal exterior building material for the solar panels is crystalline silicon.

b. What views in the immediate vicinity would be altered or obstructed?

The views of the five sites for the Columbia Solar Projects would shift from agricultural sites to energy-producing sites. Because the sites are all relatively flat, there is generally no obstruction to existing views, and the sites are not prominent from afar since there is little elevational change in the analysis area. There are no scenic views (designated or local) in the immediate vicinity that would be altered or obstructed. Non-scenic views include those that local residents experience from their property and commute, as well as the view motorists (both local and tourists) experience when driving through the greater Kittitas Valley.

When viewing the Columbia Solar Project's five solar sites, the non-scenic foreground views would be altered since the primarily agricultural use would shift to a primarily energy-producing use. The views would change from primarily natural/agricultural in nature to primarily developed/industrial in nature. Middle- and background views would not be altered or obstructed; most of the vegetation growing along fence lines, roads, and ditches is much higher than the facilities at each solar site (the replacement transmission line towers being the exception) and therefore would conceal or block the Columbia Solar Projects from non-scenic middle- and background views.

All elements of the Columbia Solar Projects would be designed in such a manner as to minimize contrast with the surrounding vicinities. Three key observation points (KOPs) were selected for each of the five sites from which to take current condition photos, prepare visual simulations, and to conduct the visual impact assessment. These KOPs were selected based upon locations where the solar projects could be most visible to either a large number of viewers or to sensitive viewers. The proposed solar projects would be visible from 10 of the 15 project sites' KOPs, and would contrast to a minor to moderate degree with the surrounding landscape. The level of change to the landscape apparent from any of the five solar project sites would be minor to moderate based on the visual resource contrast analysis. Minor to moderate contrasts in the elements of the environment would generally be consistent with the characteristic landscape. Although primarily agricultural in setting, there are numerous transmission lines, pipelines, metal buildings, and fence lines visible from each of the KOPs. There are existing visible contrasts apparent from each of the KOPs. None of the KOPs would experience a major or significant change to the characteristic views.

Each of the proposed Columbia Solar Projects would generally repeat the basic elements of line, texture, color, and form found in the predominant natural features of the characteristic landscape. Contrast would be less apparent the further the view is from each site, and would be more apparent the closer the view is to each site.

Adjacent viewers (e.g., farmers, private landowners, and motorists) would experience the greatest change in views since the contrast is most noticeable when viewing up close (i.e., 25 feet or closer). Viewers accustomed to the typical rural, agrarian landscape would be affected by the minor contrast created from solar project impacts. The construction of the Columbia Solar Project sites would cause a long-term change to scenery. However, as these views are not representative of public views they were, therefore, not considered for KOP selection.

The *Visual/Aesthetics Assessment Report,* attached to the ASC, describes in detail the existing views from each of the Columbia Solar Projects 15 key observation points (KOPs) and associated 15 visual simulations for the proposed solar project sites.

c. Proposed measures to reduce or control aesthetic impacts, if any:

Construction layout, site design, and vegetative screening help decrease the contrast to the surrounding characteristic landscape.

The following measures are proposed to decrease the contrasts of construction, operation, maintenance, and decommissioning activities:

General Mitigation Measures

- Vegetation or fencing would be used to interrupt the line of sight from nearby key observation points (KOPs) at or near the same elevation as the project sites.
- Vegetation and ground disturbance would be minimized near roads, and the use of existing clearings would be maximized.
- The use of non-necessary and/or non-safety-related signs and project construction signs should be minimized; necessary signs would be made of non-glare materials and use unobtrusive colors; reverse sides of signs and mounts would be painted or coated using the most suitable color to reduce color contrasts with the existing landscape; however, placement and design of any signs required by safety regulations must conform to regulatory requirements.
- “Good housekeeping” procedures would be developed to ensure that the sites are kept clean of debris, garbage, fugitive trash or waste, and graffiti; to prohibit scrap heaps and dumps; and to minimize storage yards. Design features regarding waste management would be applied.
- A lighting plan would be prepared that documents how lighting would be designed and installed to minimize night-sky impacts during facility construction and operations phases. Lighting for facilities would not exceed the minimum number of lights and brightness required for safety and security, and would not cause excessive reflected glare. Full cut-off luminaires would be used to minimize upward shining lighting. Lights would be directed downward or toward the area to be illuminated. Light fixtures would not spill light beyond the project boundary. Lights in high illumination areas not occupied on a continuous basis would have switches, timer switches, or motion detectors so that the lights operate only when the area is occupied. Where feasible, vehicle-mounted lights would be used for night maintenance activities. Wherever feasible, consistent with safety and security, lighting would be kept off when not in use. The lighting plan would include a process for promptly addressing and mitigating complaints about potential lighting impacts.
- Each of the five solar sites would be adequately screened by either existing or new vegetation or through the application of perimeter fencing to reduce contrast from glint and glare for KOPs with level views.

Construction

- Project developers would integrate visual and aesthetics mitigation elements early in the construction, which may include treatments such as thinning and feathering vegetation along project edges, salvaging landscape materials from within construction areas, etc.

- Visual impacts would be reduced during construction by clearly delineating construction boundaries. Within areas not intended for long-term use, impacts would be reduced by minimizing areas of surface disturbance within those boundaries; preserving vegetation to the greatest extent possible; using undulating surface disturbance edges; controlling erosion; using fugitive dust suppression techniques; and restoring exposed soils to their original contour and vegetation.
- An interim reclamation plan would be in place prior to construction. Interim reclamation of the construction site would begin immediately after construction to reduce the likelihood of visual contrasts associated with erosion and invasive weed infestation and to reduce the visibility of impacted areas as quickly as possible.
- Existing rocks, vegetation, and drainage patterns would be preserved to the maximum extent practicable, particularly within temporary use areas.
- Brush-beating or mowing, or using protective surface matting rather than vegetation removal would be done where feasible.
- For interim reclamation areas, slash from vegetation removal would be mulched and spread to cover fresh soil disturbances as part of the revegetation plan. Slash piles would not be left in sensitive viewing areas.
- No paint or permanent discoloring agents would be applied to rocks or vegetation to indicate surveyor construction activity limits, except in areas defined and designated for disturbance.
- All stakes and flagging would be removed from the construction area and disposed of in an approved facility.

Operation

- The project developer would maintain revegetated surfaces until a self-sustaining stand of vegetation is re-established and visually adapted to the undisturbed surrounding vegetation. For new areas of disturbance (beyond the scope of this project), no new disturbance would be created during operation.
- Interim restoration would be undertaken during the operating life of the project as soon as possible after disturbances.
- Maintenance activities would include noxious weed control.
- Road maintenance activities would avoid blading existing forbs and grasses in ditches and adjacent to roads.
- Painted facilities would be kept in good repair and repainted when color fades or flakes increase visual contrast.

11. Light and Glare

a. What type of light or glare will the proposal produce? What time of day would it mainly occur?

Glare

PV flat plate solar panels are designed to absorb sunlight, with an anti-reflective layer to maximize solar absorption and minimize glare. A mono-crystalline silicon solar cell absorbs two-thirds of the sunlight reaching the panel's surface. Therefore, only one-third or 30% of the sunlight reaching the surface of the solar panel has the opportunity to be reflected. This reflected light from the panels is referred to as glare, a continuous source of bright light, and is considered a nuisance concept of light. Other comparable levels of glare are listed below to help put this into context:

- Dry sand – 45%
- Mono-crystalline silicon solar cell – 30%
- Grass-type vegetation – 25%

- Needle-leaf coniferous trees – 20%
- Broad-leaf deciduous trees – 10%

In practice, from satellite view and airplanes, large arrays of solar modules resemble a dark blue body of water and are not a significant contributor of glare in most conditions. Because the Columbia Solar Projects are comprised of solar arrays that track with the movement of the sun, if any glare occurs it would only be for a very short duration at any one location.

Lighting

Lighting would be installed on metal poles, up to 20 feet tall, located around the periphery of each of the five Columbia Solar Project sites, as well as at the inverter pads, for nighttime security. Lighting would consist of modern, low-intensity, downward-shielded fixtures that are motion-activated, and would be directed onto the immediate site. For each site, five to 10 lights would be installed and powered directly by buried underground electrical supply lines.

b. Could light or glare from the finished project be a safety hazard or interfere with views?

Glare

The Solar Glare Hazard Analysis Tool (SGHAT), created by Sandia National Laboratories, was used to conduct the glare analyses for the five Columbia Solar Projects. Representative models of the five proposed PV system were constructed in the SGHAT application for each of the projects' three KOPs relative to the solar module arrays. Potential glare hazards were evaluated against the current FAA guidelines and industry standards for acceptable glare.

Based on SGHAT analysis, for all five Columbia Solar Projects, the ocular impact or glare intensity is below 2×10^2 W/cm^2 in the "Hazard plot for PV" and, therefore, the projects would have no dangerous or detrimental visual impact to the KOPs and would not poise a visual nuisance. Refer to the *Solar Glare Hazard Analysis Report* attached to the ASC for methodology and detailed results.

Lighting

The lighting for the Columbia Solar Projects would not comprise a safety hazard, and would be motion-activated and downward-shielded to minimize any interference with views.

c. What existing offsite sources of light or glare may affect your proposal?

No existing offsite sources of light or glare would affect the Columbia Solar Projects.

d. Proposed measures to reduce or control light and glare impacts, if any:

Because there would be no impacts from light and glare from the Columbia Solar Projects, no mitigation measures are proposed.

12. Recreation

a. What designated and informal recreational opportunities are in the immediate vicinity?

No recreation areas are located within or immediately adjacent to the proposed Columbia Solar Project sites. The recreation areas that are the nearest to each of the proposed solar facilities are identified below.

Camas Solar Project Site

The nearest designated potential recreation opportunity to this proposed site is Olmstead Place State Park, located approximately 1.5 miles ("as the crow flies") northeast of the project site.

Fumaria Solar Project Site

The nearest designated potential recreation opportunity is the Iron Horse Trail, also known as the John Wayne Pioneer Trail. The proposed generation tie line associated with this site would parallel the trail, approximately 550 feet away, between U.S. Route 97 and an existing substation.

Penstemon Solar Project Site

Similar to the Camas Solar Project site, the nearest designated potential recreation opportunity to this proposed site is Olmstead Place State Park, located approximately 0.75 mile ("as the crow flies") northeast of the project site.

Typha Solar Project Site

The closest recreation facility to the proposed site is the Iron Horse Trail, across the Yakima River and I-90, approximately 1 mile ("as the crow flies") to the north of the proposed site.

Urtica Solar Project Site

The closest recreation facility to the proposed site is the Ellensburg's Irene Rinehart Riverside Park. The southernmost part of the park is located approximately 0.25 mile ("as the crow flies") northeast of the project site, across the Yakima River on Umptanum Road.

b. Would the proposed project displace any existing recreational uses? If so, describe.

Because the existing sites are private agricultural land, the Columbia Solar Projects would not displace existing recreational uses.

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:

Because the existing sites are private agricultural land and the Columbia Solar Projects would not displace existing recreational uses or have recreational impacts, no mitigation measures are proposed.

13. Historic and Cultural Preservation

a. Are there any buildings, structures, or sites, located on or near the site that are over 45 years old listed in or eligible for listing in national, state, or local preservation registers? If so, specifically describe.

There are eight archaeological sites recorded within 1 mile (1.6 km) of the solar project sites, none of which are listed in or eligible for listing in national, state, or local preservation registers. SWCA completed a historic and archaeological survey of the five solar sites and resulted in the recording of 10 historic properties, three archaeological sites, and 13 archaeological isolates. Two historic properties were recommended potentially eligible for listed on the National Register of Historic Places (NRHP), and are discussed below.

The Cascade Canal, currently called the Cascade Irrigation District Canal, is 42 miles long and a portion passes through the Fumaria Solar Site. The section passing through the Fumaria Solar Project site is unlined and approximately 20 feet across. The Cascade Canal Irrigation Company formed in 1902 as a successor firm to the Inter-Mountain Irrigation Association, proposing the construction of two canals: a lower canal with an intake on the Yakima River near Thorp, and an upper canal with a dam on Lake Kachess. Construction of the lower canal began in 1903 and water began flowing in the spring of the following year. The Cascade Canal is one of the earliest canals built in Kittitas County and continues to be used more than 100 years later. It is recommended eligible for the NRHP under Criterion A for its contribution to the history of irrigation in the Pacific Northwest.

The Ellensburg Power Canal passes through the generation tie line and access route for the Typha Solar Site. The canal varies in width, measuring an average of 40 feet across, and is unlined within the solar project study area. A steel- and timber-deck bridge carries a farm driveway across the canal to provide access to a farm. A field ditch inlet on the east side of the canal, southeast of the farm bridge, indicates that in addition to power generation, the canal was also utilized for irrigation. The Ellensburg Power Canal was constructed in the first half of the twentieth century to divert water from the Yakima River for a power generation facility. This canal is recommended eligible for the NRHP under Criterion A for its contribution to the history of power generation in the region of Thorp and Ellensburg.

b. Are there any landmarks, features, or other evidence of Indian or historic use or occupation. This may include human burials or old cemeteries. Are there any material evidence, artifacts, or areas of cultural importance on or near the site? Please list any professional studies conducted at the site to identify such resources.

There are 56 cultural resource investigations that have been completed within 1 mile (1.6 km) of the solar project sites. The Camas, Fumaria, Typha, and Urtica Solar Project sites themselves have not been previously surveyed for cultural resources. One cultural resources survey was previously conducted along the north and east edges of the Penstemon Solar Project site. Schroeder and Landreau excavated 13 probes in the Penstemon Solar Project site in 2013, but did not identify cultural resources within the solar project site.

Cartographic Review

Camas Solar Project Site

A Native American trail is shown [redacted] on a General Land Office (GLO) map of T17N, R19E from 1884, and a structure is denoted as Shooshooskins [redacted]

[redacted]. The Metsker Maps (1956) atlas indicates the Camas Solar Site was farmed by A.B. Paine, Paul Wipple, E. Clerf, and Louis E. Poulsen. The Poulsen family still owns the land across Tjossem Road from the project site. Today, there is a barn in the project site, and the Valley Land Company owns the land.

Fumaria Solar Project Site

Trails used by the Yakama to travel between their villages and resource-gathering locales may have once followed [redacted], up from the Yakima River, but the original locations of these creeks have shifted due to irrigation canals and roads. The 1884 GLO map of T18N, R18E does not show any historical structures in the project vicinity. According to the Bureau of Land Management, the Northern Pacific Railroad Company was granted most of the land in Sections 9 and 17, T18N, R19E in 1864, as well as the NW¼ of Section 21, which they claimed in 1895. The State of Washington obtained Section 16 in 1934. Land in the NE¼ of Section 20 left public domain when Carl Justus Larson and Peter A. Wold claimed their homesteads in 1892 and 1883, respectively.

By 1956, the land where the Fumaria Solar Project is proposed was farmed by Creston S. Crest (Metsker Maps 1956). The land south of the solar project site and along Faust Road, which holds the Cascade Canal, was farmed by the Penningtons and Howard Altice. Jack Bopp and John Liboky farmed the land on the south side of Hungry-Junction Road where Reecer Creek once flowed freely and another irrigation canal, the Town Ditch, was present. Liboky's property was also adjacent to the railroad and land owned by Joseph McManamy at the southwest end of the proposed project. Several highways were present in the vicinity by 1956.

The Fumaria Solar Project site is currently used for agriculture and is owned by Jay T. and Lori A. Pittenger, as is the land on the north and south sides of Clarke Road following the proposed generation tie line ROW. Three buildings were constructed on the solar project site in 2002 and no other structures are present.

Penstemon Solar Project Site

A Native American trail is shown following [redacted] on a GLO map of T17N, R19E from 1884, and a structure is denoted as Shooshooskins is shown [redacted]. Additional trails are mapped [redacted], such as the Squaw Creek Trail that ran [redacted].

Typha Solar Project Site

The closest known ethnographic Yakama village site is [redacted]. The Yakama followed well-established trails from their villages to important resource-gathering locales, such as fishing sites at Selah, Icicle Creek, and Priest Rapids. A known crossing of the Yakima River was near [redacted]. Because of the river crossing and proximity to an ethnographic village, this solar project site has heightened sensitivity for encountering pre-contact and ethnographic-period cultural materials.

According to the Bureau of Land Management, land in the Typha Solar Project site left public domain by Cash Entry in 1873 and Homestead Entry in 1888. The 1884 GLO map of T18N, R18E does not show any historical structures or trails in the immediate project vicinity. B.W. Frisby and R. Geddes may have farmed land south of the project site when the earliest maps of the vicinity were drawn (GLO 1884c). By 1956, land in the project site was owned by L. D. Peters and adjacent properties west of the river were owned by P. F. P. Young (Metsker Maps 1956). A golf course was present southeast of the project site by

this time (Metsker Maps 1956). The property is currently owned by Douglas Dicken and is used for agricultural purposes. One mobile home that was built in 1979 and a few outbuildings that were built in 1910, 1960, 1980, 1982, and 1987 are present on the property, but these structures are located south of the project boundary.

Urtica Solar Project Site

According to the Bureau of Land Management, land in the project site left public domain in 1884 when Hiram H. Swasey claimed a homestead. The 1884 GLO map of T17N, R18E does not show any historic structures or trails in the immediate project vicinity. By 1956, land in the project site was farmed by Jeff Walters, Robert Kuhn, and Mare Bender (Metsker Maps 1956). A branch of the West Side Canal, the remnants of which are south of the current project and Manastash Road, flowed through Mr. Walter's property. Land in the project site is currently owned by Herbert J. Etux Snowden who continues to use the property for agriculture. Farm buildings and structures on Mr. Snowden's property (but not within the proposed solar project site) date to between 1984 and 1988, with updates as recently as 2011.

c. Describe the methods used to assess the potential impacts to cultural and historic resources on or near the project site. Examples include consultation with tribes and the department of archaeology and historic preservation, archaeological surveys, historic maps, GIS data, etc.

Tribal Consultation

SWCA sent a letter via certified mail to notify Johnson Meninick, of the Cultural Resources Program at the Confederated Tribes and Bands of the Yakama Nation, on March 23 and 30, 2017, about all five proposed Columbia Solar Projects and the cultural resource surveys that would be conducted. The purpose of this communication was to seek input and identify any of the Cultural Resources Program's Tribal concerns related to cultural resources, and it was not intended to replace any government-to-government consultation that may be required pursuant to National Historic Preservation Act (NHPA) Section 106.

Joy Potter, TUUSSO, met with Johnson Meninick of the Yakama Nation on June 15, 2017. Mr. Meninick informed Ms. Potter that all of Kittitas County once held villages of the Yakama Nation. He stated that the Yakama Nation is very concerned about the actual village locations and burial grounds; and noted that the proposed solar sites were not at known villages or burial locations. He was concerned that the Tribe did not do the study, as they are mostly concerned about the oral interview history portion of the cultural resource study. The ground disturbance was a secondary concern. TUUSSO is continuing discussion with the Yakama Nation.

Background Research

Prior to field investigations, SWCA staff searched Washington State Department of Archaeology and Historic Preservation's (DAHP's) Washington Information System for Architectural and Archaeological Records Data (WISAARD) database to identify previous cultural resource assessments and recorded archaeological and historical sites located within 1.0 mile (1.6 km) of each solar project site. Additional archival research examined historical documents, maps, research publications, and books that provided information about the natural history, human settlement, and land use around the Kittitas Valley. Specific attention was given to review of available historical maps, such as GLO plats and Metsker Maps, as part of this overview investigation.

Field Methods

Archaeological Survey

Archaeological fieldwork for each project site was conducted on the following dates: Camas Solar Project site – April 12 to 15, 2017; Fumaria Solar Project site – April 4 to 8, 2017; Penstemon Solar Project site – April 16 and 17, 2017; Typha Solar Project site – April 4 to 6, 2017; and Urtica Solar Project site – April 9 to 15, 2017. Yonara Carrilho directed 11 SWCA archaeologists and field technicians.

Archaeological surveys were conducted in a similar manner at each solar project site, and deviations are described in the individual project reports. Each solar project site was surveyed with pedestrian transects spaced at approximately 20-meter intervals. The pedestrian surveys were supplemented with shovel probes measuring between 35 and 40 cm in diameter. Shovel probes were spaced approximately 30 m apart. The shovel probes were excavated in arbitrary 20-cm levels, and the sediments from each level were passed through a ¼-inch mesh screen.

Shovel probes were terminated at 100 cm, when native alluvial cobbles or gravels were encountered, or when other obstructions prevented further excavation. If a probe was positive for cultural material, a minimum of two 20-cm negative levels were excavated beyond the lowest positive level, unless an obstruction or depth of 100 cm was reached first. Any cultural material identified during the pedestrian survey and SP survey was recorded and photographed. Subsurface artifacts were bagged in plastic bags, labeled, and reburied where they were found.

The findings of each probe were recorded on standard shovel/auger probe forms that included information regarding soil color, texture, composition, and observed cultural materials. A Trimble handheld global positioning system (GPS) unit was used to collect the Universal Transverse Mercator (UTM) coordinates of shovel probes. Digital photographs were taken of each solar project site and a sample of the excavated shovel probes, and information about the photographs was recorded on a standard photograph log. Shovel probe photographs included cardinal direction overview photos and at least one photograph of the soil stratigraphy. Project field records and files are on file at SWCA's office in Seattle.

Information about any identified archaeological sites or isolates was recorded on State of Washington Archaeological Site Inventory Forms, which were entered into the WISAARD database.

Built Environment Survey

SWCA architectural historian Eileen Heideman conducted field surveys for built environment resources for all five solar projects on April 5 and 6, 2017. Built environment resources over 50 years old were identified, and included buildings such as houses, barns, and sheds, and structures such as bridges and irrigation ditches. Resources were photographed and described on field forms, and these data were then entered into the WISAARD database, and an inventory form was generated for each resource.

d. Proposed measures to avoid, minimize, or compensate for loss, changes to, and disturbance to resources. Please include plans for the above and any permits that may be required.

Monitoring and mitigation measures are prescribed to ensure avoidance of significant cultural resources because of unavoidable impacts resulting from a project's construction, operation, or decommissioning. Mitigation measures are designed to minimize the impact on any kind of significant cultural resource, whether an element of the built environment, an ethnographic property, or an archaeological site. Projects

whose design cannot be changed to avoid known significant cultural resources would have mitigation activities.

SWCA recommends that an Inadvertent Discovery Plan be prepared for the solar sites prior to project construction to inform construction personnel what to do in the event that previously unidentified cultural resources are discovered during excavation. In addition, it is understood that DAHP may recommend additional mitigation measures after reviewing the reports on the cultural resource surveys conducted for the proposed solar projects, which they will do after EFSEC notifies them that the ASC has been received.

Camas Solar Project Site

The Camas Solar Project site plans include fencing off the Paul Wipple Barn and the irrigation lateral from the solar project site, and this would protect the resources from potential construction impacts. The pre-contact isolate (45KT4010) appears to lie [redacted]. No further mitigation measures are required for these non-NRHP-eligible resources.

Fumaria Solar Project Site

The Fumaria Solar Project site plans specifically state to protect Lateral NB 7.7, which would be located outside of the perimeter fence. The Crest Field Ditch Turnout is in the fenced facility, and project plans state to maintain this feature. Also located [redacted] is 45KT4000, and project plans do not include solar panels in this location. No further mitigation measures are required for these non-NRHP-eligible resources.

The Cascade Canal is eligible for the NRHP under Criterion A. Project plans include using the existing generation tie line to connect the solar facility with the existing PSE substation on McManamy Road. Use of the exiting line would avoid direct impacts to the Cascade Canal, and no further mitigation measures are required.

Portions of the proposed generation tie line ROW alternatives have not undergone pedestrian inventory and it is, therefore, recommended that the remaining accessible portions of the ROW undergo such survey prior to project construction. Further, because no subsurface probing was conducted for the proposed generation tie line ROW, it is recommended that a Monitoring and Discovery Plan be prepared for the generation tie line, and that all project excavation within or associated with the transmission line ROW be monitored by a professional archaeologist.

Penstemon Solar Project Site

The two cultural resources recorded in the Penstemon Solar Site—45KT4011 and 45KT4012—are recommended not eligible for the NRHP and no further mitigation measures are required.

Typha Solar Project Site

The Typha Solar Project site plans include the use of the existing generation tie line near the Ellensburg Golf Club Cart Shed, and this feature would be avoided during construction. The six isolates are located [redacted]. No further mitigation measures are required for these non-NRHP-eligible resources.

The Ellensburg Power Canal is eligible for the NRHP under Criterion A. Project plans include using the existing generation tie line to connect the solar facility with the existing PSE substation on Thorp Highway South. Use of the exiting line would avoid direct impact to the Cascade Canal, and no further mitigation measures are required.

Because no subsurface probing was conducted for the proposed generation tie line ROW, it is recommended that a Monitoring and Discovery Plan be prepared for the generation tie line, and that all project excavation within or associated with the line ROW be monitored by a professional archaeologist.

Urtica Solar Project Site

The Urtica Solar Project site plans include protection of the McCarl Creek waterway, and the Walters Field Ditch would be located outside of the solar facility. These measures would protect the resources from potential construction impacts. The remaining three resources are located [redacted]. No further mitigation measures are required for these non-NRHP-eligible resources.

14. Transportation

a. Identify public streets and highways serving the site or affected geographic area, and describe proposed access to the existing street system. Show on site plans, if any.

Existing Highways and Roadways

The anticipated access routes for construction equipment, materials deliveries, and construction and operation crews to access each of the five Columbia Solar Project sites consist of the existing roads that are adjacent to the sites and the existing roads that would be used to access the nearest interstate and Ellensburg. The interstates and state highways that would be used to access the sites include I-82, I-90, State Route (SR) 821, and U.S. Route 97. I-90 and I-82 are four-lane divided highways with limited-access on- and off-ramps and average daily traffic (ADT) counts of 16,333 vehicles and 18,477 vehicles both ways, respectively. SR 821 and U.S. Route 97 are two-lane highways with 1,500 and 2,800 ADT, respectively. Table 15 provides more detailed information about each road that would be used to access the sites, including average daily traffic counts.

Table 15. Potential Construction Vehicle Impacts for Columba Solar Project Sites

Access Highway/Road	Sites Involved	Existing Average Daily Traffic (ADT)	Construction ADT	Percent Change in ADT
Interstate 82	Camas Penstemon	18,477 (both ways)	25	0.14
State Route 821	Camas Penstemon	1,500 (2016 estimate)	25	1.67
Tjossem Road	Camas Penstemon	634 at intersection with Road No. 6 (2017 count)	25	3.94
Road No. 6	Camas Penstemon	865 at intersection with Tjossem Road (2015 count)	25	2.89
Interstate 90	Fumaria Typha Urtica	16,333 (both ways)	25	0.15
U.S. Route 97	Fumaria (generation tie line only)	2,800 (2016 estimate)	25	0.89
Clarke Road	Fumaria	66 near Faust Road (2016 count)	25	37.88
Faust Road	Fumaria	201 south of Clark Road (2016 count)	25	12.44

Access Highway/Road	Sites Involved	Existing Average Daily Traffic (ADT)	Construction ADT	Percent Change in ADT
Hungry Junction Road	Fumaria	271 at intersection with Faust Road (2016 count)	25	9.23
Reecer Creek Road	Fumaria	2,612 at intersection with West University Road (2016 count)	25	0.96
Thorp Highway South	Typha	579 at intersection with Cove Road (2016 count)	25	4.32
W University Way	Typha	3,648 at intersection with Reecer Creek Road (2016 count)	25	0.69
Umptanum Road	Urtica	2,612 at intersection with Manastash Road (2016 count)	25	0.96
Canyon Road	Urtica	8,300 at intersection with Umptanum Road (2005 estimate)	25	0.30

Note: Average Daily Traffic 2016 data for interstates is from the closest permanent traffic recorders used (R042 for I-90 and R048 for I-82).

The major roads that are part of the Kittitas County's County Road System that would be used to access the sites include Tjossem Road, Road No. 6, Clarke Road, Faust Road, Hungry Junction Road, Reecer Creek Road, Thorp Highway South, and Umptanum Road. These are two-lane roads with ADTs ranging from 66 to 3,648 vehicles. The major streets within Ellensburg city limits that would be used to access the sites include West University Way (two lanes with 3,648 ADT), Umptanum Road (two lanes with 2,612 ADT), and Canyon Road (four lanes with 8,300 ADT).

Solar Project Site Driveways and Internal Access Roads

The points of access and associated construction methods vary for each Columbia Solar Project site and are described below in greater detail. Interior all-weather access roads within each site would be designed to provide access to the inverter pads from the site entrance. These all-weather access roads would be 12 feet wide, would consist of compacted soils or gravel to 90%, and a soil binder would then be sprayed or aggregate would be laid down to protect them from wind and water erosion to allow for continuous access. The soil binder would be reapplied annually to ensure the integrity of the access roads.

The remainder of the access roads throughout each solar project site would be unpaved vegetated drive roads, with slopes less than 4%. All access roads have been located to minimize grading, closely following the existing elevations.

Construction Impacts

During the peak of construction, a typical day would include the transportation of workers, transportation of materials, and movement of heavy equipment. Vehicular trip generation for employees, delivery trucks, and heavy equipment would vary depending on the phase of construction for each of the five Columbia Solar Projects. As shown in Table 16, it is estimated that a total of approximately 1,500 trips would be made to each site during a 3-month construction period, with conservatively 25% of those trips (375) made by heavy vehicles. On average, approximately 25 trips would be made to each site each day during construction, again assuming that 25% (6) would be heavy vehicle trips. These heavy vehicle trips could

haul materials and equipment from Ellensburg on state highways and county roads. But, depending upon where they are purchased and shipped from, deliveries could also be made from Seattle, Portland, the Tri-Cities, and other urban areas using the federal interstates and highways.

Table 16. Estimated Construction Vehicle Traffic Volumes

Type of Vehicle	Average Daily Trips (ADT)	Total Site Trips
Each Site Over About 3 Months		
Heavy Vehicles	6	375
Non-heavy Vehicles	19	1,125
Total	**25**	**1,500**
Maximum for All Five Sites Over 8 Months[1]		
Heavy Vehicles	30	1,875
Non-heavy Vehicles	95	5,625
Total	**125**	**7,500**

1. This assumes that all five solar projects would be constructed simultaneously and at peak, as a worst-case scenario. However, peak ADTs would not reach these levels because construction would be phased between all five sites over 8 months.

Construction of the five Columbia Solar Projects would begin in the second quarter of 2018 and would end in the fourth quarter of 2018, occurring over about 8 months from April through November. Construction of the five solar projects would employ up to 100 workers per day during the peak construction period. Approximately 80 of the peak workforce would likely be hired locally, or would be provided by locally-contracted companies or businesses, and the remaining 20 non-local peak workforce might elect to commute to the Ellensburg area on a daily basis. However, if they elect not to commute, they are likely to either stay in a personal RV at a camp site or to rent a motel room in the Ellensburg area or Kittitas County for the duration of the construction period. These workers would commute daily to each project site individually, in pairs, or in small groups.

Table 15 showed the potential changes in traffic volumes as a result of construction of an individual solar project site. Most of the highways and roads would experience less than a 5% increase in average daily traffic volumes and, thus, transportation systems and volumes would not be impacted for four of the solar project sites (i.e., Camas, Penstemon, Typha, and Urtica).

The exception would be three county roads accessing the Fumaria Solar Project site, with ADT increases on Clarke Road (37.88%), Faust Road (12.44%), and Hungry Junction Road (9.23%) for the 3-month construction period, representing minor to moderate temporary impacts.

b. Is the site or affected geographic area currently served by public transit? If so, generally describe. If not, what is the approximate distance to the nearest transit stop?

None of the five Columbia Solar Project sites is served by public transit. No transits stops are within a feasible travel distance.

c. How many additional parking spaces would the completed project or non-project proposal have? How many would the project or proposal eliminate?

The five Columbia Solar Project sites are currently agricultural fields, with no formal parking spaces but with adequate room for any vehicles. Thus, no parking spaces would be eliminated by the solar projects. The Columbia Solar Projects have been designed with adequate off-road parking available on each site.

d. Will the proposal require any new or improvements to existing roads, streets, pedestrian, bicycle or state transportation facilities, not including driveways? If so, generally describe (indicate whether public or private).

The Columbia Solar Projects would not require any new or improvements to existing roads, streets, pedestrian, bicycle, or state transportation facilities (not including driveways/on-site access roads).

e. Will the project or proposal use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.

The solar panels for the Columbia Solar Project sites would likely be shipped from China via normal shipping routes (likely waterborne); however, delivery of the panels would not affect any existing shipping routes. No other equipment or materials would be shipped to the five Columbia Solar Project sites via waterborne, rail, or air routes. Based on these reasons, there would be no impacts to those modes of travel as a result of construction or operation of the solar projects.

f. How many vehicular trips per day would be generated by the completed project or proposal? If known, indicate when peak volumes would occur and what percentage of the volume would be trucks (such as commercial and nonpassenger vehicles). What data or transportation models were used to make these estimates?

None of the operational workforce is anticipated to permanently in-migrate or relocate into the Ellensburg area. The operational workforce for the five Columbia Solar Project sites would be relatively small and would typically be off-site. In addition, it is anticipated that four to five maintenance personnel would make about two to three visits per year to each of the solar project sites to conduct the on-site operations and maintenance functions. These staff would likely use water trucks, utility vehicles, and pickup trucks to conduct maintenance activities. Because there would be minimal operational staff levels and vehicle trips, no positive or negative impacts are anticipated to transportation infrastructure or use levels in Kittitas County, in the Ellensburg area, or on roads accessing the individual solar project sites.

g. Will the proposal interfere with, affect or be affected by the movement of agricultural and forest products on roads or streets in the area? If so, generally describe.

The Columbia Solar Projects would not affect the movement of agricultural or forest products on roads or streets in the area.

h. Proposed measures to reduce or control transportation impacts, if any:

Because there would be minimal or no impacts on area highways and roads, no mitigation measures are proposed.

15. Public Services

a. Would the project result in an increased need for public services (for example: Fire protection, police protection, public transit, health care, schools, other)? If so, generally describe.

Fire Protection

Construction Impacts

As with any major development, construction of the Columbia Solar Projects presents some minimal fire risks. Each of the project sites is currently farmed agricultural land, mostly for hay production or grazing. The Fumaria Solar Project site is the only fallow agricultural field (not recently grazed) at this time. Thus the predominant groundcover is non-native grasses and weed species, with the greatest fire risks being associated with grass fires during the hot, dry summer season. TUUSSO has initiated discussions with the Kittitas County Fire Marshal about potential fire issues, locations and dimensions of access gates and internal access roads, and other issues. A Fire Protection and Safety Plan would be developed and implemented prior to construction, in coordination with the Kittitas County Fire Marshal, Fire District No. 2/Kittitas Valley Fire and Rescue, Fire District No. 1, and other appropriate agencies. TUUSSO would coordinate with Fire District No. 2/Kittitas Valley Fire and Rescue and Fire District No. 1 to provide PV training to fire responders and construction staff.

Construction equipment would have spark-arresting mufflers, heat shields, and other protection measures to avoid starting fires. Fire extinguishers would be available in vehicles and on equipment, to quickly address any accidental fire issues. Work crews also would be trained about fire avoidance and response measures.

During construction, water would be used to suppress fugitive dust during grubbing, clearing, grading, trenching, and soil compaction. If a fire were to occur, that water could be diverted for firefighting purposes. For the Camas, Penstemon, Typha, and Urtica Solar Project sites water is already available on-site. For the Fumaria Solar Project site, water would be trucked onto the site from the Ellensburg area.

As a result of the above fire avoidance measures and ability to respond on-site to potential fires, the risks of and potential impacts from on-site fires during construction of the five Columbia Solar Projects would be minimal.

Operation Impacts

Unlike thermal power plants, solar power projects pose a much smaller risk of accidental fires or explosions because there is no need to transport, store, or combust fossil fuels to generate electricity. The five Columbia Solar Projects also would be designed to comply with the NEC and NFPA requirements, to avoid potential electrical fire risks. A strict Fire Prevention and Safety Plan would be developed and enforced during project operation, to reduce and address potential fire risks.

TUUSSO would coordinate with Fire District No. 2/Kittitas Valley Fire and Rescue and Fire District No. 1 to provide PV training to fire responders, and operation and maintenance staff. The intent of this training would be to familiarize both responders and workers with the codes, regulations, associated hazards, and mitigation processes related to solar electricity. This training would include techniques for fire suppression of PV systems.

Combustible vegetation on and around each of the five Columbia Solar Project boundaries would be maintained by TUUSSO and the landowner. Each solar project site would include fire breaks around the project boundary, in accordance with applicable state and/or county standards.

As a result of the above fire avoidance measures and ability to respond on-site to potential fires, the risks of and potential impacts from on-site fires during operation of the five Columbia Solar Projects would be minimal.

Police

Construction Impacts

Construction would have minimal impacts on state, county, or city law enforcement staff. The peak construction workforce would be 100 people, of which 80 would be hired locally and would be existing residents, and 20 would either commute to the Ellensburg area daily, or would stay at an RV park or motel. Thus, the size of the workforce should not result in any additional police calls and no impacts.

There might be minimal impacts if police have to respond to other potential project-related traffic issues, emergency medical calls, or if they would provide a coordination role in the unlikely event that a fire were to occur. These calls would be very infrequent and, thus, should not require the hiring of or additional shifts for state, county, or city law enforcement staff.

Operation Impacts

TUUSSO would take several measures (e.g., fencing, lighting, security cameras, and site security) to maintain security at the five Columbia Solar Project sites, and thus avoid placing additional burdens on state and county law enforcement. The solar project sites would be secured using 6- to 8-foot-high, perimeter, chain-link fencing, topped by razor wire, and surrounding the PV system and switchyard. The entrance gates for each of the solar sites would be about 8 feet high and 12 feet wide, to allow for fire department and maintenance access. “Warning High Voltage” signs would be placed on the fencing at about 100-foot intervals and at each gate.

In addition, lighting would be installed on metal poles, up to 20 feet tall, located around the periphery of each of the five Columbia Solar Project sites, as well as at the inverter pads, for nighttime security. Lighting would consist of modern, low-intensity, downward-shielded fixtures that are motion activated, and would be directed onto the immediate site. For each site, five to 10 lights would be installed and powered directly by buried underground electrical supply lines. TUUSSO might also install security cameras on those same light poles.

Finally, security staff may periodically drive along the site perimeter security fence. As a result of these measures, it is anticipated that operation of the five Columbia Solar Project sites should have no impacts on state or county law enforcement.

Other Public Services

Because it is not anticipated that construction of the five Columbia Solar Projects would result in the permanent relocation or in-migration of any of the direct or indirect construction or operational workforces, there would be no impacts to public transit, health care, schools, or other public services in Kittitas County or the Ellensburg area.

b. Proposed measures to reduce or control direct impacts on public services, if any.

Because there would be no or minimal potential impacts to public services, no mitigation measures are proposed.

16. Utilities

a. Circle utilities currently available at the site: Electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other.

Only electricity is available on or near the five Columbia Solar Project sites; natural gas, water, refuse service, telephone, sanitary sewer, septic system, or other utilities are not available.

b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed.

It is not anticipated that construction of the five Columbia Solar Projects would result in the permanent relocation or in-migration of any of the direct or indirect construction or operational workforces and, thus, there would be no additional demands for housing requiring additional public utilities. Thus, there would be no impacts to public utilities in Kittitas County or the Ellensburg area.

C. SIGNATURE

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature: . . . . . .

Date Submitted: . . . . . .

D. SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS

(do not use this sheet for project actions)

Because these questions are very general, it may be helpful to read them in conjunction with the list of the elements of the environment.

When answering these questions, be aware of the extent the proposal, or the types of activities likely to result from the proposal, would affect the item at a greater intensity or at a faster rate than if the proposal were not implemented. Respond briefly and in general terms.

1. How would the proposal be likely to increase discharge to water; emissions to air; production, storage, or release of toxic or hazardous substances; or production of noise?

Proposed measures to avoid or reduce such increases are:

2. How would the proposal be likely to affect plants, animals, fish, or marine life?

Proposed measures to protect or conserve plants, animals, fish, or marine life are:

3. How would the proposal be likely to deplete energy or natural resources?

Proposed measures to protect or conserve energy and natural resources are:

4. How would the proposal be likely to use or affect environmentally sensitive areas or areas designated (or eligible or under study) for governmental protection; such as parks, wilderness, wild and scenic rivers, threatened or endangered species habitat, historic or cultural sites, wetlands, flood plains, or prime farmlands?

Proposed measures to protect such resources or to avoid or reduce impacts are:

5. How would the proposal be likely to affect land and shoreline use, including whether it would allow or encourage land or shoreline uses incompatible with existing plans?

Proposed measures to avoid or reduce shoreline and land use impacts are:

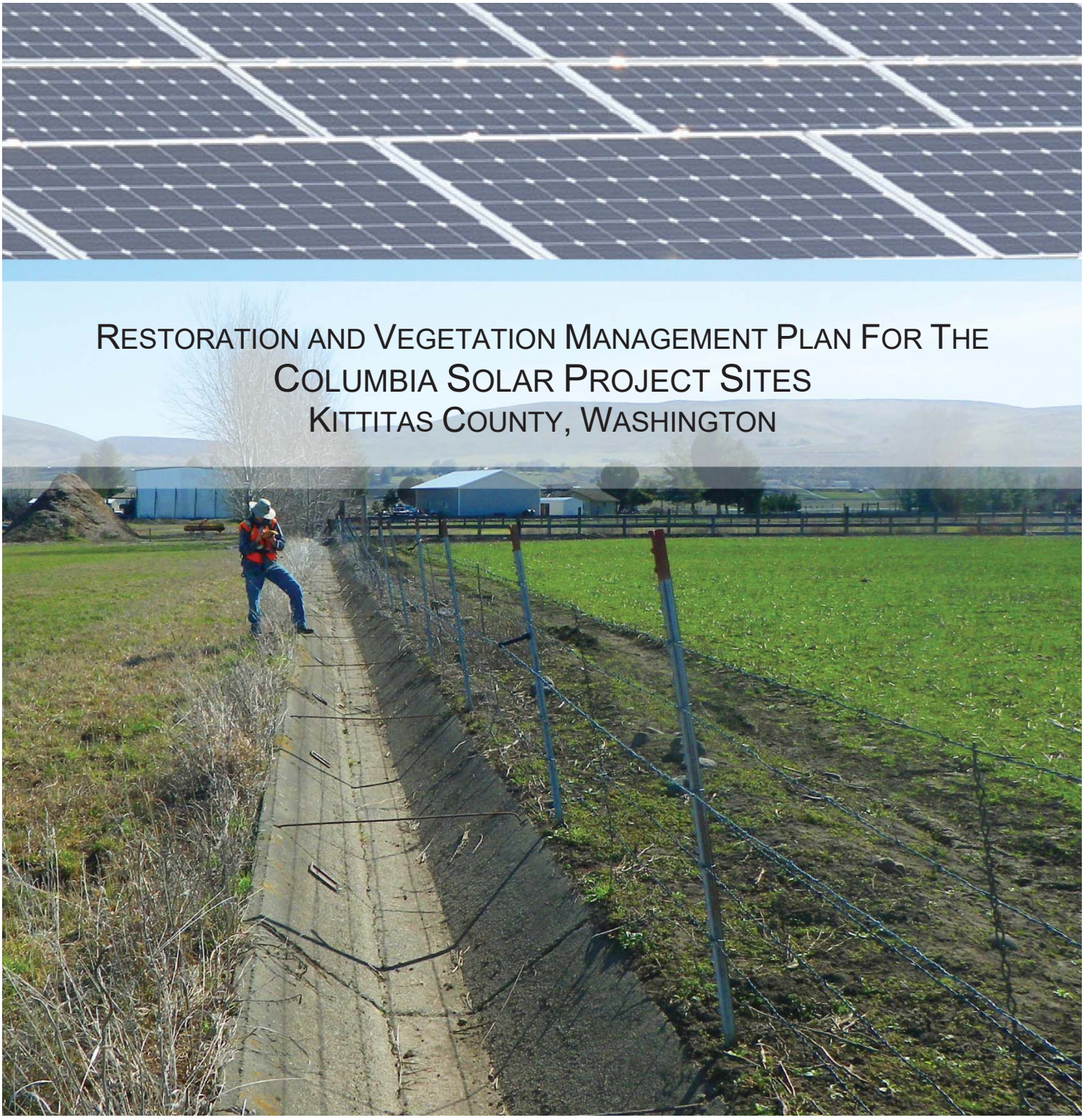
6. How would the proposal be likely to increase demands on transportation or public services and utilities?

Proposed measures to reduce or respond to such demand(s) are:

7. Identify, if possible, whether the proposal may conflict with local, state, or federal laws or requirements for the protection of the environment.

[Statutory Authority: RCW 43.21C.110. WSR 16-13-012 (Order 15-09), § 197-11-960, filed 6/2/16, effective 7/3/16. Statutory Authority: RCW 43.21C.110 and 43.21C.100 [43.21C.170]. WSR 14-09-026 (Order 13-01), § 197-11-960, filed 4/9/14, effective 5/10/14. Statutory Authority: RCW 43.21C.110. WSR 13-02-065 (Order 12-01), § 197-11-960, filed 12/28/12, effective 1/28/13; WSR 84-05-020 (Order DE 83-39), § 197-11-960, filed 2/10/84, effective 4/4/84.]

Appendix B: Vegetation Management Plan



RESTORATION AND VEGETATION MANAGEMENT PLAN FOR THE COLUMBIA SOLAR PROJECT SITES
KITTITAS COUNTY, WASHINGTON

October 5, 2017

SWCA ENVIRONMENTAL CONSULTANTS
SEATTLE, WASHINGTON

RESTORATION AND VEGETATION MANAGEMENT PLAN FOR THE COLUMBIA SOLAR PROJECT SITES KITTITAS COUNTY, WASHINGTON

Camas Solar Project Site: Sections 18 and 19, Township 17 North, Range 19 East
Fumaria Solar Project Site: Section 9, Township 18 North, Range 18 East
Penstemon Solar Project Site: Section 17, Township 17 North, Range 19 East
Typha Solar Project Site: Section 30, Township 18 North, Range 18 East
Urtica Solar Project Site: Section 10, Township 17 North, Range 18 East

Report Prepared for

TUUSSO Energy, LLC

By
Evan Dulin

October 5, 2017

Project Number 38727.05

SWCA Environmental Consultants
221 1st Ave W, Suite 205
Seattle, Washington 98119

TABLE OF CONTENTS

LIST OF TABLES I
1 INTRODUCTION 1
2 PROJECT AREA 1
2.1 Project Description 1
2.2 Geology and Soils 2
2.3 Land Use 3
2.4 Environmental Conditions 4
3 RESTORATION AND REVEGETATION 5
3.1 Site Restoration 5
3.2 Revegetation 5
3.2.1 Site Preparation 6
3.2.2 Seeding 6
3.2.3 Tree and Shrub Planting 7
3.3 Weed Control 7
3.4 Operational Vegetation Management 7
3.5 Monitoring 8
3.5.1 Procedures 8
3.5.2 Success Criteria 8
4 ADAPTIVE MANAGEMENT 8
5 LITERATURE CITED AND REVIEWED 9
APPENDIX A: NOXIOUS WEED PREVALENCE AT EACH COLUMBIA SOLAR PROJECT SITE A-1
APPENDIX B: PROPOSED SEEDING AND PLANTING LISTS B-1

LIST OF TABLES

Table 1. Soil Mapping within Each Columbia Solar Project Site 3

1 INTRODUCTION

TUUSSO Energy, LLC (TUUSSO), is proposing to construct the five new Columbia Solar Project photovoltaic (PV) facilities around the city of Ellensburg, Kittitas County, Washington. The solar projects are all located on private land that is currently in active agriculture or fallow pastoral land. As part of the development of the project sites, TUUSSO would restore and revegetate all areas disturbed by the project that would not be occupied by impervious surfaces, such as roads and transformers, under the terms of the lease with each landowner and as agreed to with the Washington Energy Facility Site Evaluation Council.

The Restoration and Vegetation Management Plan (Plan) has been prepared to guide revegetation efforts associated with the five Columbia Solar Project sites. Native, low-growing, drought-tolerant seed mixes would be utilized throughout the majority of the solar sites to help re-establish vegetation, with seeding methods, planting plans, and weed control techniques developed specifically for the different areas of the solar sites to meet the project needs. Monitoring of the restoration and revegetation actions would be conducted in the years following seeding and planting to ensure the sites meet goals set forth in this plan and to prevent erosion, including recommended remedial action should initial revegetation efforts prove unsuccessful in certain areas.

This plan describes the current site conditions (Chapter 2) and the procedures for restoration and revegetation of the sites (Chapter 3). Monitoring procedures and success criteria for revegetation are defined in Section 3.5.

2 PROJECT AREA

2.1 Project Description

The major project construction and site management activities associated with the Columbia Solar Project that would have an effect on the management of vegetation are described below.

Site Grading

Grading for each of the five Columbia Solar Projects would be minimal and would be isolated to the all-weather access roads (as needed), inverter pads, and switchyard pads to accommodate interconnection equipment. The all-weather access roads would be relatively flat and would be graded to match existing conditions to minimize earthwork. Inverter pads would be placed throughout each solar project site, each of which would be approximately 15 by 30 feet and 1 to 2 feet thick. Each of these pad areas would be leveled and poured with concrete. The switchyard and inverter pads would require a minimum of 90% relative compaction.

No export of soil is anticipated for any of the five Columbia Solar Project sites. At the conclusion of construction, all disturbed areas surrounding graded areas would be remediated through reseeding with native low cover grass vegetation.

Landscaping

Per the recommendation of the Washington Department of Fish and Wildlife, each of the five Columbia Solar Project sites, except for the Fumaria Solar Project site, would be revegetated with low cover native vegetation. This vegetation would be planted from drought-tolerant seed mixes, adapted to the Kittitas County climate. Each solar project has been designed to minimize disturbed areas by keeping grading to a minimum. The Fumaria Solar Project site has very limited water availability, so TUUSSO plans to leave

the existing grasses on-site, to the extent possible; however, some revegetation would be necessary in areas disturbed by construction activities.

To effectively establish the native vegetation, TUUSSO would undertake mowing, herbicide treatments, tilling, drilling seeds, and irrigation during the first 2 years of operations. Subsequent broadleaf treatments during Years 2 and 3 after construction would be undertaken to prevent broadleaf weeds from competing against the newly planted native vegetation. Formal landscaping is not proposed for any of the solar project sites, as the amount of proposed grading does not warrant a full landscape design. The plantings planned in some areas of the solar project sites outside of the proposed perimeter fencing are described in greater detail later in this plan.

Perimeter Fencing

The five proposed Columbia Solar Project sites would be secured using 6- to 8-foot-high, perimeter, chain-link fencing topped by razor wire surrounding the PV systems and switchyards. The entrance gates for each of the solar sites would be about 8 feet high and 12 feet wide, to allow for fire department and maintenance access. All fencing would be placed at or above grade to ensure drainage flows are unobstructed. In areas of the fence that are visible from public areas, such as roads, tree and shrub plantings are planned along the outside of the fencing to create a visual barrier.

Fire Suppression and Safety

Combustible vegetation on and around each of the five Columbia Solar Project boundaries would be maintained by TUUSSO and the landowner, and each solar project site would include fire breaks around the project boundary, in accordance with state and/or county standards, as applicable.

2.2 Geology and Soils

According to the Natural Resource Conservation Service (NRCS), the Columbia Solar Project sites include 16 different soil map units (Table 1). These soil map units range from somewhat poorly drained to well drained. Only the Weirman-Kayak-Zillah complex soil unit is on the National Hydric Soils list (NRCS 2015), which is a list of soils that can be indicative of saturated, flooded, or ponded areas that could meet the definition of a hydric soil. A major concern during construction would be wind erosion for areas with exposed soil. The Wind Erodibility Index in Table 1 indicates the tons per acre per year that can be expected to be lost to wind erosion based on soil texture and the relationship of dry soil aggregates greater than 0.84 mm to potential erosion rates of 0 to 310 tons/acre/year from a wide, bare field. The average Wind Erodibility Index is: 56 for the Camas Solar Project site, 52 for the Fumaria Solar Project site, 52 for the Penstemon Solar Project site, 65 for the Typha Solar Project site, and 56 for the Urtica Solar Project site. For this reason, TUUSSO plans on watering exposed soils during construction to reduce soil loss through wind erosion and reduce localized air quality issues from airborne dust. Permanent and temporary effects to vegetation from construction would occur primarily on active agriculture and fallow fields.

Table 1. Soil Mapping within Each Columbia Solar Project Site

Map Unit Symbol	Map Unit Name	Percent of Site (%)	Hydric	Wind Erodibility Index (tons/acre/year)
Camas Solar Project Site				
635	Opnish ashy loam, 0%–2% slopes	1.5	No	56
791	Mitta ashy silt loam, drained, 0%–2% slopes	80.3	No	56
838	Nosal ashy silt loam, 0%–2% slopes	18.2	No	56
Fumaria Solar Project Site				
822	Reeser-Reelow-Sketter complex, 2%–5% slopes	94.5	No	48–56
843	Reelow-Reeser-Sketter complex, 2%–10% slopes	5.4	No	48–56
844	Metmill very gravelly ashy loam, 0%–5% slopes	0.1	No	38
Penstemon Solar Project Site				
410	Tanaha ashy loam, 0%–2% slopes	1.2	No	56
589	Nack-Brickmill complex, 0%–5 slopes	32.4	No	48–56
635	Opnish ashy loam, 0%–2% slopes	3.1	No	56
720	Nanum ashy sandy clay loam, 0%–2% slopes	0.5	No	86
789	Deedale clay loam, 0%–2% slopes	33.2	No	48
791	Mitta ashy silt loam, drained, 0%–2% slopes	29.6	No	56
Typha Solar Project Site				
715	Weirman gravelly sandy loam, 0%–2% slopes	34.7	No	56
791	Mitta ashy silt loam, drained, 0%–2% slopes	3.5	No	56
809	Weirman-Kayak-Zillah complex, 0%–2% slopes	49.7	Yes	48–134
838	Nosal ashy silt loam, 0%–2% slopes	12.0	No	56
Urtica Solar Project Site				
481	Nanum ashy loam, 2%–5% slopes	1.5	No	56
601	Brickmill gravelly ashy loam, 0%–2% slopes	30.4	No	56
609	Ackna ashy loam, 0%–2% slopes	52.0	No	56
801	Brysill cobbly ashy loam, 0%–2% slopes	16.2	No	56

Source: NRCS (2015) and (2017a).

2.3 Land Use

Each of the five Columbia Solar Project sites is active or fallow agricultural land, and each site would be substantially converted to use as a new PV solar facility for the approximate 30-year life of the project, and the associated leases with the private property owners. Current uses of each site include:

- Camas Solar Project site – 51.2 acres of active agricultural land, growing alfalfa
- Fumaria Solar Project site – 35.2 acres of fallow agricultural land
- Penstemon Solar Project site – 39.4 acres of active agricultural land, growing Sudangrass
- Typha Solar Project site – 54.3 acres, primarily consisting of fallow agricultural land (formerly irrigated and grazed pasture)

- Urtica Solar Project site - 51.9 acres, primarily consisting of active agricultural land, growing common timothy

2.4 Environmental Conditions

The Columbia Solar Project sites are predominantly active or fallow agricultural fields dominated by non-native grasses and forbs, with some noxious weed species scattered throughout. The Ellensburg area generally experiences only 8.97 inches of rainfall annually and has a growing season of 173 days from April 20 to October 10, according to the closest wetlands climate analysis (WETS) climate station, the Ellensburg National Weather Service (NWS) station (NRCS 2017b).

The noxious weeds present on the Columbia Solar Project sites are categorized as either Class A, B, or C Weeds based on the Washington State Noxious Weed Control Board (Washington State Noxious Weed Board 2017). Listed noxious weeds observed on the Columbia Solar Project sites include spotted knapweed (*Centaurea stoebe*), Canadian thistle (*Cirsium arvense*), yellow nutsedge (*Cyperus esculentus*), Queen Anne's-lace (*Daucus carota*), Fuller's teasel (*Dipsacus fullonum*), hairy cat's-ear (*Hypochaeris radicata*), pale-yellow iris (*Iris pseudacorus*), scotch thistle (*Onopordum acanthium*), reed canary grass (*Phalaris arundinacea*), field sow-thistle (*Sonchus arvensis*), and false mayweed (*Tripleurospermum maritimum*). The prevalence of these species on a scale from 1 (low) to 5 (high) at each of the sites, along with the Washington State Weed Control Board weed classification for each of these species, is listed in Appendix A.

The dominant vegetation at each of the Columbia Solar Project sites are listed below:

Camas Solar Project Site

The Camas Solar Project site primarily consists of actively managed agriculture for growing alfalfa (*Medicago sativa*). Some species of weeds and non-native herbaceous species occur around the edges of the agricultural land and in the interspace between planted alfalfa, including downy cheat grass (*Bromus tectorum*), common dead-nettle (*Lamium amplexicaule*), prickly lettuce (*Lactuca serriola*), garden yellow-rocket (*Barbarea vulgaris*), hairy cat's-ear, and common dandelion (*Taraxacum officinale*), with some native species, such as common panic grass (*Panicum capillare*) and Gorman's desert-parsley (*Lomatium gormanii*). The portion of the study area north of Bull Ditch is dominated by mowed reed canary grass and blue grass (*Poa* spp.).

Fumaria Solar Project Site

The Fumaria Solar Project site is an upland terrace that was previously heavily grazed. Irrigation ditches border the project site on the west and south. The plant community is dominated by weeds and non-native herbaceous species in upland areas, including tall fescue (*Schedonorus arundinaceus*), blue grass, alfalfa, shepherd's-purse (*Capsella bursa-pastoris*), garden yellow-rocket, prickly lettuce, yellow salsify (*Tragopogon dubius*), chicory (*Cichorium intybus*), common dandelion, and downy cheat grass. Portions of the project site have native sagebrush habitat encroaching from the east with the establishment of native species, including bitter-brush (*Purshia tridentata*), big sagebrush (*Artemisia tridentata*), common spring-gold (*Crocidium multicaule*), spring draba (*Draba verna*), yellow bell (*Fritillaria pudica*), Gorman's desert-parsley, and Rainier violet (*Viola trinervata*). In addition, the site has patches of noxious weeds, including hairy cat's-ear, spotted knapweed, Canadian thistle, Fuller's teasel, and reed canary grass.

Penstemon Solar Project Site

The Penstemon Solar Project site primarily consists of actively managed agriculture for growing broom-corn (*Sorghum bicolor*). The majority of the site is currently plowed and un-vegetated, except along Coleman Creek where the riparian vegetation is dominated by reed canary grass, prickly lettuce, common yarrow (*Achillea millefolium*), Canadian thistle, Canadian goldenrod (*Solidago canadensis*), great mullein (*Verbascum thapsus*), garden yellow-rocket, downy cheat grass, black hawthorn (*Crataegus douglasii*), Nootka rose (*Rosa nutkana*), and crack willow (*Salix* X *fragilis*).

Typha Solar Project Site

The Typha Solar Project site consists of irrigated and grazed pasture along the right bank (when facing downstream) of the Yakima River. The site is currently dominated by weeds and non-native herbaceous species in upland areas, including tall fescue, blue grass, remnant planted common timothy (*Phleum pratense*), garden yellow rocket, hairy cat's-ear, common dandelion, and white clover (*Trifolium repens*). In addition, the site has patches of noxious weeds, including Canadian thistle, Scotch thistle, yellow nutsedge, and reed canary grass.

Urtica Solar Project Site

The Urtica Solar Project site primarily consists of actively managed agriculture for growing common timothy hay with a highly manipulated stream (formerly called McCarl Creek) that flows south of two ponds in the western portion of the site and through the northeastern quarter of the project site. In addition, a farm road bisects the project site, crossing the site from east to west and passing over McCarl Creek just east of the ponds. Some species of weeds and non-native herbaceous species occur around the edges of the agricultural land, along the sides of the farm road, and in the interspace between planted timothy, including tall fescue, blue grass, creeping wild rye (*Elymus repens*), colonial bent grass (*Agrostis capillaris*), white clover, hairy cat's-ear, and common dandelion. In addition, there are areas adjacent to McCarl Creek in the northeastern quarter of the project site that are dominated by reed canary grass.

3 RESTORATION AND REVEGETATION

3.1 Site Restoration

All of the Columbia Solar Project sites are relatively flat and would not require grading, except in the areas of the proposed access and interior roads and at the site entrance. The majority of the sites would also have some ground disturbance throughout for installing the solar panels and associated infrastructure. At the completion of construction, areas requiring any intensive restoration and remediation would be identified. These would likely include areas such as the laydown areas that may have experienced unexpected erosion from traffic or vegetation that had been disturbed by construction equipment or on-site stored generating equipment pallets. Any such areas would be restored to pre-construction levels using fill soil from within the site. Revegetation would be conducted as necessary to reduce erosion and establish a native ground cover.

3.2 Revegetation

The Columbia Solar Project sites would be constructed with the existing contours and topography of the land. For those limited areas that were cleared and grubbed, water trucks would be employed to keep dust to a minimum. As the proposed roads were compacted for construction, soil binding agents and/or aggregate would be laid down to control the dust. After construction is complete, interior roads other

than the all-weather access roads would be plowed and re-seeded with a native, low-lying, drought-tolerant plant mix that requires little maintenance and would help control dust.

The following methods are to be used for all areas of temporary ground and/or vegetation disturbance in the upland habitats that require revegetation. No permanent or temporary disturbance to wetland habitats is expected as part of the proposed construction and operation of the Columbia Solar Project sites, except for approximately 0.01 acre of permanent wetland fill during construction of a culvert or land bridge for site access across an existing wetland, TW03, for the Typha Solar Project.

In addition, plantings of trees and saplings would occur along the outside of select portions of the proposed perimeter fence that would surround most of the proposed solar sites to create a visual barrier from roads and neighboring properties. These plantings would occur in conjunction with the rest of the revegetation of the sites. Revegetation throughout the remainder of the sites would be conducted through seeding herbaceous species.

Following seeding and planting, the annual water use on the solar project sites would likely be similar to the current level of water use on the active agriculture sites, which is estimated to be approximately 400 acre-feet of water per acre per year. Each of the Columbia Solar Project sites, except for the Fumaria Solar Project site, has on-site existing water allocations that TUUSSO may be able to use during operation for irrigation purposes. Given the costs of trucking water from a municipal water source to each of the sites, TUUSSO would likely only pursue such a water source for irrigation needs for the Fumaria Solar Project site. Full revegetation of the sites would likely take 3 years.

3.2.1 Site Preparation

During and following the construction associated with the Columbia Solar Project sites, the sites would also be prepared for seeding and planting though the following actions:

Year 1 – Spring

- Mowing (at Fumaria and Typha Solar Project sites only prior to solar structure installation)
- Herbicide treatments (at all sites to control non-native and noxious weeds)
- Disk/till (at all sites)

Year 1 – Fall

- Pre-planting weed control (at all sites)
- Seedbed preparation (at all sites)
- Drill seeding using the upland seed mix (at all sites) and the wetland seed mix (at Typha and Urtica Solar Project sites only).

3.2.2 Seeding

Two different seed mixes are proposed to be used throughout the Columbia Solar sites, an upland seed mix at all five solar sites and a wetland seed mix in wetland areas at the Typha and Urtica solar sites. The two seed mixes include the following herbaceous species:

Uplands: Sandberg blue grass (*Poa sandbergii*), bluebunch fescue (*Festuca idahoensis*), red fescue (*Festuca rubra*), spike bent grass (*Agrostis exarata*), and prairie junegrass (*Koeleria macrantha*).

Wetlands: slender hair grass (*Deschampsia elongata*), fowl manna grass (*Glyceria striata*), spike bent grass, and Baltic rush (*Juncus balticus*).

These seed mixes would be applied using the drill seeding method at about 12 pounds of seed per acre in the fall of Year 1. The proposed seeding and planting lists are provided by BFI Native Seeds LLC in Appendix B.

3.2.3 Tree and Shrub Planting

A portion of the Columbia Solar Project sites would include tree and shrub planting outside of the proposed perimeter fence to create a visual barrier from roads and neighboring properties. This planting would include the following species: woods' rose (*Rosa woodsii*), golden currant (*Ribes aureum*), black hawthorn, red osier dogwood (*Cornus alba*, formerly known as *Cornus sericea*), and mockorange (*Philadelphus lewisii*). These species would be planted in sufficient quantity and density to establish a visual buffer within 5 years. Planting of these species would occur after the perimeter fence is installed.

The proposed seeding and planting lists are provided by BFI Native Seeds LLC in Appendix B.

3.3 Weed Control

During the site preparation, seeding/planting, and site operation, noxious weeds would need to be continuously monitored and managed to reduce their prevalence at the sites and prevent the spread of these weeds to other areas of the site. The prevalence of each noxious weed species on a scale from 1 (low) to 5 (high) at each of the sites, along with the Washington State Weed Control Board weed classification for each of these species, is listed in Appendix A.

Application of herbicides to control noxious weeds should adhere to the types and rates recommended for each particular weed species listed in the *Pacific Northwest Weed Management Handbook* (Prather et al. 2016).

The following management actions would take place in Years 2 and 3, following seeding and planting native vegetation to aid in the control of noxious weeds and non-native species encroachment:

<u>Year 2 – Spring and Summer</u>

- Post-planting broadleaf herbicide treatment (at all sites)

<u>Year 3 – Spring and Summer</u>

- Post-planting broadleaf herbicide treatment (at all sites)

3.4 Operational Vegetation Management

After initial site preparation and seeding and planting of the Columbia Solar Project sites, regular site operations would involve continual vegetation management. TUUSSO would utilize water conservation methods, which may include working with the current landowners to incorporate more efficient irrigation systems, such as drip lines, to water the trees and shrubs forming the visual buffers. The drought-tolerant species that would be seeded on the site would ensure that, once established, they would not require any further watering except in extreme drought conditions. Regular operational vegetation management operational actions would likely involve the following:

- Annual revegetation monitoring for a minimum of 5 years or until the revegetation is deemed successful based on the defined success criteria.
- Herbicide treatments on noxious weeds, as necessary in areas of encroachment.
- Watering shrubs and trees in the visual barriers during drought conditions to prevent plant mortality.

3.5 Monitoring

3.5.1 Procedures

In June or July of the year following each seeding/planting event, and continuing for a minimum of 5 years or until restoration and/or revegetation is deemed successful, a qualified independent botanist or revegetation specialist would examine a representative cross section of the revegetated areas. Care would be taken to survey areas throughout the geographic extent of the solar project sites and around the perimeter fences where shrub and tree planting visual barriers were planted. A minimum of 20% of the revegetated acreage would be examined.

At each survey area, the revegetation investigator would evaluate the following parameters:

- Percent cover for the following three classes: native forbs and grasses, non-native forbs and grasses, and bare ground.
- Planted shrub and tree mortality percent in visual barrier planting areas.
- Degree of erosion due to the construction activities (high, medium, or low).

3.5.2 Success Criteria

For each site other than the Fumaria Solar Project site, the areas of the Columbia Solar Project sites that would not be occupied by impervious surfaces would be deemed successfully revegetated when total cover of all vegetation exceeds 35%, and at least 25% of the ground surface is covered by native species. For the Fumaria Solar Project site, the areas that would not be occupied by impervious surfaces would be deemed successfully revegetated when total cover of all vegetation exceeds 35%. No shrub or tree plantings would occur within the perimeter fences of the solar project sites. The visual barriers established around the outside of the site perimeter fences on some of the solar sites would be considered successful when at least 25% of the shrub and tree saplings survive after Year 2 of revegetation. In the event that success criteria are not met for a site, additional reseeding or replanting of those areas may be necessary.

4 ADAPTIVE MANAGEMENT

Management of the restoration activities and on-going vegetation management would follow adaptive management practices. Therefore, additional amendments to this plan may occur if specific site conditions warrant an alteration to this plan. TUUSSO would coordinate any updates to this plan with any sub-contractors involved in the management of the Columbia Solar Project sites.

5 LITERATURE CITED AND REVIEWED

Natural Resources Conservation Service (NRCS). 2015. List of Hydric Soils. December 2015. Available at: http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/use/hydric/. Accessed March 9, 2016.

———. 2017a. Web soil survey. Available at: http://websoilsurvey.nrcs.usda.gov/app/. Accessed March 10, 2017.

———. 2017b. WETS and precipitation data for Ellensburg, Washington. Available at: http://agacis.rcc-acis.org/. Accessed May 2, 2017.

Prather, T., T. Miller, and A. Hulting. 2016. Control of Problem Weeds. Pacific Northwest Weed Management Handbook. Available at: https://pnwhandbooks.org/sites/pnwhandbooks/files/weed/chapterpdf/problemweeds.pdf. Accessed August 19, 2017.

Schuster, J. E. 2005. Geologic map of Washington State. Map GM-53. Scale 1:500,000. Washington Division of Geology and Earth Resources Geologic. Available at: http://www.dnr.wa.gov/Publications/ger_gm53_geol_map_ washington_500k.zip. Accessed May 22, 2017.

Washington State Noxious Weed Control Board. 2017. 2017 Washington State Noxious Weed List. Available at: http://www.nwcb.wa.gov/pdfs/2017-State-Weed-List_Common_Name-8.5x11.pdf. Accessed on July 31, 2017.

APPENDIX A: NOXIOUS WEED PREVALENCE AT EACH COLUMBIA SOLAR PROJECT SITE

TUUSSO Solar Projects
Noxious Weed List
April 3 - 12, 2017

Common Name	Scientific Name	Native / Introduced and Invasive / Noxious[1]	Weed Class[2]	Weed Relative Prevalence at Each Site (1=low, 5=high)				
				Camas	Fumaria	Penstemon	Typha	Urtica
spotted knapweed	*Centaurea stoebe*	noxious	B		1			1
Canadian Thistle	*Cirsium arvense*	invasive, noxious	C	2	1	2	3	1
Chufa (yellow nutsedge)	*Cyperus esculentus*	native, noxious	B		1		1	
Queen Anne's-Lace	*Daucus carota*	non-native	C					1
Fuller's Teasel	*Dipsacus fullonum*	invasive, noxious	C	1	1	1	1	2
Hairy Cat's-Ear	*Hypochaeris radicata*	non-native, noxious	C	3	3	1	3	3
Pale-Yellow Iris	*Iris pseudacorus*	noxious	C	2				
scotch thistle	*Onopordum acanthium*	noxious	B	1			3	1
Reed Canary Grass	*Phalaris arundinacea*	invasive, noxious	C	3	1	2	2	3
Field Sow-Thistle	*Sonchus arvensis*	non-native, noxious	C		1			
False Mayweed	*Tripleurospermum maritimum*	non-native, noxious	C	1			1	

[1]Native per Hitchcock & Cronquist 1973 and http://plants.usda.gov/; Noxious per Washington State Noxious Weed Control Board 2017

[2]Weed classes from Washington State Noxious Weed Control Board 2017 - see below for descriptions

Washington State Weed Class Descriptions	
Class A Weeds	Non-native species whose distribution in Washington is still limited. Preventing new infestations and eradicating existing infestations are the highest priority. **Eradication of all Class A plants is required by law.**
Class B Weeds	Non-native species presently limited to portions of the State. Species are designated for control in regions where they are not yet widespread. Preventing new infestations in these areas is a high priority. In regions where a Class B species is already abundant, control is decided at the local level, with containment as the primary goal. Please contact your Weed District Coordinator to learn which species are designated in your area.
Class C Weeds	Noxious weeds that are typically widespread in WA or are of special interest to the state's agricultural industry. The Class C status allows counties to require control if locally desired. Other counties may choose to provide education or technical consultation.

APPENDIX B: PROPOSED SEEDING AND PLANTING LISTS

PROPOSAL

#: 6192017

1550 Pilgrim Street, Suite A
Moses Lake, WA 98837
www.bfinativeseeds.com

To: Vivek Nayak, Jason Evans and Joy Potter
Tuusso Energy
vivek.nayak@tuusso.com; jason.evans@tuusso.com;
pcg@fairpoint.net

Bid Date: 6/12/2017
Project: Tuusso Solar- Ellensburg
Contract #:

Contract Line Item	Description	Qty.	Units	Price***	Total
1	Mow (Fumaria, Typha) -Spring/March 2018 *(without structures in place)*	85	acres		
2	Spring herbicide treatment (All) -Spring/March 2018*	207	acres		
3	Disc/Till (All)- Spring 2018*	207	acres		
4	Mid summer followup herbicide treatment (All)*	207	acres		
5	Pre-planting Weed Control (All) -Fall 2018*	207	acres		
6	Ringpacker/Seedbed Prep	207	acres		
7	Fall 2018 Seed Mix -12#/acre				
	Upland	193	acres		
	Wetland	14	acres		
10	Drill Seed	207	acres		
11	Spring post-plant broadleaf treatment (All) -2019**	207	acres		
12	Midsummer post-plant broadleaf treatment (All) -2019**	207	acres		
13	Spring post-plant broadleaf treatment (All) -2020**	207	acres		
14	Midsummer post-plant broadleaf treatment (All) -2020**	207	acres		
15	Visual Barrier Plants/Installation -Urtica and Penstemon				
16	Urtica Wetland Restoration				
	*Costs will decrease if task can be accomplished without structures in place				
	**Optional				

TIN: 91-1717470 Benson Farms Inc.

Subtotal	
Tax	
Shipping	
TOTAL	

We look forward to working with you!

Katherine Fitch (509)-201-6093 - kfitch@bfinativeseeds.com
Brandon Price (509) 750-2376

NOTE: TUUSSO has not committed to wetland restoration on the Urtica Solar Project site.
***Pricing has been redacted.**

Tuusso Solar Project Seed Pricing

SEED

Fumaria
36 acres

Bio-Type	Scientific Name	Common Name		% Comp	Lbs/Acre	Price/Lbs	Price/Acre
Upland							
Entiat/Chelan	*Poa sandbergii*	Sandberg bluegrass		40%	4		
Entiat/Chelan	*Festuca idahoensis*	Idaho fescue		20%	3		
GP	*Festuca rubra*	red fescue		10%	1		
Upper Yakima	*Agrostis exarata*	spike bentgrass		15%	2		
Sinlahekin	*Koeleria macrantha*	prairie junegrass		15%	2		
			Total	**100%**	**12**		
						Total for 36 acres	

Typha
50 acres: 40 acres Upland, 10 acres Wetland

Bio Type	Scientific Name	Common Name		% Comp	Lbs/Acre	Price/Lbs	Price/Acre
Upland							
Entiat/Chelan	*Poa sandbergii*	Sandberg bluegrass		40%	4		
Entiat/Chelan	*Festuca idahoensis*	Idaho fescue		20%	3		
GP	*Festuca rubra*	red fescue		10%	1		
Upper Yakima	*Agrostis exarata*	spike bentgrass		15%	2		
Sinlahekin	*Koeleria macrantha*	prairie junegrass		15%	2		
			Total	**100%**	**12**		
						Total for 40 acres	

Bio Type	Scientific Name	Common Name		% Comp	Lbs/Acre	Price/Lbs	Price/Acre
Shrub/forest wetland mix							
Upper Yakima	*Deschampsia elongata*	slender hairgrass		65%	7.8		
Willamette	*Glyceria striata*	fowl mannagrass		18%	2.2		
Upper Yakima	*Agrostis exarata*	spike bentgrass		10%	1.2		
	Juncus balticus	Baltic rush		7%	0.8		
			Total	**100%**	**12**		
						Total for 10 acres	

Tuusso Solar Project Seed Pricing

Urtica

50 acres: 43 acres upland, 7 arces wetland (in production- Timothy)

Bio Type	Scientific Name	Common Name		% Comp	Lbs/Acre	Price/Lbs	Price/Acre
Upland							
Entiat/Chelan	*Poa sandbergii*	Sandberg bluegrass		40%	4		
Entiat/Chelan	*Festuca idahoensis*	Idaho fescue		20%	3		
GP	*Festuca rubra*	red fescue		10%	1		
Upper Yakima	*Agrostis exarata*	spike bentgrass		15%	2		
Sinlahekin	*Koeleria macrantha*	prairie junegrass		15%	2		
			Total	**100%**	**12**		
						Total for 32 acres	
Shrub/forest wetland mix							
Upper Yakima	*Deschampsia elongata*	slender hairgrass		65%	7.8		
Willamette	*Glyceria striata*	fowl mannagrass		18%	2.2		
Upper Yakima	*Agrostis exarata*	spike bentgrass		10%	1.2		
	Juncus balticus	Baltic rush		7%	0.8		
			Total	**100%**	**12**		
						Total for 7 acres	

Penstemon

37 acres (in production- sudan grass)

Bio Type	Scientific Name	Common Name		% Comp	Lbs/Acre	Price/Lbs	Price/Acre
Upland							
Entiat/Chelan	*Poa sandbergii*	Sandberg bluegrass		40%	4		
Entiat/Chelan	*Festuca idahoensis*	Idaho fescue		20%	3		
GP	*Festuca rubra*	red fescue		10%	1		
Upper Yakima	*Agrostis exarata*	spike bentgrass		15%	2		
Sinlahekin	*Koeleria macrantha*	prairie junegrass		15%	2		
			Total	**100%**	**12**		
						Total for 37 acres	

Tuusso Solar Project Seed Pricing

Camas

37 acres (in production- alfalfa)

Bio Type	Scientific Name	Common Name	% Comp	Lbs/Acre	Price/Lbs	Price/Acre
Upland						
Entiat/Chelan	*Poa sandbergii*	Sandberg bluegrass	40%	4		
Entiat/Chelan	*Festuca idahoensis*	Idaho fescue	20%	3		
GP	*Festuca rubra*	red fescue	10%	1		
Upper Yakima	*Agrostis exarata*	spike bentgrass	15%	2		
Sinlahekin	*Koeleria macrantha*	prairie junegrass	15%	2		
		Total	**100%**	**12**		
					Total for 37 acres	

Tuusso Solar Project View Shed Plants

Urtica and Penstemon View Shed Plants and Installation Price List

2200 linear feet

Item No.	Scientific Name	Common Name	Type	Units	Price Per Unit	Price
1	*Rosa woodsii*	Wood's rose	225	tallpots		
2	*Ribes aureum*	golden currant	100	tallpots		
3	*Crataegus douglassii*	Douglas' hawthorne	80	tallpots		
4	*Cornus sericea*	Red-osier dogwood	100	tallpots		
5	*Philadelphis lewisii*	mock orange	225	tallpots		
6	Plant Installation		730	plant		
					TOTAL	

Tuusso Solar Urtica Wetland Project

Urtica Wetland Plants and Installation Price List

Urtica 7 acres wetland, 1600 linear feet of watersedge

Item No.	Scientific Name	Common Name	Type	Units	Price Per Unit	Price
	Trees					
1	*Crataegus douglassii*	Douglas' hawthorne	18"-36" bare root	**40**		
2	*Populus balsamifera ssp. trichocarpa*	Black cottonwood	18"-36" bare root	**400**		
4	*Prunus virginiana*	Chokecherry	40 ci container	**50**		
7	*Prunus emarginata*	Bitter cherry	40 ci container	**60**		
	Shrubs					
8	*Ribes aureum*	Golden currant	18"+ bare root	**100**		
9	*Ribes cereum*	Wax currant	18"-36" bare root	**50**		
10	*Rosa woodsii*	Wood's rose	12"-18" bare root	**950**		
11	*Symphoricarpos albus*	Snowberry	12"-18" bare root	**150**		
12	*Salix exigua*	Coyote willow	24"-36" live stake	**1250**		
16	*Cornus sericea*	Red-osier dogwood	12"-18" bare root	**800**		
17	*Salix scouleriana*	Scouler's willow	40 ci container	**200**		
18	Plant Installation		**Total**	**4050**		
	Materials					
19	Tree Pro - Weed Mats (36" x 36"), with staples			**2,800**		
					Sub-Total	

Appendix C: Habitat, Vegetation, Fish, and Wildlife Assessment Report



HABITAT, VEGETATION, FISH, AND WILDLIFE ASSESSMENT REPORT FOR FIVE PROPOSED TUUSSO SOLAR PROJECT SITES, KITTITAS COUNTY, WASHINGTON



July 10, 2017

SWCA ENVIRONMENTAL CONSULTANTS
SEATTLE, WASHINGTON

HABITAT, VEGETATION, FISH, AND WILDLIFE ASSESSMENT REPORT FOR FIVE PROPOSED TUUSSO SOLAR PROJECT SITES, KITTITAS COUNTY, WASHINGTON

Report Prepared for

TUUSSO Energy, LLC

July 10, 2017

Project Number 38727.05

SWCA Environmental Consultants
221 1st Ave W, Suite 205
Seattle, Washington 98119

TABLE OF CONTENTS

1 INTRODUCTION 1
1.1 Project Description 1
1.1.1 Camas Solar Project 1
1.1.2 Fumaria Solar Project 1
1.1.3 Penstemon Solar Project 1
1.1.4 Typha Solar Project 3
1.1.5 Urtica Solar Project 3
1.2 Proposed Schedule 3
1.3 Project Setting 3
1.4 Regulatory Framework 4
1.4.1 Federal Approvals 4
1.4.2 State Guidelines 4
2 METHODS 4
2.1 Analysis Areas 4
2.1.1 Project-scale Analysis Area 5
2.1.2 Landscape-scale Analysis Area 5
2.2 Review of Existing Information 5
2.3 Field Investigation 5
3 VEGETATION AND HABITAT 8
3.1 Habitat Types 8
3.1.1 Agricultural Production 8
3.1.2 Developed 8
3.1.3 Fallow 9
3.1.4 Open Water 11
3.1.5 Riparian Corridor 13
3.1.6 Sagebrush-bitter-brush Scrub 15
3.1.7 Wetlands 15
3.1.8 Willow–rose Shrub Thicket 15
3.1.9 Other 17
3.2 Available Habitat within the Analysis Areas 17
3.3 Special-status Plants 26
4 FISH AND WILDLIFE 27
4.1 Special-status Species 33
4.1.1 Bald Eagle 34
4.1.2 Greater Sage-grouse 34
4.1.3 Sandhill Crane 34
4.1.4 Bull Trout 34
4.1.5 Chinook Salmon and Steelhead 35

4.1.6 Columbia Spotted Frog 35
4.1.7 Sharp-Tailed Snake 35
4.1.8 Giant Palouse Earthworm 36
4.2 Site-specific Observations 36
4.2.1 Camas Solar Project Site 36
4.2.2 Fumaria Solar Project Site 38
4.2.3 Penstemon Solar Project Site 40
4.2.4 Typha Solar Project Site 41
4.2.5 Urtica Solar Project Site 43
5 RECOMMENDED ENVIRONMENTAL COMMITMENTS FOR TUUSSO'S CONSIDERATION 43
5.1 Buffers and Seasonal Timing 44
5.1.1 Migratory Birds and Bald and Golden Eagles 44
5.1.2 Riparian Corridors 44
5.2 Noise 45
5.3 Other Measures 45
6 CONCLUSIONS 47
6.1 Habitat Impacts 47
6.2 Special-status Species Impacts 47
7 LITERATURE CITED 48
8 LIST OF PREPARERS 50
APPENDIX A: USFWS IPAC TRUST RESOURCES REPORT FOR FIVE TUUSSO SOLAR PROJECT SITES A-1
APPENDIX B: WASHINGTON STATE PRIORITY HABITATS AND SPECIES LIST FOR FIVE TUUSSO SOLAR PROJECT SITES B-1
APPENDIX C: BIRD OBSERVATION LIST FOR FIVE TUUSSO SOLAR PROJECT SITES C-1
APPENDIX D: CORRESPONDENCE TO-DATE WITH WDFW REGARDING THE FIVE TUUSSO SOLAR PROJECT SITES D-1

LIST OF TABLES

Table 1. Available Habitat Types within the Analysis Areas 18
Table 2. Noxious Weeds Documented in the Project-scale Analysis Areas 26
Table 3. Representative Species Observed or Likely to Occur in the Analysis Areas 28
Table 4. Special-status Species with Potential to Occur in the Project-scale Analysis Areas 33
Table 5. Nesting Seasons for Raptor Species Likely to Occur in the Analysis Areas 44
Table 6. Surface Waters in the Project-scale Analysis Areas and Applicable Buffers 45
Table 7. List of Preparers 50

LIST OF FIGURES

Figure 1. Project locations. 2
Figure 2. Project-scale analysis areas. 6
Figure 3. Landscape-scale analysis area. 7
Figure 4. Example of agricultural production (alfalfa) at the Camas Solar Project. 9
Figure 5. Example of the fallow–native vegetation habitat type at the Fumaria Solar Project. 10
Figure 6. Example of the fallow–recently grazed habitat type at the Typha Solar Project. 11
Figure 7. The Yakima River with a great blue heron rookery in the cottonwoods east of the river, east of the Typha Solar Project. 12
Figure 8. McCarl Creek, a stream flowing through the Urtica Solar Project, from west to east. 12
Figure 9. One of two ponds in the southwest corner of the Urtica Solar Project. 13
Figure 10. A riparian corridor along a ditch southwest of the Fumaria Solar Project. 14
Figure 11. A riparian corridor along a ditch southwest of the Fumaria Solar Project. 14
Figure 12. Example of sagebrush-bitter-brush scrub habitat type east of the Fumaria Solar Project. 15
Figure 13. A willow–rose shrub thicket in the southeast corner of the Fumaria Solar Project. 16
Figure 14. A rose shrub thicket along the northwest boundary of the Fumaria Solar Project. 16
Figure 15. Habitat types within the project-scale analysis area for the Camas Solar Project. 19
Figure 16. Habitat types within the project-scale analysis area for the Fumaria Solar Project. 20
Figure 17. Habitat types within the project-scale analysis area along the north half of the Fumaria generation tie line corridor. 21
Figure 18. Habitat types within the project-scale analysis area along the south half of the Fumaria generation tie line corridor. 22
Figure 19. Habitat types within the project-scale analysis area for the Penstemon Solar Project. 23
Figure 20. Habitat types within the project-scale analysis area for the Typha Solar Project. 24
Figure 21. Habitat types within the project-scale analysis area for the Urtica Solar Project. 25
Figure 22. Red-tailed hawk nest in willows along the Little Naneum Creek riparian corridor. 37
Figure 23. Barn in the northwest corner of the Camas Solar Project that provides owl roosting habitat. 37
Figure 24. Pacific treefrog observed in the fallow–native vegetation at the Fumaria Solar Project. 38
Figure 25. Pacific treefrog observed in the ditch along the west boundary of the Fumaria Solar Project. 39
Figure 26. Willows near the Fumaria generation tie line crossing of Reecer Creek, where a bald eagle was observed perching downstream (south) of the crossing. 39
Figure 27. Red-tailed hawk nest to the left (north) and great horned owl nest to the right (south), observed east of the Fumaria generation tie line along North Faust Road. 40
Figure 28. Red-tailed hawk nest in cottonwoods along the Coleman Creek riparian corridor. 41
Figure 29. Columbia spotted frog egg masses in a ditch south of the Pentsemon Solar Project. 41
Figure 30. Columbia spotted frog egg masses in a TW01, a wetland along the southern boundary of the Typha Solar Project. 42
Figure 31. Great blue heron rookery along the Yakima River, located east of the Typha Solar Project. 42
Figure 32. Barn south of the southwest corner of the Typha Solar Project that provides owl roosting habitat. 43

1 INTRODUCTION

This Habitat Assessment Report identifies and assesses the biological resources that could potentially be affected by the five proposed TUUSSO Energy, LLC (TUUSSO), solar photovoltaic projects. The project sites are defined as the footprint of the five proposed solar projects, and also the generation tie line corridors associated with two of the sites (Figure 1). Surveys were conducted April 3 to 12, 2017, to document flora and fauna at the project sites, as well as different vegetation communities and habitat. Prior to the surveys, biologists reviewed the potential for any federal- or state-listed threatened or endangered species to occur on the sites, and evaluated sites for appropriate habitat. This report summarizes the findings of the biological resources survey and discusses environmental commitments that could avoid or reduce impacts for TUUSSO's consideration.

1.1 Project Description

TUUSSO is proposing to construct five solar photovoltaic projects near Ellensburg, in Kittitas County, Washington. Each photovoltaic project site would be located in the Kittitas Valley, east of the Cascade Range, and would generate up to 5 MW alternating current (MW_{AC}). The names and locations of each of the projects are described below. See Figure 1 for the location of each project.

1.1.1 Camas Solar Project

The Camas Solar Project would include the installation of a photovoltaic solar facility on 52.6 acres of private agricultural land, and the construction of a switchyard with a short generation tie line into an existing on-site Puget Sound Energy (PSE) distribution transmission line. The project site is composed of actively farmed alfalfa agricultural land, associated irrigation lines and ditches, an underground natural gas pipeline in the northwest portion of the site crossing from northeast to southwest, and Little Naneum Creek forming the eastern property boundary. The project site is located southeast of the city of Ellensburg. It is in Sections 18 and 19, Township (T) 17 North (N), Range (R) 19 East (E), Willamette Meridian, and in the southeast corner of where the Tjossem Road overpass crosses Interstate 82 (I-82).

1.1.2 Fumaria Solar Project

The Fumaria Solar Project would include the installation of a photovoltaic solar facility on 41.6 acres of private agricultural land, and the construction of a switchyard and an approximately 2.5-mile-long generation tie line (25.4 acres) into an existing PSE substation and distribution transmission line. The project site is composed of agricultural land and a ditch along the western boundary. It is located northwest of the city of Ellensburg. It is in the southeast portion of Section 9, T 18 N, R 18 E, north of Hungry Junction Road and east of Lower Green Canyon Road. The associated 2.5-mile generation tie line would exit the southwest portion of the project site in Section 9, run west along the border of Sections 9 and 16, then south through the central portion of Section 16, west along the borders of Sections 16 and 21 and then Sections 17 and 20, and terminate in the northeast portion of Section 20.

1.1.3 Penstemon Solar Project

The Penstemon Solar Project would include the installation of a photovoltaic solar facility on 37.0 acres of private agricultural land, and the construction of a switchyard with a short generation tie line into an existing PSE distribution transmission line. The project site is composed of actively farmed alfalfa or hay agricultural land, associated irrigation lines and ditches, and Coleman Creek forming the eastern property boundary. The project site is located southeast of the city of Ellensburg. It is in Section 17, T 17 N, R 19 E, at the corner of the intersection of Tjossem Road and Moe Road.

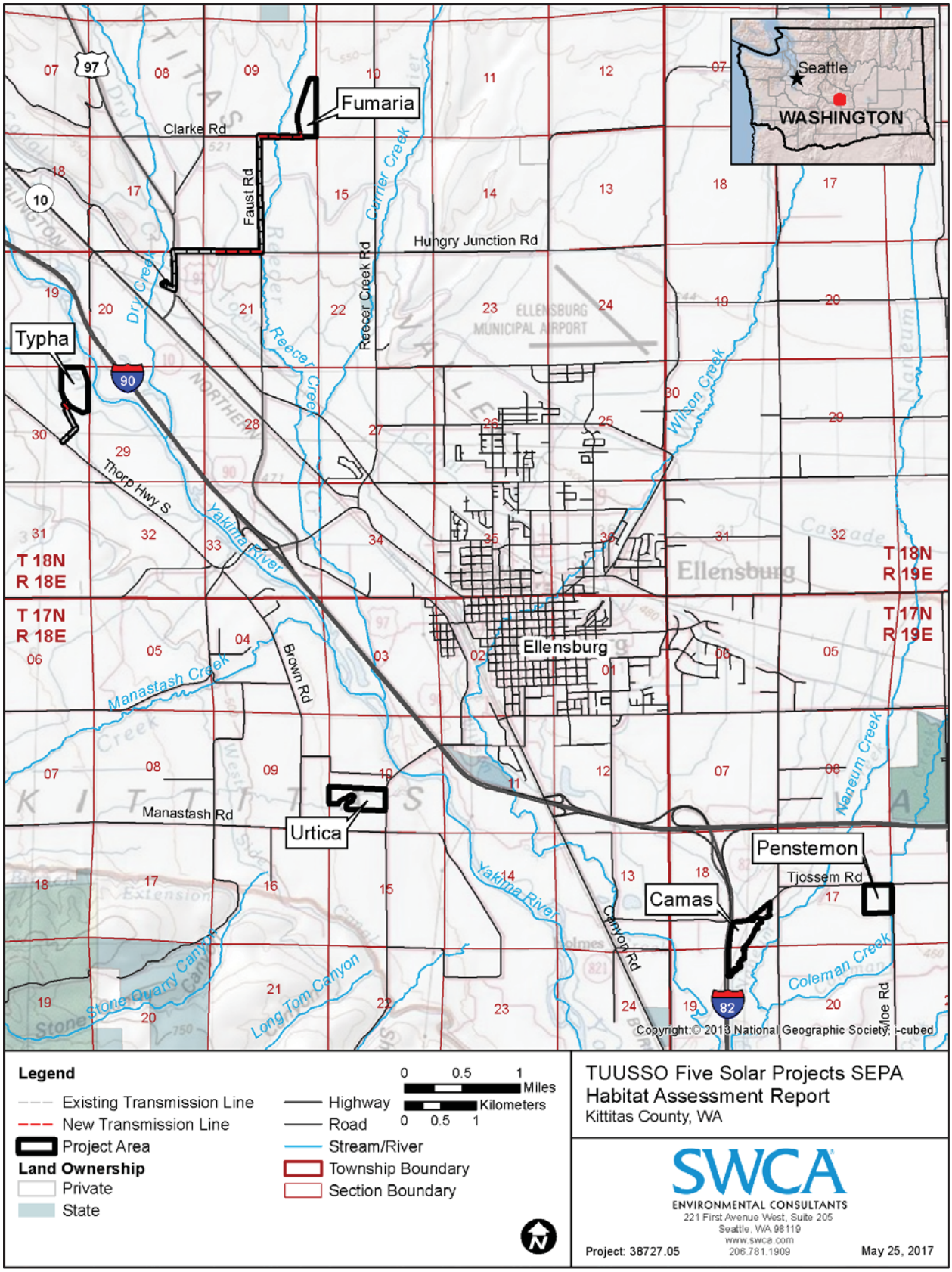


Figure 1. Project locations.

1.1.4 Typha Solar Project

The Typha Solar Project Site would include the installation of a photovoltaic solar facility on 49.7 acres of private agricultural land, and the construction of a switchyard with a short generation tie line (4.4 acres) into an existing PSE distribution transmission line. The site is composed of fallow agricultural land, associated irrigation ditches and a circular irrigator, and small wetlands. The site is located northwest of the city of Ellensburg. It is in Section 30, T 18 N, R 18 E, with the Yakima River running near the northeast border of the site, a wetland along the southern border, I-90 to the northeast, and Thorp Highway South to the southwest.

1.1.5 Urtica Solar Project

The Urtica Solar Project would include the installation of a photovoltaic solar facility on 51.1 acres of private agricultural land, and the construction of a switchyard with a short generation tie line into an existing PSE distribution transmission line. The project site is composed of actively farmed hay agricultural land, associated irrigation lines and ditches, and McCarl Creek running through the center of the site. The project site is located southwest of the city of Ellensburg. It is in Section 10, T 17 N, R 18 E, bordered on the west side by Umptanum Road and located north of Manastash Road.

1.2 Proposed Schedule

The projects are currently planned to begin construction in the second quarter of 2018 and begin operation in in the fourth quarter of 2018. This schedule is contingent upon completion of outstanding technical studies required to interconnect the projects to the local utility grid, but minimal schedule impacts are anticipated. The schedule also depends on the ability and timing of obtaining permits, as well as local weather conditions.

The projects would be built out in a single phase and are anticipated to take roughly 6 to 8 months, in total, to complete. Anticipated implementation dates are:

- Engineering and Permitting: February 2017 through April 2018
- Construction: spring through summer 2018
- Operation: fourth quarter 2018

1.3 Project Setting

U.S. Geological Survey topographic maps of the region indicate that the projects are located within the Kittitas Valley, just east of the Cascade Range and south of the Wenatchee Mountains. The valley drains centrally toward the Yakima River, which then flows to the southeast and leaves the valley through a gap in Manastash Ridge. Terrain on each site is generally flat, at an elevation of about 1,540 feet above mean sea level. Annual precipitation in the area is approximately 9 inches.

The projects are located in the Columbia Plateau Level III ecoregion area made up of arid sagebrush steppe and grassland, and surrounded on all sides by mountainous regions dominated by ponderosa pine (*Pinus ponderosa*) and Douglas-fir (*Pseudotsuga menziesii*) forests. The Columbia Plateau is underlain by basalt up to 2 miles thick, and is covered in some places by loess soils that have been extensively cultivated for wheat, particularly in the eastern portions of the region that receive more precipitation. Aromatic shrubs such as sagebrush (*Artemisia* spp.) and bitter-bush (*Purshia tridentata*) dominate the shrub-steppe habitat, while native grasslands consist of forbs and bunchgrasses, which are

being increasingly displaced by downy cheat grass (*Bromus tectorum*) and other invasive species. Aquatic plants, rushes, and thickets of shrubs are present in herbaceous wetlands found throughout the Columbia Plateau (LandScope America 2017).

1.4 Regulatory Framework

1.4.1 Federal Approvals

Section 7 of the federal Endangered Species Act (ESA) of 1973 (as amended) requires an analysis of the effects of major construction projects on any federally listed or proposed threatened or endangered species that may use the project sites, if there is a federal nexus. Consultation with the U.S. Fish and Wildlife Service (USFWS) and National Oceanic and Atmospheric Administration (NOAA) Fisheries is necessary if any threatened or endangered species would be affected by a project. Applicable regulations are found in the Code of Federal Regulations (50 CFR 17).

The Migratory Bird Treaty Act (MBTA) (16 USC 703-711) prohibits the taking, killing, or possession of migratory birds, except as allowed by the Secretary of the Interior. The list of migratory birds is found in 50 CFR 10, and permit regulations are found in 50 CFR 21.

The federal Bald Eagle Protection Act (BGEPA) (16 CFR 668-668c) prohibits the taking, possession, purchase, sale, barter, transport, export, or import of any bald or golden eagle or any part, nest, or egg of a bald or golden eagle, except for certain scientific, exhibition, and religious purposes. Eagle permit regulations are found in 50 CFR 22.

1.4.2 State Guidelines

The State of Washington regulates fish and wildlife with Title 77 of the Revised Code of Washington (RCW) and Title 220 of the Washington Administrative Code (WAC). State and protected species regulations are defined in WAC 220-610, which includes provisions for endangered, threatened, and sensitive wildlife species, ESA-listed fish, and bald eagle protection rules. Fish and aquatic habitats are protected under RCW 77.55, commonly referred to as the Hydraulic Code. Any environmental impacts that could occur in waters of the state below the ordinary high water mark would need to be addressed in a Hydraulic Project Approval process.

Washington's State Wildlife Action Plan (SWAP) is a comprehensive plan for conserving the state's fish and wildlife and their habitats. The purposes of the SWAP are to inform conservation priorities and to guide conservation actions statewide.

2 METHODS

2.1 Analysis Areas

The project sites are defined as the footprint of the five proposed solar projects, and the generation tie line corridors associated with two of the sites (see Figure 1). To provide a baseline for future analysis of potential impacts to biological resources from the proposed solar projects, this habitat assessment report evaluates two analysis areas, at a project-scale and at a landscape-scale. These areas are further described below.

2.1.1 Project-scale Analysis Area

The project-scale analysis areas include each project site and an associated surrounding 500-m buffer (Figure 2). These analysis areas include the habitat that would be directly impacted from construction and operation of each project, through ground disturbance, noise, and habitat alteration. A project-scale analysis area is appropriate for evaluating the potential impacts on species with small home ranges or territories, such as small birds, rodents, mammals, and amphibians.

2.1.2 Landscape-scale Analysis Area

The landscape-scale analysis area includes all five of the project-scale analysis areas, as well as the surrounding sub-watersheds (Figure 3). This analysis area is intended to evaluate the indirect impacts of project construction and operation on habitat in the region, and is appropriate for evaluating the potential impacts on migratory species or those species with larger home ranges such as raptors and larger mammals. Although biotic effects could occur outside of the selected sub-watersheds, they become more difficult to accurately predict with increased distance from the source of the impact.

2.2 Review of Existing Information

Prior to conducting field surveys, available scientific and technical literature regarding floral and faunal resources was reviewed for the project sites and the surrounding vicinity. Background research was also conducted to determine the potential occurrence, distribution, abundance, and life history of state or federally listed threatened and endangered species.

The USFWS Information, Planning, and Consultation system (IPaC) was queried to provide a list of federally proposed, candidate, threatened, and endangered species with potential to occur in and near the project-scale analysis areas (Appendix A). Additionally, the Washington Department of Fish and Wildlife's (WDFW's) Priority Habitats and Species (PHS) database was reviewed to determine whether any federal or state special-status species were documented as occurring in and near the project-scale analysis areas (Appendix B).

2.3 Field Investigation

Field surveys were conducted April 3 to 12, 2017, to document flora and fauna in the vicinity of the project sites, as well as different vegetation communities and habitat. Visual observations were recorded within 200 feet of each project site, and included wildlife and habitat data. A Trimble Geo XT global positioning system (GPS) unit was used by the biologist field team to assist in identifying the site boundaries and to record site spatial data. This device is capable of submeter accuracy. The full extent of each solar site was covered by the biologist field team. Photographs were taken and wildlife observations and vegetation characteristics were documented. The spatial location of some features observed outside of a project sites were approximated using field observations and aerial imagery to determine their extent. Geographic information system (GIS) software was used to analyze data and to produce the following habitat map figures.

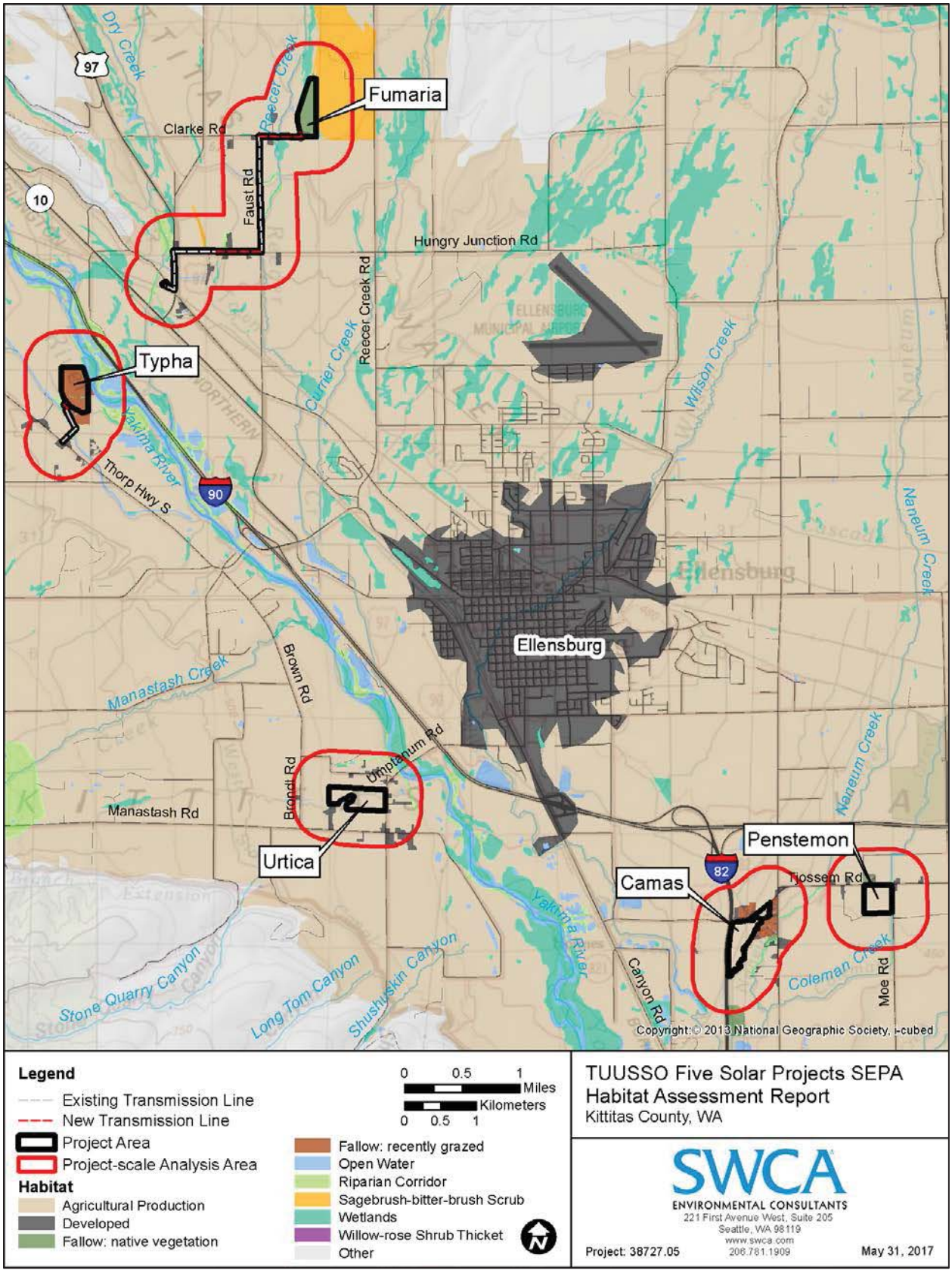


Figure 2. Project-scale analysis areas.

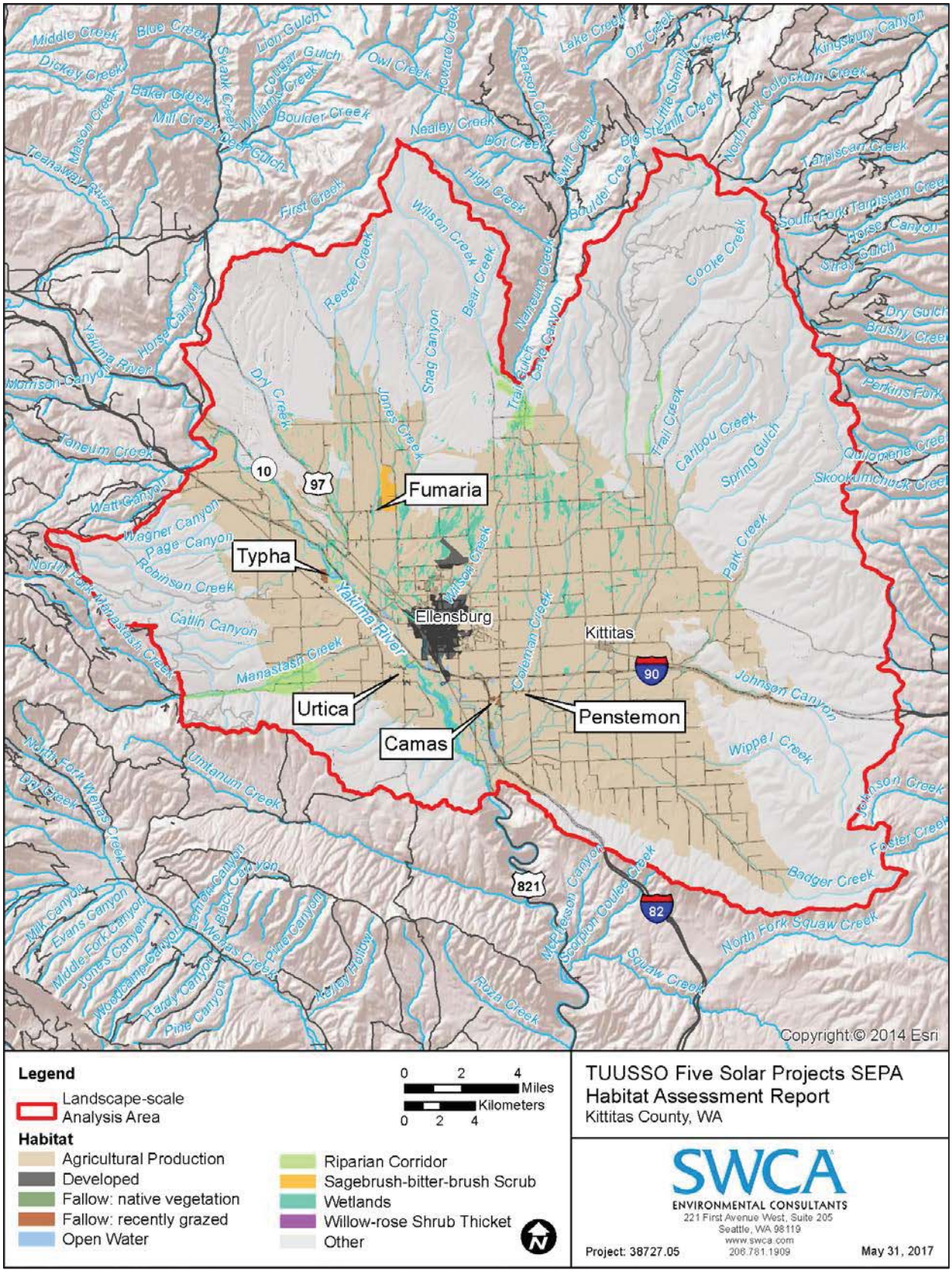


Figure 3. Landscape-scale analysis area.

3 VEGETATION AND HABITAT

Available habitats within the analysis areas were mapped based on dominant vegetation type as well as past and present land use, and habitat maps were used to determine the potential impacts from the proposed project activities. Site-specific descriptions of habitat and vegetation species documented during the April 3 to 12, 2017, field survey are provided to characterize the general habitat, and are considered representative of similar habitats found throughout the landscape-scale analysis area. Areas not surveyed were characterized using vegetation data from the Gap Analysis Project (GAP) (University of Washington, Washington Cooperative Fish and Wildlife Research Unit 1997).

3.1 Habitat Types

The majority of the project-scale analysis areas were made up of productive agricultural areas, fallow fields, recently grazed areas, and natural vegetation with several riparian, wetland, and open-water areas present. Wetlands and open-water areas have been described in detail in separate critical areas reports, and are not anticipated to be affected by the proposed solar projects. Developed areas were mostly located outside or adjacent to the project sites, but are common in the landscape-scale analysis area. Other habitats not observed during the field visit are found in the landscape-scale analysis area, but are not represented in the project-scale analysis areas, and do not provide habitat that is similar to areas potentially impacted by the projects.

The following sections provide detailed descriptions of the habitat types found in the analysis areas.

3.1.1 Agricultural Production

Three of the proposed solar project sites are primarily utilized for agricultural production (shown in Figure 4), including the production of alfalfa (*Medicago sativa*) on the Camas Solar Project site, Sudangrass (*Sorghum bicolor*) on the Penstemon site, and the production of common timothy (*Phleum pratense*) for hay on the Urtica site. These sites are dominated by the crop being produced, but often have other species encroaching into the crops in the space between plantings, which usually include bluegrass (*Poa* spp.), tall false rye grass (*Schedonorus arundinaceus*), hairy cat's-ear (*Hypochaeris radicata*), and common dandelion (*Taraxacum officinale*). In addition, these areas may go through periods during the production lifecycle in which they are unvegetated with exposed soil. Along the edges of these areas, more weedy species usually dominate, including garden yellow-rocket (*Barbarea vulgaris*), downy cheat grass, sticky-willy (*Galium aparine*), prickly lettuce (*Lactuca serriola*), great mullein (*Verbascum thapsus*), and Canadian thistle (*Cirsium arvense*).

3.1.2 Developed

This habitat type occurs throughout the landscape-scale analysis area, borders most of the solar project sites, and is composed of buildings, roads, and driveways (see Figure 2). Vegetation in this habitat is comprised mostly of ruderal species (species that colonize and thrive in disturbed areas), such as the noxious weeds documented in Section 3.3.1.



Figure 4. Example of agricultural production (alfalfa) at the Camas Solar Project.

Many areas near the proposed sites are partially developed or heavily manicured. The vegetation communities in these areas are either planted ornamental trees and shrubs or routinely mowed grass, and include rural residential landscaping, road rights-of-way (ROWs), and manicured golf course areas. Planted trees observed near the proposed sites include quaking aspen (*Populus tremuloides*), ponderosa pine, and grand fir (*Abies grandis*). The maintained lawns and golf course areas are dominated by a mix of grass species likely to include tall false rye grass, bluegrass, and creeping wild rye (*Elymus repens*). In addition, various weeds and non-native species could dominate roadside areas.

3.1.3 Fallow

Fallow fields are areas that were previously under agricultural production, or were regularly grazed, that have had these management practices removed for a period of time, long enough to allow other non-native, invasive, and native species to become dominant. This habitat type is dominant at the Fumaria and Typha Solar Project sites.

Native Vegetation

At the Fumaria Solar Project (shown in Figure 5), the majority of the vegetation community is returning to the native vegetation of the surrounding area and is partially dominated by native species, including common spring-gold (*Crocidium multicaule*), spring draba (*Draba verna*), Gorman's desert-parsley (*Lomatium gormanii*), and bitter-brush, and partially dominated by weedy species, including downy cheat grass, garden yellow-rocket, shepherd's-purse (*Capsella bursa-pastoris*), chicory (*Cichorium intybus*), common dandelion, prickly lettuce, and yellow salsify (*Tragopogon dubius*).



Figure 5. Example of the fallow–native vegetation habitat type at the Fumaria Solar Project.

Recently Grazed

At the Typha Solar Project (shown in Figure 6), the vegetation community is dominated by mostly low-growing weedy species, including tall false rye grass, remnant common timothy, hairy cat's-ear, common dandelion, and bluegrass, with patches of Canadian thistle and scotch thistle (*Onopordum acanthium*) scattered throughout the site, as well as Baltic rush (*Juncus balticus*), curly dock (*Rumex crispus*), and Rocky Mountain iris (*Iris missouriensis*) in the lower elevation areas.



Figure 6. Example of the fallow–recently grazed habitat type at the Typha Solar Project.

3.1.4 Open Water

The open water habitats found in the project-scale analysis areas are the Yakima River, streams, canals or ditches, and ponds. Representative photographs are provided below in Figures 7 to 9. For more information about the open-water areas documented during the April 3 to 12, 2017, field survey, refer to each project site's critical areas report.



Figure 7. The Yakima River with a great blue heron rookery in the cottonwoods east of the river, east of the Typha Solar Project.



Figure 8. McCarl Creek, a stream flowing through the Urtica Solar Project, from west to east.



Figure 9. One of two ponds in the southwest corner of the Urtica Solar Project.

3.1.5 Riparian Corridor

Riparian corridors generally occur along every river, stream, and some ditches and canals, in and adjacent to the proposed sites. Some of these areas are lacking mature trees, but where present the dominant trees typically include crack willow (*Salix* X *fragilis*), quaking aspen, balsam poplar (*Populus balsamifera*), and occasionally ponderosa pine. The herbaceous species that often accompany these riparian corridors include reed canary grass (*Phalaris arundinacea*), Fuller's teasel (*Dipsacus fullonum*), Canadian thistle, stinging nettle (*Urtica dioica*), tall scouring-rush (*Equisetum hyemale*), true forget-me-not (*Myosotis scorpioides*), curly dock, and great mullein. Figures 7 through 11 and 14 provide examples of this habitat type.



Figure 10. A riparian corridor along a ditch southwest of the Fumaria Solar Project.



Figure 11. A riparian corridor along a ditch southwest of the Fumaria Solar Project.

3.1.6 Sagebrush-bitter-brush Scrub

The upland sagebrush-bitter-brush scrub community (shown in Figure 12) is dominant to the east of the Fumaria Solar Project site and is beginning to return to that site. This community is characterized by the dominance of native shrubs, including bitter-brush and big sagebrush (*Artemisia tridentata*), and a low growing herbaceous community, including common spring-gold, spring draba, yellow bell (*Fritillaria pudica*), and various small bunchgrasses.



Figure 12. Example of sagebrush-bitter-brush scrub habitat type east of the Fumaria Solar Project.

3.1.7 Wetlands

Wetlands surveyed within the project-scale analysis areas ranged from <0.01 to 8.45 acres. The wetlands inventoried were depressional, riverine, and slope. Wetland ratings, based on the *Washington State Wetland Rating System for Eastern Washington – Revised*, were typically II, III, or IV (Hruby 2014). For more information about the wetlands documented during the April 3 to 12, 2017, field survey, refer to the each project site's critical areas report.

3.1.8 Willow–rose Shrub Thicket

Shrub thickets are often found along smaller drainages (i.e., small streams and ditches) and are dominated by narrow-leaf willow (*Salix exigua*) and rose (*Rosa* spp.), with occasional inclusions of red osier dogwood (*Cornus alba*) and black hawthorn (*Crataegus douglasii*). This vegetation community often lacks an herbaceous layer because the shrubs are too thick to allow adequate light penetration to the understory. Willow–rose shrub thickets occur in the southeast corner of the Fumaria Solar Project site, as well as along this site's northwest boundary (shown in Figures 13 and 14), and just outside of the northeast corner of the Typha Solar Project site and along the Ellensburg Power Canal.



Figure 13. A willow–rose shrub thicket in the southeast corner of the Fumaria Solar Project.



Figure 14. A rose shrub thicket along the northwest boundary of the Fumaria Solar Project.

3.1.9 Other

The habitat types grouped into the “other” category in this report are located within the landscape-scale analysis area, but were not observed during the field survey. These types include 1) conifer forest; 2) areas that are non-forested, but are apparently natural, parkland meadows with scattered trees; and 3) areas that are non-forested because they’ve been logged, and are in various stages of regrowth to herbs or small shrubs. Some of this habitat category is likely sagebrush-bitter-brush scrub, but because SWCA did not field survey these areas, we did not alter their mapping.

3.2 Available Habitat within the Analysis Areas

The acreage for each habitat type and the percent of the total available habitat has been calculated for both the landscape-scale and project-scale analysis areas, and are presented in Table 1. As shown in Table 1, the majority of the landscape-scale analysis area contains the “other” habitat category (60%) and agricultural production (36%). The majority of the project-scale analysis areas are a mix of agricultural production and developed areas, interspersed with a variety of the remaining habitat types. Available habitat types in the project-scale analysis areas are shown in Figures 15 to 21.

Table 1. Available Habitat Types within the Analysis Areas

Habitat Type	Landscape-scale Analysis Area		Project-scale Analysis Areas (500-meter buffer surrounding each solar site)									
			Camas		Fumaria		Penstemon		Typha		Urtica	
	Acres	% of Total	Acres	% of Total	Acres	% of Total	Acres	% of Total	Acres	% of Total	Acres	% of Total
Agricultural Production	115,057	36%	469	82%	1,098	76%	393	93%	345	59%	431	84%
Developed	4,805	1%	51	9%	56	4%	19	5%	33	6%	48	9%
Fallow: native vegetation	72	<1%	6	1%	41	3%	5	1%	-	-	-	-
Fallow: recently grazed	94	<1%	29	5%	-	-	-	-	64	11%	-	-
Open Water	1,247	<1%	4	1%	12	1%	2	<1%	68	12%	13	3%
Riparian Corridor	2,801	1%	13	2%	41	3%	3	1%	53	9%	13	3%
Sagebrush-bitter-brush Scrub	442	<1%	-	-	158	11%	-	-	-	-	-	-
Wetlands	5,315	2%	2	<1%	42	3%	<1	<1%	18	3%	9	2%
Willow-rose Shrub Thicket	4	<1%	-	-	4	<1%	-	-	<1	<1%	-	-
Other	193,188	60%	-	-	-	-	-	-	-	-	-	-
Total Acres	**323,025**		**574**		**1,452**		**422**		**583**		**513**	

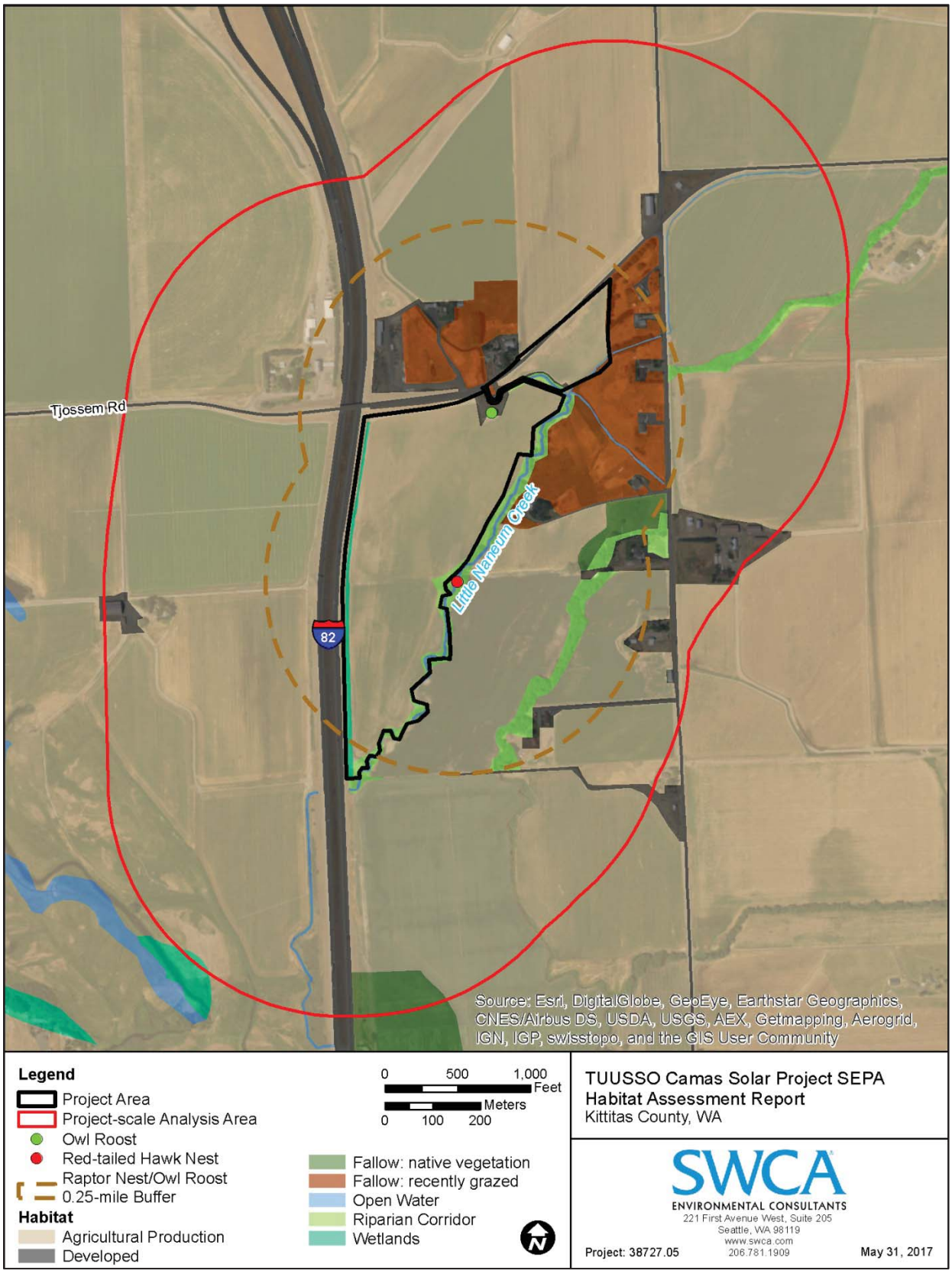


Figure 15. Habitat types within the project-scale analysis area for the Camas Solar Project.

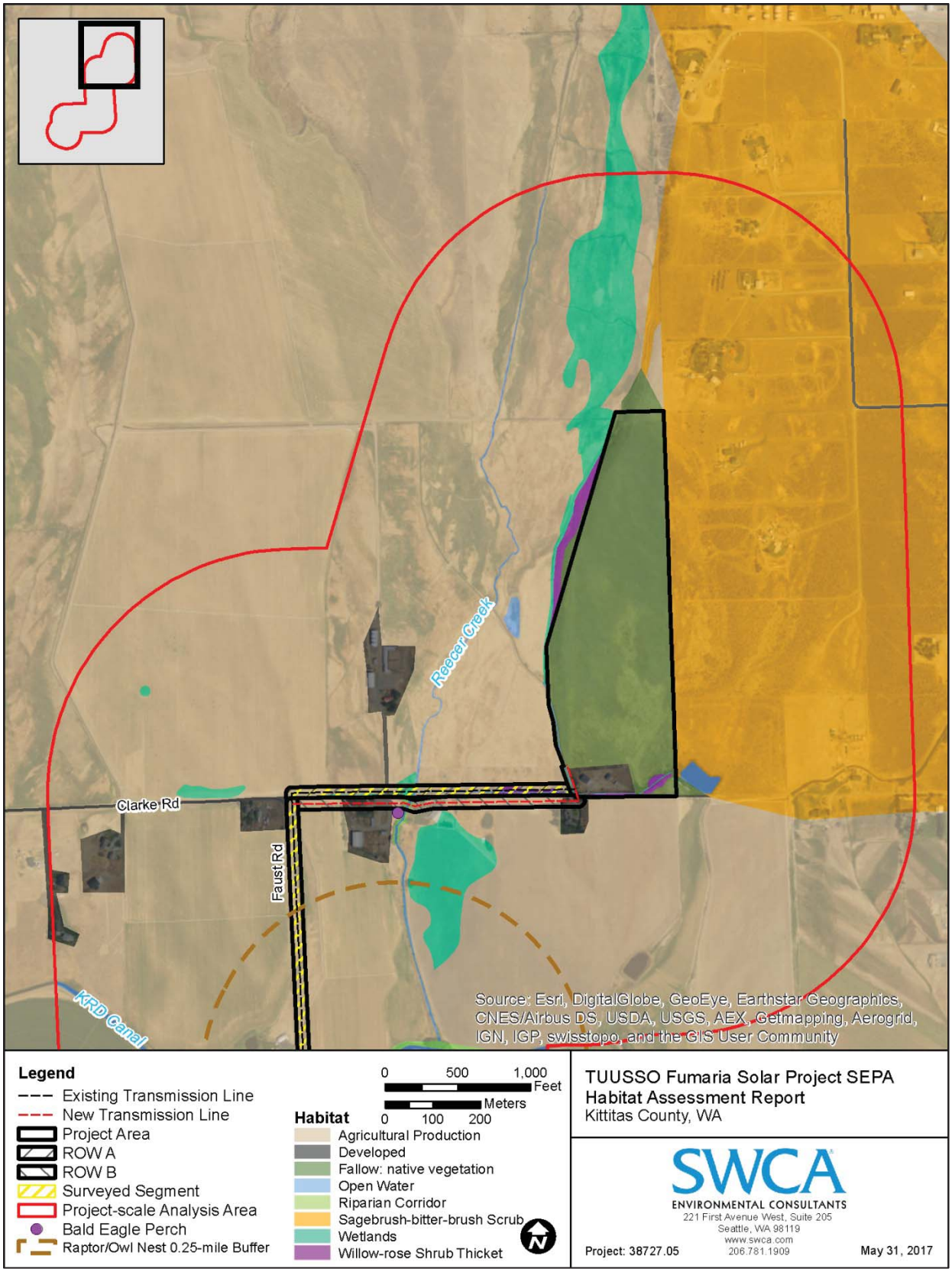


Figure 16. Habitat types within the project-scale analysis area for the Fumaria Solar Project.

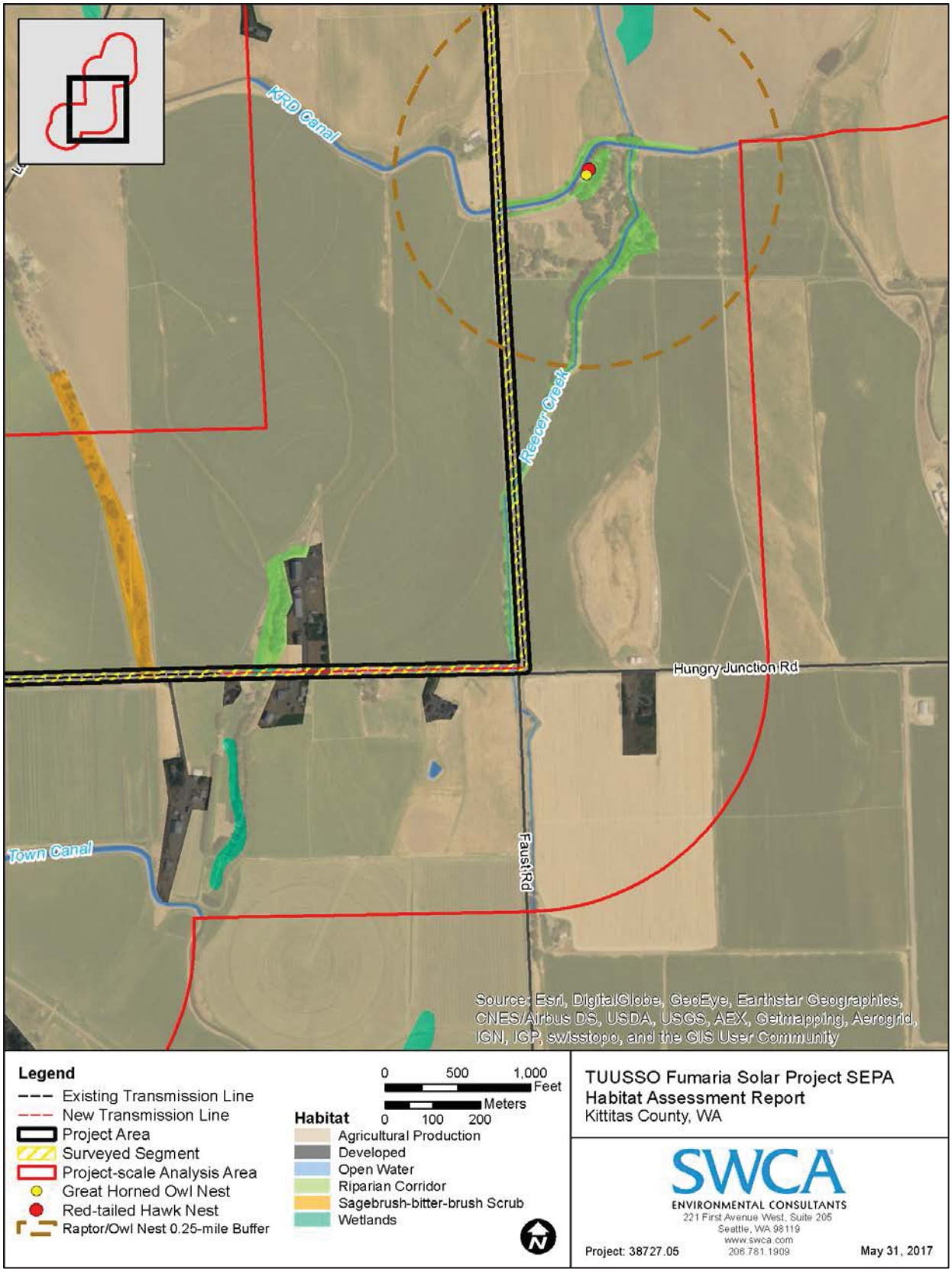


Figure 17. Habitat types within the project-scale analysis area along the north half of the Fumaria generation tie line corridor.

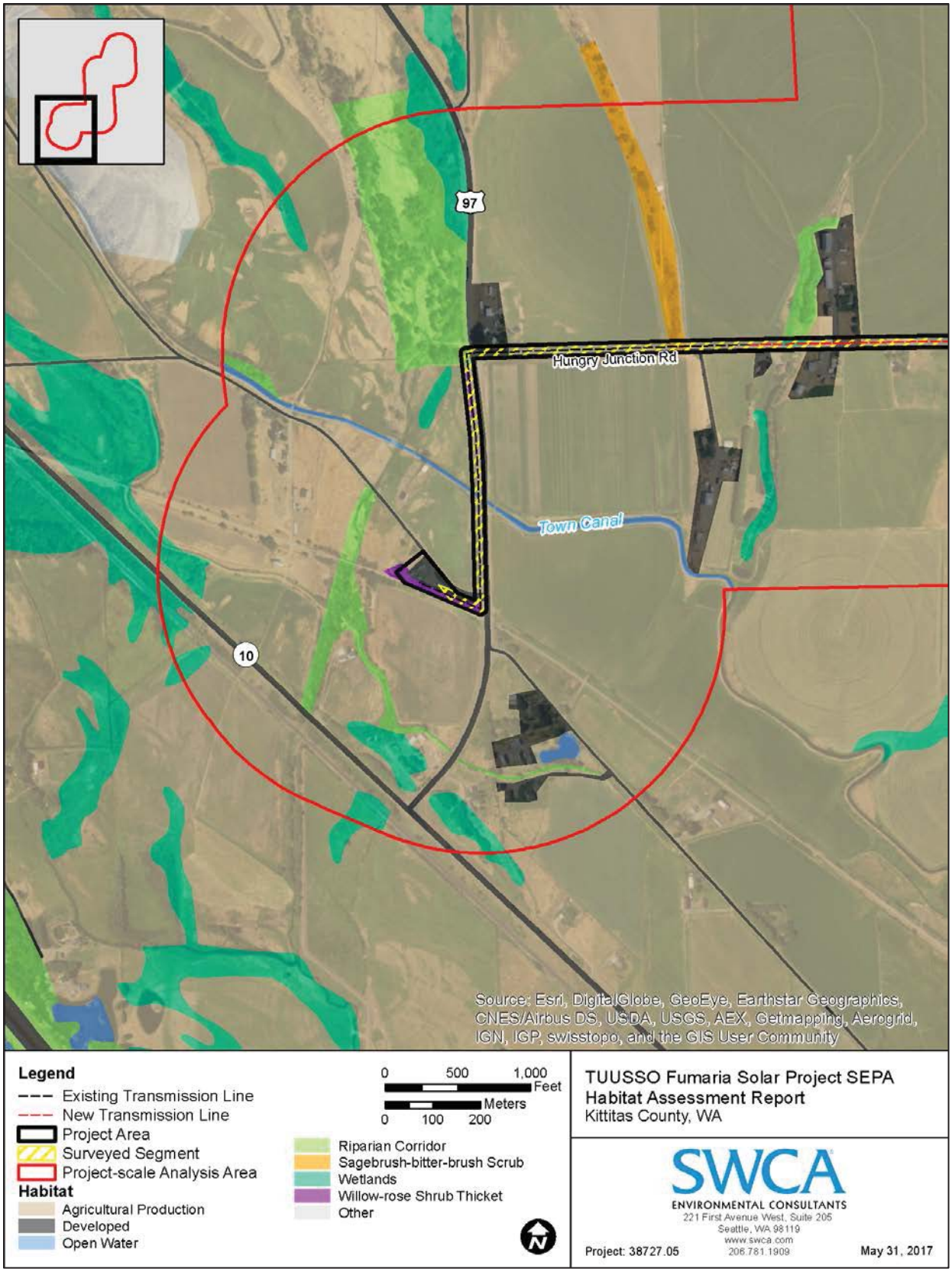


Figure 18. Habitat types within the project-scale analysis area along the south half of the Fumaria generation tie line corridor.

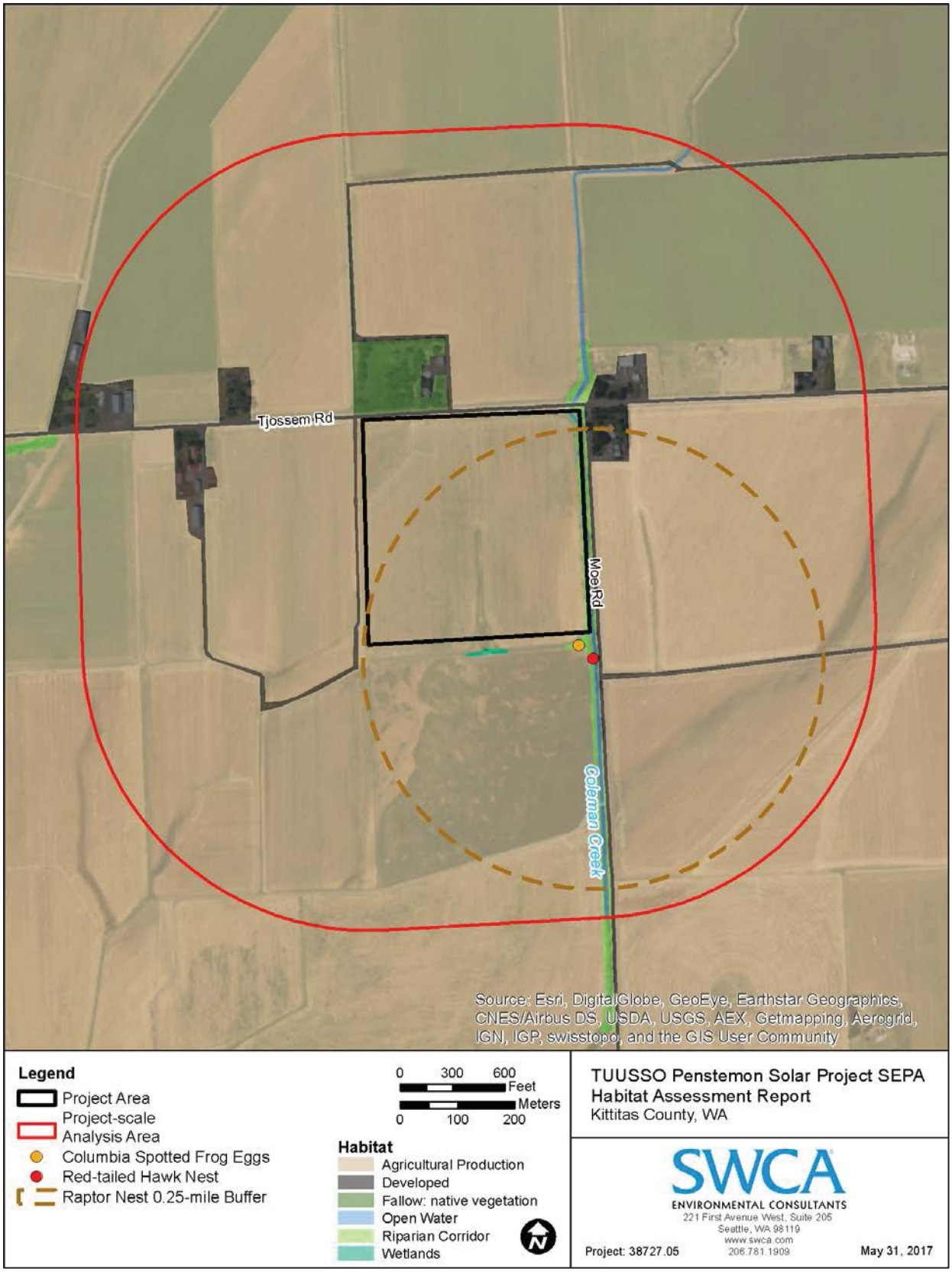


Figure 19. Habitat types within the project-scale analysis area for the Penstemon Solar Project.

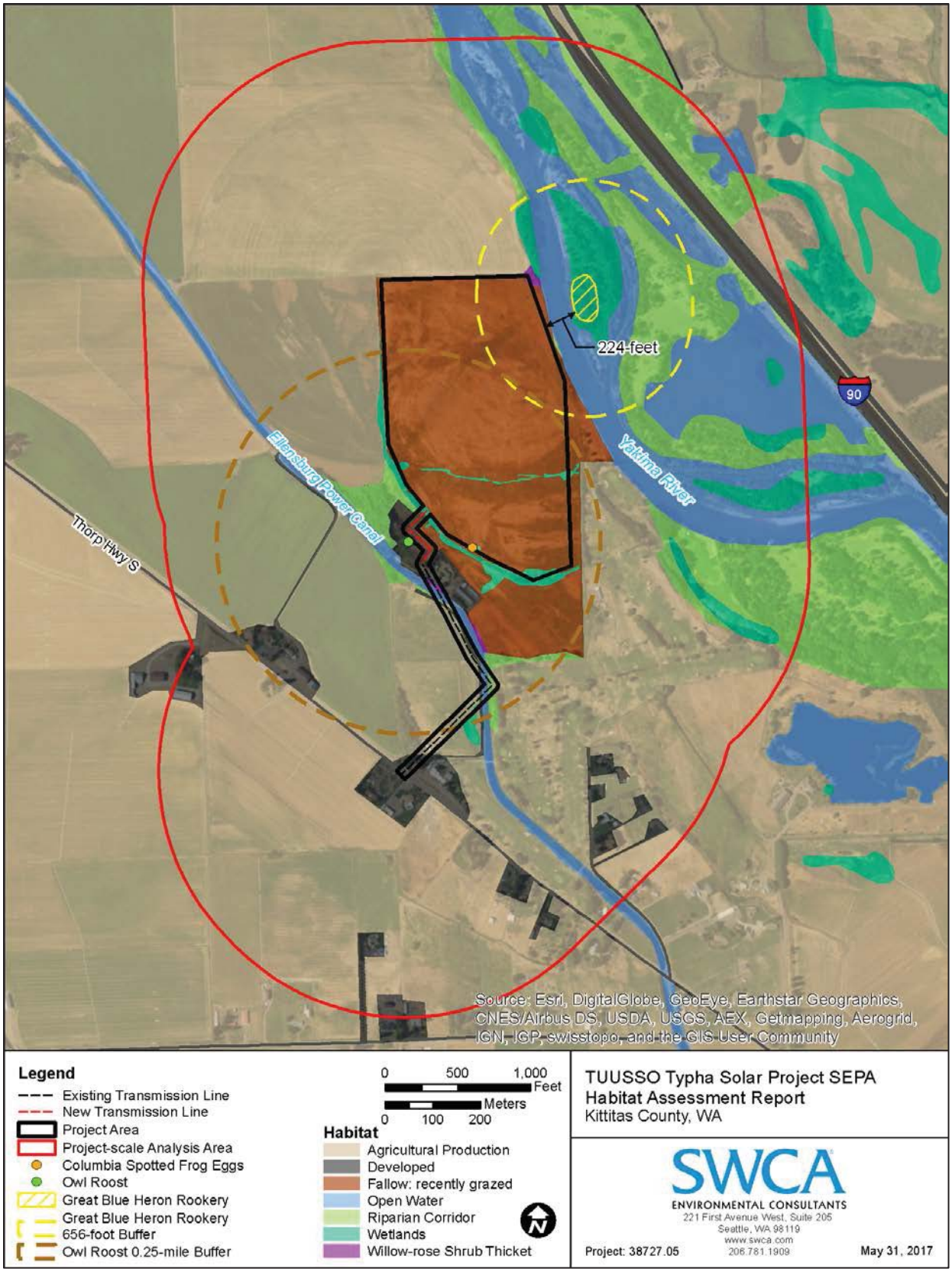


Figure 20. Habitat types within the project-scale analysis area for the Typha Solar Project.

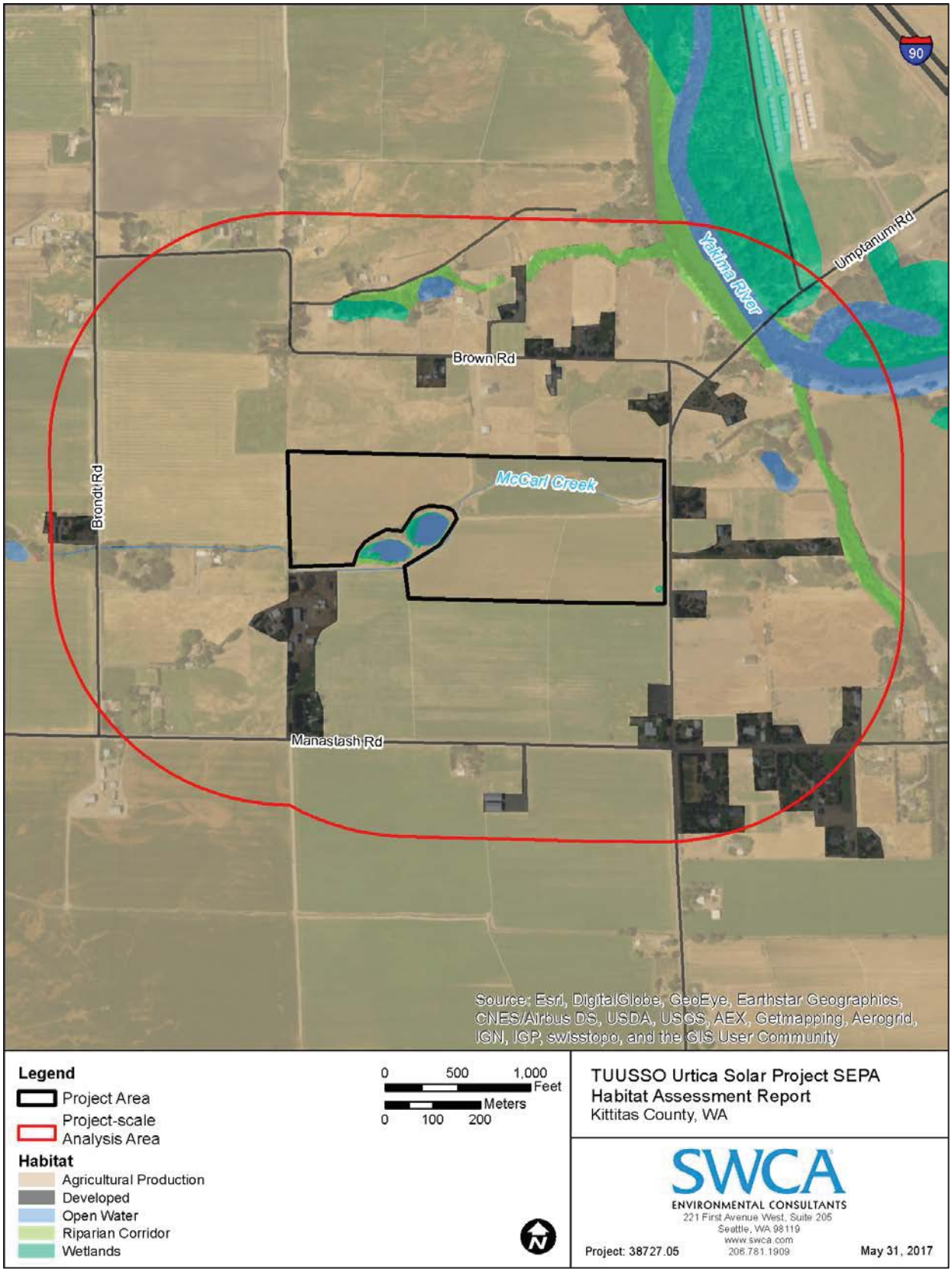


Figure 21. Habitat types within the project-scale analysis area for the Urtica Solar Project.

3.3 Special-status Plants

No sensitive or special-status plant species occur on any of the solar project sites. The plant species typically observed in each habitat type are discussed in Section 3.1. TUUSSO will prepare a Vegetation Management Plan through coordination with the landowners, WDFW, and Kittitas County.

The Washington State (WA) Noxious Weed Control Board has produced a noxious weed list for the state that categorizes weeds into three classes: A, B, and C (WA Noxious Weed Control Board 2017). A-Listed species are non-native species whose distribution in Washington State is still limited. B-Listed species are non-native species whose distribution is limited to portions of Washington State. C-Listed noxious weeds are widespread in Washington or are of special interest to the agricultural industry. Eleven noxious weeds have been identified in the project scale analysis areas, all B- or C-Listed species. A list of noxious weeds identified in the project-scale analysis areas, and a ranking of their relative prevalence at each site, is provided in Table 2.

Table 2. Noxious Weeds Documented in the Project-scale Analysis Areas

Common Name	Scientific Name	Status[1]	Weed Class[2]	Weed Relative Prevalence at Each Solar Project Site (1 = low, 5 = high)				
				Camas	Fumaria	Penstemon	Typha	Urtica
Canadian thistle	*Cirsium arvense*	Invasive, noxious	C	2	1	2	3	1
Chufa (yellow nutsedge)	*Cyperus esculentus*	Native, noxious	B		1		1	
False mayweed	*Tripleurospermum maritimum*	Non-native, noxious	C	1			1	
Field sow-thistle	*Sonchus arvensis*	Non-native, noxious	C		1			
Fuller's teasel	*Dipsacus fullonum*	Invasive, noxious	C	1	1	1	1	2
Hairy cat's-ear	*Hypochaeris radicata*	Non-native, noxious	C	3	3	1	3	3
Pale-yellow iris	*Iris pseudacorus*	Noxious	C	2				
Queen Anne's lace	*Daucus carota*	Non-native	C					1
Reed canary grass	*Phalaris arundinacea*	Invasive, noxious	C	3	1	2	2	3
Scotch thistle	*Onopordum acanthium*	Noxious	B	1			3	1
Spotted knapweed	*Centaurea stoebe*	Noxious	B		1			1

Sources:
1. Native per Hitchcock and Cronquist 1973 and USDA 2017; Noxious per WA Noxious Weed Control Board 2017
2. WA Noxious Weed Control Board 2017

4 FISH AND WILDLIFE

In all, 39 bird species were documented in the project-scale analysis areas during field surveys conducted from April 3 to 12, 2017, including raptors, passerines, near-passerines, and water birds (Appendix C). The list of documented bird species is not comprehensive and only includes those that were readily identifiable. Of the 39 bird species documented in the project-scale analysis areas, 35 are protected under the MBTA. Signs of several mammals, including of mule deer (*Odocoileus hemionus*), raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), and Virginia opossum (*Didelphis virginiana*), were observed throughout the project-scale analysis areas. Several burrows that were likely associated with American badger (*Taxidea taxus*) were observed at the Camas and Fumaria Solar Project sites, but the exact source of the burrows could not be identified. Columbia spotted frog (*Rana lutreveinus*) egg masses and Pacific tree frogs (*Pseudacris regilla*) were documented in the project-scale analysis areas.

No state- or federally-listed threatened or endangered species were observed in the project-scale analysis areas, but bald eagles (*Haliaeetus leucocephalus*) were observed at the Fumaria and Penstemon Solar Project sites and are a federal species of concern. Of the bird species documented in the project-scale analysis areas, four are currently being monitored by the State of Washington: great blue heron, prairie falcon, osprey, and turkey vulture. The American badger is also being monitored by the State of Washington, and the Columbia spotted frog is a state candidate for listing.

To evaluate the potential project impacts on fish and wildlife habitat, a list of representative species known or suspected to occur in the analysis areas was compiled and their preferred habitat was compared to the habitat types available in the analysis areas. The results of this evaluation are shown in Table 3.

Table 3. Representative Species Observed or Likely to Occur in the Analysis Areas

Common Name	Scientific Name	Management Category	Habitat Description	Habitat Types Used[1]									
				AP	DEV	FG	FN	RIP	SBB	WRS	OW	WET	OTH
Birds													
Bald eagle	*Haliaeetus leucocephalus*	MBTA, BGEPA, and Federal Species of Concern	Habitat generalist, associated with most aquatic habitats. Prefer rivers, lakes, and reservoirs with lots of fish and surrounding forests.					X				X	X
Canada goose	*Branta canadensis*	MBTA	Habitat generalists that occur near water, grassy fields, and grain fields. Always nests near water and winters where feeding areas are within short distances of water.	X	X	X	X	X		X	X	X	X
Great blue heron	*Ardea herodias*	MBTA, State Monitored	Found in a wide variety of habitats, including sheltered, shallow bays and inlets, sloughs, marshes, wet meadows, shores of lakes, and rivers. Nesting colonies are typically found in mature forests, on islands, or near mudflats, and do best when they are free of human disturbance and have foraging areas close by.					X			X	X	X
Great horned owl	*Bubo virginianus*	MBTA	Prefers secondary-growth woodlands, swamps, orchards, and agricultural areas, but are found in a wide variety of deciduous, coniferous, or mixed forests. Home range usually includes some open habitats, such as fields, wetlands, pastures, or croplands, in addition to forested areas.	X		X	X					X	X
Killdeer	*Charadrius vociferus*	MBTA	Inhabits open areas such as sandbars, mudflats, and grazed fields with vegetation generally no taller than 1 inch. Often found near water, but also common in dry areas.			X		X	X		X	X	

Table 3. Representative Species Observed or Likely to Occur in the Analysis Areas

Common Name	Scientific Name	Management Category	Habitat Description	Habitat Types Used[1]									
				AP	DEV	FG	FN	RIP	SBB	WRS	OW	WET	OTH
Northern Harrier	*Circus cyaneus*	MBTA	Breeds in freshwater and brackish marshes, lightly grazed meadows, old fields, tundra, dry upland prairies, drained marshlands, high-desert shrub-steppe, and riverside woodlands. Winter habitat includes areas with low vegetation, including deserts, coastal sand dunes, pasturelands, croplands, dry plains, grasslands, old fields, estuaries, open floodplains, and marshes.	X		X	X	X	X			X	X
Red-tailed hawk	*Buteo jamaicensis*	MBTA	Occupy most open habitat, including desert, scrublands, grasslands, roadsides, fields and pastures, parks, broken woodland, and (in Mexico) tropical rainforest.	X	X	X	X		X				X
Sandhill Crane	*Grus canadensis*	MBTA, State Endangered	Prefers open shallow waters along river channels, on alluvial islands of braided rivers, or in natural basin wetlands, but can sometimes occur in fields and agricultural lands during feeding and resting. They typically avoid visual obstructions, such as houses and bridges, and paved or gravel roads.	X		X	X	X			X	X	
Herptiles													
Columbia spotted frog	*Rana luteiventris*	State Candidate	Occurs in a variety of still-water habitats, as well as in some streams and creeks. Breeding habitat includes seasonally flooded margins of wetlands, ponds, and lakes, and even some flooded pools and still-water edges of creeks. Most often found in association with wetland plant communities consisting primarily of non-woody plants, such as sedges, rushes, and grasses.					X			X	X	

Table 3. Representative Species Observed or Likely to Occur in the Analysis Areas

Common Name	Scientific Name	Management Category	Habitat Description	Habitat Types Used[1]									
				AP	DEV	FG	FN	RIP	SBB	WRS	OW	WET	OTH
Pacific treefrog	*Pseudacris regilla*	None	Found in wetlands, meadows, woodlands, and brushy areas. Breed in shallow ponds, slow moving streams, seasonal pools, watering tanks, and roadside ditches, and spend the rest of the year in surrounding upland areas.	X				X		X	X	X	
Sharp-tailed snake	*Contia tenuis*	State Candidate	Prefers forest openings dominated by Garry oak, particularly with rock accumulations, and riparian deciduous woodlands with accumulations of decaying down woody logs within ponderosa pine, oak, or shrub-steppe.					X				X	X
Fish													
Bull trout	*Salvelinus confluentus*	Federal Threatened; State Candidate	Both resident or migratory varieties, with migratory bull trout spawning in tributary streams where juvenile fish rear for 1 to 4 years before migrating to either a larger river (fluvial) or lake (adfluvial) as adults. Successful egg incubation and survival requires very cold, clear, well-oxygenated waters, as found in pristine headwater stream habitats.								X		
Spring chinook (Upper Columbia River)	*Oncorhynchus tshawytscha*	Federal Endangered; State Candidate	Require sufficient invertebrate organisms for food; cool, flowing waters free of pollutants; high dissolved oxygen concentrations in rearing and incubation habitats; water of low sediment content during the growing season (for visual feeding); clean gravel substrate for reproduction; and unimpeded migratory access to and from spawning and rearing areas.								X		

Table 3. Representative Species Observed or Likely to Occur in the Analysis Areas

Common Name	Scientific Name	Management Category	Habitat Description	Habitat Types Used[1]									
				AP	DEV	FG	FN	RIP	SBB	WRS	OW	WET	OTH
Steelhead (Middle Columbia River	*Oncorhynchus mykiss*	Federal Threatened; State Candidate	Require sufficient invertebrate organisms for food; cool, flowing waters free of pollutants; high dissolved oxygen concentrations in rearing and incubation habitats; water of low sediment content during the growing season (for visual feeding); clean gravel substrate for reproduction; and unimpeded migratory access to and from spawning and rearing areas.								X		
Summer steelhead (Upper Columbia River)	*Oncorhynchus mykiss*	Federal Threatened; State Candidate	Require sufficient invertebrate organisms for food; cool, flowing waters free of pollutants; high dissolved oxygen concentrations in rearing and incubation habitats; water of low sediment content during the growing season (for visual feeding); clean gravel substrate for reproduction; and unimpeded migratory access to and from spawning and rearing areas.								X		
Mammals													
American badger	*Taxidea taxus*	State Monitored	Found in open habitats including semi-desert, sagebrush, grasslands, and meadows. Also found in forested areas with grassy cover.	X		X	X		X				X
Coyote	*Canis latrans*	None	Habitat generalists found in desert, scrub, grassland, foothills, populated neighborhoods, and urban environments.	X	X	X	X	X	X				X
Mule deer	*Odocoileus hemionus*	Big game	Use dense conifer forests with sufficient cover for thermal regulation and resting. Also may be found in pockets of dense brush or trees and rugged, broken terrain. Seasonal migration occurs.				X	X		X			X

Table 3. Representative Species Observed or Likely to Occur in the Analysis Areas

Common Name	Scientific Name	Management Category	Habitat Description	Habitat Types Used[1]									
				AP	DEV	FG	FN	RIP	SBB	WRS	OW	WET	OTH
Raccoon	*Procyon lotor*	None	Habitat generalists that traditionally prefer heavily wooded areas with access to trees, water, and vegetation. Often found in urban and suburban environments.		X			X		X		X	X
Small rodents (mice, voles, etc.)	Various	None	Large group of small mammals that are habitat generalists and provide prey for other species such as raptors, great blue heron, and badger.	X	X	X	X	X	X	X		X	X
Striped skunk	*Mephitis mephitis*	None	Habitat generalists, particularly associated with open areas with a mix of habitats such as wooded areas, grasslands, or meadows. Usually in close proximity to a source of water.		X		X	X		X			X
Virginia opossum	*Didelphis virginiana*	None	Habitat generalist, ranging from wooded areas to open fields. Prefer environments near streams or wetlands. Shelter in burrows of other animals, tree cavities, brush piles, or other cover.		X			X		X		X	X

1. AP = Agricultural production; DEV = Developed; FG = Fallow, recently grazed; FN = Fallow, native vegetation; RIP = Riparian corridor; SBB = Sagebrush-bitter-brush shrub; WRS = Willow–rose shrub thicket; OW = Open water; WET = Wetlands; OTH = Other

4.1 Special-status Species

Federal and state online databases were accessed to obtain current lists of sensitive species that may occur in or near the project-scale analysis areas, including the USFWS IPaC system (see Appendix A). The USFWS IPaC database provides county-level lists of Endangered Species Act (ESA) listed species, including species proposed or candidates for listing, and designated critical habitat within a defined project area. No ESA-listed species are anticipated to be affected by the proposed solar projects.

The WDFW PHS mapper, which lists sensitive wildlife species and habitats within the proposed solar project sites, was also accessed (Appendix B). Table 4 lists state-listed species that have the potential to occur in the proposed solar sites, and is followed by a brief discussion of each one. As the PHS mapper is dependent on existing records of species, other sensitive species may occur in the vicinity of the solar project sites, if suitable habitat is present. Based on the existing condition of the sites as developed agricultural lands, it is unlikely that other sensitive species occur in the project-scale analysis areas.

Table 4. Special-status Species with Potential to Occur in the Project-scale Analysis Areas

Common Name	Scientific Name	Status	Sites with Potential Occurrence	Likelihood to Occur in Project-scale Analysis Areas
Birds				
Bald Eagle	*Haliaeetus leucocephalus*	Federal Candidate; MBTA and BGEPA Protected	Fumaria	High
Greater sage-grouse	*Centrocercus urophasianus*	Federal Candidate, State Threatened	Camas, Penstemon	Low
Sandhill Crane	*Grus canadensis*	State Endangered	Camas, Fumaria, Penstemon, Urtica	Low
Fish				
Bull trout	*Salvelinus confluentus*	Federal Threatened	Typha	None
Spring Chinook salmon (Upper Columbia River)	*Oncorhynchus tshawytscha*	Federal Endangered	Penstemon	None
Steelhead (Middle Columbia River)	*Oncorhynchus mykiss*	Federal Threatened	Typha	None
Summer Steelhead (Upper Columbia River)	*Oncorhynchus mykiss*	Federal Threatened	Penstemon	None
Herptiles				
Columbia spotted frog	*Rana luteiventris*	State Candidate	Camas, Penstemon	High
Sharp-tailed snake	*Contia tenuis*	State Candidate	Camas, Fumaria	Low
Invertebrates				
Giant Palouse earthworm	*Driloleirus americanus*	State Candidate		Low

4.1.1 Bald Eagle

The bald eagle is a Federal Species of Concern, in addition to being BGEPA- and MBTA-protected. They are habitat generalists, typically associated with aquatic habitats, preferring forested areas that surround fish-bearing lakes and rivers.

The PHS mapper did not document any bald eagle occurrences in the analysis areas, but eagles were observed during the field survey at the Fumaria and Penstemon sites. Both sites are within 3 miles of the Yakima River (potential nesting habitat). Bald eagles are also scavengers, and calves were observed near both sites; it is likely that the observed eagles were scavenging afterbirth in the vicinity of these sites.

4.1.2 Greater Sage-grouse

The greater sage-grouse (*Centrocercus urophasianus*) is classified as a Federal Candidate by USFWS and a State Threatened species by WDFW. This species lives only on the sagebrush steppe of western North America, and uses several types of sagebrush habitat during different parts of year (Sage Grouse Initiative 2017). Leks, or breeding areas, are located in clear areas such as grassy swales or dry lakebeds. Nesting habitats are usually made up of areas with dense cover from big sagebrush (*Artemisia tridentate*), but can also occur in areas with rabbitbrush, greasewood, and grassy areas (Cornell 2017).

According to the PHS mapper, an occurrence of this species was recorded within the township that includes the entire area of the proposed Camas and Penstemon Solar Project sites (WDFW 2017b). However, the proposed sites do not fit the description for this species' preferred habitat. Therefore, it is unlikely that this species occurs within these two sites.

4.1.3 Sandhill Crane

The sandhill crane (*Grus canadensis*) is classified as a State Endangered species by WDFW. Klickitat and Yakima Counties hold the primary breeding grounds within the State of Washington for sandhill cranes. This species prefers open shallow waters along river channels, on alluvial islands of braided rivers, or in natural basin wetlands, but can sometimes occur in fields and agricultural lands during feeding and resting (California Department of Fish and Game 1990). They typically avoid visual obstructions, such as houses, bridges, and paved or gravel roads (Norling et al. 1992).

4.1.4 Bull Trout

The bull trout is classified as a Federally Threatened species by USFWS. Bull trout exhibit a number of life history strategies. Stream-resident bull trout complete their entire life cycle in the tributary streams where they spawn and rear. Most bull trout are migratory, however, spawning in tributary streams where juvenile fish usually rear for 1 to 4 years before migrating to either a larger river (fluvial) or lake (adfluvial) where they spend their adult life, returning to the tributary stream to spawn (Fraley and Shepard 1989). Successful egg incubation and survival requires very cold, clear, well-oxygenated waters as found in pristine headwater stream habitats (Wydoski and Whitney 2003). Bull trout in fresh water feed primarily on whitefish, sculpins, and young salmonids, although they also consume insects, amphibians, crayfish, and other available food (Kraemer 1994). The bull trout has been documented in the Yakima River by PHS, SalmonScape, and StreamNet (Pacific States Marine Fisheries Commission 2016; WDFW 2017a, 2017b). In addition, the part of the Yakima River that is adjacent to the Typha Solar Project site contains designated critical habitat for bull trout (see Appendix A).

4.1.5 Chinook Salmon and Steelhead

The Upper Columbia River Spring Chinook and Summer Steelhead are classified as Federally Endangered and Federally Threatened, respectively, by NMFS. All salmonids require sufficient invertebrate organisms for food; cool, flowing waters free of pollutants; high dissolved oxygen concentrations in rearing and incubation habitats; water of low sediment content during the growing season (for visual feeding); clean gravel substrate for reproduction; and unimpeded migratory access to and from spawning and rearing areas (Spence et al. 1996). Both the Upper Columbia River Spring Chinook and Upper Columbia River Summer Steelhead have been documented in Coleman Creek along the eastern boundary of the Penstemon Solar Project site, by PHS, SalmonScape, and StreamNet (Pacific States Marine Fisheries Commission 2016; WDFW 2017a, 2017b). In addition, the part of Coleman Creek adjacent to the Penstemon site contains designated critical habitat for the Upper Columbia River Steelhead (see Appendix A). The Middle Columbia River steelhead has been documented in the Yakima River by PHS, SalmonScape, and StreamNet (Pacific States Marine Fisheries Commission 2016; WDFW 2017a, 2017b). In addition, the part of the Yakima River that is adjacent to the Typha Solar Project site contains designated critical habitat for Middle Columbia River steelhead (see Appendix A).

4.1.6 Columbia Spotted Frog

The Columbia spotted frog (*Rana luteiventris*) is classified as a State Candidate species by WDFW. This species is rarely found far from water and occurs in a variety of still-water habitats, as well as in some streams and creeks. Their breeding habitat includes seasonally flooded margins of wetlands, ponds, and lakes, and even some flooded pools and still-water edges of creeks. They are most often found in association with wetland plant communities consisting primarily of non-woody plants, such as sedges, rushes, and grasses (Leonard et al. 1993). The egg masses are typically laid in shallow water with little or no shading from vegetation. They are most active in lowland habitats from February through October and hibernate in muddy bottoms near their breeding site in the winter (Licht 1974). Spotted frog tadpoles have been shown to be very sensitive to chemical fertilizers, which may have contributed to the species' decline (Marco 1997).

According to the PHS mapper, an occurrence of this species was recorded within 300 feet of the proposed Camas Solar Project site in a waterway to the northeast, and within 1 mile of the proposed Penstemon Solar Project site in a waterway to the southeast (WDFW 2017b). Egg masses from this species were observed at the Typha and Penstemon Solar Project sites during the April 3 to 12, 2017, field survey. A preconstruction clearance survey may be recommended by WDFW for developments in or near potential spotted frog habitat, but since current plans are to buffer and avoid water bodies, this is unlikely to be necessary.

4.1.7 Sharp-Tailed Snake

The sharp-tailed snake is classified as a State Candidate species by WDFW. This species prefers forest openings dominated by Garry oak (*Quercus garryana*), particularly with rock accumulations, and riparian deciduous woodlands with accumulations of decaying woody logs within ponderosa pine (*Pinus ponderosa*), oak, or shrub-steppe (Hallock 2009).

According to the PHS mapper, an occurrence of this species was recorded within the quarter-township that includes the entire area of the proposed Camas and Fumaria Solar Project sites (WDFW 2017b). However, the proposed sites do not fit the description for this species' preferred habitat. Therefore, it is unlikely that this species occurs within these two project sites.

4.1.8 Giant Palouse Earthworm

The only special-status invertebrate species known to occur in Kittitas County is the giant Palouse earthworm (*Driloleirus americanus*), a state candidate species. Known habitats for this species include deep, loamy soils characteristic of the Palouse bunchgrass prairies, and gravelley sandy loam or other rocky soils in forested areas. They have been observed in open forest, shrub-steppe, and prairie habitats and are typically associated with native vegetation (WDFW 2015).

4.2 Site-specific Observations

4.2.1 Camas Solar Project Site

A review of the PHS database showed that the Camas Solar Project site has historically provided habitat for Columbia spotted frog (*Rana luteiventris*), a State Candidate species. A Pacific treefrog was observed at this site. This site is also located within a township known to support greater sage-grouse (*Centrocercus urophasianus*), a State Threatened and Federal Candidate species. Greater sage-grouse are closely associated with large uninterrupted areas of sagebrush, native bunchgrasses, wildflowers, and wet meadows. Because the Camas site does not provide this type of habitat, greater sage-grouse are unlikely to occur in this project-scale analysis area.

During field surveys, an active red-tailed hawk nest was observed in a large willow along Little Naneum Creek (see Figures 15 and 22). Additionally, the floor of the barn in the northeast part of the site was littered with owl pellets and the rafters contained whitewash (see Figures 15 and 23). This barn would remain in place following solar project construction, based on current design plans. If nesting activity is observed at the nest and barn, then a 0.25-mile seasonal construction avoidance buffer may be requested by WDFW until the young have fledged (see Section 5.1.1 and Appendix D).

During a site visit on April 12, 2017, WDFW biologists stated that Little Naneum Creek is likely fish-bearing. Dace (*Leuciscus* spp.) were observed during the site visit in the irrigation ditch that flows north to south along the west side of the solar site, into Little Naneum Creek.

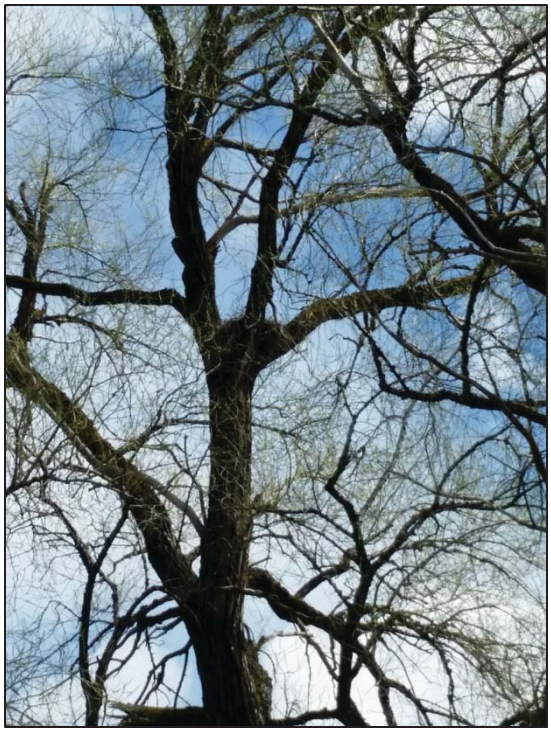


Figure 22. Red-tailed hawk nest in willows along the Little Naneum Creek riparian corridor.



Figure 23. Barn in the northwest corner of the Camas Solar Project that provides owl roosting habitat.

4.2.2 Fumaria Solar Project Site

A review of the PHS database showed that the Fumaria Solar Project site is located within a quarter-township known to support sharp-tailed snake (*Contia tenuis*) a State Candidate species. Sharp-tailed snake can occur in a wide variety of habitats, but are most commonly associated with wetter soils in coniferous or mixed woodland forests. Because this site does not provide this type of habitat, sharp-tailed snake are unlikely to occur in this project-scale analysis area.

Pacific treefrogs were observed at this site (see Figures 24 and 25). A bald eagle was seen perching in the willows near the northernmost Reecer Creek road crossing along the Fumaria generation tie line (see Figures 16 and 26). East of Fumaria's generation tie line (along North Faust Road), two active raptor nests were observed: a red-tailed hawk and great horned owl (see Figures 17 and 27). If nesting activity is observed at the nests, then a 0.25-mile seasonal construction avoidance buffer may be requested by WDFW until the young have fledged (see Section 5.1.1 and Appendix D).

During the field surveys, dace were observed in the irrigation ditches that are south of the site and are connected to Reecer Creek. Reecer Creek is known to be fish-bearing, containing rainbow trout (*O. mykiss*), a non-anadromous form of steelhead. In the past, the landowner has stocked the ponds (southeast of the site) with triploid rainbow trout.



Figure 24. Pacific treefrog observed in the fallow–native vegetation at the Fumaria Solar Project.



Figure 25. Pacific treefrog observed in the ditch along the west boundary of the Fumaria Solar Project.



Figure 26. Willows near the Fumaria generation tie line crossing of Reecer Creek, where a bald eagle was observed perching downstream (south) of the crossing.



Figure 27. Red-tailed hawk nest to the left (north) and great horned owl nest to the right (south), observed east of the Fumaria generation tie line along North Faust Road.

4.2.3 Penstemon Solar Project Site

A review of the PHS database showed that the Penstemon Solar Project site is located within a township known to support greater sage-grouse, a State Threatened and Federal Candidate species. Greater sage grouse are closely associated with large uninterrupted areas of sagebrush, native bunchgrasses, wildflowers and wet meadows. Because the site does not provide adequate greater sage-grouse habitat, they are unlikely to occur in this project-scale analysis area.

An active red-tailed hawk nest was observed southeast of the southeast site corner, in a cottonwood tree along Coleman Creek (Figure 28). If nesting activity is observed at the nest, then a 0.25-mile seasonal construction avoidance buffer may be requested by WDFW until the young have fledged (see Section 5.1.1 and Appendix D). Several egg masses, thought to be from Columbia spotted frog, were observed in an irrigation ditch that connects with Coleman Creek south of the southeast corner of the site (Figure 29). Additionally, Coleman Creek is known to be fish-bearing, containing steelhead, Chinook, and rainbow trout.



Figure 28. Red-tailed hawk nest in cottonwoods along the Coleman Creek riparian corridor.



Figure 29. Columbia spotted frog egg masses in a ditch south of the Pentsemon Solar Project.

4.2.4 Typha Solar Project Site

A review of the PHS database showed that no priority habitats or species are documented on the Typha Solar Project site. The Yakima River, located adjacent to the northeast corner of the site, is a fish bearing stream containing mountain sucker (*Catostomus platyrhyncus*), Coho (*O. kisutch*), Chinook, resident and anadromous bull trout (*Salvelinus malma*), Westslope cutthroat (*O. clarki lewisi*), and rainbow trout and summer steelhead. The portion of the Yakima River adjacent to the northeast corner is designated as a shoreline of the state based on the Washington Water Typing Criteria (WAC 222-16-030), and the Shoreline Management Act's list of streams and rivers constituting shorelines of the state for Kittitas County (WAC 173-18-230). Two egg masses, thought to be from Columbia spotted frog, were observed in TW04, a wetland located along the southern boundary of the site (see Figure 30).

A documented great blue heron (*Ardea herodias*) breeding area is 224 feet east of the site, on a landform within the Yakima River (see Figures 20 and 31). The great blue heron nesting season is February through September. WDFW may request a seasonal avoidance buffer during the first half of the season, i.e. February through May (Appendix D).



Figure 30. Columbia spotted frog egg masses in a TW01, a wetland along the southern boundary of the Typha Solar Project.



Figure 31. Great blue heron rookery along the Yakima River, located east of the Typha Solar Project.

The floor of the barn, located south of the southwest corner of the site, was littered with owl pellets and the rafters contained whitewash (see Figures 20 and 32). Current project plans include leaving this barn in-place. If nesting activity is observed at the barn, then a 0.25-mile seasonal construction avoidance buffer may be requested by WDFW until the young have fledged (see Section 5.1.1 and Appendix D).

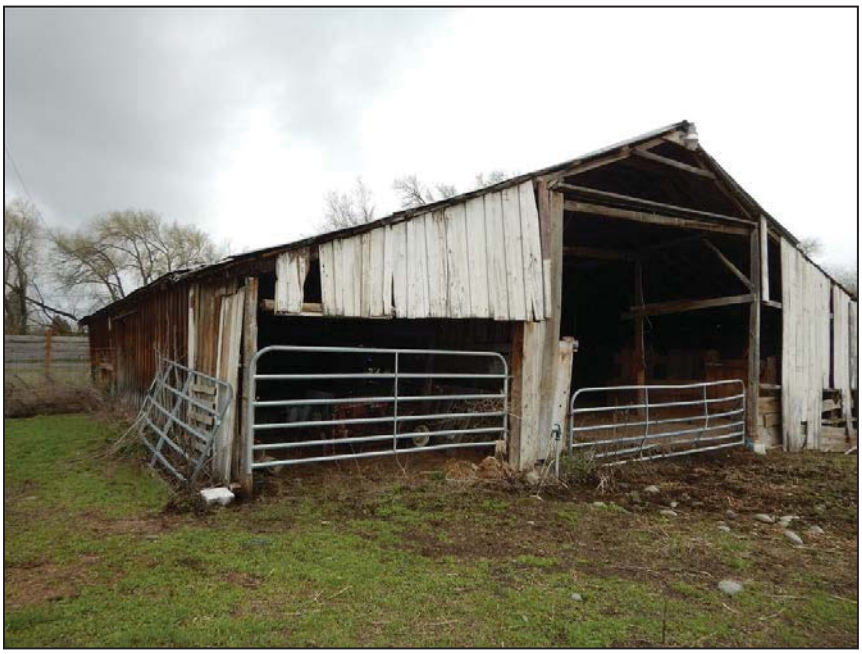


Figure 32. Barn south of the southwest corner of the Typha Solar Project that provides owl roosting habitat.

4.2.5 Urtica Solar Project Site

A review of the PHS database showed that no priority habitats or species are known to occur on the Utica Solar Project site. During an April 12 site visit, WDFW biologists stated that McCarl Creek is likely fish-bearing. In the past, the landowner has stocked the ponds with triploid rainbow trout. A Canada goose was observed nesting near the ponds.

5 RECOMMENDED ENVIRONMENTAL COMMITMENTS FOR TUUSSO'S CONSIDERATION

The proposed solar projects have the potential to negatively affect the vegetation communities and plant species in the project-scale analysis areas where ground disturbance would occur for construction of the solar sites, including a reduction in the size of the vegetation communities. Vegetation clearing or grubbing activities could also increase or introduce noxious plant populations in undisturbed habitat, contribute to soil erosion, lead to slope destabilization, or result in movement of material beyond the grading activities. Soil erosion from ground-disturbing activities may result in a negative effect on streams in the project-scale analysis areas, by increasing sedimentation into the streams.

Potential impacts to fish and wildlife may result from construction and operation of the solar projects. Ground disturbance, vegetation clearing, and noise could result in temporary impacts on wildlife species present in the project-scale analysis areas during construction. Long-term effects of the solar projects would be limited to the long-term modification of habitat in each project-scale analysis area.

The following sections describe potential best management practices (BMPs) and mitigation measures that could reduce or minimize the impacts on vegetation, fish, and wildlife.

5.1 Buffers and Seasonal Timing

5.1.1 Migratory Birds and Bald and Golden Eagles

To ensure compliance with MBTA, vegetation clearing would ideally be undertaken from August 1 through the end of February. If construction or vegetation clearing is required between March 1 and August 1, nest surveys would be required in the proposed area of disturbance. If active migratory bird nests are encountered during the surveys, land-disturbing construction activities should be avoided while the birds are allowed to fledge. An appropriate species avoidance buffer, as determined in conjunction with WDFW and local agencies, would apply to all active nests for migratory bird species.

As discussed in Section 4, the project-scale analysis areas have the potential to provide nesting habitat to raptors and bald and golden eagles. All raptor species are protected under the MBTA, and bald and golden eagles are additionally protected under the BGEPA. If active raptor nests occur within 0.25 mile of the solar project construction activities, noise and construction activities could disturb nesting and fledgling raptors, potentially causing nest abandonment. Based on WDFW guidance (Appendix D), a nest survey within 0.25-mile of construction activities would be conducted within the same year that construction is scheduled, to determine whether nests could be occupied during construction. The nesting seasons vary by species as shown in Table 5. WDFW's 0.25-mile buffer is inclusive of the distance recommended by the National Bald Eagle Management Guidelines (USFWS 2007), which specifies a 660 foot (0.125 mile) buffer of active eagle nests. If active raptor nests are observed, then TUUSSO would coordinate with WDFW to determine approaches to minimize disturbance to the nesting raptors. Buffer distances and timing restrictions would collaboratively be developed by WDFW and TUUSSO, dependent upon the sound levels produced by the construction equipment and the sensitivity of the nesting raptors.

Table 5. Nesting Seasons for Raptor Species Likely to Occur in the Analysis Areas

Species	Nesting Season
Bald eagle	January 1–August 31
Golden eagle	January 1–August 31
Red-tailed hawk	March 15–June 30
Great horned owl	February 1–May 15
Swainson's hawk	April 15–July 31

Source: Personal Communication with Scott Downes, WDFW Habitat Biologist, 2017 (see Appendix D)

5.1.2 Riparian Corridors

Rivers and streams in Kittitas County are classified according to the Washington State stream typing system, as defined in Chapter 222-16-030 WAC. The Department of Ecology and the Washington DNR recognize the WAC stream typing system. Kittitas County has established riparian habitat buffer ranges for each stream type to reflect the impact of certain intense land uses on riparian habitat functions and values. The performance standard buffers are defined in KCC 17A.070.010.

Table 6 shows the surface waters that were identified in the project-scale analysis areas, their DNR stream type, and the applicable buffers. See also each project site's critical areas report for recommended buffer and setback distances from the wetlands identified within the sites.

Table 6. Surface Waters in the Project-scale Analysis Areas and Applicable Buffers

Stream ID	Water Type	Flow Type	DNR Stream Type[a]	Kittitas County Buffers (feet)	
				Minimum	Maximum
Yakima River	River	Perennial	S	40	200
Ellensburg Power Canal (TS01)	Canal	Perennial	N/A	-	-
FS01	Ditch	Ephemeral	N/A	-	-
FS02	Ditch	Ephemeral	N/A	-	-
Reecer Creek	Stream	Perennial	F	20	100
Kittitas Reclamation District Canal (FS03)	Canal	Perennial	N/A	-	-
FS04	Stream	Intermittent	Ns	0	15
Town Canal (FS05)	Canal	Perennial	N/A	-	-
US01	Stream	Intermittent	F	20	100
Little Naneum Creek (CS01)	Stream	Perennial	F	20	100
Bull Ditch (CS02)	Ditch	Perennial	N/A	-	-
Coleman Creek	Stream	Perennial	F	20	100

[a] As defined in WAC 222-16-030: S = shoreline of the state, F = fish-bearing, Ns = non-fish-bearing. N/A = not applicable, due to ditches and canals being excluded from the WAC typing system.

To additionally protect riparian corridors and habitats, it is recommended that peak construction activities be conducted during the dry season as much as possible, to minimize erosion, sedimentation, and soil compaction. If any in-water work is required for construction of access roads, construction in fish bearing streams would need to occur during the agency-approved work windows.

5.2 Noise

Most construction activities would take place during the normal business hours of 8 a.m. to 6 p.m. and be conducted in accordance with local bylaws and noise ordinances, including but not limited to Kittitas County Code Section 9.45.010: Public Disturbance noises. Additionally, all noise generating construction activities would be conducted between the hours of 7 a.m. and 10 p.m., in accordance with WAC 173-60-050. These practices would avoid night-time noise disturbances to wildlife species.

5.3 Other Measures

Additional mitigation measures and BMPs to protect fish and wildlife in the project-scale analysis areas could include the following:

Design and Construction Techniques

- Avoid, when possible, construction in sensitive areas such as riparian zones and wetlands.
- Flag sensitive habitat areas (e.g., raptor nests, wetlands, etc.) near proposed areas of construction activity, and designate such areas as “off limits” to all construction personnel.
- During the nesting season, monitor raptor nests within 0.25-mile of the sites for nesting activity; coordinate construction timing and activities with WDFW to avoid impacts to nesting raptors.
- Minimize new road construction by improving and using existing roads and trails, instead of constructing new roads.

- Develop and implement a Fire Control plan, in coordination with local fire districts, to minimize the risk of accidental fires during construction, and respond effectively to any fire that does occur.
- Designate an environmental monitor during construction to monitor construction activities and ensure compliance with mitigation measures.
- Implement a trenching protocol during the installation of underground electrical facilities, to allow for conservation of surface soils.
- Require construction personnel to avoid driving over or otherwise disturbing areas outside of the designated construction areas.
- Properly store and manage all wastes generated during construction.
- Use certified "weed free" straw bales during construction to avoid introduction of noxious or invasive weeds.
- For poles installed by TUUSSO, when feasible:
    - equip overhead power lines with raptor perch guards to minimize risks to raptors; and
    - space overhead power line conductors to minimize potential for raptor electrocution.

Erosion and Sediment Control

- Use BMPs to minimize construction-related surface water runoff and soil erosion.
- Implement temporary erosion and sediment control measures, as appropriate, both during and after construction.
- Flag sensitive habitat areas (e.g., riparian zones, wetlands, etc.) near proposed areas of construction activity, and designate such areas as "off limits" to all construction personnel.
- Limit disturbances to the minimum necessary when working in or near waterbodies and install stakes or flagging to restrict vehicles and equipment to designated routes and areas.
- Delineate construction limits within 200 feet of waterbodies, as specified in the stormwater pollution prevention plan (SWPPP), with a sediment fence, straw wattles, or similarly approved methods to eliminate sediment discharge into waterways and wetlands, minimize the size of construction disturbance areas, and minimize removal of vegetation, to the greatest extent possible.

Post-construction Restoration and Noxious Weed Control

- Quickly revegetate habitats temporarily disturbed during construction with native species.
- Reseed all temporarily disturbed areas with an appropriate mix of native plant species as soon as possible after construction is completed, to accelerate the revegetation of these areas and to prevent the spread of noxious weeds.
- Consult with WDFW regarding the appropriate seed mixes to include in the Vegetation Management Plan for revegetation of the project sites.
- As further detailed in the Vegetation Management Plan, implement noxious weed control measures.
    - Develop a noxious weed control plan prior to construction, and implement the plan over the life of the project as mitigation. Herbicide application could be a noxious weed control method used.

6 CONCLUSIONS

6.1 Habitat Impacts

As shown in Table 1, habitat similar to the types available in the project-scale analysis areas is readily available in the landscape-scale analysis area. Long-term modification of vegetation communities would not result in a significant change to the overall habitat available to species in the analysis areas. Some species, such as small rodents, snakes, and insects, could be affected by the ground-disturbing activities due to temporary habitat alteration and could suffer mortalities from direct contact with construction equipment. More commonly, wildlife would be displaced to adjacent habitat areas. The effects from ground disturbance during construction would be considered low with respect to common wildlife species, all of which can be expected to have robust populations that would be minimally affected by the temporary and localized construction activities associated with the solar projects.

6.2 Special-status Species Impacts

No special-status plant species are known to occur within the construction areas. The proposed solar projects have the potential to affect the following special-status species:

- Bald eagle (BGEPA- and MBTA-protected; Federal Species of Concern)
- Columbia spotted frog (Washington State Candidate)

Bald eagles were observed near the Fumaria and Penstemon Solar Project sites, and are likely present throughout the project-scale analysis areas. If nests are present in the project vicinity, they have the potential to be affected by noise and visual disturbances during construction. No bald eagle nests have been identified near the solar project sites; if nests are identified near the sites, construction outside of the critical use period (January 1 – May 31) is recommended. If construction near active bald eagle nests might occur during the critical use period, local USFWS biologists would be consulted.

Columbia spotted frog is known to occur near the Typha, Camas, and Penstemon Solar Project sites, and could be affected by construction and operation in and around ponds and canals that provide breeding habitat. To avoid impacts to aquatic and semi-aquatic species, setback distances from aquatic habitats will be incorporated into site layouts, and appropriate erosion and sediment control measures would be implemented to protect wetlands and streams from sediment and other contaminants.

Recommended mitigation measures for special-status species are described in Section 5.0.

7 LITERATURE CITED

California Department of Fish and Game (CDFG). 1990. 1989 Annual Report on the Status of California's State Listed Threatened and Endangered Plants and Animals. California Department of Fish and Game, Sacramento, California.

Cornell Lab of Ornithology (Cornell). 2017. All About Birds - Greater Sage-Grouse https://www.allaboutbirds.org/guide/greater_sage-grouse/lifehistory. Accessed May 19, 2017.

Hitchcock, C. Leo and Arthur Cronquist. 1973. Flora of the Pacific Northwest, An Illustrated Manual. University of Washington Press; Fifth Printing edition (1973).

Hruby, T. 2014. Washington State Wetland Rating System for Eastern Washington – Revised. Washington State Department of Ecology Publication No. 14-06-030. Olympia, Washington: Department of Ecology. Available at: https://fortress.wa.gov/ecy/publications/ SummaryPages/1406030.html. Accessed March 10, 2017.

LandScope America. 2017. Columbia Plateau Vegetation. http://www.landscope.org/washington/natural_geography/ecoregions/columbia_plateau/vegetation/. Accessed May 19, 2017.

Leonard, W. P., H. A. Brown, L. L. C. Jones, K. R. McAllister, and R. M. Storm. 1993. *Amphibians of Washington and Oregon*. Seattle Audubon Society, Seattle, Washington.

Licht, L. E. 1974. Survival of embryos, tadpoles, and adults of the frogs *Rana aurora aurora* and *Rana pretiosa pretiosa* sympatric in southwestern British Columbia. Canadian Journal of Zoology 52:613–627.

Marco, A. 1997. Effects of nitrate and nitrite in the Oregon spotted frog and other amphibians. Conference Proceedings: The spotted frogs of Oregon. Oregon Chapter, Wildlife Society, Corvallis, Oregon.

Norling, Bradley S., Stanley H. Anderson, and Wayne A. Huber 1992 Roost sites used by sandhill crane staging along the Platte River, Nebraska. The Great Basin Naturalist 52(3):253–261.

Hallock, L. 2009. Conservation assessment for the sharp-tailed snake in Washington and Oregon. Prepared for U.S. Forest Service, Region 6 and Bureau of Land Management, Portland, Oregon. Washington Natural Heritage Program, Department of Natural Resources, Olympia, Washington.

Sage Grouse Initiative. 2017. The Habitat. https://www.sagegrouseinitiative.com/sagebrush-community/the-habitat/. Accessed May 19, 2017.

Spence, B.C., G.A. Lomnicky, R.M. Hughes, and R.P. Novitzki 1996 An Ecosystem Approach to Salmonid Conservation. TR-4501-96-6057. ManTech Environmental Research Services Corp, Corvallis, Oregon. Kraemer, C. 1994. Some observations on the life history and behavior of the native char, Dolly Varden (Salvelinus malma) and bull trout (Salvelinus confluentus) of the North Puget Sound Region. Draft.

Washington Department of Wildlife (WDFW). 2015. State Wildlife Action Plan Update. Appendix A-5. Species of Greatest Conservation Need Fact Sheets – Invertebrates. http://wdfw.wa.gov/publications/01742/14_A5_Invertebrates.pdf. Accessed May 18, 2017.

———. 2017a SalmonScape. Available at: http://apps.wdfw.wa.gov/salmonscape/. Accessed January 11, 2017.

———. 2017b Priority Habitats and Species on the Web. Available at: http://wdfw.wa.gov/mapping/phs/. Accessed January 11, 2017.

Washington State Noxious Weed Control Board. 2017. Printable Noxious Weed List. http://www.nwcb.wa.gov/printable-noxious-weed-list. Accessed May 19, 2017.

Wydoski, R. S., and R. R. Whitney. 2003. Inland Fishes of Washington. The University of Washington Press, Seattle, Washington.

University of Washington, Washington Cooperative Fish and Wildlife Research Unit. 1997. Washington Gap Project 1991 Land Cover for Washington State. Available at: ftp://ftp.dfw.wa.gov/pub/gapdata/lcv6. Accessed May 3, 2017.

U.S. Department of Agriculture. 2017. Natural Resources Conservation Service. Plants Database. http://plants.usda.gov/. Accessed May 19, 2017

United States Fish and Wildlife Service (USFWS). 2007. National Bald Eagle Management Guidelines. May 2007. Available at: https://www.fws.gov/southdakotafieldoffice/NationalBaldEagleManagementGuidelines.pdf. Accessed May 19, 2017.

8 LIST OF PREPARERS

Table 7. List of Preparers

Name	Title	Role
Jamie Young	Biologist	Report author
Sara Twitchell	Biologist	Report author
Evan Dulin	Biologist	Report author
Greg Poremba	Senior Energy Project Manager	QA/QC Review
Catherine Smith	GIS Specialist	GIS and mapping
Rhiannon Held	Technical Editor	Edit and format report

APPENDIX A: USFWS IPAC TRUST RESOURCES REPORT FOR FIVE TUUSSO SOLAR PROJECT SITES

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Kittitas County, Washington



Not for consultation

Local office

Washington Fish And Wildlife Office

(360) 753-9440
(360) 753-9405

510 Desmond Drive Se, Suite 102
Lacey, WA 98503-1263

http://www.fws.gov/wafwo/

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.

5. Click REQUEST SPECIES LIST.

Listed species[1] are managed by the Endangered Species Program of the U.S. Fish and Wildlife Service.

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information.

The following species are potentially affected by activities in this location:

Birds

NAME	STATUS
Marbled Murrelet Brachyramphus marmoratus There is a **final** critical habitat designated for this species. Your location is outside the designated critical habitat. https://ecos.fws.gov/ecp/species/4467	Threatened
Yellow-billed Cuckoo Coccyzus americanus There is a **proposed** critical habitat for this species. Your location is outside the proposed critical habitat. https://ecos.fws.gov/ecp/species/3911	Threatened

Fishes

NAME	STATUS
Bull Trout Salvelinus confluentus There is a **final** critical habitat designated for this species. Your location overlaps the designated critical habitat. https://ecos.fws.gov/ecp/species/8212	Threatened

Mammals

NAME	STATUS
Canada Lynx Lynx canadensis There is a **final** critical habitat designated for this species. Your location is outside the designated critical habitat. https://ecos.fws.gov/ecp/species/3652	Threatened
Gray Wolf Canis lupus No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/4488	Endangered
North American Wolverine Gulo gulo luscus No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/5123	Proposed Threatened

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

This location overlaps the critical habitat for the following species:

NAME	TYPE
Bull Trout Salvelinus confluentus https://ecos.fws.gov/ecp/species/8212#crithab	Final designated
Steelhead Oncorhynchus (=Salmo) mykiss https://ecos.fws.gov/ecp/species/1007#crithab	Final designated
Steelhead Oncorhynchus (=Salmo) mykiss https://ecos.fws.gov/ecp/species/1007#crithab	Final designated
Steelhead Oncorhynchus (=Salmo) mykiss https://ecos.fws.gov/ecp/species/1007#crithab	Final designated

Not for consultation

Steelhead Oncorhynchus (=Salmo) mykiss https://ecos.fws.gov/ecp/species/1007#crithab	Final designated
Steelhead Oncorhynchus (=Salmo) mykiss https://ecos.fws.gov/ecp/species/1007#crithab	Final designated

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any activity that results in the take (to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct) of migratory birds or eagles is prohibited unless authorized by the U.S. Fish and Wildlife Service[3]. There are no provisions for allowing the take of migratory birds that are unintentionally killed or injured.

Any person or organization who plans or conducts activities that may result in the take of migratory birds is responsible for complying with the appropriate regulations and implementing appropriate conservation measures.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Conservation measures for birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Year-round bird occurrence data http://www.birdscanada.org/birdmon/default/datasummaries.jsp

Not for consultation

The migratory birds species listed below are species of particular conservation concern (e.g. Birds of Conservation Concern) that may be potentially affected by activities in this location. It is not a list of every bird species you may find in this location, nor a guarantee that all of the bird species on this list will be found on or near this location. Although it is important to try to avoid and minimize impacts to all birds, special attention should be made to avoid and minimize impacts to birds of priority concern. To view available data on other bird species that may occur in your project area, please visit the AKN Histogram Tools and Other Bird Data Resources. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

NAME	SEASON(S)
Bald Eagle Haliaeetus leucocephalus https://ecos.fws.gov/ecp/species/1626	Year-round
Black Swift Cypseloides niger https://ecos.fws.gov/ecp/species/8878	Breeding
Brewer's Sparrow Spizella breweri https://ecos.fws.gov/ecp/species/9291	Breeding
Calliope Hummingbird Stellula calliope https://ecos.fws.gov/ecp/species/9526	Breeding, Migrating
Cassin's Finch Carpodacus cassinii https://ecos.fws.gov/ecp/species/9462	Year-round
Eared Grebe Podiceps nigricollis	Breeding
Ferruginous Hawk Buteo regalis https://ecos.fws.gov/ecp/species/6038	Breeding
Flammulated Owl Otus flammeolus https://ecos.fws.gov/ecp/species/7728	Breeding
Fox Sparrow Passerella iliaca	Breeding

Greater Sage-grouse Centrocercus urophasianus https://ecos.fws.gov/ecp/species/8159	Year-round
Lewis's Woodpecker Melanerpes lewis https://ecos.fws.gov/ecp/species/9408	Breeding
Loggerhead Shrike Lanius ludovicianus https://ecos.fws.gov/ecp/species/8833	Breeding
Long-billed Curlew Numenius americanus https://ecos.fws.gov/ecp/species/5511	Breeding
Peregrine Falcon Falco peregrinus https://ecos.fws.gov/ecp/species/8831	Breeding
Rufous Hummingbird selasphorus rufus https://ecos.fws.gov/ecp/species/8002	Breeding
Sage Thrasher Oreoscoptes montanus https://ecos.fws.gov/ecp/species/9433	Breeding
Short-eared Owl Asio flammeus https://ecos.fws.gov/ecp/species/9295	Year-round
Swainson's Hawk Buteo swainsoni https://ecos.fws.gov/ecp/species/1098	Breeding
Western Grebe aechmophorus occidentalis https://ecos.fws.gov/ecp/species/6743	Breeding
White Headed Woodpecker Picoides albolarvatus https://ecos.fws.gov/ecp/species/9411	Year-round
Williamson's Sapsucker Sphyrapicus thyroideus https://ecos.fws.gov/ecp/species/8832	Breeding
Willow Flycatcher Empidonax traillii https://ecos.fws.gov/ecp/species/3482	Breeding

Not for consultation

What does IPaC use to generate the list of migratory bird species potentially occurring in my specified location?

Landbirds:

Migratory birds that are displayed on the IPaC species list are based on ranges in the latest edition of the National Geographic Guide, Birds of North America (6th Edition, 2011 by Jon L. Dunn, and Jonathan Alderfer). Although these ranges are coarse in nature, a number of U.S. Fish and Wildlife Service migratory bird biologists agree that these maps are some of the best range maps to date. These ranges were clipped to a specific Bird Conservation Region (BCR) or USFWS Region/Regions, if it was indicated in the 2008 list of Birds of Conservation Concern (BCC) that a species was a BCC species only in a particular Region/Regions. Additional modifications have been made to some ranges based on more local or refined range information and/or information provided by U.S. Fish and Wildlife Service biologists with species expertise. All migratory birds that show in areas on land in IPaC are those that appear in the 2008 Birds of Conservation Concern report.

Atlantic Seabirds:

Ranges in IPaC for birds off the Atlantic coast are derived from species distribution models developed by the National Oceanic and Atmospheric Association (NOAA) National Centers for Coastal Ocean Science (NCCOS) using the best available seabird survey data for the offshore Atlantic Coastal region to date. NOAANCCOS assisted USFWS in developing seasonal species ranges from their models for specific use in IPaC. Some of these birds are not BCC species but were of interest for inclusion because they may occur in high abundance off the coast at different times throughout the year, which potentially makes them more susceptible to certain types of development and activities taking place in that area. For more refined details about the abundance and richness of bird species within your project area off the Atlantic Coast, see the Northeast Ocean Data Portal. The Portal also offers data and information about other types of taxa that may be helpful in your project review.

About the NOAANCCOS models: the models were developed as part of the NOAANCCOS project: Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf. The models resulting from this project are being used in a number of decision-support/mapping products in order to help guide decision-making on activities off the Atlantic Coast with the goal of reducing impacts to migratory birds. One such product is the Northeast Ocean Data Portal, which can be used to explore details about the relative occurrence and abundance of bird species in a particular area off the Atlantic Coast.

All migratory bird range maps within IPaC are continuously being updated as new and better information becomes available.

Can I get additional information about the levels of occurrence in my project area of specific birds or groups of birds listed in IPaC?

Landbirds:

The Avian Knowledge Network (AKN) provides a tool currently called the "Histogram Tool", which draws from the data within the AKN (latest,survey, point count, citizen science datasets) to create a view of relative abundance of species within a particular location over the course of the year. The results of the tool depict the frequency of detection of a species in survey events, averaged between multiple datasets within AKN in a particular week of the year. You may access the histogram tools through the Migratory Bird Programs AKN Histogram Tools webpage.

The tool is currently available for 4 regions (California, Northeast U.S., Southeast U.S. and Midwest), which encompasses the following 32 states: Alabama, Arkansas, California, Connecticut, Delaware, Florida, Georgia, Illinois, Indiana, Iowa, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, New Hampshire, New Jersey, New York, North, Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, Tennessee, Vermont, Virginia, West Virginia, and Wisconsin.

In the near future, there are plans to expand this tool nationwide within the AKN, and allow the graphs produced to appear with the list of trust resources generated by IPaC, providing you with an additional level of detail about the level of occurrence of the species of particular concern potentially occurring in your project area throughout the course of the year.

Atlantic Seabirds:

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAANCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Facilities

Wildlife refuges

Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGES AT THIS LOCATION.

Not for consultation

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

This location overlaps the following wetlands:

FRESHWATER EMERGENT WETLAND

- PEMC
- PEMA
- PEM1/UBF
- PEM1C
- PEM1F
- PEM1/UBFx

FRESHWATER FORESTED/SHRUB WETLAND

- PFO1A
- PFO/EM1A
- PSSC
- PFOA

FRESHWATER POND

- PUBHx
- PUBF
- PUBFx
- PUBFh

RIVERINE

R3UBH
R2UBHx
R3USC

A full description for each wetland code can be found at the National Wetlands Inventory website: https://ecos.fws.gov/ipac/wetlands/decoder

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

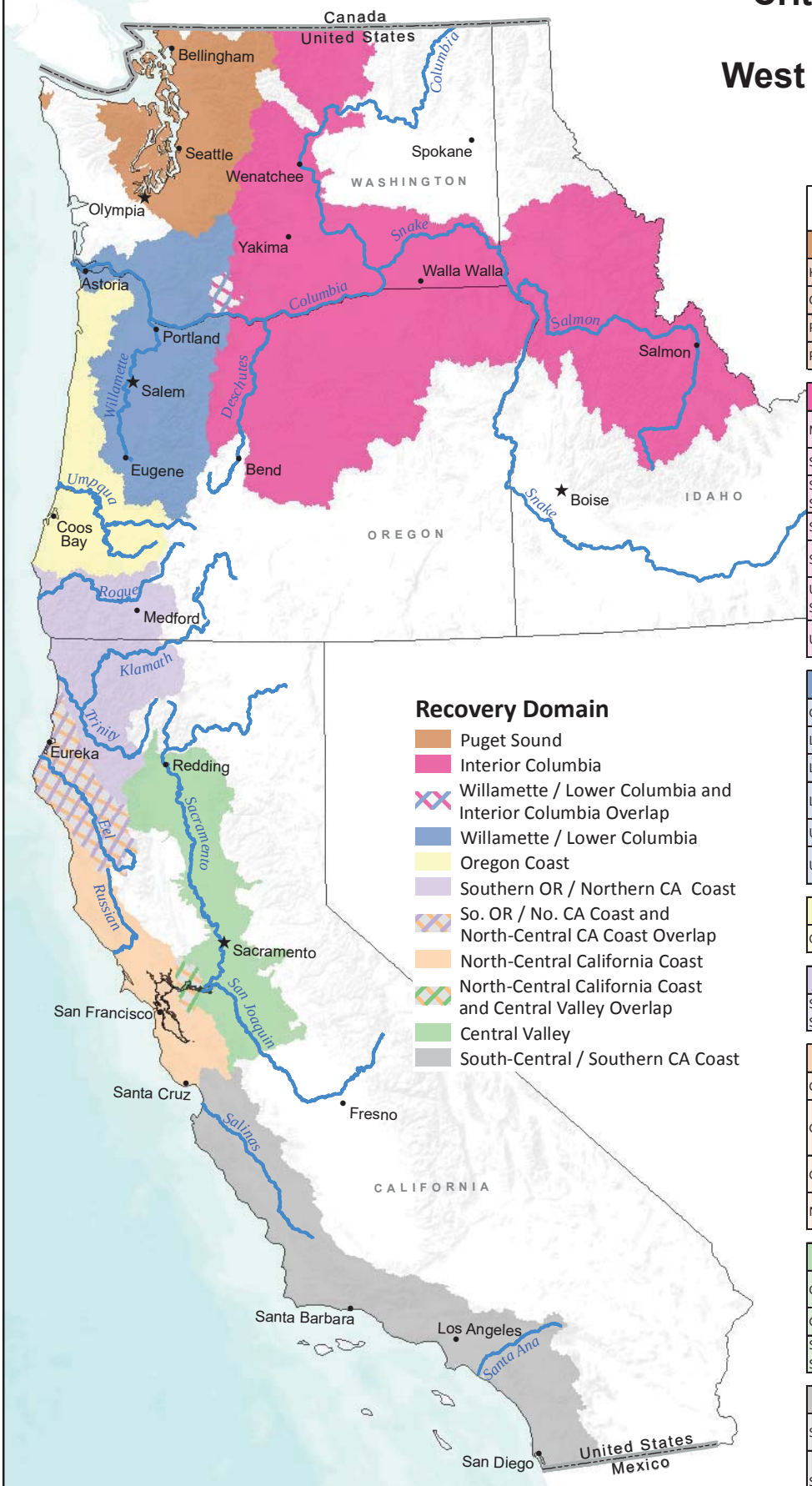
Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

Not for consultation

Status of ESA Listings & Critical Habitat Designations for West Coast Salmon & Steelhead



Evolutionarily Significant Unit / Distinct Population Segment	ESA Status	Date of ESA Listing	Date of CH Designation
Puget Sound Recovery Domain			
Hood Canal Summer-run Chum Salmon	T	3/25/1999	9/2/2005
Ozette Lake Sockeye Salmon	T	3/25/1999	9/2/2005
Puget Sound Chinook Salmon	T	3/24/1999	9/2/2005
Puget Sound Steelhead	T	5/11/2007	2/24/2016
Interior Columbia Recovery Domain			
Middle Columbia River Steelhead	T	3/25/1999 1/5/2006	9/2/2005
Snake River Fall-run Chinook Salmon	T	4/22/1992	12/28/1993
Snake River Spring / Summer-run Chinook Salmon	T	4/22/1992	10/25/1999
Snake River Sockeye Salmon	E	11/20/1991	12/28/1993
Snake River Steelhead	T	8/18/1997 1/5/2006	9/2/2005
Upper Columbia River Spring-run Chinook Salmon	E	3/24/1999	9/2/2005
Upper Columbia River Steelhead	T	8/18/1997 1/5/2006	9/2/2005
Willamette / Lower Columbia Recovery Domain			
Columbia River Chum Salmon	T	3/25/1999	9/2/2005
Lower Columbia River Chinook Salmon	T	3/24/1999	9/2/2005
Lower Columbia River Coho Salmon	T	6/28/2005	2/24/2016
Lower Columbia River Steelhead	T	3/19/1998 1/5/2006	9/2/2005
Upper Willamette River Chinook Salmon	T	3/24/1999	9/2/2005
Upper Willamette River Steelhead	T	3/25/1999 1/5/2006	9/2/2005
Oregon Coast Recovery Domain			
Oregon Coast Coho Salmon	T	2/11/2008	2/11/2008
Southern Oregon / Northern California Coast Recovery Domain			
Southern OR / Northern CA Coasts Coho Salmon	T	5/6/1997	5/5/1999
North-Central California Coast Recovery Domain			
California Coastal Chinook Salmon	T	9/16/1999	9/2/2005
Central California Coast Coho Salmon	E	10/31/1996 (T) 6/28/2005 (E) 4/2/2012 (RE)	5/5/1999
Central California Coast Steelhead	T	8/18/1997 1/5/2006	9/2/2005
Northern California Steelhead	T	6/7/2000 1/5/2006	9/2/2005
Central Valley Recovery Domain			
California Central Valley Steelhead	T	3/19/1998 1/5/2006	9/2/2005
Central Valley Spring-run Chinook Salmon	T	9/16/1999	9/2/2005
Sacramento River Winter-run Chinook Salmon	E	11/5/1990 (T) 1/4/1994 (E)	6/16/1993
South-Central / Southern California Coast Recovery Domain			
South-Central California Coast Steelhead	T	8/18/1997 1/5/2006	9/2/2005
Southern California Steelhead	E	8/18/1997 5/1/2002 (RE) 1/5/2006	9/2/2005

ESA = Endangered Species Act, CH = Critical Habitat, RE = Range Extension
E = Endangered, T = Threatened,

Updated July 2016

Critical Habitat Rules Cited

- 2/24/2016 (81 FR 9252) Final Critical Habitat Designation for Puget Sound Steelhead and Lower Columbia River Coho Salmon
- 2/11/2008 (73 FR 7816) Final Critical Habitat Designation for Oregon Coast Coho Salmon
- 9/2/2005 (70 FR 52630) Final Critical Habitat Designation for 12 ESU's of Salmon and Steelhead in WA, OR, and ID
- 9/2/2005 (70 FR 52488) Final Critical Habitat Designation for 7 ESU's of Salmon and Steelhead in CA
- 10/25/1999 (64 FR 57399) Revised Critical Habitat Designation for Snake River Spring/Summer-run Chinook Salmon
- 5/5/1999 (64 FR 24049) Final Critical Habitat Designation for Central CA Coast and Southern OR/Northern CA Coast Coho Salmon
- 12/28/1993 (58 FR 68543) Final Critical Habitat Designation for Snake River Chinook and Sockeye Salmon
- 6/16/1993 (58 FR 33212) Final Critical Habitat Designation for Sacramento River Winter-run Chinook Salmon

ESA Listing Rules Cited

- 4/2/2012 (77 FR 19552) Final Range Extension for Endangered Central California Coast Coho Salmon
- 2/11/2008 (73 FR 7816) Final ESA Listing for Oregon Coast Coho Salmon
- 5/11/2007 (72 FR 26722) Final ESA Listing for Puget Sound Steelhead
- 1/5/2006 (71 FR 5248) Final Listing Determinations for 10 Distinct Population Segments of West Coast Steelhead
- 6/28/2005 (70 FR 37160) Final ESA Listing for 16 ESU's of West Coast Salmon
- 5/1/2002 (67 FR 21586) Range Extension for Endangered Steelhead in Southern California
- 6/7/2000 (65 FR 36074) Final ESA Listing for Northern California Steelhead
- 9/16/1999 (64 FR 50394) Final ESA Listing for Two Chinook Salmon ESUs in California
- 3/25/1999 (64 FR 14508) Final ESA Listing for Hood River Canal Summer-run and Columbia River Chum Salmon
- 3/25/1999 (64 FR 14517) Final ESA Listing for Middle Columbia River and Upper Willamette River Steelhead
- 3/25/1999 (64 FR 14528) Final ESA Listing for Ozette Lake Sockeye Salmon
- 3/24/1999 (64 FR 14308) Final ESA Listing for 4 ESU's of Chinook Salmon
- 3/19/1998 (63 FR 13347) Final ESA Listing for Lower Columbia River and Central Valley Steelhead
- 8/18/1997 (62 FR 43937) Final ESA Listing for 5 ESU's of Steelhead
- 5/6/1997 (62 FR 24588) Final ESA Listing for Southern Oregon / Northern California Coast Coho Salmon
- 10/31/1996 (61 FR 56138) Final ESA Listing for Central California Coast Coho Salmon
- 1/4/1994 (59 FR 222) Final ESA Listing for Sacramento River Winter-run Chinook Salmon
- 4/22/1992 (57 FR 14653) Final ESA Listing for Snake River Spring/summer-run and Snake River Fall Chinook Salmon
- 11/20/1991 (56 FR 58619) Final ESA Listing for Snake River Sockeye Salmon
- 11/5/1990 (55 FR 46515) Final ESA Listing for Sacramento River Winter-run Chinook Salmon

APPENDIX B: WASHINGTON STATE PRIORITY HABITATS AND SPECIES LIST FOR FIVE TUUSSO SOLAR PROJECT SITES

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE
PRIORITY HABITATS AND SPECIES REPORT

SOURCE DATASET: PHSPlusPublic
REPORT DATE: 07/21/2016 9.17

Query ID: P160721091657

Common Name / Scientific Name / Notes	Site Name / Source Dataset / Source Record / Source Date	Priority Area / Occurrence Type / More Information (URL) / Mgmt Recommendations	Accuracy	Federal Status / State Status / PHS Listing Status	Sensitive Data / Resolution	Source Entity / Geometry Type
Columbia spotted frog Rana luteiventris	WS_OccurPoint 131595 October 16, 2013	Occurrence Biotic detection http://wdfw.wa.gov/publications/pub.php?	GPS	N/A Candidate PHS LISTED	N AS MAPPED	WA Dept. of Fish and Wildlife Points
Freshwater Emergent	N/A NWIWetlands	Aquatic Habitat Aquatic habitat http://www.ecy.wa.	NA	N/A N/A PHS Listed	N AS MAPPED	US Fish and Wildlife Service Polygons
Freshwater Emergent	N/A NWIWetlands	Aquatic Habitat Aquatic habitat http://www.ecy.wa.	NA	N/A N/A PHS Listed	N AS MAPPED	US Fish and Wildlife Service Polygons
Greater Sage-grouse Centrocercus urophasianus	WS_OccurPoint 117172 April 01, 1994	Breeding Area Lek http://wdfw.wa.gov/publications/pub.php?	1/8 mile	Candidate Threatened PHS LISTED	Y TOWNSHIP	WA Dept. of Fish and Wildlife Points
Sharp-tailed Snake Contia tenuis	WS_OccurPoint 18950 January 01, 2003	Occurrence Biotic detection http://wdfw.wa.gov/publications/pub.php?	1/4 mile (Quarter	N/A Candidate PHS LISTED	Y QTR-TWP	WA Dept. of Fish and Wildlife Points

DISCLAIMER. This report includes information that the Washington Department of Fish and Wildlife (WDFW) maintains in a central computer database. It is not an attempt to provide you with an official agency response as to the impacts of your project on fish and wildlife. This information only documents the location of fish and wildlife resources to the best of our knowledge. It is not a complete inventory and it is important to note that fish and wildlife resources may occur in areas not currently known to WDFW biologists, or in areas for which comprehensive surveys have not been conducted. Site specific surveys are frequently necesssary to rule out the presence of priority resources. Locations of fish and wildlife resources are subject to vraition caused by disturbance, changes in season and weather, and other factors. WDFW does not recommend using reports more than six months old.

WDFW Test Map



July 21, 2016

PHS Report Clip Area
PT
LN
AS MAPPED
SECTION
QTR-TWP
TOWNSHIP

1:19,842

0 0.15 0.3 0.6 mi
0 0.275 0.55 1.1 km

WDFW

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE
PRIORITY HABITATS AND SPECIES REPORT

SOURCE DATASET: PHSPlusPublic
REPORT DATE: 01/13/2017 1.56

Query ID: P170113135551

Common Name / Scientific Name / Notes	Site Name / Source Dataset / Source Record / Source Date	Priority Area / Occurrence Type / More Information (URL) / Mgmt Recommendations	Accuracy	Federal Status / State Status / PHS Listing Status	Sensitive Data / Resolution	Source Entity / Geometry Type
Chinook Oncorhynchus tshawytscha	Dry Creek SASI 1747	Occurrence Occurrence http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	Not Warranted N/A PHS Listed	N AS MAPPED	WDFW Fish Program Lines
Freshwater Emergent	N/A NWIWetlands	Aquatic Habitat Aquatic habitat http://www.ecy.wa.	NA	N/A N/A PHS Listed	N AS MAPPED	US Fish and Wildlife Service Polygons
Freshwater Emergent	N/A NWIWetlands	Aquatic Habitat Aquatic habitat http://www.ecy.wa.	NA	N/A N/A PHS Listed	N AS MAPPED	US Fish and Wildlife Service Polygons
Freshwater Emergent	N/A NWIWetlands	Aquatic Habitat Aquatic habitat http://www.ecy.wa.	NA	N/A N/A PHS Listed	N AS MAPPED	US Fish and Wildlife Service Polygons
Freshwater Emergent	N/A NWIWetlands	Aquatic Habitat Aquatic habitat http://www.ecy.wa.	NA	N/A N/A PHS Listed	N AS MAPPED	US Fish and Wildlife Service Polygons
Freshwater Emergent	N/A NWIWetlands	Aquatic Habitat Aquatic habitat http://www.ecy.wa.	NA	N/A N/A PHS Listed	N AS MAPPED	US Fish and Wildlife Service Polygons
Freshwater Emergent	N/A NWIWetlands	Aquatic Habitat Aquatic habitat http://www.ecy.wa.	NA	N/A N/A PHS Listed	N AS MAPPED	US Fish and Wildlife Service Polygons

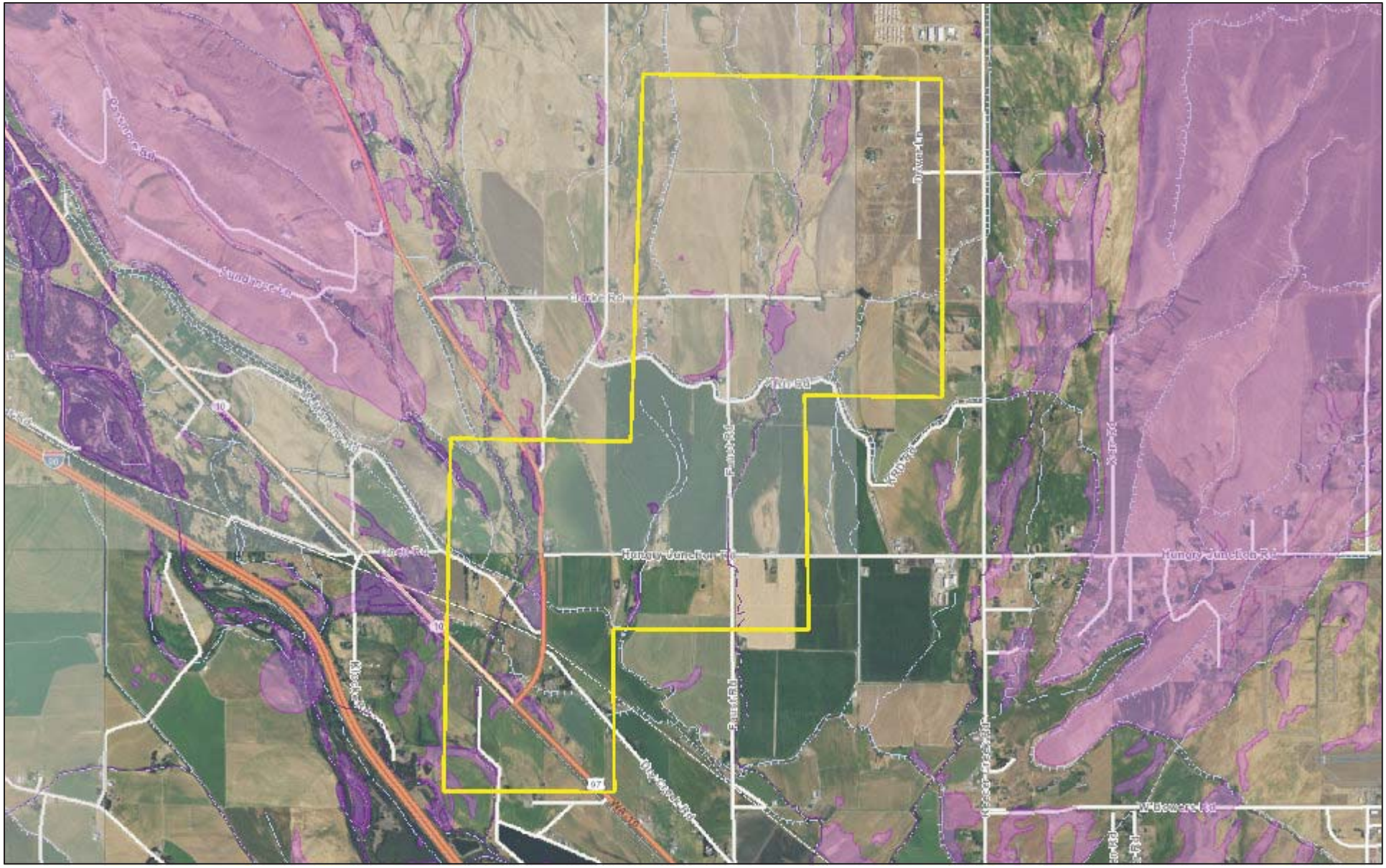
Common Name Scientific Name Notes	Site Name Source Dataset Source Record Source Date	Priority Area Occurrence Type More Information (URL) Mgmt Recommendations	Accuracy	Federal Status State Status PHS Listing Status	Sensitive Data Resolution	Source Entity Geometry Type
Freshwater Emergent	N/A NWIWetlands	Aquatic Habitat Aquatic habitat http://www.ecy.wa.	NA	N/A N/A PHS Listed	N AS MAPPED	US Fish and Wildlife Service Polygons
Freshwater Emergent	N/A NWIWetlands	Aquatic Habitat Aquatic habitat http://www.ecy.wa.	NA	N/A N/A PHS Listed	N AS MAPPED	US Fish and Wildlife Service Polygons
Freshwater Emergent	N/A NWIWetlands	Aquatic Habitat Aquatic habitat http://www.ecy.wa.	NA	N/A N/A PHS Listed	N AS MAPPED	US Fish and Wildlife Service Polygons
Freshwater Emergent	N/A NWIWetlands	Aquatic Habitat Aquatic habitat http://www.ecy.wa.	NA	N/A N/A PHS Listed	N AS MAPPED	US Fish and Wildlife Service Polygons
Freshwater Emergent	N/A NWIWetlands	Aquatic Habitat Aquatic habitat http://www.ecy.wa.	NA	N/A N/A PHS Listed	N AS MAPPED	US Fish and Wildlife Service Polygons
Freshwater Emergent	N/A NWIWetlands	Aquatic Habitat Aquatic habitat http://www.ecy.wa.	NA	N/A N/A PHS Listed	N AS MAPPED	US Fish and Wildlife Service Polygons
Freshwater Emergent	N/A NWIWetlands	Aquatic Habitat Aquatic habitat http://www.ecy.wa.	NA	N/A N/A PHS Listed	N AS MAPPED	US Fish and Wildlife Service Polygons

Common Name Scientific Name Notes	Site Name Source Dataset Source Record Source Date	Priority Area Occurrence Type More Information (URL) Mgmt Recommendations	Accuracy	Federal Status State Status PHS Listing Status	Sensitive Data Resolution	Source Entity Geometry Type
Freshwater Emergent	N/A NWIWetlands	Aquatic Habitat Aquatic habitat http://www.ecy.wa.	NA	N/A N/A PHS Listed	N AS MAPPED	US Fish and Wildlife Service Polygons
Freshwater Emergent	N/A NWIWetlands	Aquatic Habitat Aquatic habitat http://www.ecy.wa.	NA	N/A N/A PHS Listed	N AS MAPPED	US Fish and Wildlife Service Polygons
Freshwater Emergent	N/A NWIWetlands	Aquatic Habitat Aquatic habitat http://www.ecy.wa.	NA	N/A N/A PHS Listed	N AS MAPPED	US Fish and Wildlife Service Polygons
Freshwater Emergent	N/A NWIWetlands	Aquatic Habitat Aquatic habitat http://www.ecy.wa.	NA	N/A N/A PHS Listed	N AS MAPPED	US Fish and Wildlife Service Polygons
Freshwater Emergent	N/A NWIWetlands	Aquatic Habitat Aquatic habitat http://www.ecy.wa.	NA	N/A N/A PHS Listed	N AS MAPPED	US Fish and Wildlife Service Polygons
Freshwater Emergent	N/A NWIWetlands	Aquatic Habitat Aquatic habitat http://www.ecy.wa.	NA	N/A N/A PHS Listed	N AS MAPPED	US Fish and Wildlife Service Polygons
Rainbow Trout Oncorhynchus mykiss	Reecer Creek SWIFD 4396	Occurrence/Migration Occurrence/migration http://wdfw.wa.gov/wlm/diversty/soc/soc.htm	NA	N/A N/A PHS LISTED	N AS MAPPED	 Lines
Rainbow Trout Oncorhynchus mykiss	Dry Creek SWIFD 4442	Occurrence/Migration Occurrence/migration http://wdfw.wa.gov/wlm/diversty/soc/soc.htm	NA	N/A N/A PHS LISTED	N AS MAPPED	 Lines

Common Name Scientific Name Notes	Site Name Source Dataset Source Record Source Date	Priority Area Occurrence Type More Information (URL) Mgmt Recommendations	Accuracy	Federal Status State Status PHS Listing Status	Sensitive Data Resolution	Source Entity Geometry Type
Sharp-tailed Snake Contia tenuis	 WS_OccurPoint 110980 March 19, 2007	Occurrence Biotic detection http://wdfw.wa.gov/publications/pub.php?	GPS	N/A Candidate PHS LISTED	Y QTR-TWP	WA Dept. of Fish and Wildlife Points
Spring Chinook Oncorhynchus tshawytscha	Dry Creek SWIFD 4439	Breeding Area Breeding area http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	N/A N/A PHS LISTED	N AS MAPPED	 Lines
Steelhead Oncorhynchus mykiss	Dry Creek SASI 6894	Occurrence Occurrence http://wdfw.wa.gov/wlm/diversty/soc/soc.htm	NA	Threatened N/A PHS Listed	N AS MAPPED	WDFW Fish Program Lines
Summer Steelhead Oncorhynchus mykiss	Dry Creek SWIFD 4443	Breeding Area Breeding area http://wdfw.wa.gov/wlm/diversty/soc/soc.htm	NA	N/A N/A PHS LISTED	N AS MAPPED	 Lines

DISCLAIMER. This report includes information that the Washington Department of Fish and Wildlife (WDFW) maintains in a central computer database. It is not an attempt to provide you with an official agency response as to the impacts of your project on fish and wildlife. This information only documents the location of fish and wildlife resources to the best of our knowledge. It is not a complete inventory and it is important to note that fish and wildlife resources may occur in areas not currently known to WDFW biologists, or in areas for which comprehensive surveys have not been conducted. Site specific surveys are frequently necesssary to rule out the presence of priority resources. Locations of fish and wildlife resources are subject to vraition caused by disturbance, changes in season and weather, and other factors. WDFW does not recommend using reports more than six months old.

WDFW Test Map


Hungry Junction Rd
Hungry Junction Rd
Hungry Junction Rd
Plain Rd
Plain Rd
Plain Rd
Dawn Rd
Dawn Rd
Dawn

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE
PRIORITY HABITATS AND SPECIES REPORT

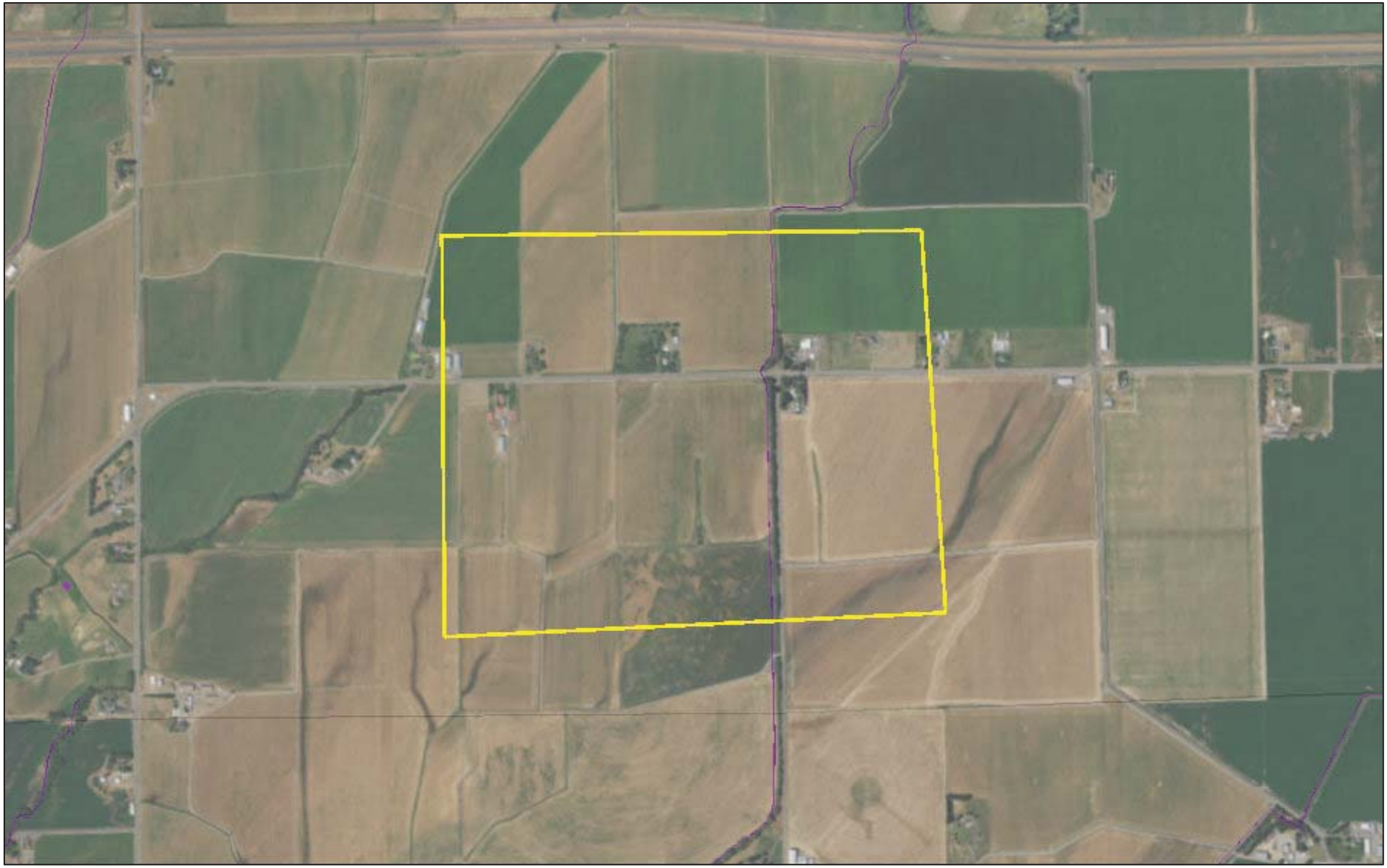
SOURCE DATASET: PHSPlusPublic
REPORT DATE: 07/26/2016 8.27

Query ID: P160726082724

Common Name / Scientific Name / Notes	Site Name / Source Dataset / Source Record / Source Date	Priority Area / Occurrence Type / More Information (URL) / Mgmt Recommendations	Accuracy	Federal Status / State Status / PHS Listing Status	Sensitive Data / Resolution	Source Entity / Geometry Type
Chinook Oncorhynchus tshawytscha	Coleman Creek SASI 1747	Occurrence Occurrence http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	Not Warranted N/A PHS Listed	N AS MAPPED	WDFW Fish Program Lines
Greater Sage-grouse Centrocercus urophasianus	WS_OccurPoint 117172 April 01, 1994	Breeding Area Lek http://wdfw.wa.gov/publications/pub.php?	1/8 mile	Candidate Threatened PHS LISTED	Y TOWNSHIP	WA Dept. of Fish and Wildlife Points
Rainbow Trout Oncorhynchus mykiss	Coleman Creek SWIFD 4096	Occurrence/Migration Occurrence/migration http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	N/A N/A PHS LISTED	N AS MAPPED	 Lines
Rainbow Trout Oncorhynchus mykiss	Coleman Creek SWIFD 4097	Occurrence/Migration Occurrence/migration http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	N/A N/A PHS LISTED	N AS MAPPED	 Lines
Spring Chinook Oncorhynchus tshawytscha	Coleman Creek SWIFD 4092	Breeding Area Breeding area http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	N/A N/A PHS LISTED	N AS MAPPED	 Lines
Summer Steelhead Oncorhynchus mykiss	Coleman Creek SWIFD 4100	Occurrence/Migration Occurrence/migration http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	N/A N/A PHS LISTED	N AS MAPPED	 Lines

DISCLAIMER. This report includes information that the Washington Department of Fish and Wildlife (WDFW) maintains in a central computer database. It is not an attempt to provide you with an official agency response as to the impacts of your project on fish and wildlife. This information only documents the location of fish and wildlife resources to the best of our knowledge. It is not a complete inventory and it is important to note that fish and wildlife resources may occur in areas not currently known to WDFW biologists, or in areas for which comprehensive surveys have not been conducted. Site specific surveys are frequently necesssary to rule out the presence of priority resources. Locations of fish and wildlife resources are subject to vraition caused by disturbance, changes in season and weather, and other factors. WDFW does not recommend using reports more than six months old.

WDFW Test Map



July 26, 2016

PHS Report Clip Area
PT
LN
AS MAPPED
SECTION
QTR-TWP
TOWNSHIP

1:19,842

0 0.15 0.3 0.6 mi
0 0.275 0.55 1.1 km

WDFW

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE
PRIORITY HABITATS AND SPECIES REPORT

SOURCE DATASET: PHSPlusPublic
REPORT DATE: 09/13/2016 3.50

Query ID: P160913155010

Common Name / Scientific Name / Notes	Site Name / Source Dataset / Source Record / Source Date	Priority Area / Occurrence Type / More Information (URL) / Mgmt Recommendations	Accuracy	Federal Status / State Status / PHS Listing Status	Sensitive Data / Resolution	Source Entity / Geometry Type
Bull Trout Salvelinus malma	Yakima River SASI 8468	Occurrence Occurrence http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	Threatened N/A PHS Listed	N AS MAPPED	WDFW Fish Program Lines
Chinook Oncorhynchus tshawytscha	Yakima River SASI 1747	Occurrence Occurrence http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	Not Warranted N/A PHS Listed	N AS MAPPED	WDFW Fish Program Lines
Coho Oncorhynchus kisutch	Yakima River SWIFD 2321	Occurrence/Migration Occurrence/migration http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	N/A N/A PHS LISTED	N AS MAPPED	Lines
Coho Oncorhynchus kisutch	SWIFD 4472	Occurrence/Migration Occurrence/migration http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	N/A N/A PHS LISTED	N AS MAPPED	Lines
Dolly Varden/ Bull Trout Salvelinus malma	Yakima River SWIFD 2324	Occurrence/Migration Occurrence/migration http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	N/A N/A PHS LISTED	N AS MAPPED	Lines
Dolly Varden/ Bull Trout Salvelinus malma	SWIFD 4473	Occurrence/Migration Occurrence/migration http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	N/A N/A PHS LISTED	N AS MAPPED	Lines
Freshwater Emergent	N/A NWIWetlands	Aquatic Habitat Aquatic habitat http://www.ecy.wa.	NA	N/A N/A PHS Listed	N AS MAPPED	US Fish and Wildlife Service Polygons

C-80

Common Name Scientific Name Notes	Site Name Source Dataset Source Record Source Date	Priority Area Occurrence Type More Information (URL) Mgmt Recommendations	Accuracy	Federal Status State Status PHS Listing Status	Sensitive Data Resolution	Source Entity Geometry Type
Freshwater Emergent	N/A NWIWetlands	Aquatic Habitat Aquatic habitat http://www.ecy.wa.	NA	N/A N/A PHS Listed	N AS MAPPED	US Fish and Wildlife Service Polygons
Freshwater Forested/Shrub	N/A NWIWetlands	Aquatic Habitat Aquatic habitat http://www.ecy.wa.	NA	N/A N/A PHS Listed	N AS MAPPED	US Fish and Wildlife Service Polygons
Freshwater Forested/Shrub	N/A NWIWetlands	Aquatic Habitat Aquatic habitat http://www.ecy.wa.	NA	N/A N/A PHS Listed	N AS MAPPED	US Fish and Wildlife Service Polygons
Freshwater Forested/Shrub	N/A NWIWetlands	Aquatic Habitat Aquatic habitat http://www.ecy.wa.	NA	N/A N/A PHS Listed	N AS MAPPED	US Fish and Wildlife Service Polygons
Freshwater Forested/Shrub	N/A NWIWetlands	Aquatic Habitat Aquatic habitat http://www.ecy.wa.	NA	N/A N/A PHS Listed	N AS MAPPED	US Fish and Wildlife Service Polygons
Great blue heron Ardea herodias	THORP WS_OccurPolygon 291 April 08, 2011	Breeding Area Colony http://wdfw.wa.gov/publications/pub.php?	Map 1:12,000 <= 33	N/A Monitored PHS LISTED	N AS MAPPED	WA Dept. of Fish and Wildlife Polygons
Osprey Pandion haliaetus	YAKIMA ISLAND WS_OccurPoint 69233 June 27, 1989	N/A Nest N/A	1/4 mile (Quarter	N/A Monitored NOT A PHS LISTED	N AS MAPPED	WA Dept. of Fish and Wildlife Points
Rainbow Trout Oncorhynchus mykiss	Yakima River SWIFD 2334	Occurrence/Migration Occurrence/migration http://wdfw.wa.gov/wlm/diversty/soc/soc.htm	NA	N/A N/A PHS LISTED	N AS MAPPED	Lines

Common Name Scientific Name Notes	Site Name Source Dataset Source Record Source Date	Priority Area Occurrence Type More Information (URL) Mgmt Recommendations	Accuracy	Federal Status State Status PHS Listing Status	Sensitive Data Resolution	Source Entity Geometry Type
Rainbow Trout Oncorhynchus mykiss	SWIFD 4435	Occurrence/Migration Occurrence/migration http://wdfw.wa.gov/wlm/diversty/soc/soc.htm	NA	N/A N/A PHS LISTED	N AS MAPPED	Lines
Rainbow Trout Oncorhynchus mykiss	SWIFD 4474	Occurrence/Migration Occurrence/migration http://wdfw.wa.gov/wlm/diversty/soc/soc.htm	NA	N/A N/A PHS LISTED	N AS MAPPED	Lines
Riverine	N/A NWIWetlands	Aquatic Habitat Aquatic habitat http://www.ecy.wa.	NA	N/A N/A PHS Listed	N AS MAPPED	US Fish and Wildlife Service Polygons
Spring Chinook Oncorhynchus tshawytscha	Yakima River SWIFD 2318	Breeding Area Breeding area http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	N/A N/A PHS LISTED	N AS MAPPED	Lines
Spring Chinook Oncorhynchus tshawytscha	SWIFD 4471	Breeding Area Breeding area http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	N/A N/A PHS LISTED	N AS MAPPED	Lines
Steelhead Oncorhynchus mykiss	Yakima River SASI 6894	Occurrence Occurrence http://wdfw.wa.gov/wlm/diversty/soc/soc.htm	NA	Threatened N/A PHS Listed	N AS MAPPED	WDFW Fish Program Lines
Summer Steelhead Oncorhynchus mykiss	Yakima River SWIFD 2337	Breeding Area Breeding area http://wdfw.wa.gov/wlm/diversty/soc/soc.htm	NA	N/A N/A PHS LISTED	N AS MAPPED	Lines
Summer Steelhead Oncorhynchus mykiss	SWIFD 4475	Breeding Area Breeding area http://wdfw.wa.gov/wlm/diversty/soc/soc.htm	NA	N/A N/A PHS LISTED	N AS MAPPED	Lines

Common Name / Scientific Name / Notes	Site Name / Source Dataset / Source Record / Source Date	Priority Area / Occurrence Type / More Information (URL) / Mgmt Recommendations	Accuracy	Federal Status / State Status / PHS Listing Status	Sensitive Data / Resolution	Source Entity / Geometry Type
Westslope Cutthroat Oncorhynchus clarki lewisi	Yakima River SWIFD 2342	Occurrence/Migration Occurrence/migration http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	N/A N/A PHS LISTED	N AS MAPPED	 Lines

DISCLAIMER. This report includes information that the Washington Department of Fish and Wildlife (WDFW) maintains in a central computer database. It is not an attempt to provide you with an official agency response as to the impacts of your project on fish and wildlife. This information only documents the location of fish and wildlife resources to the best of our knowledge. It is not a complete inventory and it is important to note that fish and wildlife resources may occur in areas not currently known to WDFW biologists, or in areas for which comprehensive surveys have not been conducted. Site specific surveys are frequently necesssary to rule out the presence of priority resources. Locations of fish and wildlife resources are subject to vraition caused by disturbance, changes in season and weather, and other factors. WDFW does not recommend using reports more than six months old.

WDFW Test Map



September 13, 2016

PHS Report Clip Area
PT
LN
AS MAPPED
SECTION
QTR-TWP
TOWNSHIP

1:19,842

0 0.15 0.3 0.6 mi
0 0.275 0.55 1.1 km

WDFW

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE
PRIORITY HABITATS AND SPECIES REPORT

SOURCE DATASET: PHSPlusPublic
REPORT DATE: 01/11/2017 7.22

Query ID: P170111192202

Common Name / Scientific Name / Notes	Site Name / Source Dataset / Source Record / Source Date	Priority Area / Occurrence Type / More Information (URL) / Mgmt Recommendations	Accuracy	Federal Status / State Status / PHS Listing Status	Sensitive Data / Resolution	Source Entity / Geometry Type
Bull Trout Salvelinus malma	Yakima River SASI 8468	Occurrence Occurrence http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	Threatened N/A PHS Listed	N AS MAPPED	WDFW Fish Program Lines
Chinook Oncorhynchus tshawytscha	Yakima River SASI 1747	Occurrence Occurrence http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	Not Warranted N/A PHS Listed	N AS MAPPED	WDFW Fish Program Lines
Coho Oncorhynchus kisutch	Yakima River SWIFD 2321	Occurrence/Migration Occurrence/migration http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	N/A N/A PHS LISTED	N AS MAPPED	 Lines
Dolly Varden/ Bull Trout Salvelinus malma	Yakima River SWIFD 2324	Occurrence/Migration Occurrence/migration http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	N/A N/A PHS LISTED	N AS MAPPED	 Lines
Freshwater Emergent	N/A NWIWetlands	Aquatic Habitat Aquatic habitat http://www.ecy.wa.	NA	N/A N/A PHS Listed	N AS MAPPED	US Fish and Wildlife Service Polygons
Freshwater Forested/Shrub	N/A NWIWetlands	Aquatic Habitat Aquatic habitat http://www.ecy.wa.	NA	N/A N/A PHS Listed	N AS MAPPED	US Fish and Wildlife Service Polygons
Freshwater Forested/Shrub	N/A NWIWetlands	Aquatic Habitat Aquatic habitat http://www.ecy.wa.	NA	N/A N/A PHS Listed	N AS MAPPED	US Fish and Wildlife Service Polygons

Common Name Scientific Name Notes	Site Name Source Dataset Source Record Source Date	Priority Area Occurrence Type More Information (URL) Mgmt Recommendations	Accuracy	Federal Status State Status PHS Listing Status	Sensitive Data Resolution	Source Entity Geometry Type
Rainbow Trout Oncorhynchus mykiss	Yakima River SWIFD 2334	Occurrence/Migration Occurrence/migration http://wdfw.wa.gov/wlm/diversty/soc/soc.htm	NA	N/A N/A PHS LISTED	N AS MAPPED	 Lines
Spring Chinook Oncorhynchus tshawytscha	Yakima River SWIFD 2318	Breeding Area Breeding area http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	N/A N/A PHS LISTED	N AS MAPPED	 Lines
Steelhead Oncorhynchus mykiss	Yakima River SASI 6894	Occurrence Occurrence http://wdfw.wa.gov/wlm/diversty/soc/soc.htm	NA	Threatened N/A PHS Listed	N AS MAPPED	WDFW Fish Program Lines
Summer Steelhead Oncorhynchus mykiss	Yakima River SWIFD 2337	Breeding Area Breeding area http://wdfw.wa.gov/wlm/diversty/soc/soc.htm	NA	N/A N/A PHS LISTED	N AS MAPPED	 Lines
Waterfowl Concentrations	IRENE REINHART PARK PHSREGION 901735	Regular Concentration Regular concentration http://wdfw.wa.gov/publications/pub.php?	1/4 mile (Quarter	N/A N/A PHS LISTED	N AS MAPPED	WA Dept. of Fish and Wildlife Polygons
Westslope Cutthroat Oncorhynchus clarki lewisi	Yakima River SWIFD 2342	Occurrence/Migration Occurrence/migration http://wdfw.wa.gov/wlm/diversty/soc/soc.htm http://wdfw.wa.gov/publications/pub.php?	NA	N/A N/A PHS LISTED	N AS MAPPED	 Lines

DISCLAIMER. This report includes information that the Washington Department of Fish and Wildlife (WDFW) maintains in a central computer database. It is not an attempt to provide you with an official agency response as to the impacts of your project on fish and wildlife. This information only documents the location of fish and wildlife resources to the best of our knowledge. It is not a complete inventory and it is important to note that fish and wildlife resources may occur in areas not currently known to WDFW biologists, or in areas for which comprehensive surveys have not been conducted. Site specific surveys are frequently necesssary to rule out the presence of priority resources. Locations of fish and wildlife resources are subject to vraition caused by disturbance, changes in season and weather, and other factors. WDFW does not recommend using reports more than six months old.

WDFW Test Map



January 11, 2017

PHS Report Clip Area

PT

LN

POLY

AS MAPPED

SECTION

QTR-TWP

TOWNSHIP

1:19,842

0 0.15 0.3 0.6 mi

0 0.275 0.55 1.1 km

Washington Fish and Wildlife
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus

APPENDIX C: BIRD OBSERVATION LIST FOR FIVE TUUSSO SOLAR PROJECT SITES

Table C-1. Bird Observations

Common Name	Scientific Name	Solar Sites Where Observed				
		Camas	Fumaria	Penstemon	Typha	Urtica
American Crow	*Corvus brachyrhynchos*	x	x			x
American Kestrel	*Falco sparverius*					x
American Robin	*Turdus migratorius*		x	x	x	
Bald Eagle	*Haliaeetus leucocephalus*		x	x		
Belted Kingfisher	*Megaceryle alcyon*				x	x
Black-billed Magpie	*Pica hudsonia*	x	x		x	x
Black-capped Chickadee	*Poecile atricapillus*	x	x	x	x	
Brewer's Blackbird	*Euphagus cyanocephalus*	x	x			x
California Quail	*Callipepla californica*		x		x	
Canada Goose	*Branta canadensis*		x	x	x	x
Common Merganser	*Mergus merganser*				x	
Common Raven	*Corvus corax*		x	x	x	x
Downy Woodpecker	*Picoides pubescens*	x			x	
Eurasian Collared-Dove	*Streptopelia decaocto*		x		x	x
European Starling	*Sturnus vulgaris*					x
Great Blue Heron	*Ardea herodias*	x			x	x
Green-winged Teal	*Anas carolinensis*				x	
House Finch	*Haemorhous mexicanus*		x		x	
House Sparrow	*Passer domesticus*		x			
Killdeer	*Charadrius vociferus*	x	x	x	x	x
Mallard	*Anas platyrhynchos*		x		x	x
Mourning Dove	*Zenaida macroura*	x	x	x	x	
Northern Flicker	*Colaptes auratus*					x
Northern Harrier	*Circus cyaneus*		x	x	x	x
Olive-sided Flycatcher	*Contopus cooperi*		x			
Osprey	*Pandion haliaetus*	x				x
Prairie Falcon	*Falco mexicanus*		x			
Red-tailed Hawk	*Buteo jamaicensis*	x	x	x	x	
Red-winged Blackbird	*Agelaius phoeniceus*	x	x	x	x	x
Savannah Sparrow	*Passerculus sandwichensis*		x			

Common Name	Scientific Name	Solar Sites Where Observed				
		Camas	Fumaria	Penstemon	Typha	Urtica
Say's Phoebe	*Sayornis saya*				x	
Song Sparrow	*Melospiza melodia*		x			
Tree Swallow	*Tachycineta bicolor*	x		x	x	x
Turkey Vulture	*Cathartes aura*		x			
Western Meadowlark	*Sturnella neglecta*		x			
White-crowned Sparrow	*Zonotrichia leucophrys*	x				
Wilson's Snipe	*Gallinago delicata*		x		x	
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*		x			
Yellow-rumped Warbler	*Setophaga coronata*	x	x	x		

APPENDIX D: CORRESPONDENCE TO-DATE WITH WDFW REGARDING THE FIVE TUUSSO SOLAR PROJECT SITES

Jamie C. M. Young

From: Jamie C. M. Young
Sent: Wednesday, May 03, 2017 4:11 PM
To: 'Downes, Scott G (DFW)'; Renfrow, Brent D (DFW)
Cc: Evan Dulin; Joy Potter; Greg Poremba; Sara Twitchell; Catherine Smith
Subject: RE: TUUSSO solar sites visit in Kittitas County-raptor nest avoidance guidance

Thanks again, Scott ☺!

From: Downes, Scott G (DFW) [mailto:Scott.Downes@dfw.wa.gov]
Sent: Wednesday, May 03, 2017 3:59 PM
To: Jamie C. M. Young <jyoung@swca.com>; Renfrow, Brent D (DFW) <Brent.Renfrow@dfw.wa.gov>
Cc: Evan Dulin <EDulin@swca.com>; Joy Potter <pcg@fairpoint.net>; Greg Poremba <GPoremba@swca.com>; Sara Twitchell <STwitchell@swca.com>; Catherine Smith <CCSmith@swca.com>
Subject: RE: TUUSSO solar sites visit in Kittitas County-raptor nest avoidance guidance

Jamie,
Yes, there is a well-defined way for consultants to obtain the PHS data directly. Here is the link to that process:
http://wdfw.wa.gov/conservation/phs/maps_data/

It will involve sending in a request for the data and signing a confidentiality agreement with WDFW (not to display the information improperly). All of which is fairly straightforward (I used to do them frequently when I worked as a consultant). On that webpage is a link to how certain data should be displayed-i.e. certain status species cannot have their information precise locations shown on public maps or reports. There is a number if you need technical assistance on requesting the documents: (360) 902-2543.

Let me know if there are other things I can do to help.

Scott

Scott Downes
Fish & Wildlife Habitat Biologist
Washington Department of Fish and Wildlife
Region 3 Habitat Program
1701 South 24th Ave
Yakima, WA 98902-5720
Scott.Downes@dfw.wa.gov
Office-509-457-9307
Cell-509-607-3578

From: Jamie C. M. Young [mailto:jyoung@swca.com]
Sent: Wednesday, May 03, 2017 10:47 AM
To: Downes, Scott G (DFW); Renfrow, Brent D (DFW)
Cc: Evan Dulin; Joy Potter; Greg Poremba; Sara Twitchell; Catherine Smith
Subject: RE: TUUSSO solar sites visit in Kittitas County-raptor nest avoidance guidance

Thank you for this thorough response, Scott.

A separate question, do you know whether it is possible for us to obtain PHS mapper GIS data? Obtaining the GIS data directly from WDFW would be the most accurate and efficient way to include these data in our reports. If not possible to obtain the existing GIS data, then we will end up digitizing it.

Please let us know, if there's a way for us to request these data for Kittitas County, and who we should contact?

Thank you for your help! Sincerely, Jamie (208.262.9323)

From: Downes, Scott G (DFW) [mailto:Scott.Downes@dfw.wa.gov]
Sent: Monday, May 01, 2017 2:38 PM
To: Jamie C. M. Young <jyoung@swca.com>; Renfrow, Brent D (DFW) <Brent.Renfrow@dfw.wa.gov>
Cc: Evan Dulin <EDulin@swca.com>; Joy Potter <pcg@fairpoint.net>; Greg Poremba <GPoremba@swca.com>; Sara Twitchell <STwitchell@swca.com>
Subject: RE: TUUSSO solar sites visit in Kittitas County-raptor nest avoidance guidance

Jamie,
WDFW past guidance for project disturbance around raptor nests has been seasonal disturbance restrictions within 0.25 mile of non-listed raptor nests (red-tailed hawk and great horned owl are both non-listed).

Steps that WDFW would recommend:

1. As raptors can change their nesting locations slightly from year to year (though they often do have site fidelity to the same tree in multiple years), a nest survey of the trees near the project boundary (all possible nesting structures within 0.25 mile of the construction boundary) should be conducted the year of construction before construction begins to determine current occupancy.
2. Active raptor nests should get a seasonal no-construction buffer (personnel stay out of this area during the seasonal restriction) on 0.25 mile from the nest until the nest has either failed or young have fledged (left the nest). This is due to noise/activity disturbance which could cause the nest to be abandoned.
3. Exact timing varies by species. Red-tailed hawks typically start nesting by mid to late March (depending on the weather and the year) and are often completed by end of June. Great horned owls typically start in February and are completed by mid-May. A third species that often uses the valley is Swainson's hawk. They arrive later and start nesting later, typically late April for start of nesting. Swainson's often do not finish nesting until late July. Because of this varied time, it would be recommended that, if possible, a biologist monitor the nests to determine when the nest finishes and construction is cleared to enter the seasonal buffer.
4. Construction could start before birds initiate nesting for the year and then there would be one year of displacement as birds go elsewhere to nest that year, but this would not cause nest failure. In the Kittitas Valley, that may be tough to do as you would likely need to start construction to a degree to discourage birds by March for hawks and February for owls. If this was planned, we'd also want to review to ensure that we aren't causing sediment issues near the creeks by working in this late-winter/early-spring period.

Let me know if you have any further questions.

Scott

Scott Downes
Fish & Wildlife Habitat Biologist
Washington Department of Fish and Wildlife
Region 3 Habitat Program
1701 South 24th Ave
Yakima, WA 98902-5720
Scott.Downes@dfw.wa.gov
Office-509-457-9307

Cell-509-607-3578

From: Jamie C. M. Young [mailto:jyoung@swca.com]
Sent: Friday, April 28, 2017 6:13 PM
To: Downes, Scott G (DFW); Renfrow, Brent D (DFW)
Cc: Evan Dulin; Joy Potter; Greg Poremba; Sara Twitchell
Subject: RE: TUUSSO solar sites visit in Kittitas County

Hello Scott, and thank you again for this excellent summary.

Because we saw pairs of red-tailed hawks near 3 of the project sites and great horned owls on a nest near 1 site, we assume that these will be active nests next year. We are currently preparing our habitat assessment report, and will include in it recommendations to TUUSSO regarding noise and disturbance buffers and timing restrictions. At your earliest convenience, please provide any guidance or recommendations that WDFW would like to see included regarding these sensitive reproductive sites.

Thank you, Jamie (208.262.9323)

From: Jamie C. M. Young
Sent: Thursday, April 20, 2017 10:21 AM
To: 'Downes, Scott G (DFW)' <Scott.Downes@dfw.wa.gov>; Renfrow, Brent D (DFW) <Brent.Renfrow@dfw.wa.gov>
Cc: Evan Dulin <EDulin@swca.com>; Joy Potter <pcg@fairpoint.net>; Greg Poremba <GPoremba@swca.com>
Subject: RE: TUUSSO solar sites visit in Kittitas County

Thank you for providing this summary, Scott.

We appreciate you and Brent's responsiveness to joining us for the site visit on such short notice.

We look forward to continuing to work with WDFW on this project and will be in touch.

Sincerely, Jamie

From: Downes, Scott G (DFW) [mailto:Scott.Downes@dfw.wa.gov]
Sent: Thursday, April 20, 2017 10:06 AM
To: Jamie C. M. Young <jyoung@swca.com>; Renfrow, Brent D (DFW) <Brent.Renfrow@dfw.wa.gov>
Cc: Evan Dulin <EDulin@swca.com>; Joy Potter <pcg@fairpoint.net>; Greg Poremba <GPoremba@swca.com>
Subject: RE: TUUSSO solar sites visit in Kittitas County

Jamie, Evan and Joy,
Thank you for meeting with us last week. As promised, here are some general notes that we talked about. Sorry this has taken more time to get out than I had hoped. Before I get into specifics below, I want to say thank you for the early outreach to us on this project to address and investigate habitats impacts. To ensure that these measures remain successful as we go forward, it is important to keep us apprised of any changes to the plans and the path of permitting on this project. Whether it is decided that the project will go through EFSEC or Kittitas County Planning, either way we will need to sit down with that entity before permits are flown to ensure that they understand our role and habitat concerns. As promised, I won't be going that much into specifics below as we will craft a formal letter once the project is more fully understood and who is permitting it. The following is a general list of resources that we promised to pass along, as well as a list of areas that WDFW is likely to ask to be involved in.

Resources:

1. Jamie had a question on some amphibian egg identification. It seems possible they were Columbia Spotted Frog, but Central Washington University has an excellent herpetologist. He is Dr. David Darda: dardad@cwu.edu. I would recommend emailing him the pictures if you would like a more complete answer.

2. Historical imagery: As mentioned, CWU geography department has compiled a series of historical photos (1954 for Kittitas County) that help to show some historical content for the valley. These photos can be found at: http://www.cwu.edu/geography/central-washington-historical-aerial-photograph-project

3. WDFW PHS Guidelines-specifically for Great Blue Herons that we observed near the Typha site. There are some guidelines for avoidance to the colonies. In the link-some of the important areas are covered in Table 1. http://wdfw.wa.gov/publications/01371/

Table 1. Recommended buffers for nesting colonies

Year-round Buffers [a]			
Meters	**Feet**	**Setting**	**Percent built within a ¼ mile of the nest colony** [c]
300	984	Undeveloped	0 - 2%
200	656	Suburban/Rural	2 - 50%
60 [d]	197	Urban	≥ 50%
Seasonal Buffers [e]			
Meters	**Feet**	**Land Use Activity**	**Time of Year**
200	656	Unusually loud activities [f]	February to September
400	1,320	Extreme loud activities like blasting	

a Buffer guidelines based on *3, 4, 7, 15*.
b Rationale for setting-specific buffers based on observed heron tolerance variations associated with land use levels (*49, 52*)
c Cutoff percentages among undeveloped, urban, and suburban/rural as defined in *36, 49*.
d When birds in an urban area exhibit behavior indicative of a low tolerance to people, assign the 300 meter buffer regardless of setting.
e Seasonal buffer begins at the outer edge of the year-round buffer when specified land uses occur near a colony in the breeding season.
f These activities generates sounds exceeding 92 decibels when the sound reaches the outer boundary of the nesting colony (*58*).

4. Native seed sources mentioned. WDFW gets much of their native seed mixes from BFI natives seeds in Moses Lake. Excellent source of information and he can help to craft an appropriate mix that could work with the site and likely work with the landowner to meet their concerns about seed spread into adjoining farm fields. As a point of note, Jerry Benson owner of BFI used to work for WDFW long ago. http://www.bfinativeseeds.com/contact.aspx

Specific habitat issues:

1. For the most part these are on agricultural lands and locating them on these areas have started the process of minimizing habitat impacts. All/most of the sites are next to streams, so WDFW will want to continue to explore ways that we can provide habitat protection for these riparian areas, including restoring some of the riparian areas as we explored. This may be clustered as habitat mitigation, those details need to be worked out later. WDFW will want to be involved in proposed buffers and the scheme for restoration/planting of those buffers.
2. The Fumaria site appears to have the most intact habitat that currently could be supporting some wildlife value. To the extent possible it may be worth exploring if the existing vegetation could be left and the panels placed on the existing site.
3. The sites currently in irrigated agriculture will need a seed mix that can work with adjoining ag lands, the functionality of the solar sites and ideally provide some minimal value for animals, even if just some birds and pollinators. WDFW would like to be involved in review of the mixture of the site.
4. The Typa site has some erosion next to the Yakima River. A riparian restoration plan will not only help habitat, but will also likely help reduce further bank erosion that eventually may come next to the solar site.
5. Wildlife issues identified were:
    a. Great blue heron colony, we would likely ask for buffer guidance similar to our PHS reference above.

b. Raptor nests-several sites have some raptor nests next to the site. It is likely they'll need some surveys to identify what's active before the project is built and then some seasonal timing restrictions for noise and disturbance. WDFW can help to identify distances and timing for those seasonal restrictions.
c. Wetlands-several sites have wetland habitat that can and are supporting wildlife including birds, mammals and amphibians. WDFW would want to continue to review plans to ensure these habitats are being protected.
d. Perimeter fencing—several fencing options were discussed. More discussion needs to be had on this subject as plans develop. WDFW understands that security is a concern, but what wires are put on top of the fence could be the difference between minimal impacts to birds flying in the area and substantial impacts to various bird species. WDFW would like to be part of those discussions.

Those are the notes I have for now. Please keep us in the loop and if you have any questions, let me know. We'll work to be responsive on issues as they come up.

Scott

Scott Downes
Fish & Wildlife Habitat Biologist
Washington Department of Fish and Wildlife
Region 3 Habitat Program
1701 South 24th Ave
Yakima, WA 98902-5720
Scott.Downes@dfw.wa.gov
Office-509-457-9307
Cell-509-607-3578

From: Jamie C. M. Young [mailto:jyoung@swca.com]
Sent: Wednesday, April 05, 2017 9:08 PM
To: Downes, Scott G (DFW); Renfrow, Brent D (DFW)
Cc: Evan Dulin; Joy Potter; Greg Poremba
Subject: TUUSSO solar sites visit in Kittitas County

Scott and Brent,

I've attached a zipped geodatabase and PDF overview map for the TUUSSO solar sites near Ellensburg, WA, where we will conduct our site visit on Wednesday April 12th.

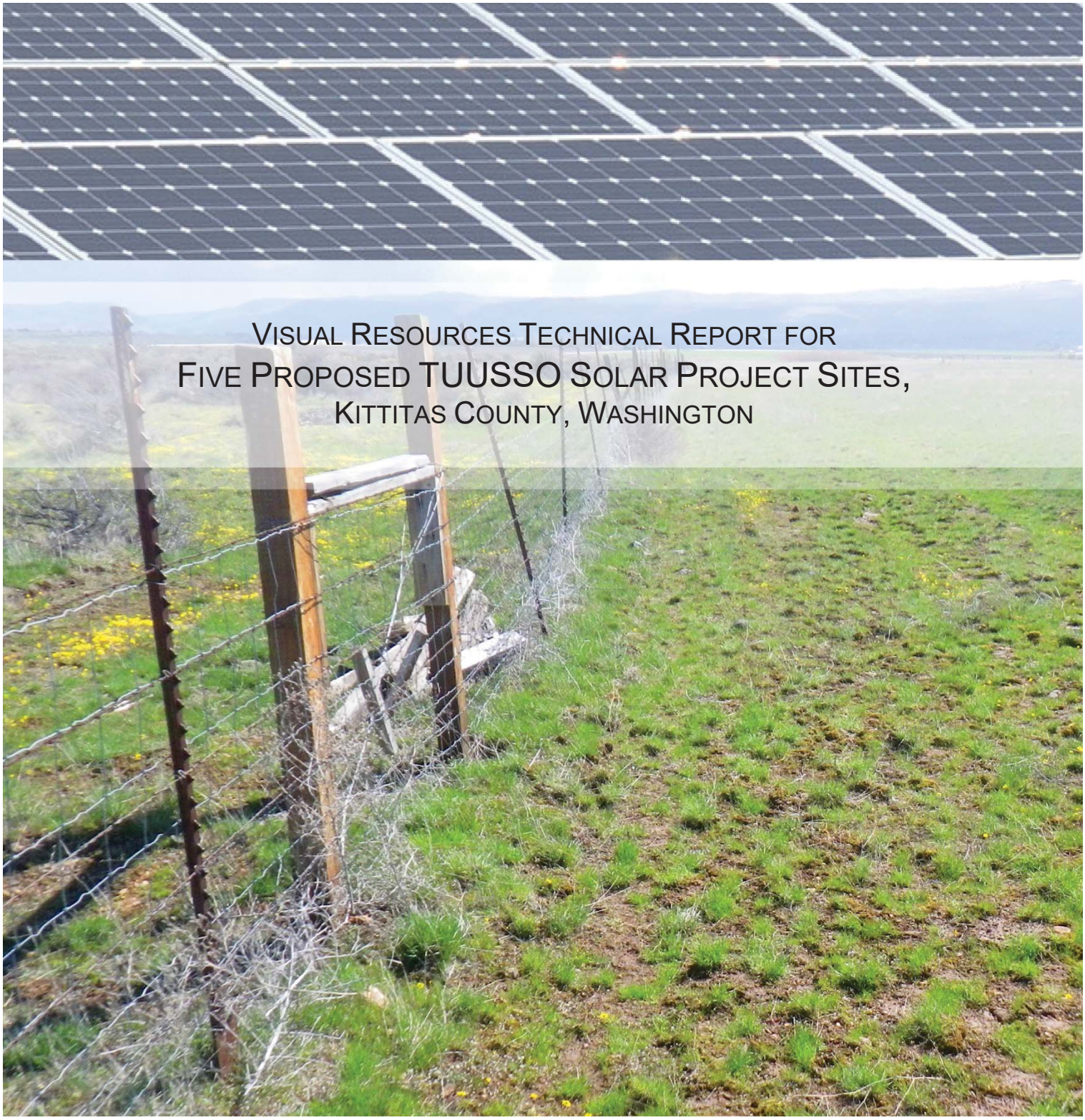
Evan and I look forward to meeting you that morning at the WDFW Ellensburg office. Please call my cell phone, if you have any questions in the meantime.

Thank you, Jamie

Jamie C. M. Young
Project Manager / Natural Resources Specialist

SWCA Environmental Consultants
4435 E. Canvasback Ave.
Post Falls, ID 83854
P 208.262.9323 | C 907.821.0404 | F 503.224.1851

Appendix D: Visual/Aesthetic Assessment Report



VISUAL RESOURCES TECHNICAL REPORT FOR FIVE PROPOSED TUUSSO SOLAR PROJECT SITES, KITTITAS COUNTY, WASHINGTON

September 12, 2017

SWCA ENVIRONMENTAL CONSULTANTS
SEATTLE, WASHINGTON

VISUAL RESOURCES TECHNICAL REPORT FOR FIVE PROPOSED TUUSSO SOLAR PROJECT SITES, KITTITAS COUNTY, WASHINGTON

Report Prepared for

TUUSSO Energy, LLC

September 12, 2017

Project Number 38727.05

SWCA Environmental Consultants
221 1st Ave W, Suite 205
Seattle, Washington 98119

TABLE OF CONTENTS

1 PROJECT BACKGROUND 5
2 VISUAL RESOURCE ASSESSMENT METHODOLOGY 5
2.1 Introduction to VRM System 5
2.2 Step 1. Viewshed Delineation 7
2.3 Step 2. KOP Selection 7
2.4 Step 3. Collect Field Data 8
2.5 Step 4. Visual Simulations and Analysis 8
3 GENERAL COUNTY SETTING 9
4 SOLAR PROJECT SITES 10
4.1 Camas Solar Site 12
4.1.1 Camas KOP 1 12
4.1.2 Camas KOP 2 12
4.1.3 Camas KOP 3 12
4.2 Fumaria Solar Site 13
4.2.1 Fumaria KOP 1 13
4.2.2 Fumaria KOP 2 13
4.2.3 Fumaria KOP 3 13
4.3 Penstemon Solar Site 14
4.3.1 Penstemon KOP 1 14
4.3.2 Penstemon KOP 2 14
4.3.3 Penstemon KOP 3 14
4.4 Typha Solar Site 14
4.4.1 Typha KOP 1 15
4.4.2 Typha KOP 2 15
4.4.3 Typha KOP 3 15
4.5 Urtica Solar Site 15
4.5.1 Urtica KOP 1 15
4.5.2 Urtica KOP 2 16
4.5.3 Urtica KOP 3 16
5 VIEWSHED DELINEATION 16
6 VISUAL CONTRAST ANALYSIS 18
6.1 Impacts Common to all Five Sites 18
6.1.1 Construction Impacts 18
6.1.2 Operational Impacts 19
6.2 Camas 20
6.2.1 Construction Impact 20
6.2.2 Operational Impacts 23
6.3 Fumaria 23

6.3.1 Construction Impacts 23
6.3.2 Operational Impacts 25
6.4 Penstemon 26
6.4.1 Construction Impacts 26
6.4.2 Operational Impacts 29
6.5 Typha 30
6.5.1 Construction Impacts 30
6.6 Urtica 32
6.6.1 Construction Impacts 32
6.6.2 Operational Impacts 35
7 MITIGATION MEASURES 36
7.1 General Mitigation Measures 36
7.2 Construction 36
7.3 Operations 37
8 LITERATURE CITED 38
APPENDIX A: KOP PHOTOGRAPH LOG 1
APPENDIX B: VISUAL CONTRAST RATING WORKSHEETS 1

LIST OF TABLES

Table 1. Criteria for Degree of Contrast 9
Table 2. Elements of Line, Form, Color, and Texture Common to all 5 Kittitas County Solar Project Sites 9
Table 3. Summary of the Five Kittitas County Solar Project KOP Locations, Directions of View, and Viewsheds 10
Table 4. Summary of Contrasts for the Camas KOPs 23
Table 5. Summary of Contrasts for the Fumaria KOPs 25
Table 6. Summary of Contrasts for the Penstemon KOPs 29
Table 7. Summary of Contrasts for the Typha KOPs 32
Table 8. Summary of Contrasts for the Urtica KOPs 35

LIST OF FIGURES

Figure 1. Project locations. 6
Figure 2. Project area viewsheds. 17
Figure 3. View from Camas KOP 1 – existing. 20
Figure 4. View from Camas KOP 1 – simulation. 21
Figure 5.View from Camas KOP 2 – existing. 21
Figure 6. View from Camas KOP 2 - simulation. 22
Figure 7. View from Camas KOP 3 – existing. 22
Figure 8. View from Camas KOP 3 – simulation. 23
Figure 9. View from Fumaria KOP 1 – existing. 24
Figure 10. View from Fumaria KOP 2 – existing. 24
Figure 11. View from Fumaria KOP 3 – existing. 25
Figure 12. View from Fumaria KOP 3 – simulation. 25
Figure 13. View from Penstemon KOP 1 – existing. 26
Figure 14. View from Penstemon KOP 1 – simulation. 27
Figure 15. View from Penstemon KOP 2 – existing. 27
Figure 16. View from Penstemon KOP 2 - simulation. 28
Figure 17. View from Penstemon KOP 3 – existing. 28
Figure 18. View from Penstemon KOP 3 – simulation. 29
Figure 19. View from Typha KOP 1 – existing. 30
Figure 20. View from Typha KOP 2 – existing. 31
Figure 21. View from Typha KOP 3 – existing. 31
Figure 22. View from Urtica KOP 1 – existing. 32
Figure 23. View from Urtica KOP 1 – simulation. 33
Figure 24. View from Urtica KOP 2 – existing. 33
Figure 25. View from Urtica KOP 2 - simulation. 34
Figure 26. View from Urtica KOP 3 – existing. 34
Figure 27. View from Urtica KOP 3 – simulation. 35

1 PROJECT BACKGROUND

TUUSSO Energy, LLC (TUUSSO), is proposing to construct the Columbia Solar Projects, five 5-MWac solar photovoltaic project sites in Kittitas County, Washington, for a total of 25 MWac (Figure 1). The five projects would be constructed over approximately 200 acres of the total 232 acres under lease. These projects have been sited based on several criteria: consistency with the Kittitas County zoning code and comprehensive plan, efficient land use by locating in one of the sunniest parts of Washington, access to a power off-taker by locating within Puget Sound Energy's (PSE's) service territory, avoiding environmentally sensitive areas by locating on previously disturbed farmland, and minimizing new electrical infrastructure by locating close to existing distribution lines.

This visual resource assessment describes both the current condition of the landscape within and surrounding the general project area, and the potential effects to the landscape from the proposed projects in order to support future documentation for the Washington State Environmental Policy Act (SEPA) (Revised Code of Washington [RCW] 43.21C). Other plans that are relevant to the project include:

- The Kittitas County Comprehensive Plan (Kittitas County 2016)
- The Ellensburg Comprehensive Plan (Ellensburg 2014)

2 VISUAL RESOURCE ASSESSMENT METHODOLOGY

For the purposes of analyzing the environmental effects from the development of the five proposed Columbia Solar Projects on the visual resources of the area, the U.S. Bureau of Land Management's (BLM's) Visual Resource System was applied. The BLM manages landscapes for varying levels of protection and modification, giving consideration to other resource values and uses and the scenic quality of the landscape. While each of the five solar project sites is located on private agricultural lands, the BLM's Visual Resource Management (VRM) analysis approach provides a useful tool for providing data that help to identify potential impacts to visual resources.

This technical report follows four steps to assess the impacts to the landscape using the BLM VRM system: 1) create viewshed delineations from each project location to determine areas from where each solar project can be seen and to select key observation points (KOPs); 2) use the viewshed delineations and points of interest to the public to select KOPs; 3) collect field data including photographs at each KOP and a description of the affected environment; 4) create visual simulations for each solar project using the KOP photographs and complete contrast rating forms to assess impacts. These four steps are outlined in detail below.

2.1 Introduction to VRM System

Visual resources (i.e., the landscape), as per the BLM VRM system, consist of landform (e.g., topography and soils), vegetation, bodies of water (e.g., lakes, streams, and rivers), and human-made structures (e.g., roads, buildings, and modifications of the land, vegetation, and water). These elements of the landscape can be described in terms of their form, line, color, and texture. Normally, the more variety of these elements there is in a landscape, the more interesting or scenic the landscape becomes, especially if the elements exist in harmony with each other.

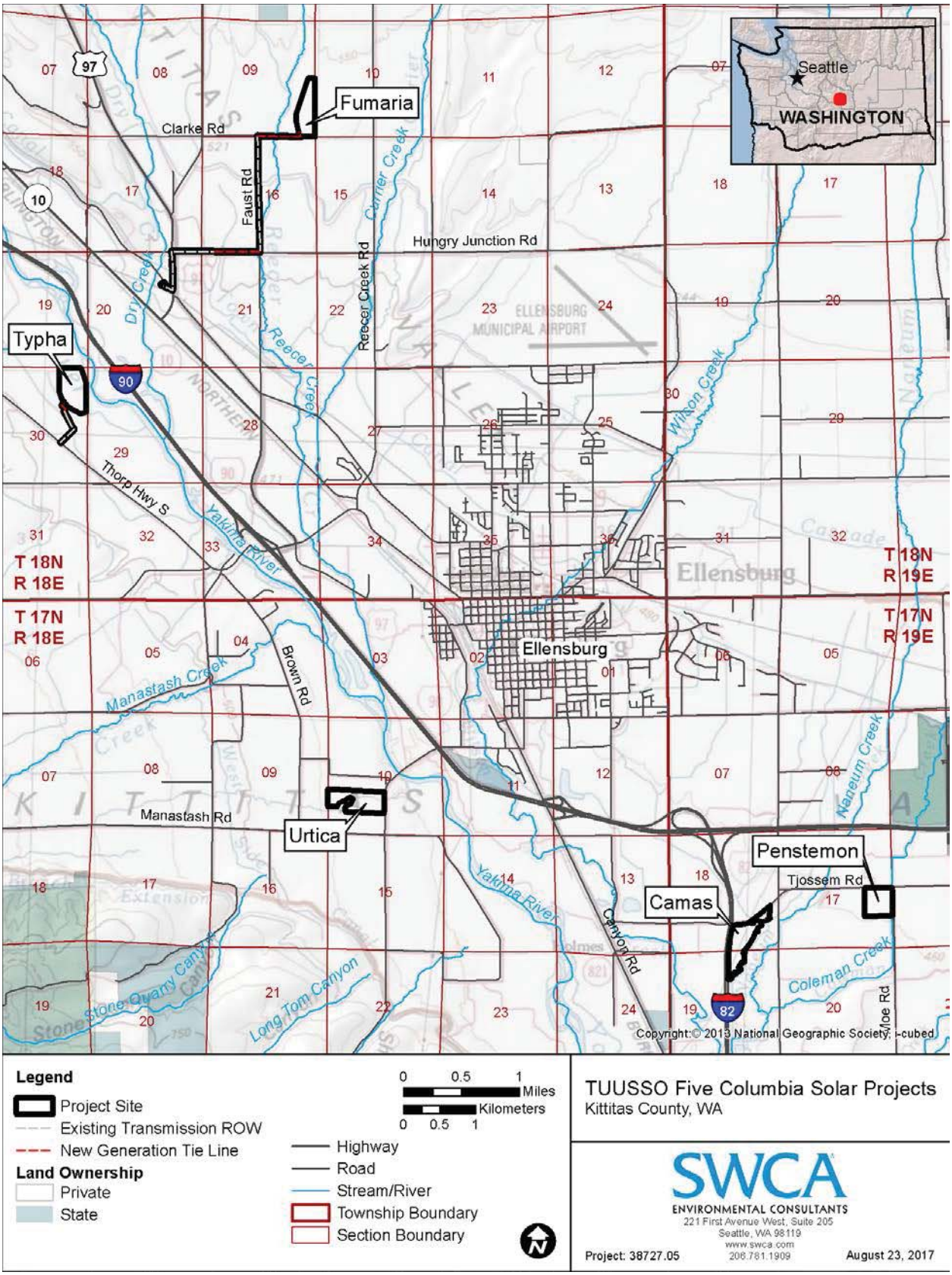


Figure 1. Project locations.

The VRM Analysis involves determining whether the potential visual impacts from proposed surface-disturbing activities or developments are consistent with the surrounding landscape, and any visual or aesthetic goals, objectives, or standards therein. A visual contrast rating process is used to compare the project features with the major features in the existing landscape using the basic design elements of form, line, color, and texture. This process is described in the BLM *Handbook H-8431-1, Visual Resource Contrast Rating*. The greater the degree of contrast between the elements, the greater the impact. The changes to the viewshed for the five Columbia Solar Project sites are portrayed through visual simulations that depict the project sites from select KOPs.

The purpose of preparing the visual simulations for the five Columbia Solar Project sites is to provide information to meet the Washington Energy Facility Site Evaluation Council (EFSEC) Application for Site Certification (ASC) and State Environmental Policy Act (SEPA) Environmental Checklist requirements for aesthetics (visual) (Washington Administrative Code [WAC] 197-11-960), which include:

1. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?
2. What views in the immediate vicinity would be altered or obstructed?
3. Proposed measures to reduce or control aesthetic impacts, if any.

Information gathered from the VRM approach was used to provide baseline conditions and impact analysis to support the aesthetics analysis requirements under SEPA.

2.2 Step 1. Viewshed Delineation

The visual analysis area is where potential visual effects to the landscape from each of the five Columbia Solar Project sites may be discerned. To better define the areas of analysis, SWCA Environmental Consultants (SWCA) prepared a viewshed delineation. The viewshed delineation reveals those areas from which the proposed projects would be in a clear line of sight (i.e., likely visible or not visible), and is a useful tool in defining the final areas of analysis and facilitating the selection of KOPs. To generate the three-dimensional (3-D) environment necessary for the viewshed delineation, Digital Elevation Model (DEM) data files from the U.S. Geological Survey were joined into a mosaic with an extent expansive enough to include the areas of analysis and potential KOPs. The areas of analysis for the five solar projects will consist of a 2-mile radius around each project site, which roughly marks the maximum distance from which an observer could clearly distinguish the facilities. Two miles is proposed due to the relatively flat topography of the Kittitas Valley. See Section 5 below for the viewshed delineation.

2.3 Step 2. KOP Selection

KOPs are used to generate representative views of the areas TUUSSO is proposing for the five Columbia Solar Project sites. KOPs represent views that an array of users would see, but the focus will be on sensitive viewers and their views. KOPs were identified considering the following potential major sensitive viewers/groups:

- those living or working in the surrounding topography,
- travelers along major transportation routes, and
- recreational users of public lands.

Factors that were considered in selecting the KOPs included:

- the types of users,
- amount of use,
- level of public interest,
- adjacent land uses,
- special areas, and
- other relevant factors that might be considered.

Three KOPs were selected to represent the viewshed from each of the five project sites (Camas, Fumaria, Penstemon, Typha, and Urtica Solar Project sites), resulting in a total of 15 KOPs. The viewshed is broken down into three areas; the foreground (0.31 mile from the KOP), the middle ground (0.50 mile from the KOP), and the background (up to 2.0 miles from the KOP). The existing conditions at each site and KOP are discussed below.

2.4 Step 3. Collect Field Data

SWCA conducted a field assessment at each of these KOPs that followed the protocols and methods for contrast rating evaluation described in detail in BLM Manual 8431 *Visual Resource Contrast Rating*. Data collected at each of the KOPs included the following:

- Global positioning system (GPS) location
- A digital photographic panorama of the viewscape, which is used for visual simulations
- Required information to complete the BLM's Visual Contrast Rating Worksheet
- Time of day and atmospheric conditions
- Existing structures and roads in the viewshed

The visual resources at each KOP were documented in a Visual Contrast Rating Worksheet (Appendix A).

2.5 Step 4. Visual Simulations and Analysis

A digital rendering of each solar project site was superimposed upon the selected KOP photographs, illustrating a simulated view of each of the projects, which assisted in determining contrasts before and after construction. For the KOPs carried forward for fieldwork and analyses, a visual contrast rating worksheet was completed for each KOP during fieldwork, as described below.

The photo simulations were constructed using ESRI ArcGIS Pro (for 3-D modeling of proposed structures), ESRI ArcGIS Desktop Advanced and Google Earth Pro (for site location, perspective, and landscape information), and Adobe Photoshop (for alteration of the existing landscape and site photographs).

Google Earth Pro was used to plot these photo points on a 3-D landscape. SWCA constructed a 3-D model of each of the five proposed solar photovoltaic project sites. Structures were modeled in SketchUp Pro and ArcGIS Pro. The models were placed in Google Earth Pro, SketchUp Pro, and ArcGIS Pro at their respective proposed locations. Using the same perspective and time of day as the actual photograph, images of the views from the KOPs in one or all of those programs were exported.

Photoshop was then used to incorporate the exported view into the photograph to generate the final simulation.

The final step in the visual impacts assessment is to rate the degree of contrast between the existing environment or viewshed and the environment after the solar project has been constructed. The degree of contrast is rated for each element (e.g., land/water, vegetation, and structures) as none, weak, moderate, or strong. The criteria for each degree of contrast are outlined in Table 1.

Table 1. Criteria for Degree of Contrast

Degree of Contrast	Criteria
None	The element contrast is not visible or perceived
Weak	The element contrast can be seen but does not attract attention
Moderate	The element contrast begins to attract attentions and begins to dominate the characteristic landscape
Strong	The element contrast demands attention, will not be overlooked, and is dominant in the landscape

Source: BLM Manual 8431 – Visual Resource Contrast Rating.

3 GENERAL COUNTY SETTING

The five proposed TUUSSO Columbia Solar Project sites are located in the Columbia Basin physiographic province, just east of the Northern and Southern Cascades provinces in Washington State. The area consists of scattered houses and farm buildings, flat agricultural fields, irrigation ditches, county roads, and major highways. The agricultural flatlands give way to rolling hills and to the north the high peaks of the Cascade Range. The topography of each of the five project areas can be characterized as flat. Elements of line, form, color and texture common to all project sites in the existing environment are shown in Table 2. Additional elements for each KOP site can be found in the descriptions for each KOP below and in Appendix B – Contrast Rating Forms. Note that the photographs for the KOPs were taken in April, before all of the vegetation had fully developed and during a time that there was no snow on the ground.

Table 2. Elements of Line, Form, Color, and Texture Common to all 5 Kittitas County Solar Project Sites

Element	Land/water	Vegetation	Structures
Form	Flat, rolling, tall, steep, and triangular	Oval, circular, and lanceolate	Houses/Buildings: Triangular, square, and rectangular Fences/Roads: Bold, simple, horizontal, and directional Signs/Utility Poles: Circular, square, hexagonal, and rectangular
Line	Straight, horizontal, and parallel	Vertical, parallel, and converging	Houses/Buildings: Straight, vertical, horizontal, and semi-circular Fences/Roads: Straight, bold, horizontal, vertical, parallel, and perpendicular Signs/Utility Poles: Geometric and bold
Color	Land: Brown, gray, and white Water: Dark olive green	Various shades of green, tan, gray, and brown	Houses/Buildings: Gray, white, red, and tan Fences/Roads: Gray, silver, white, and brown
Texture	Fine, medium, and smooth	Fine, medium, and coarse	Smooth, fine, directional, and matte

4 SOLAR PROJECT SITES

The overall visual character of each of the five Columbia Solar Project sites, as well as views from key observation points for each site, are described below. Inventory photographs are provided in Appendix A; the photographs used for simulations are provided in Section 6 below. The photographs are presented in Section 6 to offer a "side-by-side" view of the photographs showing the existing view (before) and the simulated view (after).

Table 3 summarizes the location, direction of view, and elements not common to each KOP.

Table 3. Summary of the Five Kittitas County Solar Project KOP Locations, Directions of View, and Viewsheds

KOP	Location	Direction of the View from the KOP	Viewshed
Camas Solar Project Site			
Camas KOP 1	U.S. Highway 82 at the southernmost tip of the Camas Solar Project site	Northeast	*Foreground*: Highway, fields, houses, and fences *Middle ground*: Same as the foreground *Background*: Rolling hills and snow-capped peaks
Camas KOP 2	Northeast tip of the Camas Solar Project site on Tjossem Road	Southwest to Southeast	*Foreground:* Open fields, roads, houses, farm buildings, fencing, road signs, and rows of trees *Middle ground:* Same as the foreground *Background*: Distant structures, flat agricultural lands, and trees
Camas KOP 3	Northwest intersection of U.S. Highway 82 and Tjossem Road.	Northeast to Southeast	*Foreground:* Same as Camas KOP 2 *Middle ground:* Same as Camas KOP 2, with more prominent road views *Background*: Same as Camas KOP 2
Fumaria Solar Project Site			
Fumaria KOP 1	Reecer Creek Road at the intersection of a private house driveway and an irrigation canal	Southwest to Northwest	*Foreground:* Buildings, driveway, cattle guard, ditch, shrubs, and utility poles *Middle ground:* Shrubs, trees, house and barn, and industrial and farm buildings *Background*: Ridges and distant peaks
Fumaria KOP 2	Northwest of the Fumaria Solar Project site, approximately 2.0 miles from the western boundary and generation tie line corridor on U.S. Route 97	Southeast	*Foreground:* County road, fencing, trees, houses, and utility poles *Middle ground:* Pond, agricultural field, and farm buildings *Background*: Flat topped mountain and distant peaks
Fumaria KOP 3	Southwest of the Fumaria Solar Project site, on Hungry Junction Road, 200 feet east of its intersection with Faust Road	West to Northeast	*Foreground:* Roads, ditch, fencing, and agricultural field *Middle ground:* Agricultural fields, sparse trees, and houses *Background*: Rolling hills and distant peaks
Penstemon Solar Project Site			

Table 3. Summary of the Five Kittitas County Solar Project KOP Locations, Directions of View, and Viewsheds

KOP	Location	Direction of the View from the KOP	Viewshed
Penstemon KOP 1	Along Tjossem Road, approximately 140 feet from the intersection of Moe Road, and is a few feet from the northeast boundary of the Penstemon Solar Project site	Southwest	*Foreground:* Agricultural field and no trespass sign *Middle ground:* Trees and sporadic houses *Background*: Agricultural fields, houses, rolling hills, and distant peaks
Penstemon KOP 2	Approximately 1,500 feet south of the Penstemon Solar Project southeast site boundary, on Moe Road	Northwest	*Foreground:* Coleman Creek, grass, and agricultural field *Middle ground:* Trees of varying shapes, houses, and farm buildings with red roofs *Background*: Agricultural fields, houses, hills, and distant peaks
Penstemon KOP 3	Approximately 840 feet west of the Penstemon Solar Project northwest site boundary, on Tjossem Road	Southeast	*Foreground:* Concrete-lined irrigation ditch, white water line, and grassy field *Middle ground:* Grassy field, trees of varying shapes, and houses *Background*: Fields, houses, farm buildings, rolling hills, and distant peaks
Typha Solar Project Site			
Typha KOP 1	Approximately 2.0 miles northwest of the Typha Solar Project site, on U.S. Route 97 and southwest of Thorp Highway South	Southeast	*Foreground:* I-90 freeway, green road sign, grassy area, agricultural field, and overhead irrigation sprinklers *Middle ground:* Same as the foreground *Background*: Rolling hills and distant peaks
Typha KOP 2	1.4 miles northwest from the Typha Solar Project site, on Thorp Highway South and the intersection of a county road	Southeast	*Foreground:* Road with gravel edge, utility poles, mailboxes, and agricultural field *Middle ground:* Farm buildings, trees, and agricultural fields *Background*: Boylston and Saddle Mountains
Typha KOP 3	1.0 mile to the southwest of the Typha Solar Project site, at the intersection of Cove Road and Robinson Canyon Road	Northeast	*Foreground:* Overhead irrigation sprinklers, agricultural field, houses, and trees *Middle ground:* Rolling agricultural fields and houses *Background*: Mountain ridges of Wenatchee National Forest
Urtica Solar Project Site			
Urtica KOP 1	On Umptanum Road, approximately 65 feet north of where it diverges from Brown Road	Southwest	*Foreground:* Umptanum Road, agricultural field, wire fence, and metal gate *Middle ground:* Houses, fences, and trees *Background*: Manastash and Umptanum Ridges, and the distant peaks of Snoqualmie National Forest
Urtica KOP 2	On Umptanum Road, approximately 800 feet from the Urtica Solar Project site southern boundary	Northwest	*Foreground:* Shallow ditch, wire and wood fencing, and road signs *Middle ground:* Trees, road, houses, fences *Background*: Rolling hills and peaks of Wenatchee National Forest

Table 3. Summary of the Five Kittitas County Solar Project KOP Locations, Directions of View, and Viewsheds

KOP	Location	Direction of the View from the KOP	Viewshed
Urtica KOP 3	On Brondt Road, approximately 2,000 feet (0.4 mile) from the northeast boundary of the Urtica Solar Project site	Southeast	*Foreground:* Irrigation pipe and agricultural field *Middle ground:* Barn, houses, and trees *Background*: Manastash and Umptanum Ridges, and the peaks of Snoqualmie National Forest

4.1 Camas Solar Site

The Camas Solar Project site is composed of actively farmed alfalfa agricultural land, associated irrigation lines and ditches, an underground natural gas pipeline in the northwest portion of the site crossing from northeast to southwest, and Little Naneum Creek forming the eastern property boundary. The project site is located southeast of the city of Ellensburg. It is in Sections 18 and 19, Township (T) 17 North (N), Range (R) 19 East (E), Willamette Meridian, and in the southeast corner of where the Tjossem Road overpass crosses Interstate 82 (I-82). The project site is divided by an irrigation ditch.

4.1.1 Camas KOP 1

Camas KOP 1 is located on U.S. Highway 82 at the southernmost tip of the Camas Solar Project site. The view is to the northeast, where the project would be constructed. The foreground and middle ground topography includes the highway and flat agricultural fields, a tan grassy area surrounding a ditch, a few white and gray houses, and fences with straight smooth lines. The background view, while initially flat, eventually gives rise to the blue-gray Ellensburg Hills and then to the Cascade Range with snowy white peaks. Dominant colors for the landscape are brown, green, and tan while the structures (e.g., houses, highway, and fencing) are white and gray. The grasses, deciduous trees, and shrubs have varying textures of fine, medium, and coarse (Appendix A, KOP Photo Log).

4.1.2 Camas KOP 2

Camas KOP 2 is located at the northeast tip of the Camas Solar Project site on Tjossem Road. The view from the KOP is southwest to south-southeast, where the project would be constructed. The foreground and middle ground at Camas KOP 2 consist of strong vertical and diagonal lines of demarcated agricultural fields, roads, houses, farm buildings, fencing, utility poles, and a road sign along with straight rows of trees and randomly placed trees with oval, lanceolate, and circular canopies. The background consists of distant buildings, flat agricultural lands, and green trees, which all give way to Manastash Ridge in the distant background (Appendix A, KOP Photo Log).

4.1.3 Camas KOP 3

Camas KOP 3 is located at the northwest intersection of U.S. Highway 82 and Tjossem Road; KOP 3 is located at a superior position, elevated approximately 25 feet higher than the Camas Solar Project site. The view from Camas KOP 3 is a panorama looking east to southeast, where the Camas Solar Project would be constructed. The foreground, middle ground, and background are all similar to Camas KOP 2, except there are long curving lines from the gray and white-striped four-lane freeway and overpass that dominate the foreground. The freeway curves in the middle ground as it retreats into the blue-gray

undulating Manastash Ridge in the background. To the southeast there is a flat grassy field where the project would be constructed (Appendix A, KOP Photograph Log).

4.2 Fumaria Solar Site

The Fumaria Solar Project site is composed of fallow agricultural land and a ditch along the western boundary. It is located northwest of the city of Ellensburg. It is in the southeast portion of Section 9, T18N, R18E, north of Hungry Junction Road and east of Lower Green Canyon Road. An 80-foot-wide by 2.2-mile-long generation tie line corridor with wooden poles would be included as part of the project site. This generation tie line would run along existing roads from the southwest corner of the project site; approximately 0.4 mile east to west along Clarke Road, turning due south for 1.0 mile along Faust Road, turning west again for 0.75 mile on Hungry Junction Road. From Hungry Junction Road, the final segment would run south along U.S. Route 97 before turning northwest into an electrical substation near the John Wayne Pioneer Trail.

4.2.1 Fumaria KOP 1

Fumaria KOP 1 is located on Reecer Creek Road at the intersection of a private house driveway and an irrigation canal, approximately 2,650 feet (0.5 mile) from the eastern boundary of the Fumaria Solar Project site. The view from Fumaria KOP 1 is westerly, from southwest to west. The foreground topography includes gray and white buildings next to a lot full of scrap metal and industrial vehicles including dump trucks, backhoes, and trailers. There is also a grey-brown dirt/gravel road with a cattle guard, utility poles, a brown earthen ditch bordered by tall tan grasses on one side and bright green short clump grass on the other, and a slightly inclining hill covered with low lying dense shrubs in the foreground (e.g., bitter-brush [*Purshia tridentata*], big sagebrush [*Artemisia tridentata*]). The middle ground topography contains shrubs giving way to a line of trees of various shapes, a large brown and tan house, a red barn, and other industrial and farm buildings. The background consists of blue-gray ridges and the distant snowy peaks of the Wenatchee National Forest (Appendix A, KOP Photograph Log).

4.2.2 Fumaria KOP 2

Fumaria KOP 2 is located to the northwest of the Fumaria Solar Project site, approximately 2.0 miles from the western boundary and the generation tie line corridor on U.S. Route 97. The view from Fumaria KOP 2 is east to southeast towards the project site. The foreground topography is dominated by the gray U.S. Route 97, straight wire fencing, a few roundish trees shielding a house, a mailbox, white irrigation pipes, and brown wooden utility poles. The middle ground has an agricultural field surrounded by patches of shrubs and trees, with sparse distant buildings and houses. The background consists of blue-gray flat topped Table Mountain and the distant peaks of the Wenatchee National Forest (Appendix A, KOP Photograph Log).

4.2.3 Fumaria KOP 3

Fumaria KOP 3 is located to the southwest of the Fumaria Solar Project site, on Hungry Junction Road, 200 feet east of its intersection with Faust Road. The view from Fumaria KOP 3 is a panorama from west to north toward the solar project site and the generation tie line that would travel along Hungry Junction and Faust Roads. The foreground consists of gray roads with yellow striping, a ditch blackened by fire and surrounded by grasses, brown smooth wire fencing, and a green agricultural field. The middle ground is composed of agricultural fields, sparse trees, and gray and white houses and storage buildings. The background is composed of blue-gray rolling hills and the distant peaks of the Wenatchee National Forest (Appendix A, KOP Photograph Log).

4.3 Penstemon Solar Site

The Penstemon Solar Project site is composed of actively farmed Sudangrass hay agricultural land, associated irrigation lines and ditches, and Coleman Creek forming the eastern property boundary. The project site is located southeast of the city of Ellensburg. It is in Section 17, T17N, R19E, at the corner of the intersection of Tjossem Road and Moe Road.

4.3.1 Penstemon KOP 1

Penstemon KOP 1 is located on Tjossem Road, approximately 140 feet from the intersection of Moe Road, and is a few feet from northeast boundary of the Penstemon Solar Project site. The view from the Penstemon KOP 1 is a panorama from southeast to southwest. A row of trees borders Coleman Creek on the east boundary of the project site, providing cover for a blue houses located 145 feet away. The foreground topography is a flat brown, tilled agricultural field with a black, orange, and brown private property, no trespass sign, and a short section of a guardrail. The middle ground consists of various shapes (e.g., round, lanceolate) and heights (e.g., short, medium, and tall) of trees and wood utility poles. Sporadic houses are mostly white and gray. The background has more fields and houses, and the distant background consists of blue-gray rolling hills and the distant peaks of the Wenatchee National Forest (Appendix A, KOP Photograph Log).

4.3.2 Penstemon KOP 2

Penstemon KOP 2 is located approximately 1,500 feet south of the Penstemon Solar Project site southeast boundary, on Moe Road. Moe Road runs parallel to the eastern project site boundary. The view from Penstemon KOP 2 is to the northwest where the solar project site would be located. The foreground topography consists of Coleman Creek, which is surrounded by tall grasses trees and shrubs edging up to Moe Road, a flat agricultural field, and wood utility poles and lines. The middle ground topography consists of trees of various shapes, as noted in Penstemon KOP 1. Several houses and farm buildings are present, many with red roofs or sides. The background consists of smooth green and brown fields, gray and white houses, and the distant background consists of blue-gray rolling hills and the distant peaks of the Wenatchee National Forest (Appendix A, KOP Photograph Log).

4.3.3 Penstemon KOP 3

Penstemon KOP 3 is located approximately 840 feet west of the Penstemon Solar Project site northwest boundary, on Tjossem Road. Tjossem Road runs parallel to the northern project site boundary. The view from Penstemon KOP 3 is east to southeast, where the project site would be located. The foreground topography consists of a gray, concrete-lined irrigation ditch; a smooth, white, tubular water line; and a flat, medium-textured grassy field. The middle ground topography also has a flat grassy field, along with a line of trees of varying shapes and a few white and gray houses and farm buildings to the southeast. The background has more fields and houses, and the distant background consists of blue-gray rolling hills and the distant peaks of the Wenatchee National Forest (Appendix A, KOP Photograph Log).

4.4 Typha Solar Site

The Typha Solar Project site is composed of irrigated agricultural land being used for a grazing pasture, associated irrigation ditches and a circular irrigator, and small wetlands. The project site is located northwest of the city of Ellensburg. It is in Section 30, T18N, R18E, with the Yakima River running near the northeast border of the site, a wetland along the southern border, Interstate 90 (I-90) to the northeast, and Thorp Highway South to the southwest.

4.4.1 Typha KOP 1

Typha KOP 1 is located approximately 2.0 miles northwest of the Typha Solar Project site on I-90/U.S. Route 97, southwest of Thorp Highway South . The view from Typha KOP 1 is to the southeast, where the project site would be located (Appendix A, KOP Photograph Log). The foreground consists of an agricultural field that at the time of the photograph had a long, metal overhead irrigation system present and a white pipeline. There are grasses and shrubs in the foreground bordering the agricultural field. The middle ground consists of trees, houses, and more agricultural fields. The background consists of dark blue-gray rolling hills and the distant peaks of the Wenatchee National Forest.

4.4.2 Typha KOP 2

Typha KOP 2 is located 1.4 miles northwest of the Typha Solar Project site on Thorp Highway South and the intersection of Miller Road, a county road. The view from Typha KOP 2 is to the east-northeast and to the east-southeast (Appendix A, KOP Photograph Log). The foreground topography consists of a short brown utility pole and a creosote log that appears to be part of an old fence that lies in front of a bright green grassy agricultural field. The middle ground consists of farm buildings, trees of varying shapes, and smooth brown and green agricultural fields. The background consists of the blue-gray Boylston and Saddle Mountains.

4.4.3 Typha KOP 3

Typha KOP 3 is located 1.0 mile to the southwest of the Typha Solar Project site, at the intersection of Cove Road and Robinson Canyon Road. The view from Typha KOP 3 is north to the east-northeast, where the project would be constructed (Appendix A, KOP Photograph Log). The foreground consists of smooth, silver, overhead irrigation sprinklers; a finely textured, grassy agricultural field; red, tan, and gray houses with flat and triangular roofs; and a few roughly textured, dark green sparse trees. The middle ground consists of rolling agricultural fields and houses. The background consists of the curving line of the blue-gray mountains of the Wenatchee National Forest.

4.5 Urtica Solar Site

The Urtica Solar Project site is composed of actively farmed timothy hay agricultural land, associated irrigation lines and ditches, and McCarl Creek running through the center of the site. The project site is located southwest of the city of Ellensburg. It is in Section 10, T17N, R18E, bordered on the west side by Umptanum Road and located north of Manastash Road.

4.5.1 Urtica KOP 1

Urtica KOP 1 is located on Umptanum Road, approximately 65 feet north of where it diverges from Brown Road. The Urtica Solar Project site northeast boundary is approximately 350 feet from Urtica KOP 1. The view is south to west-southwest, where the project would be constructed. The foreground topography includes the gray and white striped curving Umptanum Road; a flat, grassy, green agricultural field; bunched medium height trees near a wood and metal brown wire fence; a gray, smooth metal gate; road signs; wire fencing; and wooden utility poles. The middle ground consists of more houses and farm buildings, agricultural fields, and medium and tall trees. The background consists of Manastash and Umptanum Ridges and the distant snowy peaks of the Snoqualmie National Forest (Appendix A, KOP Photograph Log).

4.5.2 Urtica KOP 2

Urtica KOP 2 is located on Umptanum Road, approximately 800 feet from the Urtica Solar Project site southern boundary. The view from Urtica KOP 2 is to the west and the northwest. The foreground topography includes a chain-link fence that divides a parking lot from an agricultural field, a wire fence with metal and wood poles, the back side of a road sign, and a brown and green agricultural field. The middle ground appears as a line of trees of varying heights and shapes, houses, and farm buildings. The background consists of curving blue-gray rolling hills and the distant snowy peaks of the Wenatchee National Forest (Appendix A, KOP Photograph Log).

4.5.3 Urtica KOP 3

Urtica KOP 3 is located on Brondt Road, approximately 2,000 feet (0.4 mile) from the northeast boundary of the Urtica Solar Project site. The view from Urtica KOP 3 is east-southeast to southeast. The foreground topography includes a silver irrigation pipe with circular wheels and a medium textured green grassy field. The middle ground topography includes a red barn with a diagonal gray roof, several white and brown houses, and a line of various shaped trees of different heights. The background consists of the blue-gray Manastash and Umptanum Ridges and the distant snowy peaks of the Snoqualmie National Forest (Appendix A, KOP Photograph Log).

5 VIEWSHED DELINEATION

The 2-mile-radius analysis area surrounding each site includes a variety of landscape settings and land uses. For purposes of describing this delineation, the viewshed is described by combining each site into one viewshed; in other words, the delineation groups the viewsheds together as one delineation, as shown on Figure 2. The shaded areas indicate where the Columbia Solar Projects may be visible to a human's naked eye.

Divided by the I-90 and Interstate 82 (I-82) transportation corridors, the land in the analysis area includes privately owned lands. The community of Ellensburg is centrally located among the five sites. Transportation corridors, arterial streets, transmission lines, and distribution lines cross the landscape. The Yakima River flows in a southeasterly direction, bisecting the analysis area. Farming, ranching, rangeland, and grazing improvements such as fences, ditches, barns, and corrals occur intermittently along the dirt roads that also cross the proposed projects area. There are residential dwellings interspersed throughout the analysis area.

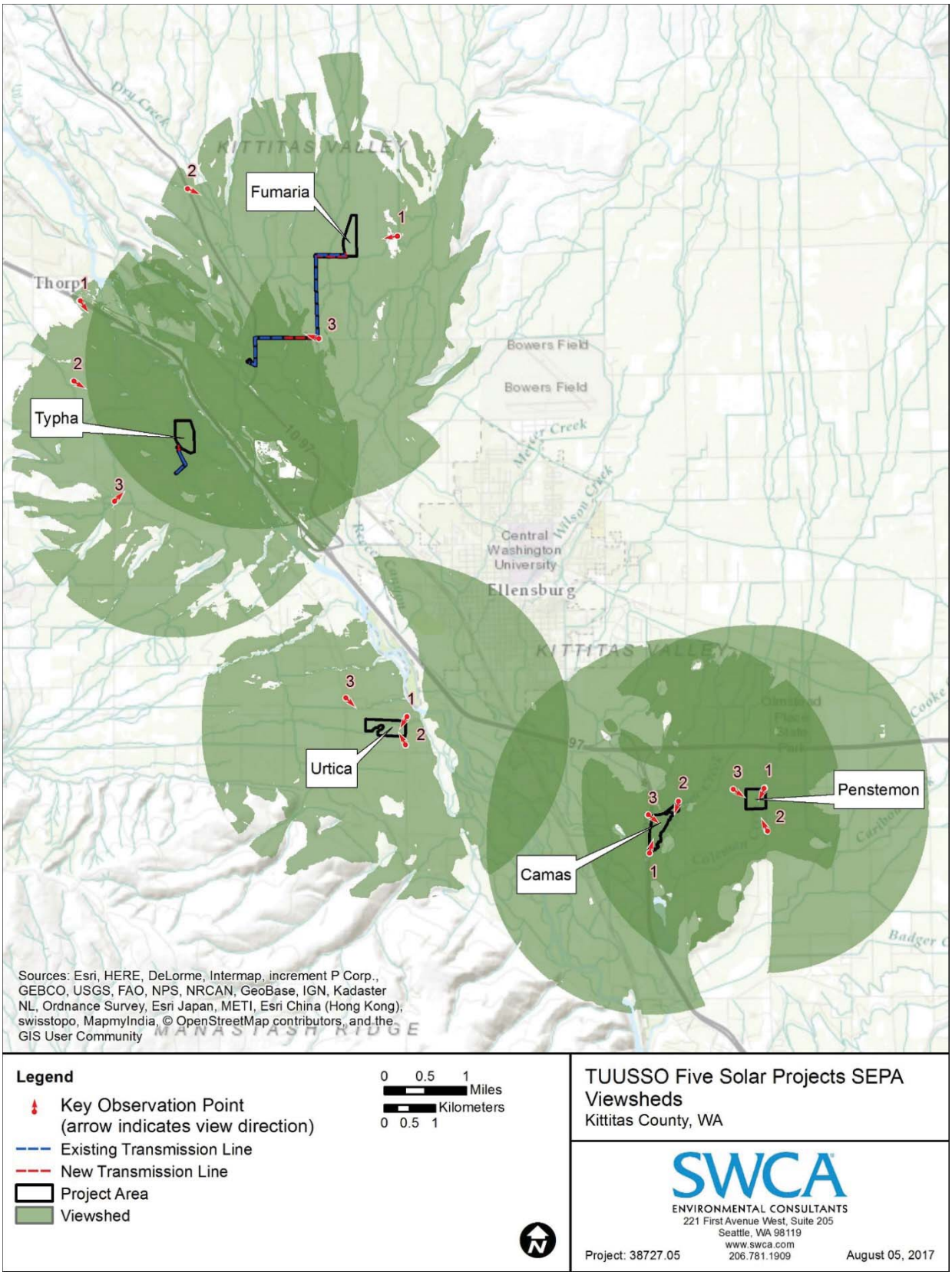


Figure 2. Project area viewsheds.

6 VISUAL CONTRAST ANALYSIS

To determine the five Columbia Solar Project sites' potential to contrast with the surrounding landscape, the contrast rating system was used to evaluate the effects of the five project sites on visual resources. Contrast rating is done from the KOPs. KOPs for the proposed projects were selected based on the following considerations:

- Anticipated viewshed delineation
- Distance from the project site
- High degree of visibility to the project site
- Angle of observation or slope of the project site
- The vast open area of the landscape
- Number of potential viewers of the project site
- Length of time that the project sites would be in view
- Relative size of the project sites
- Light conditions

Using BLM Form 8400-4 – Visual Contrast Rating Worksheet, visual resource specialists evaluated the degree of visual contrasts from each KOP, based on the form, line, color, and texture changes between the existing landscapes and how the landscapes would look after implementation of the proposed projects. As part of the contrast rating process, visual simulations of the proposed projects were used to visually portray the realistic changes in landscape features that would be perceivable to the general public. Visual simulations of the proposed projects were created for each of the selected KOPs. Visual Contrast Rating Worksheets are included as Appendix B; summaries of each visual contrast rating worksheets are provided below in Section 6.2s through 6.6.

6.1 Impacts Common to all Five Sites

6.1.1 Construction Impacts

Construction impacts (visual contrasts) with the characteristic landscape of the project sites would result from activities associated with construction of the five Columbia Solar Project sites. Removal of existing vegetation, grading for all-weather access roads (leveling), and trenching would result in visual contrasts in the color and irregular texture and lines of the characteristic landscape over the 10-month construction period. In addition, construction equipment, vehicles, supplies, and associated project activities would be clearly visible from the KOPs during construction activities. During the initial phases of construction, these changes to the views may seem uncharacteristic or appear out of place, discordant, or distracting; however, as construction progresses and much of the equipment is no longer needed, equipment is removed from the site, and the views would appear more normal, less discordant, and less distracting. Construction activities will be transient and of short duration as construction progresses, and given the other activities in the area (e.g., commercial agriculture), construction would not substantially degrade the existing visual character or quality.

Construction of the proposed project would be visible from ten of the fifteen KOPs and contrast to a minor to moderate degree with the surrounding landscape. The level of change to the landscape apparent from the construction of any of the solar project sites would be minor to moderate based on the visual resource contrast analysis (see Sections 6.2 through 6.6 for detailed analysis). Minor to moderate contrasts in the elements of the environment would generally be consistent with the characteristic landscape; though primarily agricultural in setting, there are numerous transmission lines,

pipelines, metal buildings, and fence lines visible from each of the KOPs. There are existing visible contrasts apparent from each of the KOPs. None of the KOPs would experience a major or significant change to the characteristic views.

The proposed project would generally repeat the basic elements of line, texture, color, and form found in the predominant natural features of the characteristic landscape. Contrast from construction would be less apparent the further the view is from the site, and would be more apparent the closer the view is to the site. Adjacent viewers (farmers, private landowners, motorists) would experience the greatest change in views since the contrast is most noticeable when viewing up close (i.e., 25 feet or closer); however, as these views are not representative of public views they were therefore not considered for KOP selection.

Viewers accustomed to the typical rural, agrarian landscape would be affected by the minor contrast created from construction impacts. The construction of the solar sites would cause a long-term change to scenery (see Operational Impacts below), while the actual construction of the sites and facilities would be short-term changes. During construction, the motion associated with construction equipment, movement, panel placement, alteration of topography, earthwork, vegetation clearing, short-term impacts from dust generation, and landform modification would be noticeable to all viewers (residents, motorists, tourists) and create visual contrast within the viewshed.

The minor contrast would occur along routes of various travel speeds (trail, unpaved routes, and high-speed interstate) and would generally be visible in the foreground for only a few hundred feet and for a brief duration. As described below in detail, contrasts are less likely to be visible the further away the viewer is from the sites, eventually becoming indiscernible as the viewer moves further away. When considering the minor to moderate contrast cumulatively, construction of the Columbia Solar Projects would attract attention and be seen, but would not dominate the view of the casual observer from the KOPs. In most cases, the views from the KOPs would be minimally altered from existing conditions.

Simulations demonstrate that the construction of the Columbia Solar Project would result in changes to the visual and aesthetic conditions, but these changes would be moderate and weak when considering the surrounding landscapes. In addition, the applicant-proposed mitigation measures (see Section 7 below) are intended to decrease the contrasts of constructing the Columbia Solar Project.

6.1.2 Operational Impacts

During operation of the five solar project sites, the regular geometric forms and strong horizontal and vertical lines associated with the solar arrays and associated infrastructure would result in a visual contrast with the irregular, organic forms and colors of the existing landform and vegetation. However, the existing fence lines, transmission/distribution lines, metal buildings, and roads also possess horizontal and vertical lines and therefore the introduction of the Columbia Solar Project sites would not dominate the landscape. Applicant-proposed mitigation such as vegetation screening would decrease the contrast more each year as the vegetation matures and covers larger areas.

In addition, color contrast associated with the solar panels would vary throughout the day as the panels rotate to track the sun from east to west. Although concentrated light would not be directly reflected toward any of the KOPs, the solar panels, when viewed from distant elevated viewing positions at certain times of the day, would reflect the sky, resembling a dark blue body of water, resulting in a contrast with the dull hues of the surrounding green/tan agricultural fields and grey-green vegetation. The contrast would be dull due to the flat plate and anti-reflective design.

Once operational, the contrast would remain unchanged from construction. As vegetative screening (see mitigation measures) matures and grows, the contrast of the Columbia Solar Project sites would become less visible and the contrast of the site to the surrounding areas would be decreased.

Operation of the Columbia Solar Project sites would require routine and periodic equipment testing, panel cleaning, and other ongoing maintenance tasks. However, these activities will not increase in duration or intensity in such a way as to alter or adversely affect the existing landscape (i.e., the aesthetics) beyond what occurred during construction.

The applicant has proposed numerous mitigation measures intended to decrease the contrasts that may result from construction (Section 7 below).

6.2 Camas

6.2.1 Construction Impact

Weak visual contrast at Camas KOP 1 would directly result from introduction of the solar site, converters, and fencing into the landscape, removal of vegetation to construct and maintain the solar array, construction of access roads, temporary construction laydown yards, and any landform modifications necessary to prepare the site for construction (Figures 3 and 4).



Figure 3. View from Camas KOP 1 – existing.

The view from Camas KOP 1 would be altered from the existing conditions, but the solar project site would not dominate the view, block any current views, or change the characteristic landscape. As Figure 4 illustrates, the contrast would repeat the form and line of the existing view, but the color would change. The view duration would be very brief since viewers would be travelling at a high speed (55-plus miles per hour [mph]). See Appendix B for the contrast rating worksheet.



Figure 4. View from Camas KOP 1 – simulation.

Moderate visual contrast at Camas KOP 2 would directly result from introduction of the solar project site, converters, and fencing into the landscape; removal of vegetation to construct and maintain the solar array; construction of access roads; creation of temporary construction laydown yards; and any landform modifications necessary to prepare the site for construction (Figures 5 and 6).



Figure 5.View from Camas KOP 2 – existing.

The view from Camas KOP 2 would be altered from the existing conditions, but the solar project site would not dominate the view, block any current views, or change the characteristic landscape. As Figure 6 illustrates, form and line contrast would increase from the existing view since the Camas KOP 2 is located very nearby the site, and the level of contrast appears more apparent. The view duration would be very brief since viewers would be travelling at a moderate speed (35-plus mph). See Appendix B for the contrast rating worksheet.



Figure 6. View from Camas KOP 2 - simulation.

Moderate visual contrast at Camas KOP 3 would directly result from introduction of the solar site, converters, and fencing into the landscape; removal of vegetation to construct and maintain the solar array; construction of access roads; creation of temporary construction laydown yards; and any landform modifications necessary to prepare the site for construction (Figures 7 and 8). Camas KOP 3 offers a rare perspective for the Kittitas Valley: the view is elevated above the surrounding landscape (approximately 25 feet higher than the Camas KOP 3 site). Because the viewer would be looking down on the site rather than across at it (such as Camas KOPs 1 and 2), the viewer is able to see the entire site. Even with an increase in the amount of the site that is visible, the contrast would be moderate and the changes to the site would not change the overall aesthetics of the site and surrounding areas.



Figure 7. View from Camas KOP 3 – existing.

The view from Camas KOP 3 would be altered from the existing conditions, and the solar project site would not dominate the view, block any current views, or change the characteristic landscape. As Figure 8 illustrates, form and line contrast would increase from the existing view since the Camas KOP 3 is located at a superior position in reference to the site, and the level of contrast appears more apparent. The view duration would be very brief since viewers would be travelling at a moderate speed (35-plus mph). See Appendix B for the contrast rating worksheet.



Figure 8. View from Camas KOP 3 – simulation.

6.2.2 Operational Impacts

Table 4 provides a summary of the operational impacts expected for the Camas Solar Project site.

Table 4. Summary of Contrasts for the Camas KOPs

KOP	Line	Form	Color	Texture
Camas KOP 1	Long-term, weak contrasts created in the land/water, vegetation and structures from the solar panels adding additional straight lines to the viewshed	Long-term, weak to moderate contrasts created by the addition of angular and flat infrastructure	Moderate contrasts from the change of the green, tans, and browns of vegetation to blue, silver, and black of the solar panels	Moderate contrasts from the change in medium and coarse textures to smooth textures from the solar panels
Camas KOP 2	Long-term, weak contrasts created in the land/water, vegetation and structures from the solar panels adding additional straight lines to the viewshed	Long-term, weak to moderate contrasts created by the addition of angular and flat infrastructure	Moderate contrasts from change of colors	Moderate contrasts from change of colors
Camas KOP 3	Long-term, weak contrasts created in the land/water, vegetation and structures from the solar panels adding additional straight lines to the viewshed	Long-term, weak to moderate contrasts created by the addition of angular and flat infrastructure	Weak contrasts from the change of the green, tans, and browns of vegetation to blue, silver, and black of the solar panels	Moderate contrasts from the change in medium and coarse textures to smooth textures from the solar panels

6.3 Fumaria

6.3.1 Construction Impacts

No visual contrast at Fumaria KOP 1 would result from introduction of the solar site, converters, fencing, and new generation tie line (Figure 9). Viewers from Fumaria KOP 1 would not see the site due to topographic screening.



Figure 9. View from Fumaria KOP 1 – existing.

No visual contrast at Fumaria KOP 2 would result from introduction of the solar site, converters, fencing, and new generation tie line (Figure 10). Viewers from Fumaria KOP 2 would not see the site due to topographic screening.



Figure 10. View from Fumaria KOP 2 – existing.

No visual contrast at Fumaria KOP 3 would result from introduction of the solar site, converters, or fencing; the Fumaria solar site would not be visible from Fumaria KOP 3 (Figure 11). However, viewers would see the contrast the new generation tie line and structures create. The contrast would be weak since there are already distribution towers present; however, the new generation tie line has the potential to increase the number of and height of generation tie line towers (Figure 12). Viewers from Fumaria KOP 3 would not see the site due to topographic screening.



Figure 11. View from Fumaria KOP 3 – existing.

The view from Fumaria KOP 3 would be altered from the existing conditions since the new generation tie line would be visible (Figure 12). The new generation tie line has the potential to increase the number of poles as well as increase the height, but would not dominate the view, block any current views, or change the characteristic landscape. The view duration would be brief since viewers would be travelling at a moderate speed (35-plus mph). See Appendix B for the contrast rating worksheet.



Figure 12. View from Fumaria KOP 3 – simulation.

6.3.2 Operational Impacts

Table 5 provides a summary of the operational impacts expected for the Fumaria site.

Table 5. Summary of Contrasts for the Fumaria KOPs

KOP	Line	Form	Color	Texture
Fumaria KOP 1	None	None	None	None
Fumaria KOP 2	None	None	None	None
Fumaria KOP 3	Solar project site: None Generation tie line: Long-term, weak contrasts from the transmission line towers extending height of straight lines to the viewshed	Solar project site: None Generation tie line: None	Solar project site: None Generation tie line: None	Solar project site: None Generation tie line: None

6.4 Penstemon

6.4.1 Construction Impacts

Moderate visual contrast at Penstemon KOP 1 would directly result from introduction of the solar site, converters, and fencing into the landscape; construction of access roads; creation of temporary construction laydown yards; and any landform modifications necessary to prepare the site for construction (Figures 13 and 14).



Figure 13. View from Penstemon KOP 1 – existing.

The view from Penstemon KOP 1 would be altered from the existing conditions, but would not dominate the view, block any current views, or change the characteristic landscape. As Figure 14 illustrates, the contrast would change the form and line of the exiting view, and the color would change; these changes would be moderate in the context of the view from this KOP. The foreground view would change, and the middle ground and background views would be slightly altered. The view duration would be very brief since viewers would be travelling at a moderate speed (35-plus mph). See Appendix B for the contrast rating worksheet.



Figure 14. View from Penstemon KOP 1 – simulation.

Weak visual contrast at Penstemon KOP 2 would directly result from introduction of the solar site, converters, and fencing into the landscape; removal of vegetation to construct and maintain the solar array; construction of access roads; creation of temporary construction laydown yards; and any landform modifications necessary to prepare the site for construction (Figures 15 and 16).



Figure 15. View from Penstemon KOP 2 – existing.

The view from Penstemon KOP 2 would experience a minor change from the existing conditions, but the solar project site would not dominate the view, block any current views, or change the characteristic landscape. As Figure 16 illustrates, the contrast would change the line of the existing view (adding to the already present “edge or hedgerow” look), and the color would change to a darker shade; these changes would be minor in the context of the view from this KOP. The foreground view would not change, and the middle ground and background views would be slightly altered. The view duration would be very brief since viewers would be travelling at a moderate speed (35-plus mph). See Appendix B for the contrast rating worksheet.



Figure 16. View from Penstemon KOP 2 - simulation.

Weak visual contrast at Penstemon KOP 3 would directly result from introduction of the solar site, converters, and fencing into the landscape; removal of vegetation to construct and maintain the solar array; construction of access roads; creation of temporary construction laydown yards; and any landform modifications necessary to prepare the site for construction (Figures 17 and 18).



Figure 17. View from Penstemon KOP 3 – existing.

The view from Penstemon KOP 3 would be slightly altered from the existing conditions, but the solar project site would not dominate the view, block any current views, or change the characteristic landscape. As Figure 18 illustrates, the contrast would repeat the form and line of the exiting view. The view duration would be very brief since viewers would be travelling at a high speed (55-plus mph). See Appendix B for the contrast rating worksheet.



Figure 18. View from Penstemon KOP 3 – simulation.

6.4.2 Operational Impacts

Table 6 provides a summary of the operational impacts expected for the Penstemon site.

Table 6. Summary of Contrasts for the Penstemon KOPs

KOP	Line	Form	Color	Texture
Penstemon KOP 1	Long-term, moderate contrasts created in the land/water, vegetation and structures from the solar panels adding additional straight lines to the viewshed	Long-term, moderate contrasts created by the additional of angular and flat infrastructure	Moderate contrasts from the change of the green, tans, and browns of vegetation to blue, silver, and black of the solar panels	Moderate contrasts from the change in medium and coarse textures to smooth textures from the solar panels
Penstemon KOP 2	Long-term, weak contrasts created in the land/water, vegetation and structures from the solar panels adding additional straight lines to the viewshed	Long-term, weak contrasts created by the additional of angular and flat infrastructure	Weak contrasts from the change of the green, tans, and browns of vegetation to blue, silver, and black of the solar panels	Weak contrasts from the change in medium and coarse textures to smooth textures from the solar panels
Penstemon KOP 3	Long-term, weak contrasts created in the land/water, vegetation and structures from the solar panels adding additional straight lines to the viewshed	Long-term, weak contrasts created by the additional of angular and flat infrastructure	Weak contrasts from the change of the green, tans, and browns of vegetation to blue, silver, and black of the solar panels	Weak contrasts from the change in medium and coarse textures to smooth textures from the solar panels

6.5 Typha

6.5.1 Construction Impacts

Typha KOP 1 is located 2.0 miles northwest of the Typha Solar Project site on I-90 /U.S. Route 97, southwest of Thorp Highway South. From this location, viewers would be exclusively motorists traveling southeast on I-90. Due to the high speed of travel (65-plus mph), the view duration at this KOP is very brief (less than 10 seconds). The existing view toward the project site includes irrigation infrastructure, farmhouses, fields, and distant mountains. Due to the short view duration, distance, and vegetative screening, the aesthetics from this KOP would not change during construction. No visual contrast at Typha KOP 1 would directly result from introduction of the solar site, converters, and fencing into the landscape; removal of vegetation to construct and maintain the solar array; construction of access roads; creation of temporary construction laydown yards; and any landform modifications necessary to prepare the site for construction; Figure 19 illustrates no discernible changes to the characteristic landscape.



Figure 19. View from Typha KOP 1 – existing.

Typha KOP 2 is located 1.4 miles northwest from the Typha Solar Project site on Thorp Highway South and the intersection of Miller Road. From this location, viewers would be local residents and motorists traveling southeast on the Thorp Highway South. Due to the moderate speed of travel (35-plus mph), the view duration at this KOP is brief (less than 20 seconds). The existing view towards the project site includes open fields, fence posts, farmhouses, and distant mountains. Due to the short view duration, and distance, the aesthetics from this KOP would not change during construction (no contrasts would occur); Figure 20 shows no discernible changes to the characteristic landscape.



Figure 20. View from Typha KOP 2 – existing.

Typha KOP 3 is located 1.0 mile to the southwest of the Typha Solar Project site, at the intersection of Cove Road and Robinson Canyon Road. From this location, viewers would be local residents and traveling north. Due to the moderate speed of travel (35-plus mph), the view duration at this KOP is brief (less than 20 seconds). The existing view toward the project site includes open fields, barns, and distant mountains. Due to the short view duration, and distance, the aesthetics from this KOP would not change during construction (no contrasts would occur); Figure 21 shows no discernible changes to the characteristic landscape.



Figure 21. View from Typha KOP 3 – existing.

Operational Impacts

Table 7. provides a summary of the operational impacts expected for the Typha site. The Typha site would not be visible from any of the selected KOPs.

Table 7. Summary of Contrasts for the Typha KOPs

KOP	Line	Form	Color	Texture
Typha KOP 1	None	None	None	None
Typha KOP 2	None	None	None	None
Typha KOP 3	None	None	None	None

6.6 Urtica

6.6.1 Construction Impacts

Weak visual contrast at Urtica KOP 1 would directly result from introduction of the solar site, converters, and fencing into the landscape; removal of vegetation to construct and maintain the solar array; construction of access roads; temporary construction laydown yards; and any landform modifications necessary to prepare the site for construction (Figures 22 and 23).



Figure 22. View from Urtica KOP 1 – existing.

The view from Urtica KOP 1 would be altered from the existing conditions, but the solar project site would not dominate the view, block any current views, or change the characteristic landscape. As Figure 23 illustrates, the contrast would repeat the form and line of the existing view, but the color would slightly change due to the vegetation screening. The view duration would be very brief since viewers would be travelling at a moderate speed (35-plus mph). See Appendix B for the contrast rating worksheet.



Figure 23. View from Urtica KOP 1 – simulation.

Weak visual contrast at Urtica KOP 2 would directly result from introduction of the solar site, converters, and fencing into the landscape; removal of vegetation to construct and maintain the solar array; construction of access roads; creation of temporary construction laydown yards; and any landform modifications necessary to prepare the site for construction (Figures 24 and 25).



Figure 24. View from Urtica KOP 2 – existing.

The view from Urtica KOP 2 would be altered from the existing conditions, but the solar project site would not dominate the view, block any current views, or change the characteristic landscape. As Figure 25 illustrates, the contrast would repeat the form and line of the existing view, but the color would slightly change due to the vegetation screening and fencing surrounding the site. The view duration would be very brief since viewers would be travelling at a moderate speed (35-plus mph). See Appendix B for the contrast rating worksheet.



Figure 25. View from Urtica KOP 2 - simulation.

Weak visual contrast at Urtica KOP 3 would directly result from introduction of the solar site, converters, and fencing into the landscape; removal of vegetation to construct and maintain the solar array; construction of access roads; creation of temporary construction laydown yards; and any landform modifications necessary to prepare the site for construction (Figures 26 and 27).



Figure 26. View from Urtica KOP 3 – existing.

The view from Urtica KOP 3 would be altered from the existing conditions, but would not dominate the view, block any current views, or change the characteristic landscape. As Figure 27 illustrates, the contrast would repeat the form and line of the existing view, but the color would slightly change due to the vegetation screening. The view duration would be very brief since viewers would be travelling at a moderate speed (35-plus mph). See Appendix B for the contrast rating worksheet.



Figure 27. View from Urtica KOP 3 – simulation.

6.6.2 Operational Impacts

Table 8 provides a summary of the operational impacts expected for the Urtica site.

Table 8. Summary of Contrasts for the Urtica KOPs

KOP	Line	Form	Color	Texture
Urtica KOP 1	Long-term, weak contrasts created in the land/water, vegetation and structures from the solar panels adding additional straight lines to the viewshed	Long-term, weak to moderate contrasts created by the additional of angular and flat infrastructure	Weak contrasts from the change of the green, tans, and browns of vegetation to blue, silver, and black of the solar panels	Weak contrasts from the change in medium and coarse textures to smooth textures from the solar panels
Urtica KOP 2	Long-term, weak contrasts created in the land/water, vegetation and structures from the solar panels adding additional straight lines to the viewshed	Long-term, weak to moderate contrasts created by the additional of angular and flat infrastructure	Weak contrasts from the change of the green, tans, and browns of vegetation to blue, silver, and black of the solar panels	Weak contrasts from the change in medium and coarse textures to smooth textures from the solar panels
Urtica KOP 3	Long-term, weak contrasts created in the land/water, vegetation and structures from the solar panels adding additional straight lines to the viewshed	Long-term, weak to moderate contrasts created by the additional of angular and flat infrastructure	Weak contrasts from the change of the green, tans, and browns of vegetation to blue, silver, and black of the solar panels	Weak contrasts from the change in medium and coarse textures to smooth textures from the solar panels

7 MITIGATION MEASURES

The project is being designed as a sustainable amenity for the community and will be reviewed by EFSEC for compliance with design guidelines.

The following measures are proposed to decrease the aesthetic contrasts of construction, operation, maintenance, and decommissioning activities:

7.1 General Mitigation Measures

- Vegetation or fencing would be used to interrupt the line of sight from nearby KOPs at or near the same elevation of the projects.
- Vegetation and ground disturbance would be minimized near roads, and the use of existing clearings would be maximized.
- The use of non-necessary and/or non-safety-related signs and project construction signs should be minimized; necessary signs would be made of nonglare materials and use unobtrusive colors; reverse sides of signs and mounts would be painted or coated using the most suitable color to reduce color contrasts with the existing landscape; however, placement and design of any signs required by safety regulations must conform to regulatory requirements.
- "Good housekeeping" procedures would be developed to ensure that the sites are kept clean of debris, garbage, fugitive trash or waste, and graffiti; to prohibit scrap heaps and dumps; and to minimize storage yards. Design features regarding waste management would be applied.
- A lighting plan would be prepared that documents how lighting will be designed and installed to minimize night-sky impacts during facility construction and operations phases. Lighting for facilities would not exceed the minimum number of lights and brightness required for safety and security, and would not cause excessive reflected glare. Full cut-off luminaires would be used to minimize upward shining lighting. Lights would be directed downward or toward the area to be illuminated. Light fixtures would not spill light beyond the project boundary. Lights in high illumination areas not occupied on a continuous basis would have switches, timer switches, or motion detectors so that the lights operate only when the area is occupied. Where feasible, vehicle-mounted lights would be used for night maintenance activities. Wherever feasible, consistent with safety and security, lighting would be kept off when not in use. The lighting plan would include a process for promptly addressing and mitigating complaints about potential lighting impacts.
- Each of the five solar sites would be adequately screened by either existing or new vegetation or through the application of perimeter fencing to reduce contrast from glint and glare for KOPs with level views.

7.2 Construction

- Project developers would integrate visual and aesthetics mitigation elements early in the construction, which may include treatments such as thinning and feathering vegetation along project edges, salvaging landscape materials from within construction areas, etc.

- Visual impacts would be reduced during construction by clearly delineating construction boundaries. Within areas not intended for long-term use, impacts would be reduced by minimizing areas of surface disturbance within those boundaries; preserving vegetation to the greatest extent possible; using undulating surface disturbance edges; controlling erosion; using fugitive dust suppression techniques; and restoring exposed soils to their original contour and vegetation.

- An interim reclamation plan would be in place prior to construction. Interim reclamation of the construction site would begin immediately after construction to reduce the likelihood of visual contrasts associated with erosion and invasive weed infestation and to reduce the visibility of impacted areas as quickly as possible.

- Existing rocks, vegetation, and drainage patterns would be preserved to the maximum extent practicable, particularly within temporary use areas.

- Brush-beating or mowing, or using protective surface matting rather than vegetation removal would be done where feasible.

- For interim reclamation areas, slash from vegetation removal would be mulched and spread to cover fresh soil disturbances as part of the revegetation plan. Slash piles would not be left in sensitive viewing areas.

- No paint or permanent discoloring agents would be applied to rocks or vegetation to indicate surveyor construction activity limits, except in areas defined and designated for disturbance.

- All stakes and flagging would be removed from the construction area and disposed of in an approved facility.

7.3 Operations

- The project developer would maintain revegetated surfaces until a self-sustaining stand of vegetation is re-established and visually adapted to the undisturbed surrounding vegetation. For new areas of disturbance (beyond the scope of this project), no new disturbance would be created during operation.

- Interim restoration would be undertaken during the operating life of the project as soon as possible after disturbances.

- Maintenance activities would include noxious weed control.

- Road maintenance activities would avoid blading existing forbs and grasses in ditches and adjacent to roads.

- Painted facilities would be kept in good repair and repainted when color fades or flakes increase visual contrast.

8 LITERATURE CITED

Ellensburg. 2014. Ellensburg Comprehensive Plan – 2006 Update (Amended Through 2014). Available at: https://www.ci.ellensburg.wa.us/DocumentCenter/View/649. Accessed May 22, 2017.

Kittitas County. 2016. Kittitas County Comprehensive Plan. Available at: https://www.co.kittitas.wa.us/uploads/documents/cds/comp-plan/2016/2016%201206%20Comp%20Plan%20per%20Kittitas%20Co%20Ord%202016-023.pdf. Accessed May 22, 2017.

APPENDIX A: KOP PHOTOGRAPH LOG

Date

April 5, 2017

Feature ID

KOP 1

Project Site

Camas

Description

View north northwest



Date

April 5, 2017

Feature ID

KOP 1

Project Site

Camas

Description

View north northeast



Date April 5, 2017 **Feature ID** KOP 1 **Project Site** Camas **Description** View northeast	
Date April 5, 2017 **Feature ID** KOP 1 **Project Site** Camas **Description** View east northwest	

Date

April 5, 2017

Feature ID

KOP 2

Project Site

Camas

Description

View Southeast



Date

April 5, 2017

Feature ID

KOP 2

Project Site

Camas

Description

View south southeast



Date

April 5, 2017

Feature ID

KOP 2

Project Site

Camas

Description

View south southwest



Date

April 5, 2017

Feature ID

KOP 2

Project Site

Camas

Description

View southwest



Date

April 5, 2017

Feature ID

KOP 2

Project Site

Camas

Description

View west southwest



Date

April 5, 2017

Feature ID

KOP 3

Project Site

Camas

Description

View northeast



Date April 5, 2017 **Feature ID** KOP 3 **Project Site** Camas **Description** View east	
Date April 5, 2017 **Feature ID** KOP 3 **Project Site** Camas **Description** View east	

Date

April 5, 2017

Feature ID

KOP 3

Project Site

Camas

Description

View southeast



Date

April 5, 2017

Feature ID

KOP 3

Project Site

Camas

Description

View south southeast



Date

April 5, 2017

Feature ID

KOP 1

Project Site

Fumaria

Description

View south southwest



Date

April 5, 2017

Feature ID

KOP 1

Project Site

Fumaria

Description

View southwest



Date April 5, 2017 **Feature ID** KOP 1 **Project Site** Fumaria **Description** View west southwest	
Date April 5, 2017 **Feature ID** KOP1 **Project Site** Fumaria **Description** View west	

Date April 5, 2017 **Feature ID** KOP 1 **Project Site** Fumaria **Description** View west northwest	
Date April 5, 2017 **Feature ID** KOP 2 **Project Site** Fumaria **Description** View north	

Date April 5, 2017 **Feature ID** KOP 2 **Project Site** Fumaria **Description** View northeast	
Date April 5, 2017 **Feature ID** KOP 2 **Project Site** Fumaria **Description** View east northeast	

Date April 5, 2017 **Feature ID** KOP 2 **Project Site** Fumaria **Description** View east southeast	
Date April 5, 2017 **Feature ID** KOP 2 **Project Site** Fumaria **Description** View southeast	

Date

April 5, 2017

Feature ID

KOP 3

Project Site

Fumaria

Description

View west



Date

April 5, 2017

Feature ID

KOP 3

Project Site

Fumaria

Description

View northwest



Date

April 5, 2017

Feature ID

KOP 3

Project Site

Funmaria

Description

View north northwest



Date

April 5, 2017

Feature ID

KOP 3

Project Site

Fumaria

Description

View north



Date April 5, 2017 **Feature ID** KOP 3 **Project Site** Fumaria **Description** View northeast	
Date April 5, 2017 **Feature ID** KOP 3 **Project Site** Fumaria **Description** View east northeast	

Date

April 5, 2017

Feature ID

KOP 1

Project Site

Penstemon

Description

View southeast



Date

April 5, 2017

Feature ID

KOP 1

Project Site

Penstemon

Description

View south



Date April 5, 2017 **Feature ID** KOP 1 **Project Site** Penstemon **Description** View southwest	
Date April 5, 2017 **Feature ID** KOP 1 **Project Site** Penstemon **Description** View southwest	

Date

April 5, 2017

Feature ID

KOP 1

Project Site

Penstemon

Description

View west



Date

April 5, 2017

Feature ID

KOP 2

Project Site

Penstemon

Description

View west northwest



Date

April 5, 2017

Feature ID

KOP 2

Project Site

Penstemon

Description

View northwest



Date

April 5, 2017

Feature ID

KOP 2

Project Site

Penstemon

Description

View north northwest



Date April 5, 2017 **Feature ID** KOP 2 **Project Site** Penstemon **Description** View north	
Date April 5, 2017 **Feature ID** KOP3 **Project Site** Penstemon **Description** View east	

Date April 5, 2017 **Feature ID** KOP 3 **Project Site** Penstemon **Description** View east southeast	
Date April 5, 2017 **Feature ID** KOP 3 **Project Site** Penstemon **Description** View southeast	

Date April 5, 2017 **Feature ID** KOP 1 **Project Site** Typha **Description** View east southeast	
Date April 5, 2017 **Feature ID** KOP 1 **Project Site** Typha **Description** View southeast	

Date

April 5, 2017

Feature ID

KOP 1

Project Site

Typha

Description

View south southeast



Date

April 5, 2017

Feature ID

KOP 2

Project Site

Typha

Description

View east northeast



Date April 5, 2017 **Feature ID** KOP 2 **Project Site** Typha **Description** View east southeast	
Date April 5, 2017 **Feature ID** KOP 2 **Project Site** Typha **Description** View southeast	

Date

April 5, 2017

Feature ID

KOP 3

Project Site

Typha

Description

View north



Date

April 5, 2017

Feature ID

KOP 3

Project Site

Typha

Description

View northeast



Date April 5, 2017 **Feature ID** KOP 3 **Project Site** Typha **Description** View east northeast	
Date April 5, 2017 **Feature ID** KOP 1 **Project Site** Urtica **Description** View south	

Date

April 5, 2017

Feature ID

KOP 1

Project Site

Urtica

Description

View south southwest



Date

April 5, 2017

Feature ID

KOP 1

Project Site

Urtica

Description

View southwest



Date April 5, 2017 **Feature ID** KOP1 **Project Site** Urtica **Description** View west southwest	
Date April 5, 2017 **Feature ID** KOP 2 **Project Site** Urtica **Description** View west	

Date

April 5, 2017

Feature ID

KOP 2

Project Site

Urtica

Description

View west northwest



Date

April 5, 2017

Feature ID

KOP 2

Project Site

Urtica

Description

View northwest



Date

April 5, 2017

Feature ID

KOP 2

Project Site

Urtica

Description

View north



Date

April 5, 2017

Feature ID

KOP 3

Project Site

Urtica

Description

View east northeast



Date April 5, 2017 **Feature ID** KOP 3 **Project Site** Urtica **Description** View east southeast	
Date April 5, 2017 **Feature ID** KOP 3 **Project Site** Urtica **Description** View southeast	

Date April 5, 2017 **Feature ID** KOP 3 **Project Site** Urtica **Description** View south southeast	
Date April 5, 2017 **Feature ID** KOP 3 **Project Site** Urtica **Description** View southeast	

APPENDIX B: VISUAL CONTRAST RATING WORKSHEETS

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
VISUAL CONTRAST RATING WORKSHEET

Date:
District/ Field Office:
Resource Area:
Activity (program):

SECTION A. PROJECT INFORMATION

1. Project Name TUUSSO Solar Fumaria Site	4. Location Township_____	5. Location Sketch
2. Key Observation Point KOP 1	Range_____	
3. VRM Class NOT ON FEDERAL LAND	Section_____	

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Distant hills – smooth, rounded Undeveloped land – gentle, rolling, irregular	Grasses – smooth and rough, simple, short and tall Shrubs – rounded, regular, short Trees – large, irregular, rounded and vertical	Gravel roadway – prominent, curving, Irrigation ditch – linear, parallel Buildings – low, small, contrasting, angular Utility pole – tall, vertical
LINE	Distant hills – soft, simple, undulating Undeveloped land – complex, broken, undulating	Grasses – soft and hard, simple and complex Shrubs – simple, rounded, regular, short Trees – large, irregular, rounded and vertical	Gravel roadway – grey, light brown Irrigation ditch – irregular, continuous, parallel Buildings – straight, diagonal Utility poles: Vertical, horizontal
COLOR	Distant hills – blue, grey, medium brown Undeveloped land – green, grey, light brown	Grasses – dark green, light brown Shrubs – light green, grey Trees – dark green, light brown	Gravel roadway – regular, curving, parallel Irrigation ditch – brown, grey Buildings - white, gray, black, red Utility poles – brown
TEX-TURE	Distant hills – medium grain, sparse snow patches Undeveloped land – coarse grain, dotted with regular vegetation	Grasses – fine to medium grain, uniform short grass, patchy clumped tall grasses. Shrubs – random, dotted Trees – random, discontinuous, scattered	Gravel roadway – fine grain, directional tracks Irrigation ditch – rough edges, clumped vegetation Buildings – smooth, medium, even Utility poles – ordered, contrasting, directional

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Indiscernible	Indiscernible	Not visible
LINE	Indiscernible	Indiscernible	Not visible
COLOR	Indiscernible	Indiscernible	Not visible
TEX-TURE	Indiscernible	Indiscernible	Not visible

SECTION D. CONTRAST RATING __SHORT TERM __LONG TERM

1. DEGREE OF CONTRAST		FEATURES: LAND/WATER BODY (1) STRONG	MODERATE	WEAK	NONE	VEGETATION (2) STRONG	MODERATE	WEAK	NONE	STRUCTURES (3) STRONG	MODERATE	WEAK	NONE
ELEMENTS	FORM				x				x				x
	LINE				x				x				x
	COLOR				x				x				x
	TEXTURE				x				x				x

2. Does project design meet visual resource management objectives? ___Yes ___No
(Explain on reverses side)
NOT ON FEDERAL LAND

3. Additional mitigating measures recommended
_x__Yes ___No (Explain on reverses side)

Evaluator's Names Date
Ryan Rausch August 2017

Comments from item 2.

Additional Mitigating Measures (See item 3)

See technical report

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
VISUAL CONTRAST RATING WORKSHEET

Date:
District/ Field Office:
Resource Area:
Activity (program):

SECTION A. PROJECT INFORMATION

1. Project Name TUUSSO Solar Camas Site	4. Location Township_____	5. Location Sketch
2. Key Observation Point KOP 1	Range_____	
3. VRM Class: NOT ON FEDERAL LAND	Section_____	

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Distant hills – tall, smooth, Drainage swale – long, linear, parallel Fields – flat	Agricultural fields – regular Trees and shrubs – irregular, rounded, short and tall Grasses – irregular, rough	Distant farms/houses – low, small, contrasting Roadway – prominent, flat, regular, straight, linear
LINE	Distant hills – simple, undulating Drainage swale – continuous, irregular Fields – horizontal	Agricultural fields – simple, regular Trees and shrubs – complex, irregular, broken Grasses – irregular, rough	Distant farms/houses – discontinuous, irregular Roadway – regular, straight, horizontal
COLOR	Distant hills – blue, grey Drainage swale – tan, brown, grey Fields – green	Agricultural fields – green Trees and shrubs – light brown, light grey, dark green Grasses – gold, brown, grey	Distant farms/houses – white, light grey, tan Roadway – grey, white striping
TEX-TURE	Distant hills – continuous, patchy snow Drainage swale – coarse, patchy Fields – uniform, fine	Fine, medium and coarse	Distant farms/houses – random, dotted Roadway – fine, continuous, striped

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Flat	Geometric and linear forms created by vegetation clearing	Square, contrasting, block, solid, smooth
LINE	Horizontal (solar site and road)	Weak irregular lines, edge effect	Straight, regular
COLOR	Dark grey, saturated fill, glaring	Brown/tans	Dark grey
TEX-TURE	Fine to smooth	Course, rough, random, dotted	Fine to smooth

SECTION D. CONTRAST RATING __SHORT TERM __LONG TERM

1. DEGREE OF CONTRAST		FEATURES											
		LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
		STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE
ELEMENTS	FORM			x				x					
	LINE			x				x			x		
	COLOR		x				x					x	
	TEXTURE			x				x		x			

2. Does project design meet visual resource management objectives? ___Yes ___No
(Explain on reverses side)
NOT ON FEDERAL LAND

3. Additional mitigating measures recommended
_x__Yes ___No (Explain on reverses side)

YES
Evaluator's Names Ryan Rausch, August 2017
Date

SECTION D. (Continued)

Comments from item 2.

Additional Mitigating Measures (See item 3)

See Technical Report

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
VISUAL CONTRAST RATING WORKSHEET

Date:	
District/ Field Office:	
Resource Area:	
Activity (program):	

SECTION A. PROJECT INFORMATION

1. Project Name TUUSSO	4. Location Township_____	5. Location Sketch
2. Key Observation Point Camas KOP 2	Range_____	
3. VRM Class NOT FEDERAL LAND	Section_____	

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Flat terrain of fields and highways in foreground Rolling terrain of low lying mountains in middle and background	Regular and irregular, rounded, oval and lanceolate tree canopies and shrubs	Cylindrical fence posts Tall vertical utility poles Straight linear fencing Rectangular, triangular, vertical and horizontal buildings
LINE	Diagonal band from the road, gently curving line from the low lying mountains, straight line from the flat terrain intersecting the low lying mountains	Vertical and branching lines created by trees and shrubs Random, curving lines of patchy vegetation; edge effects	Diagonal lines created by the highway and fence Vertical lines created by utility poles Horizontal lines from utility pole wires Diamond shaped lines from street signs
COLOR	Brown, light and dark gray, white Low lying hills appear dark blue	Green, white and tan low growing grasses and weeds Brownish gray of deciduous trees not in foliage Dark green of evergreen trees	Brown, gray, silver fencing and road signs White, gray, tan buildings
TEX-TURE	Uniform, medium texture of the road	Patchy, medium – low lying grasses and weeds rough	Rough wooden fence and utility pole Smooth road sign Fine, even houses

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Flat	Geometric and linear forms created by vegetation clearing	Square, contrasting, block, solid, smooth
LINE	Horizontal (solar site and road)	Weak irregular lines, edge effect	Straight, regular
COLOR	Dark grey, saturated fill, glaring	Brown/tans	Dark grey
TEX-TURE	Fine to smooth	Course, rough, random, dotted	Fine to smooth

SECTION D. CONTRAST RATING __SHORT TERM __LONG TERM

1. DEGREE OF CONTRAST		FEATURES											
		LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
		STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE
ELEMENTS	FORM		x					x				x	
	LINE			x				x				X	
	COLOR		x				x					x	

2. Does project design meet visual resource management objectives? ___Yes ___No
(Explain on reverses side)
NOT ON FEDERAL LAND

3. Additional mitigating measures recommended
_x__Yes ___No (Explain on reverses side)

Evaluator's Names Ryan Rausch August 2017
Date

	TEXTURE													

SECTION D. (Continued)

Comments from item 2.

Additional Mitigating Measures (See item 3)

See Technical Report

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
VISUAL CONTRAST RATING WORKSHEET

Date:
District/ Field Office:
Resource Area:
Activity (program):

SECTION A. PROJECT INFORMATION

1. Project Name TUUSSO Solar Camas Site	4. Location Township_____	5. Location Sketch
2. Key Observation Point KOP 3	Range_____	
3. VRM Class NOT ON FEDERAL LAND	Section_____	

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Bold, parallel, curving highway Flat foreground terrain Angular, rolling distant mountains in background terrain	Round, lanceolate, triangular, oval - trees and shrubs	Vertical and horizontal - road/highway overpass Rectangular, vertical reflector signs
LINE	Bold band of the curving highway	Converging simple agricultural field	Straight and curving, perpendicular
COLOR	Gray roads with yellow and white striping Dark blue distant rolling hills	Bright green and dark green of deciduous and evergreen trees and shrubs	Gray overpass of road/highway Black and yellow reflector sign Brown creosote road stabilizers White/gray/tan buildingsB
TEX-TURE	Smooth	Medium, even texture of grassy field	Fine texture of the concrete overpass Smooth texture of road reflectors

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Flat, sloping, superior	Geometric and linear forms created by vegetation clearing	Square, contrasting, block, solid, smooth
LINE	Horizontal (solar site and road)	Weak irregular lines, edge effect	Straight, regular
COLOR	Dark grey, saturated fill, glaring	Brown/tans, greens	Light grey & white
TEX-TURE	Fine to smooth	Course, rough, random, dotted	Fine to smooth

SECTION D. CONTRAST RATING __SHORT TERM __LONG TERM

1. DEGREE OF CONTRAST		FEATURES											
		LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
		STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE
ELEMENTS	FORM			x				x			x		
	LINE		x					x				x	
	COLOR		x					x			x		
	TEXTURE			x				x				x	

2. Does project design meet visual resource management objectives? ___Yes ___No
(Explain on reverses side)
NOT ON FEDERAL LAND

3. Additional mitigating measures recommended
x___Yes ___No (Explain on reverses side)

Evaluator's Names Ryan Rausch August 2017
Date

SECTION D. (Continued)

Comments from item 2.

Additional Mitigating Measures (See item 3)

See Technical Report

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
VISUAL CONTRAST RATING WORKSHEET

Date:
District/ Field Office:
Resource Area:
Activity (program):

SECTION A. PROJECT INFORMATION

1. Project Name TUUSSO Solar Fumaria Site	4. Location Township_____	5. Location Sketch
2. Key Observation Point KOP 2	Range_____	
3. VRM Class NOT ON FEDERAL LAND	Section_____	

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Road – bold, regular, curving Field – flat, low Distant hills – smooth, rounded	Trees – roundish Shrubs – patches of low lying rectangular shapes	Building – triangular and rectangular Mailbox - rectangular Irrigation pipes – linear, narrow Utility poles – Tall, vertical
LINE	Road- bold, curving Field- straight, converging Distant hills-weak, smooth	Trees – Circular, complex Shrubs- perpendicular, continuous	Building – Angular, straight Mailbox - angular Irrigation pipes – straight Utility poles – perpendicular
COLOR	Road- gray, white, yellow Field – brown, tan green Distant hills - Blue, gray	Trees- brown/gray without foliage Shrubs-tan, brown gray without foilage	Building – white, gray Mailbox – silver, red, brown Irrigation pipes – white Utility poles – brown
TEX-TURE	Road- fine, smooth Field – medium, uneven Distant hills – fine, uniform	Trees- Coarse, patchy Shrubs – coarse, random	Building – directional Mailbox – smooth, ordered Irrigation pipes – smooth, ordered Utility poles – coarse

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Indiscernible	Indiscernible	Not visible
LINE	Indiscernible	Indiscernible	Not visible
COLOR	Indiscernible	Indiscernible	Not visible
TEX-TURE	Indiscernible	Indiscernible	Not visible

SECTION D. CONTRAST RATING __SHORT TERM __LONG TERM

1. DEGREE OF CONTRAST		FEATURES											
		LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
		STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE
ELEMENTS	FORM				x				x				x
	LINE				x				x				x
	COLOR				x				x				x
	TEXTURE				x				x				x

2. Does project design meet visual resource management objectives? ___Yes ___No
(Explain on reverses side)
NOT ON FEDERAL LAND

3. Additional mitigating measures recommended
___Yes ___No (Explain on reverses side)

Evaluator's Names Date
Ryan Rausch August 2017

Comments from item 2.

Additional Mitigating Measures (See item 3)

See technical report

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
VISUAL CONTRAST RATING WORKSHEET

Date:
District/ Field Office:
Resource Area:
Activity (program):

SECTION A. PROJECT INFORMATION

1. Project Name TUUSSO Solar Fumaria Site	4. Location Township_____	5. Location Sketch
2. Key Observation Point KOP 3	Range_____	
3. VRM Class NOT ON FEDERAL LAND	Section_____	

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Distant hills – low, rounded Fields – flat, simple,	Agricultural fields – flat and simple Trees – irregular, rounded, short and tall, branching Cattails and grasses – irregular, nondirectional, short and tall	Roadway – prominent, flat, horizontal Utility poles – tall, vertical, regular Fencing – low, regular, simple Buildings – angular, diverse, irregular
LINE	Distant hills – simple, undulating Fields – horizontal, simple, continuous	Agricultural fields – horizontal, simple, continuous Trees – complex, soft, irregular Cattails and grasses – irregular, jagged	Roadway – simple, regular, straight, continuous Utility poles – straight, vertical, regular Fencing – straight, vertical, regular Buildings – regular, hard, angular
COLOR	Distant hills – blue, grey Fields – green, light brown, black	Agricultural fields – green, light brown, black Trees – light brown, dark green Cattails and grasses – golden brown, tan	Roadway – grey, yellow striping Utility poles – dark brown Fencing – dark brown, yellow and white Buildings – white, light brown, red
TEX-TURE	Distant hills – fine and medium grain, patchy random snow Fields – fine grain, uniform	Agricultural fields – uniform, fine grain Trees – complex, soft, irregular Cattails and grasses – irregular, jagged	Roadway – uniform, fine, continuous, striped Utility poles – ordered, contrasting Fencing – ordered Buildings – random, scattered

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Indiscernible	Indiscernible	Not visible
LINE	Transmission line: horizontal, consistent with existing landscape	Indiscernible	Horizontal, vanishing, parallel with ground
COLOR	Indiscernible	Indiscernible	Not visible
TEX-TURE	Indiscernible	Indiscernible	Not visible

SECTION D. CONTRAST RATING __SHORT TERM __LONG TERM

1. DEGREE OF CONTRAST		FEATURES											
		LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
		STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE
ELEMENTS	FORM				x				x				x
	LINE				x				x			x	
	COLOR				x				x				x

2. Does project design meet visual resource management objectives? ___Yes ___No (Explain on reverses side)

NOT ON FEDERAL LAND

3. Additional mitigating measures recommended ___Yes ___No (Explain on reverses side)

Evaluator's Names Ryan Rausch August 2017
Date

	TEXTURE				x				x				x	

SECTION D. (Continued)

Comments from item 2.

Additional Mitigating Measures (See item 3)

See technical report

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
VISUAL CONTRAST RATING WORKSHEET

Date:
District/ Field Office:
Resource Area:
Activity (program):

SECTION A. PROJECT INFORMATION

1. Project Name TUUSSO Solar Penstemon Site	4. Location Township_____	5. Location Sketch
2. Key Observation Point KOP 1	Range_____	
3. VRM Class NOT ON FEDERAL LAND	Section_____	

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Foreground field- flat Distant hills – tall, smooth, rolling	Trees and shrubs – round, lanceolate, short and tall	Buildings- rectangular, triangular Guardrail – short, rectangular Utility poles- tall, vertical
LINE	Field- horizontal Hills – Simple, flowing Creek- Flat, straight	Trees and shrubs – Vertical, branching, perpendicular	Buildings- Straight, vertical Guardrail – Straight, vertical Utility Poles – Straight, vertical
COLOR	Brown, gray, tan	Green, brown, tan	Buildings- White, red, blue and gray Guardrail – Brown, silver/gray Utility poles - brown
TEX-TURE	Fine to medium	Medium to coarse	Buildings- smooth Guardrail – rough wood, smooth metal Utility Poles - Rough

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Foreground – flat Distant hills – tall, smooth, rolling	Trees and shrubs - oval, roundish	Chain link fence – Rough, transparent, vertical, linear Solar panels – Low, horizontal, parallel Guardrail – Short, rectangular Utility poles – tall, vertical
LINE	Foreground – horizontal Hills – Simple, flowing	Trees and shrubs – Curving, circular, vertical	Chain link fence - Straight, regular, continuous Solar panels – Parallel, regular, straight Guardrail – Straight, vertical Utility poles – Straight, vertical
COLOR	Brown, gray tan	Trees and shrubs – Green Grasses - Green	Chain link fence - Gray Solar panels - Gray, silver Guardrail – Brown, gray Utility poles – Brown Vegetation screening - green
TEX-TURE	Foreground - Fine to medium Distant hills - Patchy	Trees and shrubs – Rough, continuous	Chain link fence – Even/ordered, directional Solar panels – Even/ordered, directional Guardrail – Rough wood, smooth metal Utility poles - Rough

SECTION D. CONTRAST RATING __SHORT TERM __LONG TERM

1. DEGREE OF CONTRAST		FEATURES											
		LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
		STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE
ELEMENTS	FORM			x				x				x	
	LINE			x			x				x		

2. Does project design meet visual resource management objectives? ___Yes ___No
(Explain on reverses side)

NOT ON FEDERAL LAND
3. Additional mitigating measures recommended
__x_Yes ___No (Explain on reverses side)

	COLOR			x				x			x			Evaluator's Names Ryan Rausch August 2017 Date
	TEXTURE			x				x				x		

SECTION D. (Continued)

Comments from item 2.

Additional Mitigating Measures (See item 3)

See technical report

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
VISUAL CONTRAST RATING WORKSHEET

Date:
District/ Field Office:
Resource Area:
Activity (program):

SECTION A. PROJECT INFORMATION

1. Project Name TUUSSO Solar Penstemon Site	4. Location Township_____	5. Location Sketch
2. Key Observation Point KOP 2	Range_____	
3. VRM Class NOT ON FEDERAL LAND	Section_____	

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Fields – flat Distant hills – tall, smooth, rolling Stream – regular and meandering	Agricultural fields – regular Riparian growth – low, irregular Trees/shrubs - irregular, rounded, short and tall, branching	Distant farms – low, small, contrasting Roadway – prominent, flat, regular, linear, horizontal Utility poles – tall, vertical
LINE	Fields – horizontal Distant hills – simple, flowing Stream – horizontal, parallel shorelines	Agricultural fields – simple, regular Riparian growth –complex, broken Trees/shrubs – vertical, irregular	Distant farms – broken, discontinuous Roadway – simple, straight, continuous Utility poles – straight, vertical
COLOR	Fields – green Distant hills – blue, grey, light grey Stream – grey with some glare	Agricultural fields – green Riparian growth – golden brown, light brown, grey Trees/shrubs – grey, brown, light green	Distant farms – white, light brown Roadway – light and medium grey, monotone Utility poles – light and dark brown
TEX-TURE	Fields – uniform, fine Distant hills – uniform, fine Stream – uniform, stippled	Agricultural fields – uniform, fine Riparian growth – coarse, rough, nondirectional Trees/shrubs – patchy, clumped	Distant farms – random, dotted Roadway – uniform, fine, continuous \ Utility poles – ordered, contrasting

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Fields – flat Distant hills – tall, smooth, rolling Stream – regular and meandering	Agricultural fields – regular Riparian growth – low, irregular Trees/shrubs - irregular, rounded, short and tall, branching	Distant farms – low, small, contrasting Roadway – prominent, flat, regular, linear, horizontal Utility poles – tall, vertical Solar panels – low, horizontal
LINE	Fields – horizontal Distant hills – simple, flowing Stream – horizontal, parallel shorelines	Agricultural fields – simple, regular Riparian growth –complex, broken Trees/shrubs – vertical, irregular	Distant farms – broken, discontinuous Roadway – simple, straight, continuous Utility poles – straight, vertical Solar panels – Straight, parallel, continuous
COLOR	Fields – green Distant hills – blue, grey, light grey Stream – grey with some glare	Agricultural fields – green Riparian growth – golden brown, light brown, grey Trees/shrubs – grey, brown, light green	Distant farms – white, light brown Roadway – light and medium grey, monotone Utility poles – light and dark brown Solar panels – White, gray
TEX-TURE	Fields – uniform, fine Distant hills – uniform, fine Stream – uniform, stippled	Agricultural fields – uniform, fine Riparian growth – coarse, rough, non-directional Trees/shrubs – patchy, clumped	Distant farms – random, dotted Roadway – uniform, fine, continuous \ Utility poles – ordered, contrasting Solar panels – Smooth, matte

SECTION D. CONTRAST RATING __SHORT TERM __LONG TERM

1. DEGREE OF CONTRAST		FEATURES											
		LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
		STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE
ELEMENTS	FORM			x				x				x	
	LINE			x				x				x	
	COLOR			x				x				x	

2. Does project design meet visual resource management objectives? ___Yes ___No (Explain on reverses side)
NOT ON FEDERAL LAND

3. Additional mitigating measures recommended _x__Yes ___No (Explain on reverses side)

Evaluator's Names Date
Ryan Rausch August 2017

	TEXTURE			x				x				x		

SECTION D. (Continued)

Comments from item 2.

Additional Mitigating Measures (See item 3)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
VISUAL CONTRAST RATING WORKSHEET

Date:	
District/ Field Office:	
Resource Area:	
Activity (program):	

SECTION A. PROJECT INFORMATION

1. Project Name TUUSSO Solar Penstemon Site	4. Location Township_____	5. Location Sketch
2. Key Observation Point KOP 3	Range_____	
3. VRM Class NOT ON FEDERAL LAND	Section_____	

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Fields – flat Distant hills – tall, smooth, rolling	Agricultural fields – regular Trees – irregular, rounded, low	Distant farms – low, small, contrasting Roadway – prominent, flat, regular, linear, horizontal Utility poles – tall, vertical Irrigation line and ditch – simple, low, linear, contrasting
LINE	Fields – simple, horizontal Distant hills – undulating	Agricultural fields – regular Trees – irregular, broken	Distant farms – broken, discontinuous Roadway – simple, straight, continuous Utility poles – straight, vertical Irrigation line and ditch – straight, parallel
COLOR	Fields – green Distant hills – blue, grey, light brown	Agricultural fields – green, brown Trees – light and dark brown	Distant farms – while, light grey Roadway –medium grey, with while striping Utility poles – dark brown Irrigation line and ditch – white irrigation line, grey concrete ditch
TEX-TURE	Fields – uniform, fine Distant hills – patchy, discontinuous	Agricultural fields – regular Trees – patchy, clumped	Distant farms – random, dotted Roadway – uniform, fine, striped Utility poles – ordered, contrasting Irrigation line and ditch – smooth and contrasting irrigation line, rough concrete ditch

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Fields – flat Distant hills – tall, smooth, rolling	Agricultural fields – regular Trees – irregular, rounded, low New trees and shrubs – lanceolate trees, round shrubs, short and tall	Distant farms – low, small, contrasting Roadway – prominent, flat, regular, linear, horizontal Utility poles – tall, vertical Irrigation line and ditch – simple, low, linear, contrasting Solar panels – Indistinct, horizontal
LINE	Fields – simple, horizontal Distant hills – undulating	Agricultural fields – regular Trees – irregular, broken New trees and shrubs – regular,continuous	Distant farms – broken, discontinuous Roadway – simple, straight, continuous Utility poles – straight, vertical Irrigation line and ditch – straight, parallel Solar panels – straight, parallel, horizontal
COLOR	Fields – green Distant hills – blue, grey, light brown	Agricultural fields – green, brown Trees – light and dark brown New trees and shrubs –green	Distant farms – while, light grey Roadway –medium grey, with while striping Utility poles – dark brown Irrigation line and ditch – white irrigation line, grey concrete ditch Solar panels – white, gray
TEX- TURE	Fields – uniform, fine Distant hills – patchy, discontinuous	Agricultural fields – regular Trees – patchy, clumped New trees and shrubs – Even, directional	Distant farms – random, dotted Roadway – uniform, fine, striped Utility poles – ordered, contrasting Irrigation line and ditch – smooth and contrasting irrigation line, rough concrete ditch Solar panels – smooth, matte

SECTION D. CONTRAST RATING __SHORT TERM __LONG TERM

1.	FEATURES			2. Does project design meet visual resource
	LAND/WATER BODY (1)	VEGETATION (2)	STRUCTURES (3)	

DEGREE OF CONTRAST		STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE
ELEMENTS	FORM			x				x			x		
	LINE			x			x				x		
	COLOR			x			x				x		
	TEXTURE			x			x				x		

management objectives? ___Yes ___No
(Explain on reverses side)
NOT ON FEDERAL LAND

3. Additional mitigating measures recommended
__x_Yes ___No (Explain on reverses side)

Evaluator's Names Date
Ryan Rausch August 2017

SECTION D. (Continued)

Comments from item 2.

Additional Mitigating Measures (See item 3)

See technical report

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
VISUAL CONTRAST RATING WORKSHEET

Date:
District/ Field Office:
Resource Area:
Activity (program):

SECTION A. PROJECT INFORMATION

1. Project Name TUUSSO Solar Typha Site	4. Location Township_____	5. Location Sketch
2. Key Observation Point KOP 1	Range_____	
3. VRM Class NOT ON FEDERAL LAND	Section_____	

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Distant hills – low, rounded, irregular Fields – flat, regular, horizontal	Agricultural fields – flat, regular, horizontal Trees – rounded, irregular, short and tall Weeds and grasses – rough, irregular	Roadway – prominent, flat, regular, linear Irrigation equipment –prominent, complex regular Distant buildings – low, indistinct, irregular
LINE	Distant hills – simple, undulating Fields – simple, horizontal, continuous	Agricultural fields – simple, horizontal, continuous Trees – irregular, tall and short Weeds and grasses – complex, broken	Roadway – simple, regular, straight, continuous Irrigation equipment – regular, hard, undulating, parallel Distant buildings – broken, irregular
COLOR	Distant hills – blue, grey, light brown Fields – green, brown	Agricultural fields – green, brown Trees – dark and light brown Weeds and grasses – grey, golden brown	Roadway – light and medium grey, white roads striping Irrigation equipment – grey, white Distant buildings – white, grey
TEX-TURE	Distant hills – fine and medium grain, patchy snow Fields – fine uniform grain	Agricultural fields – fine uniform grain Trees – patchy, clumped Weeds and grasses – patchy, rough, scattered	Roadway – fine uniform grain, directional, striped Irrigation equipment – ordered, contrasting, rough Distant buildings – random, dotted

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Foreground – flat Distant hills – tall, smooth, rolling	Trees and shrubs - oval, roundish	None
LINE	Foreground – horizontal Hills – Simple, flowing	Trees and shrubs – Curving, circular, vertical	None
COLOR	Brown, gray tan	Trees and shrubs – Green Grasses - Green	None
TEX-TURE	Foreground - Fine to medium Distant hills - Patchy	Trees and shrubs – Rough, continuous	None

SECTION D. CONTRAST RATING __SHORT TERM __LONG TERM

1. DEGREE OF CONTRAST		FEATURES: LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
		STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE
ELEMENTS	FORM			x				x					x
	LINE			x				x					x
	COLOR			x				x					x
	TEXTURE			x				x					x

2. Does project design meet visual resource management objectives? ___Yes ___No
(Explain on reverses side)
NOT ON FEDERAL LAND

3. Additional mitigating measures recommended
_x__Yes ___No (Explain on reverses side)

Evaluator's Names Date
Ryan Rausch August 2017

Comments from item 2.

Additional Mitigating Measures (See item 3)

See technical report

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
VISUAL CONTRAST RATING WORKSHEET

Date:
District/ Field Office:
Resource Area:
Activity (program):

SECTION A. PROJECT INFORMATION

1. Project Name TUUSSO Solar Typha Site	4. Location Township_____	5. Location Sketch
2. Key Observation Point KOP 2	Range_____	
3. VRM Class NOT ON FEDERAL LAND	Section_____	

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Distant hills – low, rolling, simple Fields – low, flat, smooth	Agricultural crops – low, flat, smooth Trees – rounded, conical, irregular, short and tall	Roadway – prominent, flat, simple, curved Utility poles – tall, vertical Fencing – vertical and horizontal Distant buildings – low, irregular, angular
LINE	Distant hills – simple, undulating Fields – simple, horizontal, continuous	Agricultural crops – simple, horizontal, continuous Trees – irregular, broken, tall and short	Roadway – simple, regular, curving, continuous Utility poles – straight, vertical Fencing – bold, straight, diagonal Distant buildings – complex, hard, irregular
COLOR	Distant hills – blue, grey Fields – green	Agricultural crops – green Trees –light brown, dark green	Roadway – light grey, white and yellow striping Utility poles – dark brown Fencing – dark brown Distant buildings –White, grey
TEX-TURE	Distant hills – fine grain, smooth Fields – fine grain, uniform	Agricultural crops – fine grain, uniform Trees – patchy, clumped	Roadway – fine grain, uniform, directional, striped Utility poles – ordered, contrasting Fencing – rough, random Distant buildings – ransom, dotted

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Foreground – flat Distant hills – tall, smooth, rolling	Trees and shrubs - oval, roundish	None
LINE	Foreground – horizontal Hills – Simple, flowing	Trees and shrubs – Curving, circular, vertical	None
COLOR	Brown, gray tan	Trees and shrubs – Green Grasses - Green	None
TEX-TURE	Foreground - Fine to medium Distant hills - Patchy	Trees and shrubs – Rough, continuous	None

SECTION D. CONTRAST RATING __SHORT TERM __LONG TERM

1. DEGREE OF CONTRAST		FEATURES											
		LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
		STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE
ELEMENTS	FORM			x				x					x
	LINE			x				x					x
	COLOR			x				x					x

2. Does project design meet visual resource management objectives? ___Yes ___No
(Explain on reverses side)
NOT ON FEDERAL LAND

3. Additional mitigating measures recommended
_x__Yes ___No (Explain on reverses side)

Evaluator's Names Date
Ryan Rausch August 2017

	TEXTURE			x				x					x	

SECTION D. (Continued)

Comments from item 2.

Additional Mitigating Measures (See item 3)

See technical report

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
VISUAL CONTRAST RATING WORKSHEET

Date:
District/ Field Office:
Resource Area:
Activity (program):

SECTION A. PROJECT INFORMATION

1. Project Name TUUSSO Solar Typha Site	4. Location Township_____	5. Location Sketch
2. Key Observation Point KOP 3	Range_____	
3. VRM Class NOT ON FEDERAL LAND	Section_____	

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Field – Flat, simple Distant Hills – Rounded, simple	Field in Foreground – Low, flat Trees and Shrubs in Middle ground – Lanceolate, triangular, vertical	Overhead Sprinklers – Triangular, tall, directional Buildings – Rectangular, triangular Utilities, Fence posts – Rectangular, vertical, low and tall
LINE	Field – Horizontal, simple Distant Hills – Horizontal, curving, simple	Field in Foreground – Straight, flat Trees and Shrubs in Middle ground – Irregular, vertical, converging	Overhead Sprinklers – Bold, angular Buildings – Angular, parallel Utilities, Fence posts – Straight, parallel
COLOR	Field – Brown Distant Hills – blue, gray, white	Field in Foreground - Green Trees and Shrubs in Middle ground – Dark green	Overhead Sprinklers – silver, gray Buildings –Red, gray, light yellow, brown Utilities, Fence posts – dark brown, yellow
TEX-TURE	Field – Fine to medium Distant Hills – Fine, even	Field in Foreground – Fine to medium grain, dense Trees and Shrubs in Middle ground – Coarse grain, sparse	Overhead Sprinklers – Smooth, uniform Buildings – Smooth, uniform Utilities, Fence posts – Rough, uniform

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Foreground – flat Distant hills – tall, smooth, rolling	Trees and shrubs - oval, roundish	None
LINE	Foreground – horizontal Hills – Simple, flowing	Trees and shrubs – Curving, circular, vertical	None
COLOR	Brown, gray tan	Trees and shrubs – Green Grasses - Green	None
TEX-TURE	Foreground - Fine to medium Distant hills - Patchy	Trees and shrubs – Rough, continuous	None

SECTION D. CONTRAST RATING __SHORT TERM __LONG TERM

1. DEGREE OF CONTRAST		FEATURES											
		LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)			
		STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE
ELEMENTS	FORM			x				x					x
	LINE			x				x					x
	COLOR			x				x					x

2. Does project design meet visual resource management objectives? ___Yes ___No
(Explain on reverses side)
NOT ON FEDERAL LAND

3. Additional mitigating measures recommended
_x__Yes ___No (Explain on reverses side)

Evaluator's Names Date
Ryan Rausch

	TEXTURE			x				x					x	

SECTION D. (Continued)

Comments from item 2.

Additional Mitigating Measures (See item 3)

See technical report

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
VISUAL CONTRAST RATING WORKSHEET

Date:	
District/ Field Office:	
Resource Area:	
Activity (program):	

SECTION A. PROJECT INFORMATION

1. Project Name TUUSSO Solar Urtica Site	4. Location Township_____	5. Location Sketch
2. Key Observation Point KOP 1	Range_____	
3. VRM Class NOT ON FEDERAL LAND	Section_____	

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Road – Flat, definite, curving Field – Flat, simple Hills – Rolling, horizontal	Field – Flat, simple Road edge trees and shrubs – Vertical, complex, branching Middle ground trees and shrubs – Lancelolate, circular, vertical	Buildings – Rectangular, triangular Road signs – Octagonal, diamond, rectangular, vertical Gates, fencing and utility poles – vertical, horizontal, parallel
LINE	Road – Curving, diverging Field – Diverging, weak Hills – Undulating	Field – Simple, continuous Road edge trees and shrubs– Complex, branching Middle ground Trees and Shrubs – Lanceloate, roundish	Buildings – Straight, angular Road signs – Geometric Gates, fencing and utility poles – Vertical, straight
COLOR	Road – Gray, white Land – Brown, tan	Field – Bright green Road edge trees and shrubs – Brown, dark green Middle ground Trees and Shrubs – Dark Green, brownish	Buildings – White, gray Road signs – Red, white, yellow, black, silver/gray Gates, fencing and utility poles – Brown, silver/gray, white
TEX-TURE	Road – Rough, patchy Field – Uniform, medium grain Hills – Fine to medium grain, patchy	Field – Medium grain, uniform Road edge trees and shrubs – Coarse grain, dense Middle ground Trees and Shrubs – Coarse grain, random	Buildings – Smooth Road signs – Smooth, glossy Gates, fencing and utility poles – Coarse grain, contrasty

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Fields – flat Distant hills – tall, smooth, rolling	Agricultural fields – regular Trees – irregular, rounded, low New trees and shrubs – lanceolate trees, round shrubs, short and tall	Distant farms – low, small, contrasting Roadway – prominent, flat, regular, linear, horizontal Utility poles – tall, vertical Irrigation line and ditch – simple, low, linear, contrasting Solar panels – Indistinct, horizontal
LINE	Fields – simple, horizontal Distant hills – undulating	Agricultural fields – regular Trees – irregular, broken New trees and shrubs – regular,continuous	Distant farms – broken, discontinuous Roadway – simple, straight, continuous Utility poles – straight, vertical Irrigation line and ditch – straight, parallel Solar panels – straight, parallel, horizontal
COLOR	Fields – green Distant hills – blue, grey, light brown	Agricultural fields – green, brown Trees – light and dark brown New trees and shrubs –green	Distant farms – while, light grey Roadway –medium grey, with while striping Utility poles – dark brown Irrigation line and ditch – white irrigation line, grey concrete ditch Solar panels – white, gray
TEX- TURE	Fields – uniform, fine Distant hills – patchy, discontinuous	Agricultural fields – regular Trees – patchy, clumped New trees and shrubs – Even, directional	Distant farms – random, dotted Roadway – uniform, fine, striped Utility poles – ordered, contrasting Irrigation line and ditch – smooth and contrasting irrigation line, rough concrete ditch Solar panels – smooth, matte

SECTION D. CONTRAST RATING __SHORT TERM __LONG TERM

1.	FEATURES			2. Does project design meet visual resource
	LAND/WATER BODY (1)	VEGETATION (2)	STRUCTURES (3)	

DEGREE OF CONTRAST		STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE
ELEMENTS	FORM			x				x				x	
	LINE			x			x					x	
	COLOR			x			x				x		
	TEXTURE			x			x				x		

management objectives? ___Yes ___No
(Explain on reverses side)
NOT ON FEDERAL LAND

3. Additional mitigating measures recommended
_x__Yes ___No (Explain on reverses side)

Evaluator's Names Date
Ryan Rausch August 2017

SECTION D. (Continued)

Comments from item 2.

Additional Mitigating Measures (See item 3)

See technical report

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
VISUAL CONTRAST RATING WORKSHEET

Date:	
District/ Field Office:	
Resource Area:	
Activity (program):	

SECTION A. PROJECT INFORMATION

1. Project Name TUUSSO Solar Urtica Site	4. Location Township_____	5. Location Sketch
2. Key Observation Point KOP 2	Range_____	
3. VRM Class NOT ON FEDERAL LAND	Section_____	

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Foreground, middle ground – Flat Background hills – Rolling, solid	Field – Flat, regular Middle ground trees and shrubs – Roundish, lanceolate, vertical	Fences – Vertical, regular, horizontal Road signs – Rectangular, pentagonal Buildings – Rectangular, triangular
LINE	Foreground – Straight, diverging Middle ground – Irregular, broken Background hills – Curving, simple	Field – Straight, horizontal Middle ground trees and shrubs – vertical, branching	Fences – Horizontal, vertical, parallel Road Signs – Angular, vertical Buildings - Straight, smooth
COLOR	Foreground land – Brown, gray Foreground parking lot – Dark gray Background hills – Blue/gray, white	Field – Green, tan, brown Middle ground trees and shrubs – Dark green	Fences – Brown,orange, white, silver/gray Road Signs – Silver/gray Buildings - White, gray
TEX-TURE	Foreground land – Rough, granular Foreground parking lot - Smooth Background hills – Smooth, fine	Field – Medium grain, even Middle ground trees and shrubs – Coarse grain, medium density Background hills – Fine grain, even	Fences – Smooth, directional Road Signs – Smooth, glossy Buildings – Medium, uniform

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Fields – flat Distant hills – tall, smooth, rolling	Agricultural fields – regular Trees – irregular, rounded, low New trees and shrubs – lanceolate trees, round shrubs, short and tall	Distant farms – low, small, contrasting Roadway – prominent, flat, regular, linear, horizontal Utility poles – tall, vertical Irrigation line and ditch – simple, low, linear, contrasting Solar panels – Indistinct, horizontal
LINE	Fields – simple, horizontal Distant hills – undulating	Agricultural fields – regular Trees – irregular, broken New trees and shrubs – regular,continuous	Distant farms – broken, discontinuous Roadway – simple, straight, continuous Utility poles – straight, vertical Irrigation line and ditch – straight, parallel Solar panels – straight, parallel, horizontal
COLOR	Fields – green Distant hills – blue, grey, light brown	Agricultural fields – green, brown Trees – light and dark brown New trees and shrubs –green	Distant farms – while, light grey Roadway –medium grey, with while striping Utility poles – dark brown Irrigation line and ditch – white irrigation line, grey concrete ditch Solar panels – white, gray
TEX- TURE	Fields – uniform, fine Distant hills – patchy, discontinuous	Agricultural fields – regular Trees – patchy, clumped New trees and shrubs – Even, directional	Distant farms – random, dotted Roadway – uniform, fine, striped Utility poles – ordered, contrasting Irrigation line and ditch – smooth and contrasting irrigation line, rough concrete ditch Solar panels – smooth, matte

SECTION D. CONTRAST RATING __SHORT TERM __LONG TERM

1.	FEATURES												
	LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)				2. Does project design meet visual resource management objectives? ___Yes ___No (Explain on reverses side) NOT ON FEDERAL LAND 3. Additional mitigating measures recommended
DEGREE OF CONTRAST	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	

ELEMENTS	FORM			x			x					x		___Yes ___No (Explain on reverses side)
	LINE			x				x				x		
	COLOR			x			x				x			Evaluator's Names Date
	TEXTURE			x			x				x			

SECTION D. (Continued)

Comments from item 2.

Additional Mitigating Measures (See item 3)

See technical report

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
VISUAL CONTRAST RATING WORKSHEET

Date:	
District/ Field Office:	
Resource Area:	
Activity (program):	

SECTION A. PROJECT INFORMATION

1. Project Name TUUSSO Solar Urtica Site	4. Location Township_____	5. Location Sketch
2. Key Observation Point KOP 3	Range_____	
3. VRM Class NOT ON FEDERAL LAND	Section_____	

SECTION B. CHARACTERISTIC LANDSCAPE DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Foreground, Middle ground – Flat Background Hills – Rolling, vertical	Foreground field– Flat Foreground and middle ground trees and shrubs – Lanceolate, roundish	Sprinklers – Circular, straight, horizontal Utility Pole/guy wire – Vertical, angular Buildings – Triangular, rectangular
LINE	Foreground – Flat, diverging Middle ground – Broken, rugged Background hills - Undulating	Foreground field – Simple, straight Middle ground trees and shrubs – Branching, complex Background hills - Undulating	Sprinklers – Curving and straight Utility Pole/guy wire – Angular, vertical Buildings – Straight, vertical
COLOR	Foreground, middle ground – Brown, gray Background hills – Blue/gray	Foreground field – Green, tan Middle ground trees and shrubs – Dark green, brown	Sprinklers – Silver/gray Utility Pole/guy wire – Brown, silver, yellow Buildings – Red, white, gray, rust, tan
TEX-TURE	Foreground, middle ground – Medium and coarse grain Background hills – Fine, smooth	Foreground field – Medium grain, even Foreground and middle ground trees – Coarse, clumped	Sprinklers – Smooth, continuous Utility Pole/guy wire – Rough and smooth Buildings – Smooth, directional

SECTION C. PROPOSED ACTIVITY DESCRIPTION

	1. LAND/WATER	2. VEGETATION	3. STRUCTURES
FORM	Fields – flat Distant hills – tall, smooth, rolling	Agricultural fields – regular Trees – irregular, rounded, low New trees and shrubs – lanceolate trees, round shrubs, short and tall	Distant farms – low, small, contrasting Roadway – prominent, flat, regular, linear, horizontal Utility poles – tall, vertical Irrigation line and ditch – simple, low, linear, contrasting Solar panels – Indistinct, horizontal
LINE	Fields – simple, horizontal Distant hills – undulating	Agricultural fields – regular Trees – irregular, broken New trees and shrubs – regular,continuous	Distant farms – broken, discontinuous Roadway – simple, straight, continuous Utility poles – straight, vertical Irrigation line and ditch – straight, parallel Solar panels – straight, parallel, horizontal
COLOR	Fields – green Distant hills – blue, grey, light brown	Agricultural fields – green, brown Trees – light and dark brown New trees and shrubs –green	Distant farms – while, light grey Roadway –medium grey, with while striping Utility poles – dark brown Irrigation line and ditch – white irrigation line, grey concrete ditch Solar panels – white, gray
TEX- TURE	Fields – uniform, fine Distant hills – patchy, discontinuous	Agricultural fields – regular Trees – patchy, clumped New trees and shrubs – Even, directional	Distant farms – random, dotted Roadway – uniform, fine, striped Utility poles – ordered, contrasting Irrigation line and ditch – smooth and contrasting irrigation line, rough concrete ditch Solar panels – smooth, matte

SECTION D. CONTRAST RATING __SHORT TERM __LONG TERM

1. DEGREE OF CONTRAST	FEATURES												2. Does project design meet visual resource management objectives? ___Yes ___No (Explain on reverses side) NOT ON FEDERAL LAND 3. Additional mitigating measures recommended
	LAND/WATER BODY (1)				VEGETATION (2)				STRUCTURES (3)				
	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	STRONG	MODERATE	WEAK	NONE	

ELEMENTS	FORM			x				x			x			__x_Yes ___No (Explain on reverses side)
	LINE			x			x				x			
	COLOR			x			x				x			Evaluator's Names Date Ryan Rausch August 2017
	TEXTURE			x				x			x			

SECTION D. (Continued)

Comments from item 2.

Additional Mitigating Measures (See item 3)

See technical report

Appendix E: Solar Glare Hazard Analysis Report

8/12/2017

Solar Glare Hazard Analysis

Camas, Fumaria, Penstemon, Typha, and Urtica Solar Projects

Kittitas County, WA

CLIENT
Tuusso Energy
Jason Evans

CONSULTANT
MaxPV Engineering
Larry Booth, PE
Principal Engineer

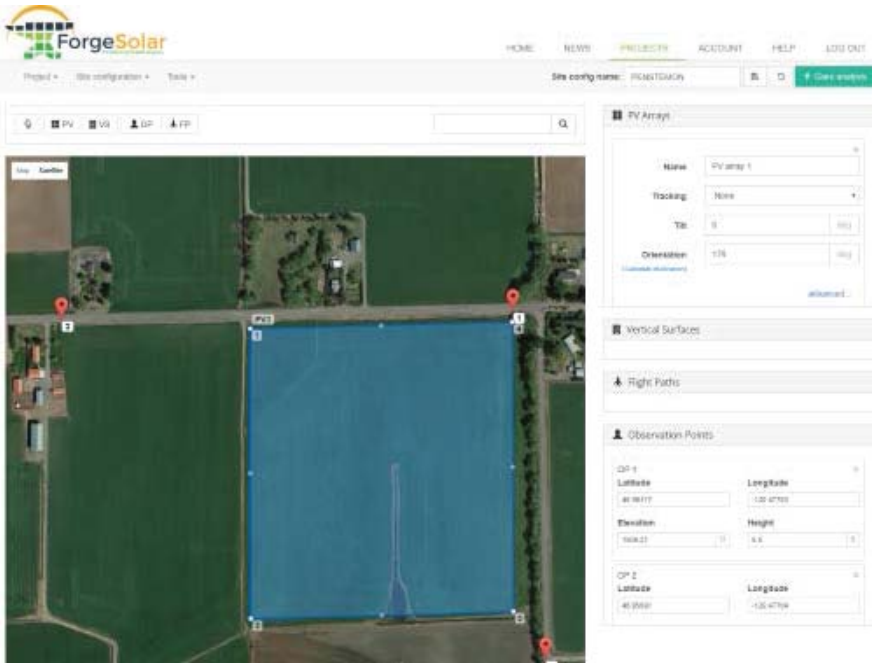
Executive Summary

This Solar Glare Hazard Analysis has been prepared to evaluate the potential for glare at each photovoltaic (PV) system from Key Observation Points (KOPs). The analysis takes into consideration the location, orientation, and reflective characteristics of the PV system relative the KOPs.

The results of this analysis show that the predicted glare hazards for the proposed PV system are within acceptable levels for potential glare contribution. The general standard for acceptable glare is met by maintaining that no stationary observers have potential for ocular after-image that could impair vision for safety reasons (such as air traffic control towers). For moving observers, low (green) and potential (yellow) after image are considered acceptable given the observer is moving, glare is momentary, and within normal driving conditions.

The KOPs in this study were all considered roadway-based and thus moving observers, none of which experienced glare events outside of those expected in normal driving conditions.

The time of day when glare potential exists at an intensity that can cause a temporary after image are sunrise and sunset periods, when the glare potential from the solar modules is insignificant to the greater danger of viewing the unfiltered Sun, and therefore the solar reflection intensities at these times are not considered significant at less than .01x of other present sources.



Modeling in the SGHAT/ForgeSolar Glare Analysis tool

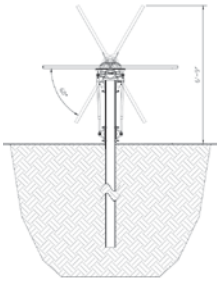
Purpose

The purpose of this analysis is to determine possible glare hazards and their severity due to the PV system being proposed for various project locations in Kittitas County. Any possible glare hazards will be evaluated against the current FAA guidelines and industry standards for acceptable glare.

Technology and Inputs

Modules
The solar photovoltaic (PV) modules are standard flat-face (non-concentrating) solar modules, which have the industry standard anti-reflective glass face. The modules are approximately 3.5' by 6.5' in size.

Solar Tracking
The solar modules will be supported by horizontal axis trackers, to track the Sun's hourly progress across the sky for a better energy yield. The movement of the modules is considered in the SolarForge GlareGauge (formerly SGHAT) tool and calculates the resulting glare for each time of year. The module racking height of elevation 5'-0" was chosen.



Tracker Profile

Tracker Spacing
The solar array energy yield is very intolerant of small amounts of direct shading, and as such rows of modules are spaced for clear sky access. This results in roughly 13'-0" empty ground spacing for a 6'-6" length module-width between each module tracker assembly in the east-west directions. This translates to roughly a 33% module ground coverage ratio when in the horizontal or stow position. The remaining ground will be native vegetation or access paths.

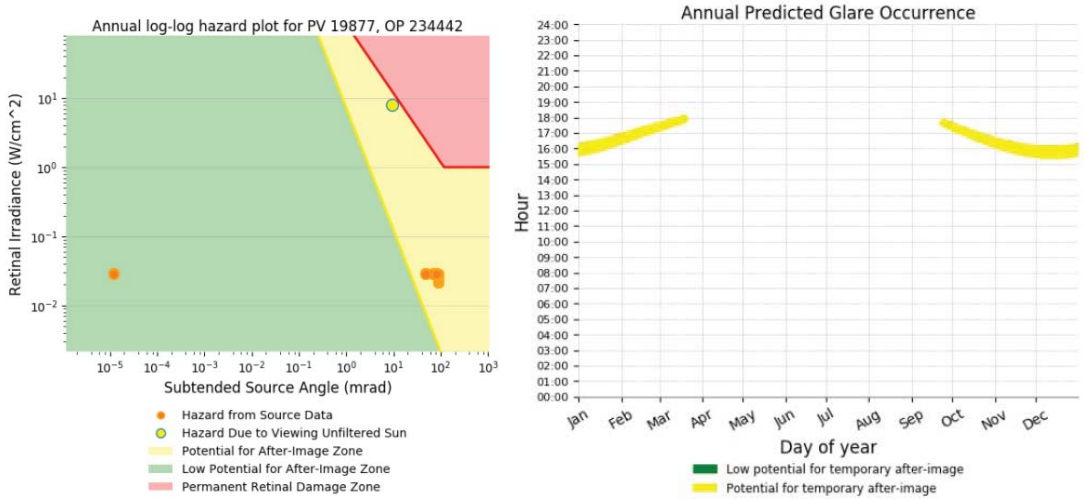
However, for this analysis, all areas within the project site are analyzed for glare in order to determine the worst case conditions. We view this as a conservative input.

Tool & Approach

The tool used for this analysis is based on the Solar Glare Hazard Analysis Tool (SGHAT) created by Sandia National Laboratories. In 2017, the Solar Glare Hazard Analysis Tool was licensed to the private company Forge Solar run by one of the original engineers behind the popular glare modeling tool, which now appears on the reports and have a new, simpler format for presenting ocular impacts.

Representative models of the five proposed PV system were constructed in the SGHAT application for each of the project's 3 KOPs relative to the solar module arrays.

The below example shows how the SGHAT tool results are displayed.



In the above case, yellow glare potential is indicated for temporary after image during sunset hours in winter months. However, the source data intensity is 2 orders of magnitude below the direct sun intensity and within normal driving conditions during sunset hours as indicated in the plot to the top left.

It is generally accepted that flat plate solar PV modules are designed to be non-reflective, given than maximum power harvest correlates with light capture, the opposite of reflectance. In practice from satellite view and airplanes, large arrays of solar modules resemble a dark blue body of water and are not a significant contributor of glare in most conditions due to the flat plate and anti-reflective module design.

Project Specific Results

For all projects, the ocular impact, or glare intensity is below $2x10^{-2}$ W/cm^2 in the 'Hazard plot for PV' and therefore the projects have no dangerous or detrimental visual impact to the KOPs.

Camas Solar Project
Camas KOPs 2 and 3 indicate as expected that the elevated approach above the lower lying solar project would result in some longer periods of green and yellow potential indicators during morning hours.

Fumaria Solar Project
All KOPs are a significant distance and at similar elevation to the solar project. As such there is practically no glare component contributing to the KOPs.

Penstemon Solar Project
KOPs #1 and #2 indicate a reasonable amount of yellow potential glare indications. However, all are low intensity and acceptable. It is also noted that between both observations showing more potential glare minutes per month, both will have visual obstructions between them not reflected in this model. KOP #1 will have a future fence and #2 an existing vegetative screen. Both are within acceptable glare intensity levels for observers in motion as shown.

Typha Solar Project
Similar to Fumaria, all KOPs for Typha are a significant distance to the solar project. As such there is practically no glare component from the solar project contributing to the KOPs.

Urtica Solar Project
All KOPs for Urtica are green and yellow indicators and within acceptable intensities for KOPs in motion.

End Report

Attachments Follow

Appendix F: Decommissioning Plan

TUUSSO ENERGY, LLC
EFSEC SOLAR PROJECTS
FACILITY DECOMMISSIONING PLAN



1.0 INTRODUCTION 3
1.1 Background 3
1.2 Decommission Plan Purpose 3
2.0 PROJECT COMPONENTS 3
2.1 Site Construction Preparation 4
2.2 Well Water 4
2.3 PV Equipment Installation 4
2.4 Operations and Maintenance Building 5
2.5 Substation 5
2.6 Internal Power Collection System 5
2.7 Roads 5
2.8 Vegetation During Operations 5
3.0 PROJECT DECOMMISSIONING AND RECYCLING 5
3.1 Decommissioning Preparation 6
3.2 Well Water 6
3.3 PV Equipment Removal and Recycling 6
3.4 O&M Building Area 7
3.5 Substation 7
3.6 Water Tanks 7
3.7 Internal Power Collection System 7
3.8 Transmission Line 7
3.9 Roads 7
3.10 Site Restoration 8
3.10.1 Restoration Plan 8
3.10.2 Monitoring 8
3.10.3 Criteria for Restoration Success 8
3.10.4 Report and Schedule 8
3.11 Fences 9
4.0 FUTURE LAND USE 9
5.0 PROJECT DECOMMISSIONING COSTS AND BONDING 9

1.0 INTRODUCTION

1.1 Background

TUUSSO Energy LLC (TUUSSO) will construct, own and operate five 5-megawatt ac (MWAC) solar photovoltaic (PV) power generation facilities and associated electrical interconnection facilities, each a Project and collectively referred to as the Projects. The project sites are located on privately owned land in Kittitas County, State of Washington.

This Facility Decommissioning Plan (Decommissioning Plan) is developed for the Projects for review and approval by The Energy Facility Site Evaluation Commission (EFSEC) and in compliance with the State Environmental Policy Act. The Decommissioning Plan will be implemented upon discontinuance of operations, abandonment of the Projects, or termination of any or all of the Site Certification Agreements (SCA).

The Decommissioning Plan shall include, but not be limited to, the following:

a. Removal of solar panel structures and all appurtenant above-ground equipment;
b. Removal of on-site overhead poles and above-ground electricity lines;
c. Removal of all on-site septic tanks;
d. Removal of permanent above-ground or below-ground transmission lines and/or poles located in the public right-of-way if determined not usable by Public Works and/or any other applicable public or private utility;
e. Restoration of any disturbed soil of the site to the pre-construction condition;
f. Restoration or reclamation of project roads to their pre-construction condition unless the then-existing owner of the site elects to retain the improved roads for access throughout the site;
g. Documentation of the pre-construction condition of the project site, including, but not limited to, a photographic record; and
h. Performance and financial assurance guarantees.

1.2 Decommission Plan Purpose

The purpose of this Decommissioning Plan is to clarify the process of conducting decommissioning activities for the permanent closure of the Projects or a portion of the Projects. The facilities are designed for an operating life of more than 30 years. This Decommissioning Plan describes the approach for removal and/or proper abandonment of facilities and equipment associated with the Projects and describes anticipated land restoration activities at the end of the SCAs. Elements of this process may be adjusted based on baseline conditions at the time of decommissioning, and any adjustment will have been determined to be in substantial compliance with EFSEC requirements.

2.0 PROJECT COMPONENTS

The Projects' components subject to decommissioning include the equipment summarized below. These components are discussed in detail in the Mitigated Determination of Non-Significance (MDNS) for the Projects. The decommissioning activities associated with these components are discussed in Section 3.0 of this Decommissioning Plan.

2.1 Site Construction Preparation

Construction facilities will be located at each of the Project sites. Facilities will include the construction entrance/exit, all-weather access roads, and parking and staging areas for vehicle and equipment storage and maintenance. Laydown areas will be used for pre-assembly of components and materials storage/staging. Each Project site will also include areas for construction worker parking. Temporary construction offices will be installed on-site using modular trailers.

All-weather access roads will be built for access to inverter pads on each Project site via new gates at the access points shown in the respective Site Plans.

Site access driveways and gates will remain in place for the operational phase of the Projects.

2.2 Well Water

No well water will be obtained or used for the Projects. Dust control water for construction, fire protection water, and water for panel washing and for watering vegetation on-site will be obtained from water trucks bringing in off-site water or through the landowners' existing water rights on the Project sites.

2.3 PV Equipment Installation

The PV equipment for the Projects will consist of approximately 100,000 PV panels mechanically fastened on steel support structures and driven by single axis trackers. The steel support structures will be supported on galvanized steel posts that will be driven into the ground. The tracker motors will be supported on cast-in-place foundations.

The construction methods for the preparation of the sites and the installation of the panels shall be consistent with all approved SCA conditions for the respective Project sites. Should a discrepancy exist between the SCA for the Project and the installation methods outlined below, the SCA shall govern.

Grading shall be limited mainly to the all-weather access roads, tanks, inverter pads, project switchyards, or other areas consistent with the approved exhibit map/grading plan. Work within the area where the solar panels are proposed shall be conducted with minimal disturbance, and the operator shall take all necessary precautions to not use vehicles or machineries for grading or alter the existing grade in these areas.

When vehicles or machinery are deemed necessary for solar field installation work, appropriate ground-protection practices (such as construction mats, stabilizers, or established vegetation) shall be utilized for both dust suppression and to ensure that the vehicles or machineries are compatible with continued and future vegetation growth to the satisfaction of EFSEC. Any grading, disking, and scraping for access roads, walkways, required basins and/or berms shall be permanently stabilized with an earth-stabilizing product.

Contrary to conventional power plant design where the site has to be prepared to meet a set of pre-engineered contours, the construction approach will be to use existing contours where possible without significantly altering grades on the Project sites.

A Light-on-Land (LoL) philosophy will be used for the grading and installation of the Projects. Several features of the LoL philosophy are as follows:

a. Preservation of property - temporary fencing will be used to protect areas not to be disturbed.
b. Existing improvements, properties, utilities, facilities, trees, and plants that are not to be removed will be protected from injury or damage. Construction materials and equipment will not be placed within the drip line of trees if any are encountered. Damaged trees, if any, will be replaced.
c. Temporary staging areas will be utilized within the solar fields, and they will ultimately be built over with solar arrays. The areas will be seeded after construction is completed.
d. Limited all-weather access roads through the solar fields will be constructed by compacting existing soil with minimal fill utilized only when necessary.

2.4 Operations and Maintenance Building

The Projects will not have Operations and Maintenance (O&M) Buildings.

2.5 Substation

The Projects will each include onsite switchgear and protection, and will be connected to existing utility distribution lines.

2.6 Internal Power Collection System

The PV modules will convert sunlight into direct current (DC) electricity. The PV-generated DC power will be collected from each of the multiple rows of PV modules, from which it will be connected to multiple combiner boxes and ultimately to skids each containing multiple inverters and a distribution voltage transformer. The inverters will convert the DC power to alternating current (AC) power which will then flow to the transformer that will increase the AC power voltage to 12.47 kilovolt (kV). Multiple transformers from multiple skids will be connected in parallel to on-site switchgear and protection equipment. The power will then be delivered to the above-ground Puget Sound Energy (PSE) existing distribution lines either on-site or via a generation tie-line.

2.7 Roads

Access to the Project sites will be from public right of ways and private access roads. Access permits will be required when connecting to a County owned right of way. Construction of those access points will be in compliance with State and/or County requirements.

2.8 Vegetation During Operations

Perimeter vegetation will be planted per the Site Plan and watered as required. Vegetation under the solar panels will be managed as per the SCAs and other safety and operational requirements.

3.0 PROJECT DECOMMISSIONING AND RECYCLING

The activities involved in the facility closure will depend on the expected future use of each of the Project sites. At the time of decommissioning, in addition to this Decommissioning Plan, a detailed Removal Work Plan and Schedule and a Site Restoration Plan, as described in Section 3.10 Site

Restoration below, shall be filed with EFSEC as a Discretionary Site Plan Review, for review and approval by the EFSEC. The Removal Work Plan and Schedule will describe the proposed equipment that will be removed and an associated schedule for such removal based on expected future uses of the Project site. The currently envisaged plan involves completion of the decommissioning, excluding establishment of revegetation, in a six-month period.

In general, decommissioning will attempt to maximize the recycling of all facility components. Specific opportunities for recycling (e.g. PV solar panels) are discussed below in the context of various site components. The individual Project components to be decommissioned will be recycled to the maximum extent practical.

The key Project components affected by decommissioning activities are discussed below. The general decommissioning approach will be the same whether a portion, one, or all of the Projects are decommissioned.

3.1 Decommissioning Preparation

The first step in the decommissioning process will be to assess existing site conditions and prepare the Project site for demolition, including preparation and submittal of the above referenced Removal Work Plan and Schedule for the components and provisions described below.

Site decommissioning, excluding revegetation, can take six months. Establishment of revegetation on the Project sites will be the responsibility of the landowner for their agricultural or other approved land uses. The current land use of each of the Project sites is agricultural, with all locations historically producing hay or serving as pasture.

Demolition debris will be placed in temporary onsite storage areas for no more than 120 days per location with no more than one 120-day extension per location if determined necessary by EFSEC, pending final transportation and disposal/recycling according to the procedures listed below. The location of the temporary onsite storage areas will be included on a site plan with the Removal Work Plan and Schedule and Site Restoration Plan review submittal.

3.2 Well Water

There will be no wells used for the Projects. At decommissioning, no well activity is anticipated.

3.3 PV Equipment Removal and Recycling

At the start of decommissioning, the Projects will be de-energized and disconnected from the distribution grid. During decommissioning, project components that are no longer needed will be removed from the site and recycled. The de-energized crystalline Silicon PV panels will be unmounted from the torque tubes by sliding the panels off the mounting saddles once the rivet connectors are drilled out. The panels will then be collected into rear-loading garbage trucks and transported to a landfill facility or to a recycling center.

The torque tubes and any additional panel mounting hardware and rack supports will be removed in their entirety from the site using cranes, dump trucks, and flat-bed and rear-loader garbage trucks. Tracker motors and any tracker control equipment will be dismantled and recycled as per state e-waste recycling requirements. The support piers/posts will be removed by CAT excavators with attachments

and recycled. Cranes will be utilized to remove any inverters and transformers, including the inverter skids and any foundations.

The demolition debris and removed equipment may be cut or dismantled into pieces that can be safely lifted or carried with the on-site equipment being used. The majority will be processed for transportation to an offsite recycling center. All steel, copper, and aluminum will be recycled to the maximum extent possible.

3.4 O&M Building Area

There will be no O&M Buildings on the Project sites, and therefore there will be no O&M Building decommissioning activity.

3.5 Substation

The Projects will be connected to existing substations located off-site, therefore no decommissioning activities will be required. All onsite switchgear and protection equipment will be de-energized, dismantled and removed from the Project sites using flat-bed and rear-loader garbage trucks.

3.6 Water Tanks

Any on-site water tanks for fire protection will be drained, detached and loaded onto flat-bed trucks by cranes during the decommissioning process. The water tanks will be salvaged for scrap metals.

3.7 Internal Power Collection System

The combiner boxes that convey DC power generated from the solar arrays will be dismantled. The inverters that convert DC power to AC power and transformers that increase the AC power voltage to 12.47 kV will also be dismantled and removed by cranes and flat-bed trucks. Any insulating and cooling mineral oil and fluids from the transformers will be drained, removed from the site, and recycled or disposed of at an appropriately licensed disposal facility. The underground 12.47 kV cables and conduits that form the AC and DC collection systems will be removed and recycled as well as any above ground DC electrical wiring. If any cable or conduit is left in place, the depth will be a minimum of 4 feet below grade to allow for future farming activities.

3.8 Transmission Line

Generation tie lines that have been installed on existing poles will be removed and recycled.

3.9 Roads

Onsite access roads will remain in place to accomplish decommissioning at the end of the facility's life. At the time of decommissioning, if the landowner determines that some of these roads will be beneficial for future use of the site, such roads may remain after decommissioning. On site roads will be compacted dirt roads or gravel roads. Roads that will not be re-used will be restored to preconstruction conditions. For any asphalt access driveways that will be removed, asphalt material will be broken up and removed to an appropriate disposal site. The landowners may choose to maintain the access driveways for their farming purposes.

3.10 Site Restoration

Once removal of Project equipment is complete, the sites will be restored to preconstruction conditions. The landowners will be responsible for the re-vegetation with the crop of their choice.

The restoration will be enhanced by the operational landscape re-vegetation and restoration plan outlined in Section 2.9 earlier. Fugitive dust control on remaining vacant land shall be met by preservation of the vegetation planted on site during the operation phase.

Photo documentation of the pre-construction vegetative conditions on the site is provided in Attachment 1. At the time of decommissioning, the site will be evaluated by a qualified biologist to determine the extent of and type of vegetation existing on the site. The decommissioning will leave the existing vegetation on site and allow the landowner to determine the re-vegetation of the area for their farming purposes. The landowners will also determine any fertilizers to apply that are applicable to the specific crop they choose to plant.

3.10.1 Restoration Plan

All decommissioning shall occur in a manner where appropriate dust suppression can be achieved. Based on the site conditions, a biologist will develop a restoration plan acceptable to EFSEC at the time of decommissioning. Because of the limited disturbance to soils and site contours by the construction of the Projects, it is expected that restoration will largely involve reseeding by the landowner. De-compaction if required may involve disking or similar methods by the landowners. The Projects' land contours will be maintained very similar to pre-construction conditions, as the panels will be constructed on the existing contours when possible.

3.10.2 Monitoring

During the first growing season following site restoration, the Projects' biologist will coordinate with EFSEC on site-specific monitoring of the re-vegetated area, with landowner approval and consent. If the landowner consents, the biologist may monitor the re-vegetation for a period of three years for data collection on the restoration efforts. The monitoring will not interfere with the landowner's farming operations.

3.10.3 Criteria for Restoration Success

Success criteria for site restoration will be established prior to commencement of decommissioning activities, based on the documented pre-construction conditions, experience gained with re-vegetation during operation and the condition of the site at the time of decommissioning. The restoration success criteria will be established in the Restoration Plan submitted with the Removal Work Plan and Schedule to EFSEC in consultation with the designated biologist.

3.10.4 Report and Schedule

Acceptable levels of re-vegetation success and the schedule for achieving them could vary based on various factors such as soil, rainfall conditions and farming operations. The re-vegetation success and scheduling of success monitoring efforts will be determined to the satisfaction of EFSEC and the designated biologist, with the cooperation of the landowners. The annual reports submitted to EFSEC of

the Project sites will include copies of completed site review forms and a summary of monitoring data and results, and identification of site locations successfully re-vegetated by the landowners.
Once restoration of the Project sites is determined to be complete, a final report of restoration activities and results will be submitted to EFSEC in consultation with the designated biologist, for review and approval.

3.11 Fences

Once the sites have been fully restored according to section 3.10 above, the chain link fences and gates surrounding the Project sites can be removed and recycled.

4.0 FUTURE LAND USE

The activities involved in the facility closures will depend on the expected future use of the Project sites. Certain facility equipment may be utilized for future uses. Therefore, the extent of site closure activities will be determined at the time of the closure. Future uses of the lands occupied by the Projects will be contingent on current land use plans and regulations applicable to the Project sites at the time such future use is proposed to be established.

5.0 PROJECT DECOMMISSIONING COSTS AND BONDING

TUUSSO shall provide performance financial assurance in a form and an amount sufficient to ensure the decommissioning of the Project sites. TUUSSO will provide a report to EFSEC staff every five years after approval of the Application for Site Certification, confirming that the performance and financial assurance guarantees are sufficient to ensure performance and implementation of the Decommissioning Plan. The report shall provide a decommissioning pro-forma budgetary analysis summarizing the residual value of the salvageable property, excluding residual value of the real property (land value). The pro-forma shall include, at a minimum, the expected revenue from all salvageable property excluding land value, the then-current cost of decommissioning the sites, and the then-current value of any performance and financial guarantees.

Appendix G: Camas Solar Project Site Reports and Permit Applications

G-1: Camas Solar Project Critical Areas Report

G-2: Camas Solar Project Cultural Resources Report

G-3: Camas Solar Project Permit Applications

G-4: Camas Solar Project Geotechnical Engineering Study

G-5: Camas Solar Project Drainage Report

Appendix G-1: Camas Solar Project Critical Areas Report



CRITICAL AREAS WETLAND AND WATERS DELINEATION REPORT FOR THE CAMAS SOLAR PROJECT



July 10, 2017

SWCA ENVIRONMENTAL CONSULTANTS
SEATTLE, WASHINGTON

CRITICAL AREAS WETLAND AND WATERS DELINEATION REPORT FOR THE CAMAS SOLAR PROJECT KITTITAS COUNTY, WASHINGTON

Sections 18 and 19, Township 17 North, Range 19 East
Parcel Numbers 920233, 050233, 10566, 20568

Report Prepared for

TUUSSO Energy, LLC

By
Evan Dulin

July 10, 2017

Project Number 38727.05

SWCA Environmental Consultants
221 1st Ave W, Suite 205
Seattle, Washington 98119

TABLE OF CONTENTS

1 INTRODUCTION 1

1.1 Background 1

1.2 Project Setting 1

2 METHODS 1

2.1 Study Area 1

2.2 Review of Existing Information 1

2.3 Field Investigation 3

2.3.1 Wetlands 6

2.3.2 Riparian Habitats 10

3 RESULTS AND DISCUSSION 10

3.1 Wetlands 11

3.1.1 Wetland CW01 12

3.2 Frequently Flooded Areas 12

3.3 Geologically Hazardous Areas 13

3.4 Habitats 13

3.4.1 Riparian Habitat 13

3.4.2 Priority Habitats and Species 14

3.5 Aquifer Recharge Areas 15

4 CONCLUSIONS AND RECOMMENDATIONS 15

5 DISCLAIMER 16

6 LITERATURE CITED AND REVIEWED 17

APPENDIX A: WETLAND DELINEATION METHODOLOGY A-1

APPENDIX B: VEGETATION LIST B-1

APPENDIX C: WETLAND DATA SHEETS C-1

APPENDIX D: WETLAND AND STREAM PHOTOGRAPHS D-1

APPENDIX E: ECOLOGY RATING FORMS E-1

APPENDIX F: KITTITAS COUNTY WETLAND BUFFER GUIDANCE F-1

LIST OF TABLES

Table 1. Precipitation for 3 Months Prior to Site Visits (in inches) 6
Table 2. Precipitation 2 Weeks Prior to Site Visits (in inches) 6
Table 3. Washington State Department of Ecology Wetland Rating System 7
Table 4. Summary of the Water Typing System 10
Table 5. Soil Mapping within the Study Area 11
Table 6. Wetland Size, Rating, and Classification for Wetlands within the Study Area 11
Table 7. Summary of Streams in the Study Area 13
Table 8. Wetland and Waters Summary 15

LIST OF FIGURES

Figure 1. Project vicinity map. 2
Figure 2. NWI, NHD, and floodplain mapping. 4
Figure 3. Soils and PHS mapping. 5
Figure 4. Wetland and waters delineation map, north portion. 8
Figure 5. Wetland and waters delineation map, south portion. 9

1 INTRODUCTION

This report describes the methods and findings of wetland, stream, and other critical areas delineation for the proposed Camas Solar Project. The report was prepared by SWCA Environmental Consultants (SWCA), and is intended to address permitting requirements under Energy Facility Site Evaluation Council (EFSEC) Washington Administrative Code (WAC) 463-60-322, -332, and -333, and to show compliance of the proposed project with Kittitas County's Code for Critical Areas Ordinance (KCC Chapter 17A).

1.1 Background

TUUSSO Energy, LLC (TUUSSO) is proposing to construct a new photovoltaic solar facility installation on approximately 52.6 acres of private agricultural land, which would connect into the existing Puget Sound Energy (PSE) distribution transmission line along Tjossem Road, located southeast of Ellensburg, Kittitas County, Washington. The project is intended to provide up to 5 MW of solar energy to PSE for use within their service area.

1.2 Project Setting

The Camas Solar Project site is active agricultural land located immediately southeast of the intersection of Tjossem Road and Interstate 82 (I-82) in unincorporated Kittitas County, Washington. The project would be located approximately 2.25 miles southeast of the Ellensburg city center, in Sections 18 and 19 of Township 17 North, Range 19 East, Willamette Meridian (Figure 1). The project site totals approximately 52.6 acres. Topography of the site is fairly flat and slopes to the south towards Little Naneum Creek, with surface elevations ranging from 1,465 to 1,455 feet above mean sea level.

2 METHODS

2.1 Study Area

The Camas Solar Project site is approximately 52.6 acres in size (Figure 1). Wetlands and streams outside of the project site but that occur within 200 feet of the project site boundary and had the potential to have buffers extend into the project site were included in the study area. Wetlands and streams outside of the project site and within the study area were visually inspected but not formally delineated.

2.2 Review of Existing Information

Prior to conducting fieldwork, background materials were reviewed to determine the potential for wetlands, floodplains, habitats, and other critical areas and their buffers that may occur within the study area. Materials referenced during the desktop study are listed below. The list below follows the KCC Critical Areas required checklist outlined in KCC Chapter 17A.03.035.

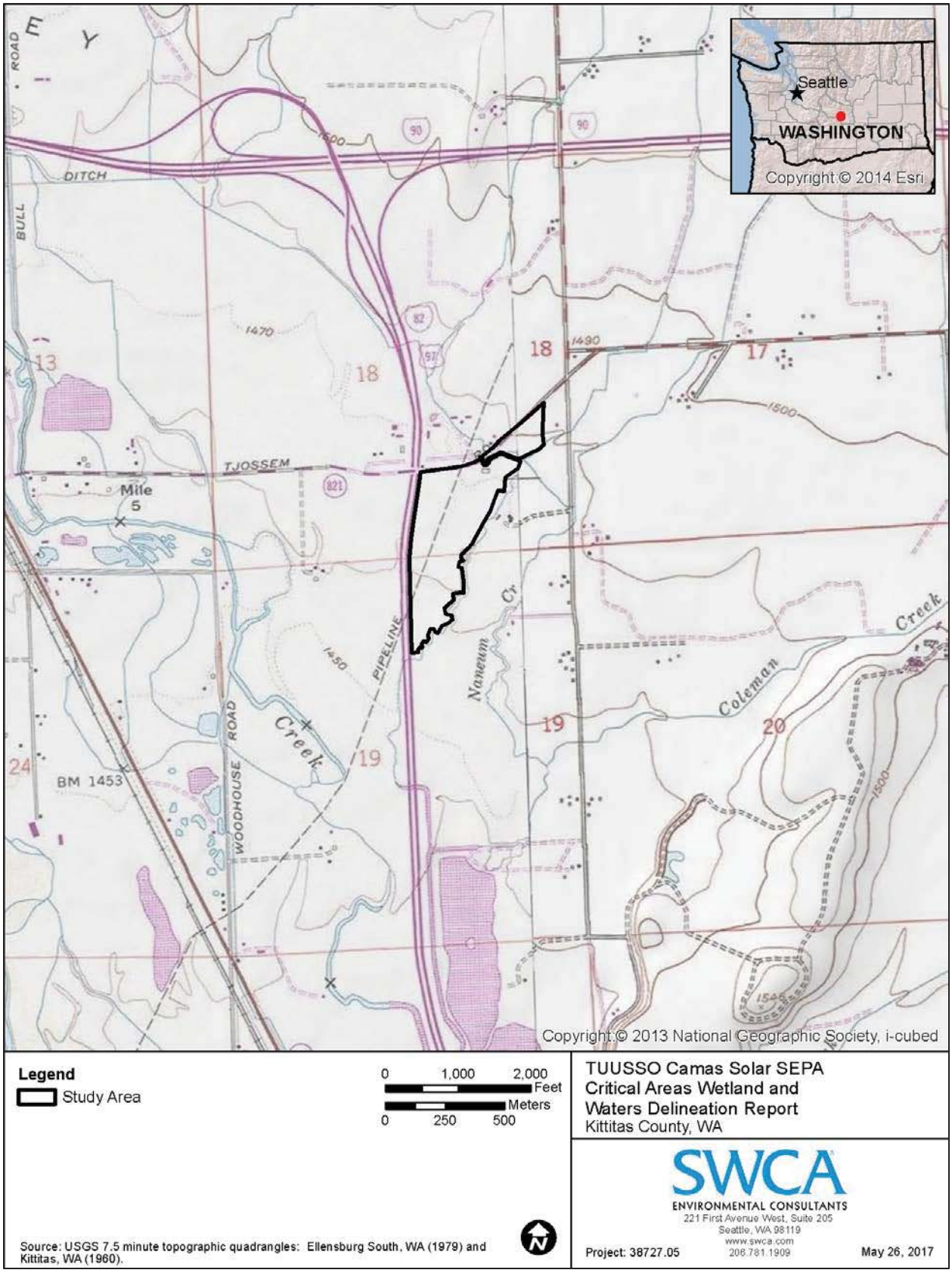


Figure 1. Project vicinity map.

Wetlands (KCC Chapter 17A.04)

- Historical Google Earth aerial photography (2000–2016).
- U.S. Department of Agriculture (USDA) historical imagery (USDA 1954).
- U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle map for Ellensburg South, Washington, included in Figure 1.
- USFWS National Wetlands Inventory (NWI) data and USGS National Hydrography Dataset (NHD), included in Figure 2.
- Natural Resources Conservation Service (NRCS) Soil Survey of Kittitas County Area, Washington and NRCS Web Soil Survey map of the study area, included in Figure 3.

Frequently flooded areas (KCC Chapter 17A.05)

- Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Panel 5300950558B, included in Figure 2.

Geologically hazardous areas (KCC Chapter 17A.06)

- Includes erosion, landslide, mine, and seismic hazard areas.
- Kittitas County COMPAS mapping tool.

Habitats (KCC Chapter 17A.07)

- Includes riparian habitats and streams and rivers.
- Washington State Department of Fish and Wildlife (WDFW) SalmonScape online mapper.
- WDFW Priority Habitats and Species (PHS) online mapper, included in Figure 3.

Aquifer recharge areas (KCC Chapter 17A.08)

- No critical aquifer recharge locations have been identified in Kittitas County.

Spatial data obtained during the review of existing information were incorporated into the Camas Solar Project base maps (Figures 1 through 3).

2.3 Field Investigation

Following the desktop review of existing information, a team of two biologists conducted a site visit on April 10, 2017, to assess the Camas Solar Project study area for the presence of wetland and non-wetland water features and to record data relevant to the Washington State Department of Ecology's (Ecology's) most recently approved version of the *Washington State Wetland Rating System for Eastern Washington, 2014 Update* (Hruby 2014). Visual observations were recorded within 200 feet of the project site, and included wildlife and habitat data.

Precipitation data were obtained from the closest wetlands climate analysis (WETS) climate station, the Ellensburg National Weather Service (NWS) station (ELBW1), approximately 1.75 miles to the northwest of the project site in southern Ellensburg, Washington. Historical (1971–2000) average annual rainfall is 8.96 inches. Table 1 shows the monthly precipitation at the Ellensburg NWS weather station for the 3 months prior to the April 10, 2017, site visit. Table 2 shows the rainfall received 2 weeks prior to the site visit, and the water-year-to-date (WYTD) rainfall. Rainfall recorded 3 months prior to fieldwork was wetter than normal.



Figure 2. NWI, NHD, and floodplain mapping.

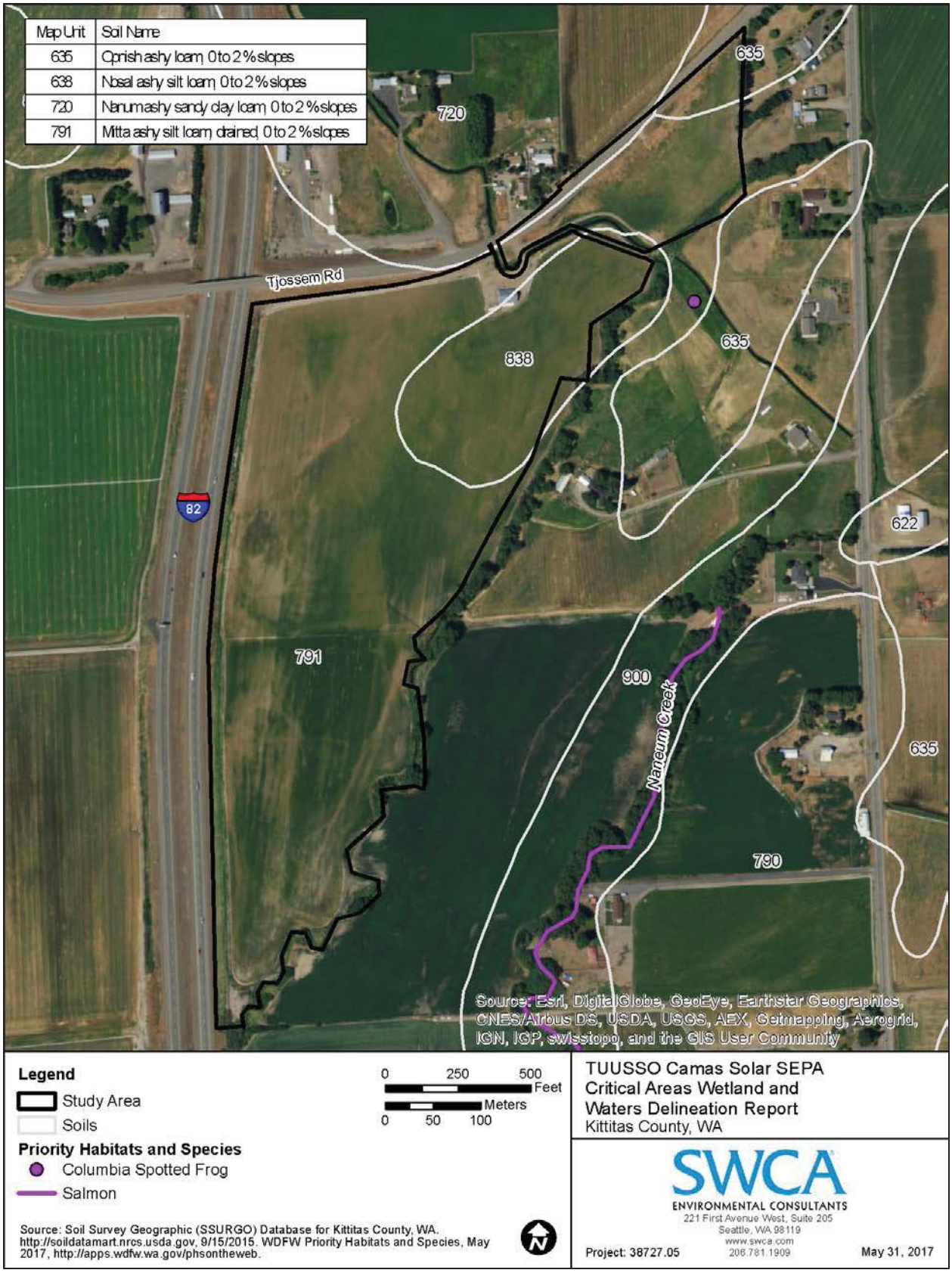


Figure 3. Soils and PHS mapping.

Table 1. Precipitation for 3 Months Prior to Site Visits (in inches)

Month	Average	30% Chance Will Have		Observed Precipitation	Within Normal Range?
		Less Than	More Than		
March	0.76	0.36	0.93	1.49	Above
February	0.91	0.59	1.10	2.04	Above
January	1.19	0.65	1.45	1.54	Above

Source: NRCS 2017b.

Table 2. Precipitation 2 Weeks Prior to Site Visits (in inches)

Field Study	Precipitation 2 Weeks Prior	WYTD	Inches Above or Below Normal WYTD*
April 9–March 27, 2017	0.76	9.37	3.11 above

*Based on average precipitation from 1981 to 2010.
Source: NRCS 2017b.

2.3.1 Wetlands

The Camas Solar Project study area was investigated for wetlands in accordance with the current methodology of the U.S. Army Corps of Engineers' (USACE's) 2008 *Arid West Regional Supplement (Version 2)* and the *Wetlands Delineation Manual* (Environmental Laboratory 1987). A detailed description of the field methods used in this study is provided in Appendix A.

A Trimble Geo XT global positioning system (GPS) unit was used by the field team to assist in identifying the project site boundaries and to record site spatial data. This device is capable of submeter accuracy. The full extent of the study area was covered by the team of biologists. Photographs were collected and vegetation, soil, and hydrology characteristics were documented. The boundaries for wetlands located outside of the project site but within the study area were approximated using field observations and aerial imagery to determine the extent of on-site wetland buffers.

Geographic information system (GIS) software were used to analyze data and to produce the report figures (Figures 4 and 5). Per WAC 463-60-333 and KCC Chapter 17A, wetlands were rated using the *Washington State Wetland Rating System for Eastern Washington, 2014 Update*. Per KCC 17A.04.020, the resulting wetland ratings were used to determine the County-prescribed range of wetland buffers for each wetland. Table 3 lists Ecology's wetland rating criteria. Kittitas County's definition of a wetland is based on the Revised Code of Washington (RCW) 36.70A.030, which states:

> *(21) "Wetland" or "wetlands" means areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Wetlands do not include those artificial wetlands intentionally created from nonwetland sites, including, but not limited to, irrigation and drainage ditches, grass-lined swales, canals, detention facilities, wastewater treatment facilities, farm ponds, and landscape amenities, or those wetlands created after July 1, 1990, that were unintentionally created as a result of the construction of a road, street, or highway. Wetlands may include those artificial wetlands intentionally created from nonwetland areas created to mitigate conversion of wetlands.*

A detailed analysis of wetland functions is not included in this report; however, a brief description of wetland functions is provided as part of the general description for each wetland.

Table 3. Washington State Department of Ecology Wetland Rating System

Category			
I	**II**	**III**	**IV**
Category I wetlands: Represent a unique or rare wetland type; are more sensitive to disturbance than most wetlands; are relatively undisturbed and contain ecological attributes that are impossible to replace within a human lifetime; or provide a high level of functions. Specific wetlands that meet the Category I criteria include: 1. alkali wetlands, characterized by the presence of shallow saline water with a high pH; 2. natural heritage wetlands, specifically, wetlands identified by the Washington Natural Heritage Program/DNR as high quality relatively undisturbed wetlands; and wetlands that support state-listed threatened or endangered plants; 3. bogs and calcareous fens; 4. mature and old-growth forested wetlands with slow growing trees that are over 0.25 acre in size; and 5. wetlands that perform many functions very well, as indicated by a score of 22 or more points out of 27 on the wetland rating form.	Category II wetlands: Wetlands that are difficult, though not impossible, to replace, and provide high levels of some functions. Specific wetlands that meet the Category II criteria include: 1. forested wetlands in the floodplains of rivers; 2. mature and old-growth forested wetlands with fast growing trees that are over 0.25 acre in size; 3. vernal pool that are located in a landscape with other wetlands and that are relatively undisturbed during the early spring; and 4. wetlands scoring between 19 and 21 points, out of 27, on the wetland rating form.	Category III wetlands: Wetlands that provide a moderate level of functions. Specific wetlands that meet the Category III criteria include: 1. wetlands scoring between 16 and 18 points, out of 27, on the wetland rating form.	Category IV wetlands: Wetlands that have the lowest levels of functions and are heavily disturbed. Specific wetlands that meet the Category IV criteria include: 1. wetlands scoring less than 16 points out of 27 on the wetland rating form.

Source: Hruby (2014).
Kittitas County wetland category definitions defer to Washington Administrative Code for guidance.
Appendix F includes the County-issued guidance.

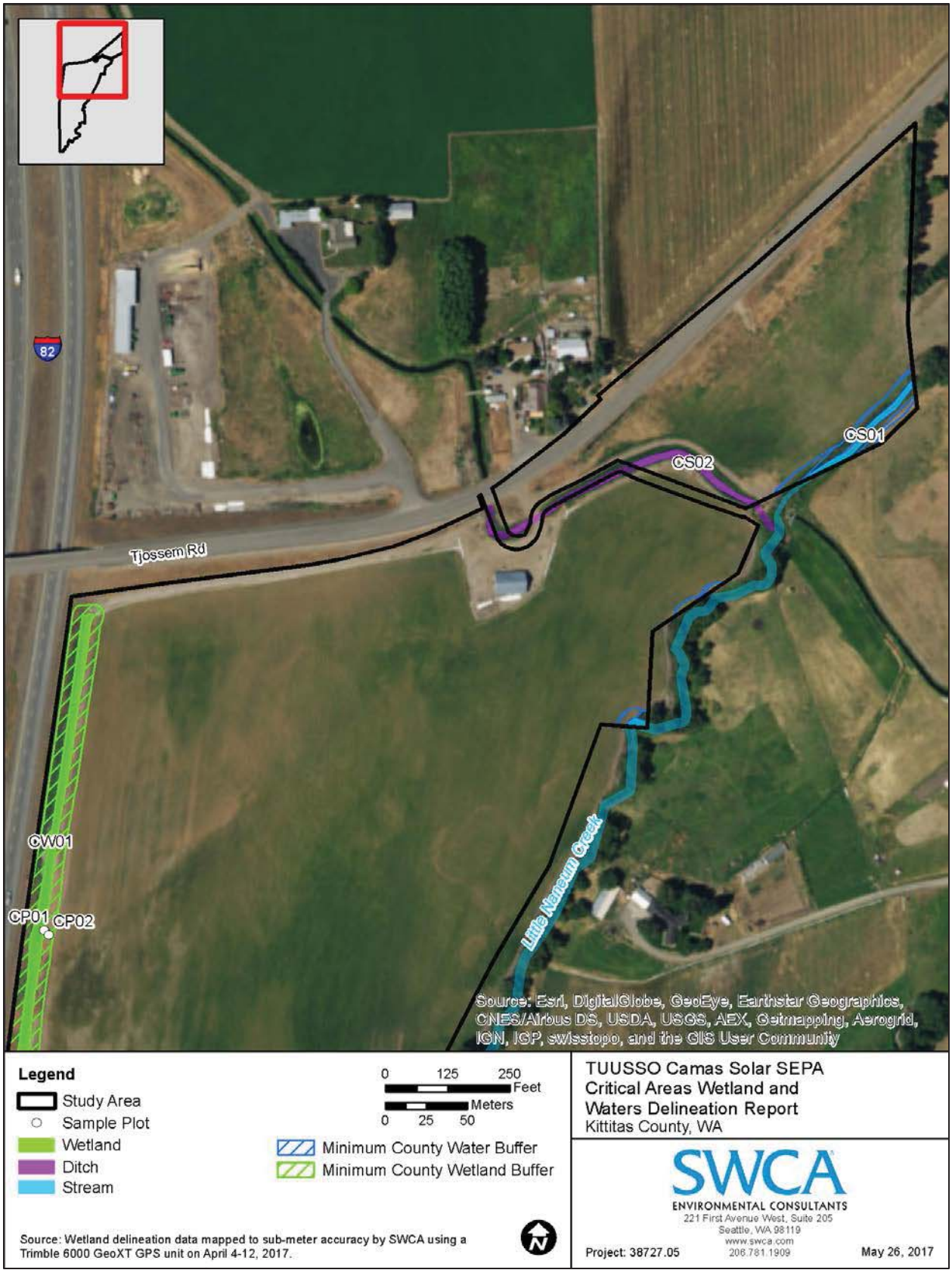


Figure 4. Wetland and waters delineation map, north portion.



Figure 5. Wetland and waters delineation map, south portion.

2.3.2 Riparian Habitats

Biologists also investigated the Camas Solar Project study area for the presence of non-wetland waters and used a GPS device to delineate the ordinary high water marks (OHWMs) of streams per the definitions in WAC 173-22-030 (Figure 5). The OHWMs of streams and rivers outside of the project site but within the study area were approximated using field observations and aerial imagery to determine the extent of on-site stream buffers.

Streams identified in the study area were classified according to the WAC stream typing system (WAC 222-16-030). Criteria for this typing system are described in Table 4. The stream types described in this report are based on the stream reaches within the study area; downstream reaches may be rated higher.

Table 4. Summary of the Water Typing System

Stream Type	Definition [a]
S	All waters, within their bankfull width, as inventoried as "shorelines of the state" under Chapter 90.58 RCW and the rules promulgated pursuant to Chapter 90.58 RCW including periodically inundated areas of their associated wetlands.
F	All segments of natural waters that are not Type S waters, and that contain fish or fish habitat, including: 1) waters diverted for domestic use by more than 10 residential or camping units or by a public accommodation facility; 2) waters diverted for use by a federal, state, or Tribal fish hatchery from the point of diversion for 1,500 feet or the entire tributary if the tributary is highly significant for protection of downstream water quality; 3) waters that are within a federal, state, local, or private campground having more than 10 camping units; or 4) riverine ponds, wall-based channels, and other channel features that are used by fish for off-channel habitat.
Np	All segments of natural waters within the bankfull width of defined channels that are perennial non–fish habitat streams. Perennial streams are flowing waters that do not go dry any time of a year of normal rainfall and include the intermittent dry portions of the perennial channel below the uppermost point of perennial flow.
Ns	All segments of natural waters within the bankfull width of the defined channels that are not Type S, F, or Np waters. These are seasonal, non–fish habitat streams in which surface flow is not present for at least some portion of a year of normal rainfall and the stream is not located downstream from any stream reach that is a Type Np water. Ns waters must be physically connected by an above-ground channel system to Type S, F, or Np waters.

[a] Definitions are summarized from WAC 222-16-030. Kittitas County stream type definitions defer to WAC for guidance.

3 RESULTS AND DISCUSSION

The Camas Solar Project site primarily consists of actively managed agriculture for growing alfalfa (*Medicago sativa*). An irrigation canal (Bull Ditch) enters the northern project site through a culvert beneath Tjossem Road, flows through the northeast corner of the project site for 675 feet, and exits the project site along the eastern boundary. Naneum Creek flows into the project site on the eastern boundary and flows southwest within the study area for about 4,250 feet, and exits the study area through a box culvert beneath I-82.

Some species of weeds and non-native herbaceous species occur around the edges of the agricultural land and in the interspace between planted alfalfa, including downy cheat grass (*Bromus tectorum*), common dead-nettle (*Lamium amplexicaule*), prickly lettuce (*Lactuca serriola*), garden yellow-rocket (*Barbarea vulgaris*), hairy cat's-ear (*Hypochaeris radicata*), and common dandelion (*Taraxacum officinale*), with some native species, such as common panic grass (*Panicum capillare*) and Gorman's desert-parsley (*Lomatium gormanii*). The portion of the study area north of Bull Ditch is dominated by mowed reed canary grass (*Phalaris* arundinacea) and blue grass (*Poa* sp.). Refer to Appendix B for a complete list of vegetation observed within the study area.

The proposed Camas Solar Project site is bordered by Tjossem Road to the north, I-82 to the west, and agricultural fields to the south and east. The project site is approximately 1.4 miles east of the Yakima River and is surrounded by active agricultural land and rural residences in all directions. Access to the proposed project site is via an access road from Tjossem Road, near the on-site barn.

According to NRCS, the Camas Solar Project study area encompasses three different soil map units (Table 5). These soil map units range from somewhat poorly drained to moderately well drained soils that occur on alluvial fans, flood plains, inset fans, fan skirts, and fan aprons. None of the soil units within the study area are on the National Hydric Soils list (NRCS 2015), which is a list of soils that can be indicative of saturated, flooded, or ponded areas that could meet the definition of a hydric soil.

Table 5. Soil Mapping within the Study Area

Map Unit Symbol	Map Unit Name	Hydric
635	Opnish ashy loam, 0 to 2 percent slopes	No
838	Nosal ashy silt loam, 0 to 2 percent slopes	No
791	Mitta ashy silt loam, drained, 0 to 2 percent slopes	No

Source: NRCS 2015 and 2017b.

3.1 Wetlands

One wetland was delineated within the Camas Solar Project study area. The wetland was distinguished from adjoining uplands by a significant change in topography and plant community. Wetland delineation data sheets are provided in Appendix C, photographs are provided in Appendix D, and wetland rating forms are provided in Appendix E.

Table 6 summarizes the size, rating, and classification of the wetland found within the Camas Solar Project study area. The delineated wetland would fall under the jurisdiction of the USACE, Ecology, and Kittitas County. Figures 4 and 5 show the locations of the wetlands, streams, data plots, and their associated minimum protection buffers. The minimum wetland protection buffers were calculated per KCC guidance, based on Ecology's Wetland Rating for each wetland. Detailed descriptions of each wetland are provided in the following sections.

Table 6. Wetland Size, Rating, and Classification for Wetlands within the Study Area

Wetland Name	Delineated Area within Project Site (Wetland Rating Unit Size) [a] (acres)	Wetland Rating [b]	Hydrogeomorphic Classification	Cowardin Classification [c]	Dominant Species Observed within Wetland
CW01	1.62 (1.72)	III	Riverine	PEM	Reed canary grass, broad-leaf cat-tail, pale-yellow iris

a Wetland rating unit size is the total area of wetland delineated or estimated based on aerial photograph interpretation and field reconnaissance. Area of delineated portions of the wetlands is based on SWCA survey data.

b Wetland ratings are based on *Washington State Wetland Rating System for Eastern Washington – Revised* (Hruby 2014).

c Cowardin et al. (1979).

3.1.1 Wetland CW01

Palustrine emergent
Category III
1.62 acres within the project site, approximately 1.72 acres in total

Wetland CW01 is a long, linear riverine wetland that parallels the western project site boundary (see Figures 4 and 5; and wetland rating Figures 1 through 5 in Appendix E). Delineation data were recorded at sample plots CP01 through CP03, provided on datasheets in Appendix C. The majority of the wetland is within the project site, with a small portion extending outside of the project site to the south where it connects to Little Naneum Creek. The upland boundary is defined by an obvious rise in elevation, a transition from hydric to non-hydric soils, and the absence of wetland hydrology indictors.

Wetland CW01 is a palustrine emergent (PEM) wetland habitat type (Cowardin et al. 1979). Refer to Table A-1 in Appendix A for definitions of wetland indictor statuses listed in this section (i.e., FACW and OBL). The wetland was dominated by reed canary grass (FACW), with smaller amounts of pale-yellow iris (*Iris pseudacorus*, OBL) and broad-leaf cat-tail (*Typha latifolia*, OBL) in the areas of longer inundation.

Soils in Wetland CW01 are mapped as Mitta ashy silt loam, drained, with 0% to 2% slopes (NRCS 2017a) (see Figure 3). The soil profile observed within 16 inches of the soil surface consisted of very dark grayish brown (2.5Y 3/2) silt loam over a black (2.5Y 2.5/1) silt loam with redoximorphic features starting at 8 inches (Munsell Color 2009). The soils in Wetland CW01 meet the hydric soil indicator for Redox Dark Surface (F6).

Primary indicators of hydrology within the wetland included surface water, and high water table and saturation within 12 inches. Surface water, 1 foot away from the sample pit, was 5 inches deep. Secondary indicators observed within the wetland included drift deposits (riverine). The presence of these indicators meets wetland hydrology criteria.

Wetland CW01 is rated as a Category III wetland in the Ecology rating system (see Table 3), with a moderately low score for water quality improvement (5/9 points) and moderate scores for hydrologic function and habitat function (6/9 points). Wetland CW01 has moderate potential to provide water quality function and hydrologic function because it has ungrazed herbaceous vegetation, a floodplain wider than its channel, it is located in an area with intensive land use that generates pollutants, and it discharges to a fork of Naneum Creek with water quality and flooding issues. Wetland CW01 has moderate potential to provide habitat function because it contains some vegetation structure diversity and open water, and is adjacent to three priority habitats including biodiversity areas and corridors, riparian, and instream habitat in Little Naneum Creek.

3.2 Frequently Flooded Areas

FEMA floodplain mapping depicts two 100-year floodplains within the Camas Solar Project study area (see Figure 2). The northernmost 100-year floodplain appears to have been a former overflow channel of Little Naneum Creek. The floodplain enters the study area in the north, heads west slightly, makes a gradual curve to the south, and follows the edge of the highway, encompassing Wetland CW01, to its confluence with Little Naneum Creek. The southernmost 100-year floodplain within the study area is associated with Little Naneum Creek. This floodplain encompasses the creek and trends from the northeast corner to the southwest corner of the study area. In total, the FEMA-mapped 100-year floodplain occupies 11.15 acres of the project site. Based on observations during the site visit, this mapped floodplain area does not appear to match the current site conditions and may be unreliable.

Regardless, development within the 100-year floodplain will be avoided or reduced to the maximum extent possible; therefore, no net loss of floodplain storage is expected as a result of the proposed project.

3.3 Geologically Hazardous Areas

The Camas Solar Project site is not within any mapped geologically hazardous areas. No erosion/landslide geologic hazard areas, snow avalanche hazards, or mine hazard areas are mapped on any of the parcels that encompass the project site (Kittitas County 2017). The project will not require specialized engineering to ascertain that the property is suitable for development.

3.4 Habitats

Based on the criteria provided in KCC Chapter 17A.07, the Camas Solar Project study area only includes riparian habitat. The project is not located on federal land or land owned or leased by the WDFW, and therefore is not considered big game winter range. An occurrence of the priority species, Columbia spotted frog (*Rana luteiventris*), is mapped about 200 feet southeast of the project site, adjacent to Bull Ditch.

3.4.1 Riparian Habitat

One perennial stream (Little Naneum Creek) and one irrigation ditch (Bull Ditch) are located in the Camas Solar Project study area. Both of these features continue outside of the project site, to the south and east. Based on the field observations, Little Naneum Creek would be considered a jurisdictional water by the USACE, Ecology, and Kittitas County because it satisfies the definition of "waters of the United States" under the Clean Water Rule 40 CFR 230.3. Bull Ditch is an irrigation canal and does not fall under the purview of the County, Ecology, or USACE. Table 7 summarizes the size, rating, and classification of the streams found in the study area (see Figures 4 and 5). Photographs of these features are provided in Appendix D.

Table 7. Summary of Streams in the Study Area

Stream Name	Tributary to	Stream Type [a]	USACE Jurisdiction [b]	Average Width in Study Area (feet) [c]	Approximate Length in Project Site (feet) [c]
Little Naneum Creek	Naneum Creek	F	RPW	19	2050
Bull Ditch	N/A	N/A	N/A	14	690

[a] F =fish-bearing stream (WAC 222-16-030), N/A = not applicable, due to canals being excluded from the WAC typing system.

[b] RPW = relatively permanent water, N/A = not applicable, due to exclusion from jurisdiction.

[c] Average widths and approximate lengths were determined based on SWCA survey data and field observations.

3.4.1.1 Little Naneum Creek

Little Naneum Creek is a perennial tributary to the Naneum Creek and the Yakima River. Little Naneum Creek is the north fork of Naneum Creek and combines with Naneum Creek about 0.5 mile south of the Camas Solar Project site. This fork of Naneum Creek is not mapped as having anadromous fish present (WDFW 2017a); however, a former fish passage barrier preventing anadromous fish from accessing this fork of Naneum Creek has recently been removed between the project site and Naneum Creek, which is documented to possess anadromous fish. Therefore, Little Naneum Creek is designated as a Type F water, based on the Washington Water Typing Criteria (WAC 222-16-030) and the presence of potential fish habitat.

The reach of Little Naneum Creek, within the Camas Solar Project study area, is somewhat altered from its natural condition. The creek flows unimpeded into the study area from the property to the northeast, where the creek flows southwest along the eastern project site boundary for about 150 feet, where a diversion channel captures and conveys some water parallel to the creek for about 200 feet, to Bull Ditch. Little Naneum Creek crosses over the top of Bull Ditch, which has been routed beneath the creek through a culvert.

Little Naneum Creek continues to travel a tightly meandering sinuous path southeast along the remainder of the eastern project site boundary, and then passes through a box culvert beneath I-82. The reach of the creek southwest of the Bull Ditch has moderate shrub cover for about 2,000 feet that gradually diminishes as the creek flows southwest. A small bridge crosses the creek. The southern 1,000 feet of the creek has little tree or shrub cover. Riparian vegetation along Little Naneum Creek consists mainly of crack willow (*Salix* X *fragilis*), Nootka rose (*Rosa nutkana*), black hawthorn (*Crataegus douglasii*), reed canary grass, Canadian thistle (*Cirsium arvense*), Fuller's teasel (*Dipsacus fullonum*), and singing nettle (*Urtica dioica*). The banks of the creek are relatively stable where adequate larger vegetation has stabilized the silt loam soils. The substrate of the creek consists of cobble, gravel, and sediment. There are many areas where large woody debris has fallen into the creek, which has caused moderate channel complexity. The creek is not constrained within the channel and floodplain roughness is relatively high, with abundant large woody debris, shrubs, and trees present along most of the reach.

Bull Ditch is an irrigation canal within the Camas Solar Project study area that was initially created in 1886 to serve 1,300 acres (Kittitas Reclamation District 2017). The canal enters the northern study area boundary through a culvert beneath Tjossem Road, flows through the northeastern portion of the project site for 675 feet, and exits the study area along the eastern boundary. The plant community is regularly sprayed with herbicide and dominated entirely by reed canary grass. Ditches and canals are excluded from the WAC typing system, therefore, Bull Ditch within the study area has not been assigned a stream type.

3.4.2 Priority Habitats and Species

There is one PHS-mapped occurrence of Columbia spotted frog about 200 feet southeast of the Camas Solar Project site, adjacent to Bull Ditch (WDFW 2017a). This occurrence is outside of the project site and the species would not likely be affected by the proposed project. In addition, salmon have been recorded in Naneum Creek downstream of the project site. Former fish barriers have been removed between this fish occurrence and Little Naneum Creek; therefore, fish could potentially utilize Little Naneum Creek now and in the future. For this reason, Little Naneum Creek could be subject to additional buffers requested by WDFW and Kittitas County. PHS mapping is depicted in Figure 3.

According to the PHS mapper, two species habitat areas overlap the Camas Solar Project study area. The PHS mapper shows an overlay for greater sage-grouse (*Centrocercus urophasianus*) breeding habitat at an accuracy level of quarter/quarter (1/8) Land Survey System (PLSS) section and encompasses the entire Camas Solar Project site. The PHS mapper also shows an overlay for sharp-tailed snake (*Contia tenuis*) at an accuracy level of quarter (1/4) PLSS section and overlaps the southern portion of the project site (WDFW 2017a). However, there is no suitable habitat for either of these species within the study area, and there is no potential habitat for sage grouse within 1 mile of the project site.

3.5 Aquifer Recharge Areas

As described in KCC 17A.08.010, no critical aquifer recharge locations have been identified in Kittitas County. Additionally, the Camas Solar Project will not involve any hazardous materials or disposal of on-site sewage. No well-heads have been identified within the study area.

4 CONCLUSIONS AND RECOMMENDATIONS

EFSEC will provide permitting requirements for the Camas Solar Project, but this report evaluates and shows compliance with County requirements. A review of the Camas Solar Project study area determined that the following Kittitas County defined critical areas have the potential to be affected by the project:

- Wetlands
- Frequently Flooded Areas
- Habitats:
    - Riparian Habitat

A summary of all wetlands, waters, and critical area buffers documented within the Camas Solar Project study area is provided in Table 8. The wetland and non-wetland waters identified in and adjacent to the study area will likely be determined jurisdictional by Ecology and the USACE. Although EFSEC will provide permitting requirements for the proposed project, to show compliance with County requirements, KCC guidance (Chapter 17A.07.010) defines a minimum 20-foot protection buffer for Type F waters, such as Little Naneum Creek. However, up to a 100-foot protection buffer could be requested once Kittitas County has had the opportunity to review the results of this study, and has had discussions with TUUSSO Energy (see Figures 4 and 5). KCC guidance does not define protection buffers for irrigation canals, such as Bull Ditch, because it does not qualify as a stream.

To show compliance with County requirements, the minimum and maximum wetland protection buffers defined by the KCC (Chapter 17A.04.020) are listed in Appendix F, and are provided for these wetlands in Table 8, but only the minimum protection buffers are depicted on Figures 4 and 5.

Table 8. Wetland and Waters Summary

Critical Area	Wetland Rating/Water Typing [a]	Kittitas County Minimum/Maximum Buffer Distances (feet) [b]	Total Size of Feature Within the Project Site (acres) [c]
Wetlands			
Wetland CW01	III	20 / 80 [d]	1.62
Frequently Flooded Areas			
100-year flood zone	N/A	N/A	11.15
Riparian Habitat			
Little Naneum Creek	F	20 / 100	0.57
Bull Ditch	N/A	None	0.14

[a] III = Category III (Hruby 2014); F = fish bearing water (WAC 22-16-030);
[b] Only minimum buffer distances are depicted on maps;
[c] Does not include buffer areas;
[d] No Kittitas County buffer is defined because the wetland area is below the minimum size threshold for protection; however, building setbacks may be required based on zoning lot line setbacks, but would not exceed 25 feet.

Design plans are incomplete for the proposed Camas Solar Project; however, TUUSSO Energy will attempt to design the project to avoid, reduce, or eliminate impacts to wetlands, waters, and their buffers. Following the finalization of the design footprint, all removal-fill activities proposed within jurisdictional features would require a Joint Aquatic Resources Permit Application (JARPA) submitted for USACE and Ecology review.

There is no minimum threshold to implement mitigation sequencing for potential impacts to wetland and waters features. Where possible, the Camas Solar Project should demonstrate avoidance of jurisdictional features and then minimization of impacts. Avoidance and minimization could be achieved by making minor design alterations around delineated feature boundaries.

Where impact avoidance is not possible, mitigation measures should be implemented to minimize temporary construction disturbance and other permanent alterations to the features. Mitigation would include the implementation of construction best management practices. Where permanent alterations to wetland and water features are unavoidable, wetland mitigation measures to achieve “no net loss” would be required. Desktop research shows that there are no approved mitigation banks or in-lieu fee programs in Kittitas County; therefore, any mitigation that would be required must be conducted as Advance Permittee-Responsible Mitigation. Under KCC guidance (Chapter 17A.04.050), the mitigation ratio for a Category III wetland is 1:1.

5 DISCLAIMER

This report documents the investigation, best professional judgment, and conclusions of the investigators. This should be considered a Preliminary Jurisdictional Determination of wetlands and other waters and is not a final determination.

6 LITERATURE CITED AND REVIEWED

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. FWS/OBS-79/31. Washington, D.C.: U.S. Fish and Wildlife Service. Available at: http://www.fws.gov/wetlands/Documents/Classification-of-Wetlands-and-Deepwater-Habitats-of-the-United-States.pdf.

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual*. Technical Report Y-87-1. Online edition. Vicksburg, Mississippi: U.S. Army Engineer Waterways Experiment Station. Available at: http://el.erdc.usace.army.mil/wetlands/pdfs/wlman87.pdf.

Hruby, T. 2014. *Washington State Wetland Rating System for Eastern Washington – Revised.* Washington State Department of Ecology Publication No. 14-06-030. Olympia, Washington: Department of Ecology. Available at: https://fortress.wa.gov/ecy/publications/SummaryPages/1406030.html. Accessed March 10, 2017.

Kittitas County Code (KCC). 2017. Kittitas County, Washington, Ordinances and Resolutions. Available at: http://co.kittitas.wa.us/boc/countycode/. Accessed March 13, 2017.

Kittitas County. 2017. COMPAS Mapping Tool Parcel Report. Available at: https://gis.co.kittitas.wa.us/compas/default.aspx. Accessed May 15, 2017.

Kittitas Reclamation District. 2017. KRD History. Available at: http://krdistrict.org/history.htm. Accessed May 31, 2017.

Lichvar, R.W., D.L. Banks, W.N. Kirchner, and N.C. Melvin. 2016. *The National Wetland Plant List: 2016 Wetland Ratings.* Phytoneuron 2016-30:1–17. Available at: http://www.phytoneuron.net/ and http://rsgisias.crrel.usace.army.mil/NWPL/. Accessed May 3, 2016.

Munsell Color. 2009. Munsell Soil-Color Charts. Revised Edition. Grand Rapids, Michigan: Munsell Color.

Natural Resources Conservation Service (NRCS). 2008. *Hydrogeomorphic Wetland Classification System: An Overview and Modification to Better Meet the Needs of the Natural Resources Conservation Service*. Technical Note No. 190-8-79. Available at: http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs143_010784.pdf.

———. 2015. List of Hydric Soils. December 2015. Available at: http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/use/hydric/. Accessed March 9, 2016.

———. 2017a. Web soil survey. Available at: http://websoilsurvey.nrcs.usda.gov/app/. Accessed March 10, 2017.

———. 2017b. WETS and precipitation data for Ellensburg, Washington. Available at: http://agacis.rcc-acis.org/. Accessed May 2, 2017.

Olson, P., and E. Stockdale. 2010. *Determining the Ordinary High Water Mark on Streams in Washington State*. Second Review Draft. Ecology Publication No. 08-06-001. Lacey, Washington: Washington State Department of Ecology, Shorelands and Environmental Assistance Program.

U.S. Army Corps of Engineers (USACE). 2008. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0)*, edited by J.S. Wakeley, R.W. Lichvar, and C.V. Noble. ERDC/EL TR-08-28. Vicksburg, Mississippi: U.S. Army Engineer Research and Development Center.

U. S. Department of Agriculture (USDA). 1954. Kittitas County. Central Washington Historical Aerial Photograph Project. Central Washington University, Department of Geography. Available at: http://www.gis.cwu.edu/geog/historical_airphotos/. Accessed on June 23, 2017.

U. S. Fish and Wildlife Service (USFWS). 2017. National Wetland Inventory. Wetlands Online Mapper. Available at: http://wetlandsfws.er.usgs.gov/wtlnds/launch.html. Accessed March 10, 2017.

Washington State Department of Ecology (Ecology). 1997. Washington State Wetland Identification and Delineation Manual. Publication No. 96-94. Olympia, Washington: Washington State Department of Ecology.

Washington State Department of Fish and Wildlife (WDFW). 2017a. Priority Habitats and Species on the Web. Available at: http://wdfw.wa.gov/mapping/phs/. Accessed March 10, 2017.

———. 2017b. SalmonScape. Available at: http://wdfw.wa.gov/mapping/salmonscape. Accessed March 10, 2017.

APPENDIX A: WETLAND DELINEATION METHODOLOGY

Wetlands are defined as areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and which under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. The methods used to delineate wetlands within the study area conform to guidance in the *Washington State Wetland Identification and Delineation Manual* (Ecology 1997), the *Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987), and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0)* (USACE 2008).

To be considered a wetland by the U.S. Army Corps of Engineers (USACE), an area must express hydrophytic vegetation, hydric soils, and wetland hydrology. SWCA Environmental Consultants (SWCA) staff documented site conditions for these parameters in areas representative of the project site and in areas most likely to exhibit wetland features. Staff collected additional data in associated uplands, as needed, to confirm wetland boundaries. Wetland boundaries, stream boundaries, and wetland data plot locations in the study area were recorded with a Trimble Geo XT global positioning system (GPS) unit. All delineated wetlands and streams were processed and projected onto existing base maps using ArcGIS software.

Vegetation

The dominant and sub-dominant plants were identified and recorded at each sample plot location. These plants were evaluated based on their wetland indicator status to determine if the vegetation was hydrophytic. SWCA biologists utilized the 50/20 rule per USACE recommendations to determine which plants were dominant at each sample plot. Under this guidance, absolute cover estimates were made for each species found rooted within the sample plot radius for each vegetative strata found in the habitat (tree, sapling/shrub, herb, and woody vine). Refer to the USACE regional supplement for exact applications of this method of determining dominance (USACE 2008).

Sample plot radii varied in size depending on site topography and habitat complexity. When documenting vegetation in smaller or oddly-shaped wetlands or habitat features, vegetation strata radii may be adjusted to more accurately depict vegetation rooted within the wetland or habitat feature being delineated.

Hydrophytic vegetation is defined as vegetation adapted to wetland conditions, such as inundation or prolonged saturation. To meet the hydrophytic vegetation criterion, more than 50% of the total dominant plants across all stratums must have a wetland indicator status of Facultative (FAC), Facultative Wetland (FACW), or Obligate (OBL). The wetland indicator status is assigned to plant species that have the potential to occur in wetlands by the USACE (Lichvar et al. 2016). Table A-1 lists the definitions for each wetland indicator status.

Table A-1. Definitions for Each Wetland Plant Indicator Status

Wetland Indicator Status	Symbol	Definition
Obligate Wetland Plants	OBL	Plants that almost always (> 99% of the time) occur in wetlands, but which may rarely (< 1% of the time) occur in non-wetlands.
Facultative Wetland Plants	FACW	Plants that often (67 to 99% of the time) occurs in wetlands, but sometimes (1 to 33% of the time) occur in non-wetlands.
Facultative Plants	FAC	Plants with a similar likelihood (34 to 66% of the time) of occurring in both wetlands and non-wetlands.
Facultative Upland Plants	FACU	Plants that sometimes (1 to 33% of the time) occur in wetlands, but occur more often (67 to 99% of the time) in non-wetlands.
Upland Plants	UPL	Plants that rarely (< 1% of the time) occur in wetlands, and almost always (> 99% of the time) occur in non-wetlands.

Source: Lichvar et al. (2016).

SWCA biologists identified plants found in the field to species whenever possible, when adequate vegetative or flowering characteristics were available. Scientific and common plant names were reported with the currently accepted nomenclature.

Soils

An area typically must contain hydric soils to be considered a wetland, except when problematic site conditions occur. Hydric soils typically form under an area that experiences durations of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper portion of the soil profile. Chemical and biological processes in saturated soil result in reduced oxygen concentrations and promote anaerobic metabolism in microorganisms. These prolonged anaerobic conditions often create mottling and other distinct patterns in the soil, which are used as indicators of hydric soils. The hue, value, and chroma and relative percentage of mottling are recorded in the field at each data plot location. Other important hydric soil indicators include organic matter accumulations in the surface horizon, reduced sulfur odors, and organic matter staining in the soil profile (Natural Resource Conservation Service [NRCS] 2017a).

SWCA staff examined soil profiles at each data plot location by excavating sample pits to a depth of 16 to 20 inches to observe the soil profile, colors, and textures. In some cases, a shallower soil pit was used due to shovel refusal from obstructions in the soil profile, such as gravel, bedrock, thick roots, or clay hardpan. Munsell color charts (Munsell Color 2009) were used to determine soil colors in the field.

Hydrology

SWCA staff investigated the entire project site for evidence of wetland hydrology. Where data plot locations were taken, additional notes were recorded to fully document the presence of primary and secondary wetland hydrology indicators at the sample location. According to the USACE, wetland hydrology criteria were considered to be satisfied if the soil was seasonally inundated or saturated to the surface for a consecutive number of days greater than or equal to 12.5% of the growing season. The growing season for the area was determined based on the period in which temperatures are above 28 degrees Fahrenheit 5 out of 10 years (Ecology 1997) using the long-term climatological data collected by the NRCS (2017). Using the wetlands climate analysis (WETS) table for the nearest station (Ellensburg, Washington), the growing season was approximated as typically between April 20 and October 10, or a total of 173 days (NRCS 17b).

However, often times multiple site visits to determine the duration of seasonal inundation or saturation are not possible. Therefore, field indicators are used in an attempt to determine an area's hydro-period through field observations. Wetland hydrology indicators are divided into two categories: primary and secondary indicators (USACE 2008). Primary indicators of hydrology include, but are not limited to, surface inundation and high water table and saturated soils within 12 inches of the soil surface. The presence of one primary indicator is sufficient to conclude that wetland hydrology is present. Secondary hydrology indicators are also recorded and may substitute in the case of a lack of any primary indicators if multiple secondary indicators are observed. Secondary indicators of hydrology include, but are not limited to, drainage patterns, crayfish burrows, and dry-season water table (USACE 2008). If no primary indicators, and fewer than two secondary indicators, are observed within the sample area, then it is likely that the area is not considered a wetland, unless problematic conditions exist on-site. Aerial and historic imagery are often reviewed before and after site visits to ensure all possible hydrology indicators are taken into account.

References

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual*. Technical Report Y-87-1. Online edition. Vicksburg, MSMississippi: U.S. Army Engineer Waterways Experiment Station. Available at: http://el.erdc.usace.army.mil/wetlands/pdfs/wlman87.pdf.

Lichvar, R.W., D.L. Banks, W.N. Kirchner, and N.C. Melvin. 2016. *The National Wetland Plant List: 2016 Wwetland Rratings.* Phytoneuron 2016-30:1–17. Available at: http://www.phytoneuron.net/ and http://rsgisias.crrel.usace.army.mil/NWPL/. Accessed May 3, 2016.

Munsell Color. 2009. Munsell Soil-Color Charts. Revised Edition. Grand Rapids, Michigan: Munsell Color.

Natural Resources Conservation Service (NRCS). 2017a. *Field Indicators of Hydric Soils in the United States, a Guide for Identifying and Delineating Hydric Soils, Version 8.1*. Edited by L.M. Vasilas, G.W. Hurt, and J.F. Berkowitz. Available at: https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_053171.pdf. Accessed March 10, 2017.

———. 2017b. WETS and precipitation data for Ellensburg, Washington. Available at: http://agacis.rcc-acis.org/. Accessed May 2, 2017.

U.S. Army Corps of Engineers (USACE). 2008. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0)*, edited by. J.S. Wakeley, R.W. Lichvar, and C.V. Noble. ERDC/EL TR-08-28. Vicksburg, Mississippi: U.S. Army Engineer Research and Development Center.

United States Geological Survey (USGS). 2017. Kittitas Quadrangle, Washington – Kittitas County, 7.5 Minute Series. Available at: https://store.usgs.gov/map-locator

Washington State Department of Ecology (Ecology). 1997. Washington State Wetland Identification and Delineation Manual. Publication No. #96-94. Olympia, Washington: Washington State Department of Ecology.

APPENDIX B: VEGETATION LIST

Camas Solar Project
Vegetation Table
April 10, 2017

Common Name	Scientific Name	Wetland Indicator Status[1]	Native / Introduced and Invasive / Noxious
Lesser Burrdock	*Arctium minus*	FACU	non-native
Garden Yellow-Rocket	*Barbarea vulgaris*	FAC	non-native
Devil's-Pitchfork	*Bidens frondosa*	FACW	native
downy cheat grass	*Bromus tectorum*	NOL	non-native
Canadian Thistle	*Cirsium arvense*	FACU	invasive, noxious
Black Hawthorn	*Crataegus douglasii*	FAC	native
Fuller's Teasel	*Dipsacus fullonum*	FAC	invasive, noxious
tall annual willowherb	*Epilobium brachycarpum*	NOL	native
Sticky-Willy	*Galium aparine*	FACU	native
Hairy Cat's-Ear	*Hypochaeris radicata*	FACU	non-native, noxious
Pale-Yellow Iris	*Iris pseudacorus*	OBL	noxious
Prickly Lettuce	*Lactuca serriola*	FACU	non-native
common dead-nettle	*Lamium amplexicaule*	NOL	non-native
Gorman's desert-parsley	*Lomatium gormanii*	NOL	native
alfalfa	*Medicago sativa*	UPL	non-native
Spearmint	*Mentha spicata*	FACW	non-native
True Forget-Me-Not	*Myosotis scorpioides*	FACW	non-native
scotch thistle	*Onopordum acanthium*	NOL	noxious
Common Panic Grass	*Panicum capillare*	FACU	native
Dock-Leaf Smartweed	*Persicaria lapathifolia*	FACW	non-native
Reed Canary Grass	*Phalaris arundinacea*	FACW	invasive, noxious
English Plantain	*Plantago lanceolata*	FAC	non-native
bluegrass	*Poa species*	FAC ?	-
Nootka Rose	*Rosa nutkana*	FACU	native
Curly Dock	*Rumex crispus*	FAC	non-native
crack willow	*Salix X fragilis*	FAC	non-native
Narrow-Leaf Willow	*Salix exigua*	FACW	native
Russian thistle	*Salsola kali*	NOL	non-native
maidenstears	*Silene vulgaris*	NOL	non-native
Common Dandelion	*Taraxacum officinale*	FACU	non-native
False Mayweed	*Tripleurospermum maritimum*	FACU	non-native, noxious
Broad-Leaf Cat-Tail	*Typha latifolia*	OBL	native
Stinging Nettle	*Urtica dioica*	FAC	native
Great Mullein	*Verbascum thapsus*	FACU	non-native

[1]Wetland Indicator Status (WIS) from the NWPL AW Region - see below.

A question mark (?) preceded by a space indicates our default assumption that the plant is FAC.

Wetland Indicator Status (WIS) and taxonomy for the AW Region per the National Wetland Plant List 2016v3.3:
(common names are capitalized) http://wetland-plants.usace.army.mil/ Accessed January 10, 2017
WIS for non-wetland plants and taxonomy from Reed 1988 and Reed et al. 1993, and the USDA PLANTS database:
(common names are not capitalized) http://plants.usda.gov/ Accessed multiple dates

Native per Hitchcock & Cronquist 1973 and http://plants.usda.gov/
Noxious per Washington State NWCB 2017 http://www.nwcb.wa.gov/

WETLAND INDICATOR STATUS - Arid West Region	
OBL	**Obligate Wetland** – Almost always is a hydrophyte, rarely in uplands. Examples: broad-leaf cat-tail, yellow-skunk-cabbage
FACW	**Facultative Wetland** - Usually is a hydrophyte but occasionally found in uplands. Examples: Oregon ash, red osier
FAC	**Facultative** – Commonly occurs as either a hydrophyte or non-hydrophyte. Examples: red alder, salmon raspberry
FACU	**Facultative Upland** - Occasionally is a hydrophyte but usually occurs in uplands. Examples: big-leaf maple, Himalayan blackberry
UPL	**Upland** - Rarely is a hydrophyte, almost always in uplands. These plants have been removed from the NWPL WMVC Region.
NOL	**Not Listed** - Not on the list; assumed to be UPL.

APPENDIX C: WETLAND DATA SHEETS

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Camas Solar Project City/County: - / Kittitas Sampling Date: 4/10/2017

Applicant/Owner: TUUSSO Energy, LLC State: WA Sampling Point: **CP01**

Investigator(s): Evan Dulin, Jamie Young Section, Township, Range: Section 18, T17N, R19E

Landform (hillslope, terrace, etc.): Channel Local relief (concave, convex, none): Concave Slope (%): 3

Subregion (LRR): B, Columbia/Snake River Plateau Lat: 46.956698 Long: -120.506806 Datum: NAD 1983

Soil Map Unit Name: Mitta ashy silt loam, drained, 0 to 2 percent slopes (791) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X* (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?**	**Yes X No ____**
Hydric Soil Present?	Yes X	No ____		
Wetland Hydrology Present?	Yes X	No ____		

Precipitation prior to fieldwork: 0.76" two weeks prior, 2.65" above normal for CYTD, 3.11" above normal for WYTD. *Wetter than normal.

Remarks:

CW01. Wetland is in a man-made irrigation ditch between an ag. field and Interstate-82, but meets all wetland criteria.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1.			
2.			
3.			
4.			
5.			
	0% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Phalaris arundinacea*	35%	Yes	FACW
2. *Epilobium brachycarpum*	5%	No	NOL
3. *Iris pseudacorus*	5%	No	OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	45% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 0%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species 5	x 1 =	5
FACW species 35	x 2 =	70
FAC species 0	x 3 =	0
FACU species 0	x 4 =	0
UPL species 5	x 5 =	25
Column Totals: 45 (A)		100 (B)

Prevalence Index = B/A = 2.22

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ____ 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

55% open water.

Entered by: KL/ED QC by: TJD

SOIL

Sampling Point: **CP01**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	2.5Y 3/2	100					SiL	
8-14	2.5Y 2.5/1	98	5YR 3/4	2	C	M	SiL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distrubed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): N/A

Hydric Soil Present? Yes X No ___

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)
Very faint H_2S smell.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- X Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ___	Depth (inches):	5
Water Table Present?	Yes X	No ___	Depth (inches):	11
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches):	to surface

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Surface water within one foot of sample plot.

Entered by: KL/ED QC by: TJD

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Camas Solar Project City/County: - / Kittitas Sampling Date: 4/10/2017

Applicant/Owner: TUUSSO Energy, LLC State: WA Sampling Point: **CP02**

Investigator(s): Evan Dulin, Jamie Young Section, Township, Range: Section 18, T17N, R19E

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): None Slope (%): 1

Subregion (LRR): B, Columbia/Snake River Plateau Lat: 46.956672 Long: -120.506767 Datum: NAD 1983

Soil Map Unit Name: Mitta ashy silt loam, drained, 0 to 2 percent slopes (791) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X* (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No **X**	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** **X**
Hydric Soil Present?	Yes ____	No **X**		
Wetland Hydrology Present?	Yes ____	No **X**		

Precipitation prior to fieldwork: 0.76" two weeks prior, 2.65" above normal for CYTD, 3.11" above normal for WYTD. *Wetter than normal.

Remarks:
Sample plot located in planted alfalfa field.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1.			
2.			
3.			
4.			
5.			
	0% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Medicago sativa*	50%	Yes	UPL
2. *Hypochaeris radicata*	30%	Yes	FACU
3. *Panicum capillare*	10%	No	FACU
4. *Lactuca serriola*	5%	No	FACU
5. *Bromus tectorum*	5%	No	NOL
6.			
7.			
8.			
9.			
10.			
11.			
	100% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 0%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species 0	x 1 =	0
FACW species 0	x 2 =	0
FAC species 0	x 3 =	0
FACU species 45	x 4 =	180
UPL species 55	x 5 =	275
Column Totals: 100 (A)		455 (B)

Prevalence Index = B/A = 4.55

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

____ 5 - Wetland Non-Vascular Plants[1]

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Remarks:

Entered by: KL/ED QC by: TJD

SOIL

Sampling Point: **CP02**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-7	10YR 3/2	100					SiL	
7-14	10YR 2/2	98	10YR 5/2	2	D	PL	SiCL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distrubed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): N/A

Hydric Soil Present? Yes ___ **No X**

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches):	N/A
Water Table Present?	Yes ___	No X	Depth (inches):	>14
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches):	>14

Wetland Hydrology Present?

Yes ___ **No X**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Entered by: KL/ED QC by: TJD

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Camas Solar Project City/County: - / Kittitas Sampling Date: 4/10/2017

Applicant/Owner: TUUSSO Energy, LLC State: WA Sampling Point: **CP03**

Investigator(s): Evan Dulin, Jamie Young Section, Township, Range: Section 19, T17N, R19E

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Convex Slope (%): 2

Subregion (LRR): B, Columbia/Snake River Plateau Lat: 46.951764 Long: -120.507035 Datum: NAD 1983

Soil Map Unit Name: Mitta ashy silt loam, drained, 0 to 2 percent slopes (791) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X* (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes **X**	No ____		
Hydric Soil Present?	Yes ____	No **X**	**Is the Sampled Area within a Wetland?**	Yes ____ No **X**
Wetland Hydrology Present?	Yes ____	No **X**		

Precipitation prior to fieldwork: 0.76" two weeks prior, 2.65" above normal for CYTD, 3.11" above normal for WYTD. *Wetter than normal.

Remarks:
Sample plot located on the stream terrace between CW01 and CS01, just north of the confluence.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1. *Salix X fragilis*	5%	Yes	FAC
2.			
3.			
4.			
5.			
	5% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Phalaris arundinacea*	100%	Yes	FACW
2. *Lactuca serriola*	5%	No	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	105% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 0%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

	Total % Cover of:	Multiply by:	
OBL species	0	x 1 =	0
FACW species	100	x 2 =	200
FAC species	5	x 3 =	15
FACU species	5	x 4 =	20
UPL species	0	x 5 =	0
Column Totals:	110 (A)		235 (B)

Prevalence Index = B/A = 2.14

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ____ 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes **X** No ____

Remarks: Entered by: KL/ED QC by: TJD

SOIL

Sampling Point: **CP03**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-15	10YR 3/2	100					SL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distrubed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): N/A

Hydric Soil Present? Yes ___ **No X**

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches):	N/A
Water Table Present?	Yes ___	No X	Depth (inches):	>15
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches):	>15

Wetland Hydrology Present?

Yes ___ **No X**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Entered by: KL/ED QC by: TJD

APPENDIX D: WETLAND AND STREAM PHOTOGRAPHS



Photo A. View north of northern portion of Wetland CW01.



Photo B. View south of the middle portion of Wetland CW01, with fellow flag iris.



Photo C. View south of southern portion of Wetland CW01.



Photo D. View south of the southern study area extent of Little Naneum Creek.



Photo E. View northeast of old bridge crossing of Little Naneum Creek.



Photo F. View east of beaver chew over Little Naneum Creek.



Photo G. View northwest of Bull Ditch at road crossing.



Photo H. View down of tree frog in Wetland CW01.

APPENDIX E: ECOLOGY RATING FORMS

Wetland name or number CW01

RATING SUMMARY – Eastern Washington

Name of wetland (or ID #): CW01 Date of site visit: 4/10/17

Rated by N. Evan Dulin Trained by Ecology? ✓ Yes ___ No Date of training 3/24/17

HGM Class used for rating Riverine Wetland has multiple HGM classes? ___ Y ___ N

NOTE: Form is not complete without the figures requested (*figures can be combined*).
Source of base aerial photo/map Google Earth

OVERALL WETLAND CATEGORY III (based on functions ✓ or special characteristics ___)

1. Category of wetland based on FUNCTIONS

___ **Category I** – Total score = 22-27
___ **Category II** – Total score = 19-21
✓ **Category III** – Total score = 16-18
___ **Category IV** – Total score = 9-15

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
	Circle the appropriate ratings			
Site Potential	H M (L)	(H) M L	H (M) L	
Landscape Potential	H (M) L	H M (L)	H M (L)	
Value	H (M) L	H (M) L	(H) M L	TOTAL
Score Based on Ratings	5	6	6	17

Score for each function based on three ratings *(order of ratings is not important)*

9 = H,H,H
8 = H,H,M
7 = H,H,L
7 = H,M,M
6 = H,M,L
6 = M,M,M
5 = H,L,L
5 = M,M,L
4 = M,L,L
3 = L,L,L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	CATEGORY *Circle the appropriate category*
Vernal Pools	II III
Alkali	I
Wetland of High Conservation Value	I
Bog and Calcareous Fens	I
Old Growth or Mature Forest – slow growing	I
Aspen Forest	I
Old Growth or Mature Forest – fast growing	II
Floodplain forest	II
None of the above	✓

Wetland name or number CW01

Maps and figures required to answer questions correctly for Eastern Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	D 1.3, H 1.1, H 1.5	
Hydroperiods (including area of open water for H 1.3)	D 1.4, H 1.2, H 1.3	
Location of outlet (*can be added to map of hydroperiods)*	D 1.1, D 4.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	
Map of the contributing basin	D 5.3	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	D 3.3	

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	1
Hydroperiods	H 1.2, H 1.3	1
Ponded depressions	R 1.1	1
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	R 2.4	1
Map of the contributing basin	R 2.2, R 2.3, R 5.2	2
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	1
Width of wetland vs. width of stream *(can be added to another figure)*	R 4.1	1
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	3
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	4
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	R 3.2, R 3.3	5

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	L 1.1, L 4.1, H 1.1, H 1.5	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants *(can be added to figure above)*	S 4.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	S 3.3	

Wetland name or number CW01

HGM Classification of Wetland in Eastern Washington

For questions 1-4, the criteria described must apply to the entire unit being rated.

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-4 apply, and go to Question 5.

1. Does the entire unit **meet both** of the following criteria?
   ___The vegetated part of the wetland is on the water side of the Ordinary High Water Mark of a body of permanent open water (without any plants on the surface) that is at least 20 ac (8 ha) in size
   ___At least 30% of the open water area is deeper than 10 ft (3 m)

   NO – go to 2 **YES –** The wetland class is **Lake Fringe** (Lacustrine Fringe)

2. Does the entire wetland unit **meet all** of the following criteria?
   ✓ The wetland is on a slope (*slope can be very gradual*),
   ✓ The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks;
   ___The water leaves the wetland **without being impounded**.

   NO - go to 3 YES – The wetland class is **Slope**
   NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 foot deep).

3. Does the entire wetland unit **meet all** of the following criteria?
   ✓ The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river;
   ✓ The overbank flooding occurs at least once every 10 years.

   NO - go to 4 YES – The wetland class is **Riverine**
   NOTE: The Riverine wetland can contain depressions that are filled with water when the river is not flooding.

4. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year. *This means that any outlet, if present, is higher than the interior of the wetland.*

   NO – go to 5 YES – The wetland class is **Depressional**

5. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-4 APPLY TO DIFFERENT AREAS IN THE WETLAND UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

Wetland name or number CW01

NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the wetland unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM Class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine (the riverine portion is within the boundary of depression)	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine

If you are still unable to determine which of the above criteria apply to your wetland, or if you have ***more than 2 HGM classes*** *within a wetland boundary, classify the wetland as Depressional for the rating.*

Wetland name or number CW01

RIVERINE WETLANDS **Water Quality Functions** - Indicators that the site functions to improve water quality	Points (only 1 score per box)
R 1.0. Does the site have the potential to improve water quality?	
R 1.1. Area of surface depressions within the Riverine wetland that can trap sediments during a flooding event: Depressions cover > 1/3 area of wetland — points = 6 Depressions cover > 1/10 area of wetland — points = 3 Depressions present but cover < 1/10 area of wetland — points = 1 No depressions present — points = 0	0
R 1.2. Structure of plants in the wetland (areas with >90% cover at person height; **not** Cowardin classes): Forest or shrub > 2/3 the area of the wetland — points = 10 Forest or shrub 1/3 – 2/3 area of the wetland (5% shrub) — points = 5 Ungrazed, herbaceous plants > 2/3 area of wetland (100% ungrazed) — points = 5 Ungrazed herbaceous plants 1/3 – 2/3 area of wetland — points = 2 Forest, shrub, and ungrazed herbaceous < 1/3 area of wetland — points = 0	5
Total for R 1 — Add the points in the boxes above	5

Rating of Site Potential If score is: ___ **12-16 = H** ___ **6-11 = M** ✓ **0-5 = L** *Record the rating on the first page*

R 2.0. Does the landscape have the potential to support the water quality function of the site?	
R 2.1. Is the wetland within an incorporated city or within its UGA? Yes = 2 (No = 0)	0
R 2.2. Does the contributing basin include a UGA or incorporated area? Yes = 1 (No = 0)	0
R 2.3. Does at least 10% of the contributing basin contain tilled fields, pastures, or forests that have been clearcut within the last 5 years? (Yes = 1) No = 0	1
R 2.4. Is > 10% of the area within 150 ft of wetland in land uses that generate pollutants (Yes = 1) No = 0	1
R 2.5. Are there other sources of pollutants coming into the wetland that are not listed in questions R 2.1-R 2.4? Source_____ Yes = 1 (No = 0)	0
Total for R 2 — Add the points in the boxes above	2

Rating of Landscape Potential If score is: ___ **3-6 = H** ✓ **1 or 2 = M** ___ **0 = L** *Record the rating on the first page*

R 3.0. Is the water quality improvement provided by the site valuable to society?	
R 3.1. Is the wetland along a stream or river that is on the 303(d) list or on a tributary that drains to one within 1 mi? (within 1 mile of Naneum) (Yes = 1) No = 0	1
R 3.2. Does the river or stream have TMDL limits for nutrients, toxics, or pathogens? Yes = 1 (No = 0)	0
R 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality? *Answer YES if there is a TMDL for the drainage in which wetland is found.* Yes = 2 (No = 0)	0
Total for R 3 — Add the points in the boxes above	1

Rating of Value If score is: ___ **2-4 = H** ✓ **1 = M** ___ **0 = L** *Record the rating on the first page*

Wetland name or number CW01

RIVERINE WETLANDS **Hydrologic Functions** - Indicators that site functions to reduce flooding and stream erosion	Points (only 1 score per box)
R 4.0. Does the site have the potential to reduce flooding and erosion?	
R 4.1. Characteristics of the overbank storage the wetland provides: *Estimate the average width of the wetland perpendicular to the direction of the flow and the width of the stream or river channel (distance between banks). Calculate the ratio: (average width of wetland)/(average width of stream between banks).* — If the ratio is more than 2 (ditch = 6', wetland = 20') points = 10 If the ratio is 1-2 points = 8 If the ratio is ½-<1 points = 4 If the ratio is ¼-< ½ points = 2 If the ratio is < ¼ points = 1	10
R 4.2. Characteristics of plants that slow down water velocities during floods: *Treat large woody debris as forest or shrub. Choose the points appropriate for the best description (polygons need to have > 90% cover at person height. These are NOT Cowardin classes).* Forest or shrub for more than $^2/_3$ the area of the wetland points = 6 Forest or shrub for $>^1/_3$ area OR emergent plants $>^2/_3$ area (5% shrub 66% emergent (90%)) points = 4 — Forest or shrub for $>^1/_{10}$ area OR emergent plants $>^1/_3$ area points = 2 Plants do not meet above criteria points = 0	2
Total for R 5 — Add the points in the boxes above	12

Rating of Site Potential If score is: ✓ **12-16 = H** ___ **6-11 = M** ___ **0-5 = L** *Record the rating on the first page*

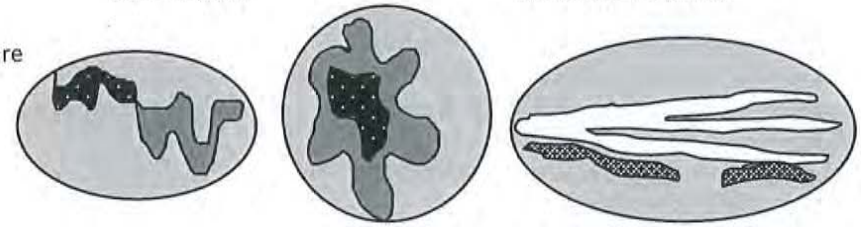
R 5.0. Does the landscape have the potential to support the hydrologic functions of the site?		
R 5.1. Is the stream or river adjacent to the wetland downcut?	(Yes = 0) No = 1	0
R 5.2. Does the up-gradient watershed include a UGA or incorporated area?	Yes = 1 (No = 0)	0
R 5.3. Is the up-gradient stream or river controlled by dams? No, but highly controlled	(Yes = 0) No = 1	0
Total for R 5 — Add the points in the boxes above		0

Rating of Landscape Potential If score is: ___ **3 = H** ___ **1 or 2 = M** ✓ **0 = L** *Record the rating on the first page*

R 6.0. Are the hydrologic functions provided by the site valuable to society?	
R 6.1. Distance to the nearest areas downstream that have flooding problems? *Choose the description that best fits the site.* The sub-basin immediately down-gradient of site has surface flooding problems that result in damage to human or natural resources points = 2 — Surface flooding problems are in a basin farther down-gradient points = 1 No flooding problems anywhere downstream points = 0	1
R 6.2. Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan? Yes = 2 (No = 0)	0
Total for R 6 — Add the points in the boxes above	1

Rating of Value If score is: ___ **2-4 = H** ✓ **1 = M** ___ **0 = L** *Record the rating on the first page*

Wetland name or number CW01

These questions apply to wetlands of all HGM classes. **HABITAT FUNCTIONS** - Indicators that site functions to provide important habitat	(only 1 score per box)
H 1.0. Does the wetland have the potential to provide habitat for many species?	
H 1.1. Structure of the plant community: *Check the Cowardin vegetation classes present and categories of emergent plants. Size threshold for each category is >= ¼ ac or >= 10% of the wetland if wetland is < 2.5 ac.* ✓ Aquatic bed 10% ___ Emergent plants 0-12 in (0-30 cm) high are the highest layer and have > 30% cover ✓ Emergent plants >12-40 in (>30-100 cm) high are the highest layer with >30% cover 66% ✓ Emergent plants > 40 in (> 100 cm) high are the highest layer with >30% cover 10% ___ Scrub-shrub (areas where shrubs have >30% cover) 5% ___ Forested (areas where trees have >30% cover) 4 or more checks: points = 3 — 3 checks: points = 2 2 checks: points = 1 1 check: points = 0	2
H 1.2. Is one of the vegetation types Aquatic Bed? (Yes = 1) No = 0	1
H 1.3. Surface water H 1.3.1. Does the wetland have areas of open water (without emergent or shrub plants) over at least ¼ ac **OR** 10% of its area during the March to early June **OR** in August to the end of September? *Answer YES for Lake Fringe wetlands.* 17% (Yes = 3 points & go to H 1.4) No = go to H 1.3.2 H 1.3.2. Does the wetland have an intermittent or permanent, and unvegetated stream within its boundaries, or along one side, over at least ¼ ac or 10% of its area? *Answer yes only if H 1.3.1 is No.* vegetated intermittent flow through wetland Yes = 3 (No = 0)	3
H 1.4. Richness of plant species Count the number of plant species in the wetland that cover at least 10 ft². *Different patches of the same species can be combined to meet the size threshold. You do not have to name the species.* *Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Russian olive, Phragmites, Canadian thistle, yellow-flag iris, and saltcedar (Tamarisk)* # of species ____ Scoring: > 9 species: points = 2 4-9 species: points = 1 — < 4 species: points = 0	0
H 1.5. Interspersion of habitats Decide from the diagrams below whether interspersion among types of plant structures (described in H 1.1), and unvegetated areas (open water or mudflats) is high, moderate, low, or none. *Use map of Cowardin and emergent plant classes prepared for questions H 1.1 and map of open water from H 1.3. If you have four or more plant classes or three classes and open water, the rating is always high.*  **None** = 0 points **Low** = 1 point **Moderate** = 2 points All three diagrams in this row are **High** = 3 points  Riparian braided channels with 2 classes	Figure__ 1

Wetland name or number CW01

H 1.6. Special habitat features *Check the habitat features that are present in the wetland. The number of checks is the number of points.* ____Loose rocks larger than 4 in OR large, downed, woody debris (> 4 in diameter) within the area of surface ponding or in stream. __✓__Cattails or bulrushes are present within the wetland. ____Standing snags (diameter at the bottom > 4 in) in the wetland or within 30 m (100 ft) of the edge. ____Emergent or shrub vegetation in areas that are permanently inundated/ponded. ____Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 45 degree slope) OR signs of recent beaver activity ____ Invasive species cover less than 20% in each stratum of vegetation *(canopy, sub-canopy, shrubs, herbaceous, moss/ground cover)*	1
Total for H 1 — Add the points in the boxes above	8

Rating of Site Potential If score is: ___ **15-18 = H** __✓__ **7-14 = M** ___ **0-6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support habitat functions of the site?	
H 2.1. Accessible habitat (only area of habitat abutting wetland). If total accessible habitat is: *Calculate:* % undisturbed habitat 0 + [(% moderate and low intensity land uses)/2] 0 = 0 % > 1/3 (33.3%) of 1 km Polygon — points = 3 20-33% of 1km Polygon — points = 2 10-19% of 1km Polygon — points = 1 __✓__ <10% of 1km Polygon — points = 0	0
H 2.2. Undisturbed habitat in 1 km Polygon around wetland. (5+ Patches) *Calculate:* % undisturbed habitat 2 + [(% moderate and low intensity land uses)/2] 12 = 14 % Undisturbed habitat > 50% of Polygon — points = 3 Undisturbed habitat 10 - 50% and in 1-3 patches — points = 2 __✓__ Undisturbed habitat 10 - 50% and > 3 patches — points = 1 Undisturbed habitat < 10% of Polygon — points = 0 undis: 21 / 1150 ac = 2%; mid: 280 / 1150 ac = 24%	1
H 2.3. Land use intensity in 1 km Polygon: > 50% of Polygon is high intensity land use 74% — points = (- 2) Does not meet criterion above — points = 0	-2
H 2.4. The wetland is in an area where annual rainfall is less than 12 in, and its water regime is not influenced by irrigation practices, dams, or water control structures. *Generally, this means outside boundaries of reclamation areas, irrigation districts, or reservoirs* — Yes = 3 (No = 0)	0
Total for H 2 — Add the points in the boxes above	-1

Rating of Landscape Potential If score is: ___ **4-9 = H** ___ **1-3 = M** __✓__ **< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose the highest score that applies to the wetland being rated* Site meets ANY of the following criteria: — points = 2 __✓__ — It has 3 or more priority habitats within 100 m (see Appendix B) — It provides habitat for Threatened or Endangered species (any plant or animal on state or federal lists) — It is mapped as a location for an individual WDFW species — It is a Wetland of High Conservation Value as determined by the Department of Natural Resources — It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan Site has 1 or 2 priority habitats within 100 m (see Appendix B) — points = 1 Site does not meet any of the criteria above — points = 0	2

Rating of Value If score is: __✓__ **2 = H** ___ **1 = M** ___ **0 = L** *Record the rating on the first page*

Appendix B: WDFW Priority Habitats in Eastern Washington

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp. http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here: http://wdfw.wa.gov/conservation/phs/list/)

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland: ***NOTE:*** *This question is independent of the land use between the wetland and the priority habitat.*

— **Aspen Stands:** Pure or mixed stands of aspen greater than 1 ac (0.4 ha).

✓— **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).

— **Old-growth/Mature forests:** Old-growth east of Cascade crest – Stands are highly variable in tree species composition and structural characteristics due to the influence of fire, climate, and soils. In general, stands will be >150 years of age, with 10 trees/ac (25 trees/ha) that are > 21 in (53 cm) dbh, and 1-3 snags/ac (2.5-7.5 snags/ha) that are > 12-14 in (30-35 cm) diameter. Downed logs may vary from abundant to absent. Canopies may be single or multi-layered. Evidence of human-caused alterations to the stand will be absent or so slight as to not affect the ecosystem's essential structures and functions. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west and 80-160 years old east of the Cascade crest.

— **Oregon White Oak:** Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).

✓— **Riparian:** The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

✓— **Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.

— **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

— **Cliffs:** Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.

— **Talus:** Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

— **Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 12 in (30 cm)in eastern Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

— **Shrub-steppe:** A nonforested vegetation type consisting of one or more layers of perennial bunchgrasses and a conspicuous but discontinuous layer of shrubs (see Eastside Steppe for sites with little or no shrub cover).

— **Eastside Steppe:** Nonforested vegetation type dominated by broadleaf herbaceous flora (i.e., forbs), perennial bunchgrasses, or a combination of both. Bluebunch wheatgrass (*Pseudoroegneria spicata*) is often the prevailing cover component along with Idaho fescue (*Festuca idahoensis*), Sandberg bluegrass (*Poa secunda*), rough fescue (*F. campestris*), or needlegrasses (*Achnatherum* spp.).

— **Juniper Savannah:** All juniper woodlands.

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list because they are addressed elsewhere.


CW01
Figure 1a
Legend
Aquatic bed/Emergent (>40") mix
CW01
Emergent cover (>90%/12-40")
Scrub-shrub
Width
G-1-60
197
Google earth
© 2016 Google
N
700 ft


CW01
Figure 1b
Legend
Aquatic bed/Emergent (>40") mix
CW01
Emergent cover (>90%/12-40")
Scrub-shrub
Width
82
G-1-61
Google earth
© 2016 Google
N
700 ft


CW01
Figure 2
Legend
CW01
Contributing Basin
Tjossem Rd
G-1-62
97
Woodhouse Loop
Number 5 Rd
Google earth
© 2016 Google
N
2000 ft


CW01
Figure 3
Legend
CW01
Mid-intensity
Undisturbed
82
Berry Rd
Tipsem Rd
Woodhouse Loop
G-1-63
Canyon Rd
Stone Rd
Number 6 Rd
97
Canyon View Ln
Heron Ln
Google earth
© 2016 Google
N
4000 ft

April 28, 2017

CW01 - Figure 4



Assessed Waters/Sediment

Water
- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

Sediment
- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

Miles
0 0.25 0.5 1

Image courtesy of USGS Earthstar Geographics SIO © 2017 Microsoft Corporation © 2017 HERE © AND

DEPARTMENT OF ECOLOGY
State of Washington

Water Quality Improvement Projects (TMDLs)

WATER QUALITY IMPROVEMENT PROJECTS (TMDLs)

Overview of the process

Project Catalog

- by WRIA
- by County

Funding Opportunities

Project Development Priority Lists

Related Information

TMDL Contacts

RELATED ECOLOGY PROGRAMS

Water Quality

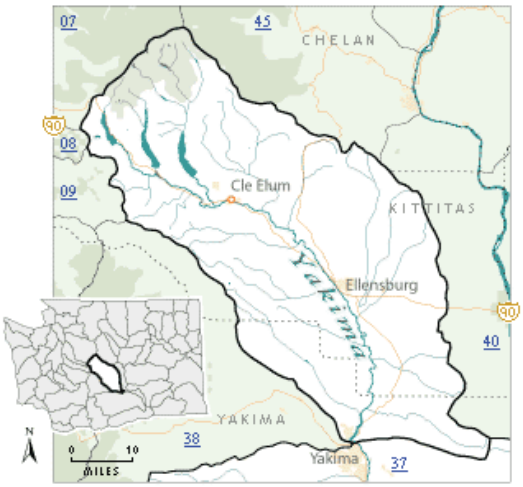
Water Quality Improvement > Water Quality Improvement Projects by WRIA > WRIA 39: Upper Yakima

WRIA 39: Upper Yakima

The following table lists overview information and links to specific water quality improvement projects (including total maximum daily loads, or TMDLs) for this water resource inventory area (WRIA). Please use links (where available) for more information on a project.

Yakima River basin project index:
www.ecy.wa.gov/programs/wq/tmdl/yakima_wq/index.html
Counties

- Kittitas
- Yakima



Project Name	Pollutants	Status**	TMDL Lead
Crystal Creek	Ammonia-N BOD (5-day) Chlorine Fecal Coliform	EPA approved	Jane Creech 509-454-7860
Selah Ditch	Fecal Coliform Temperature	EPA approved	Greg Bohn 509-454-4174
Teanaway River segments: • Upper West Fork Teanaway River • Upper Middle Fork Teanaway River • Upper North Fork Teanaway River • Stafford Creek • Lower West Fork Teanaway River • Lower Middle Fork Teanaway River • Lower North Fork Teanaway River • Mainstem Teanaway River	Temperature	EPA approved	Jane Creech 509-454-7860
Wilson/Cooke Creek Tributaries: • Badger Creek • Bull Ditch • Caribou Creek • Cherry Creek • CID Canal • Coleman Creek • Cook Creek • EWC Canal • Johnson Drain • KRD Canal	Fecal Coliform	EPA approved Has an implementation plan Post-TMDL monitoring report	Jane Creech 509-454-7860 Greg Bohn 509-454-4174

Mercer Creek • Naneum Creek • Parke Creek • Whiskey Creek • Wilson Creek • Wipple Wasteway			
Yakima River, Upper	Dieldrin DDT Suspended Sediments Turbidity	EPA approved	Jane Creech 509-454-7860
	Temperature	EPA approved Has an implementation plan	Jane Creech 509-454-7860
Yakima River	Toxics	Under development	Jane Creech 509-454-7860

**** Status** will be listed as one of the following: Approved by EPA, Under Development or Implementation. No status means project work has not yet started.*

For more information about WRIA 39:

- Waterbodies in WRIA 39 - using the Water Quality Assessment Query Tool
- Watershed Information for WRIA 39

* The Department of Ecology and other state resource agencies frequently use a system of 62 "Water Resource Inventory Areas" or "WRIAs" to refer to the state's major watershed basins.

Back to top of page

Last updated December 2016

Feedback?

About us
Director Maia Bellon
Tracking progress
Newsroom
Jobs
Staff only
Contact us

Publications & forms
Databases
Laws & rules
Public records disclosure
Public input & events
Environmental education
Sustainability information

中文 | Chinese
Tiếng Việt | Vietnamese
한국어 | Korean
Русский | Russian
Español | Spanish
Accessibility

Access Washington®
Welcome to the State of Washington

Copyright © Washington State Department of Ecology
Privacy Notice | Site Info | Accessibility | Contact the web team |

SHARE

APPENDIX F: KITTITAS COUNTY WETLAND BUFFER GUIDANCE

Chapter 17A.04
CRITICAL AREAS DESIGNATION AND DEVELOPMENT STANDARDS

Sections

17A.04.010 Wetlands.
17A.04.015 No net loss of wetland areas.
17A.04.020 Buffer width requirements.
17A.04.025 Wetland buffer ranges.
17A.04.030 Wetland buffer averaging.
17A.04.035 Natural condition of wetland buffer.
17A.04.040 Allowed uses.
17A.04.045 Building setback lines from wetland buffers.
17A.04.050 Wetland replacement ratios.

17A.04.010 Wetlands.
Wetlands in Kittitas County are defined in Section 17A.02.310 and classified in four categories: Category I (extreme high value), Category II (high value), Category III (average value), Category IV (less than average value). Critical area wetlands in Kittitas County are defined as Category I, Category II, Category III and Category IV wetlands as determined by the planning manager.

Category IV wetlands may be determined by the director to constitute a critical area based upon application of the criteria in this chapter. (Ord. 95-15 (part), 1995; Ord. 94-22 (part), 1994).

17A.04.015 No net loss of wetland areas.
Kittitas County shall require, to the extent practical, and except for Category IV wetlands, a zero net loss of natural wetlands functions and values together with, if reasonably possible through voluntary agreements or government incentives, a gain of wetlands in the long term. (Ord. 94-22 (part), 1994).

17A.04.020 Buffer width requirements.
Wetland buffer requirements apply to all nonexempt activities on regulated wetlands. All wetland buffers shall be measured from the wetland boundary.

Category	Size of Wetland	Required Buffer
I	any size	50 - 200 feet
II	over 2,000 sq. ft.	25 - 100 feet
III	over 10,000 sq. ft.	20 - 80 feet
IV*	43,560 sq. ft. (1 acre)	Building setbacks will be determined by the zoning lot line setbacks, but shall not exceed 25 feet.

*Includes only nonirrigation induced or enhanced Category IV wetlands. Irrigation water does influence ground water table elevations in Kittitas County.

(Ord. 96-14 (part), 1996; Ord. 95-15 (part), 1995; Ord. 94-22 (part), 1994).

17A.04.025 Wetland buffer ranges.
The wetland buffer ranges have been established to reflect the impact of certain intense land uses on wetland function and values. The director shall base the buffer size on the following criteria and shall establish the least restrictive width of buffer necessary to account for all of the following considerations:

1. The overall intensity of the proposed use;
2. The presence of threatened, endangered, or sensitive species;
3. The site's susceptibility to severe erosion;
4. The use of a buffer enhancement plan by the applicant which uses native vegetation or other measures which will enhance the functions and values of the wetland or buffer. (Ord. 94-22 (part), 1994).

17A.04.030 Wetland buffer averaging.
Wetland buffers may be modified by averaging buffer widths. Wetland buffer width averaging shall be allowed only where the applicant demonstrates that the following exists:

1. That averaging is necessary to avoid an extraordinary hardship to the applicant caused by circumstances peculiar to the property;
2. That the wetland contains variations in sensitivity due to existing physical characteristics;
3. That the proposed use would be located adjacent to areas where buffer width is reduced, and that such land uses are low in impact;
4. That width averaging will not adversely impact wetland function and values. (Ord. 9422 (part), 1994).

17A.04.035 Natural condition of wetland buffer.
Natural condition of wetland buffer. Wetland buffer areas shall be retained in their natural condition or may be improved to enhance buffer functions and values. Where buffer disturbance has occurred during construction, revegetation with native vegetation may be required. The Kittitas County noxious weed ordinance shall be adhered to. (Ord. 94-22 (part), 1994).

17A.04.040 Allowed uses.
In addition to exempt activities otherwise identified herein, the following activities are allowed to occur on wetland and wetland buffer areas: nonmotorized outdoor recreational activities including hunting and fishing; educational activities; existing and ongoing agricultural activities, silviculture and mining; and maintenance of existing facilities, structures, ditches, roads, bridges and other utility systems. Up to two acres of Class IV wetlands may be filled, drained or modified with no approval required from the planning manager. If more than two acres of Class IV wetlands are filled, drained or modified, approval of the planning manager is required. Such development activity shall provide mitigation in accordance with Section 17A.04.050 for that portion of the wetland fill or modification that exceeds two acres. Category IV wetlands may be used for secondary stormwater management facilities having no reasonable alternative on-site location, provided there is no significant adverse impact to the functions and values of those wetlands. (Ord. 95-15 (part), 1995; Ord. 94-22 (part), 1994).

17A.04.045 Building setback lines from wetland buffers.
A building setback line equal to the side yard setback requirement of the applicable zoning district is required from the edge of any wetland buffer. Minor intrusions into the area of the building setback may be allowed if the director determines that such intrusions will not negatively impact the wetland. The setbacks shall be shown on all site plans submitted with the application. (Ord. 94-22 (part), 1994).

17A.04.050 Wetland replacement ratios.
Wetland replacement ratios are expressed in gross area required for replacement. The actual replacement, enhancement or rehabilitation of wetlands shall be determined by the director and meet all applicable standards for such. Replacement areas shall be determined according to function, acreage, type, location, time factors, ability to be self sustaining and projected success. Wetland functions and values shall be calculated using the Kittitas County critical areas policy document and the professional judgment of the director.

Category of Wetland	**Replacement Ratio**
I	3:1
II	2:1
III	1.5:1
IV	1:1 for the portion of a wetland fill or modification

(Ord. 96-14 (part), 1996; Ord. 95-15 (part), 1995; Ord. 94-22 (part), 1994).

Appendix G-2: Camas Solar Project Cultural Resources Report



CULTURAL RESOURCES ASSESSMENT
CAMAS SOLAR PROJECT
KITTITAS COUNTY, WASHINGTON



June 8, 2017

SWCA ENVIRONMENTAL CONSULTANTS
SEATTLE, WASHINGTON

This report has been redacted due to archaeological site confidentiality

Appendix G-3: Camas Solar Project Permit Applications

KITTITAS COUNTY
DEPARTMENT OF PUBLIC WORKS

ACCESS AND ADDRESS APPLICATION

Application for: ☐ **Address $100.00** ☐ **Access $270.00** **Payment Method:** ☐ **Check** _____ ☐ **Cash**
☒ **Access and Address $330.00**

Owner Name Valley Land Company LLC
Mailing Address 1585 Tjossem Rd
Ellensburg, WA 98926
Phone Number 509-962-2840
Email Address jbrunson@fairpoint.net

Permit #_____

Applicant Name TUUSSO Energy, LLC
Mailing Address 500 Yale Ave North
Seattle, WA 98109
Phone Number 206-303-0198
Email Address jason.evans@tuusso.com

DATE STAMP

Request Access and/or Address for:

☐ Approved Subdivision ☐ Pending Subdivision ☐ Agricultural Access
☐ Single Family Dwelling ☐ Commercial Access ☐ Temporary Access
☒ Other Photovoltaic Solar Project

Number of Lots to be served by the Access: 1

Assessor's Map No.: 17-19-19010-0001; 17-19-18040-0022; 17-19-18040-0006

Plat Name N/A Lot N/A

Road Name of Access Location: Tjossem Road

Distance and Direction to Nearest Intersection or Adjacent Address:
0.15 miles east of SH 82 overpass

Desired Width of Driveway: 12 FT (Minimum Width Requirement is based on length of driveway)

CALL BEFORE YOU DIG 1-800-424-5555 OR 811

Applicant is responsible for calling for underground utility locates 48 hours prior to construction.

☒ **I have attached a site map with details on the access, driveway and any buildings (existing or proposed).**
☒ **Applicant will stake along right-of-way to mark desired location of access.**
☒ **Applicant agrees to perform the work in compliance with the Kittitas County Road Standards and the requirements on the Access Permit.**
☒ **Applicant certifies that the access applied for is only for the purpose indicated.**

Applicant declares he/she is the owner or owner's agent of the real property whose access is under construction.
Applicant Signature _____ Date _____

Reviewers Notes:

NEW ADDRESS: _____

CITY: _____ ZIP: _____

☐ PRIVATE ROAD CERTIFICATION REQUIRED PRIOR TO_____

ACCESS REQUIREMENTS PRIOR TO BUILDING PERMIT:

☐ PAVED APRON REQUIRED – WSDOT DESIGN STANDARDS
☐ CULVERT REQUIRED-MUST BE BEDDED ON A MINIMUM OF 4" OF 5/8 GRAVEL OR EQUIVALENT
-Minimum Culvert Diameter: _____ Inches
-Minimum Beveled End Length: _____ Feet
-Total Culvert Length: _____ Feet
-Minimum Cover of: _____ Inches
☐ 4:1 BEVELS REQUIRED ON CULVERT ENDS
☐ CONSTRUCT APRON(FIRST 20 FEET) WITH NO MORE THAN 6% GRADE
☐ COMPACTED GRAVEL SURFACE LAYER REQUIRED
☐ 10 FOOT TURNING RADIUS ON APRON
☐ SIDE SLOPES OFF OF APRON NOT TO EXCEED A 4:1 SLOPE

☐ PERMIT EXPIRES ON: _____

DRIVEWAY REQUIREMENTS PRIOR TO OCCUPANCY PERMIT:

☐ DRIVEWAY NOT TO EXCEED 15% GRADE
☐ DRIVEWAYS LESS THAN 150 FEET IN LENGTH TO BE A MINIMUM OF 12 FEET WIDE WITH COMPACTED GRAVEL SURFACE LAYER
☐ DRIVEWAYS LONGER THAN 150 FEET IN LENGTH TO BE A MINIMUM OF 16 FEET WIDE WITH COMPACTED GRAVEL SURFACE LAYER
☐ DRIVEWAY SET BACK OF 5 FEET FROM SIDE PROPERTY BOUNDARIES
☐ SIDE SLOPE OFF DRIVEWAY SURFACE LAYER NOT TO EXCEED A 2:1 SLOPE

NOTES: _____

_____

_____

_____

_____

_____

_____

_____

_____

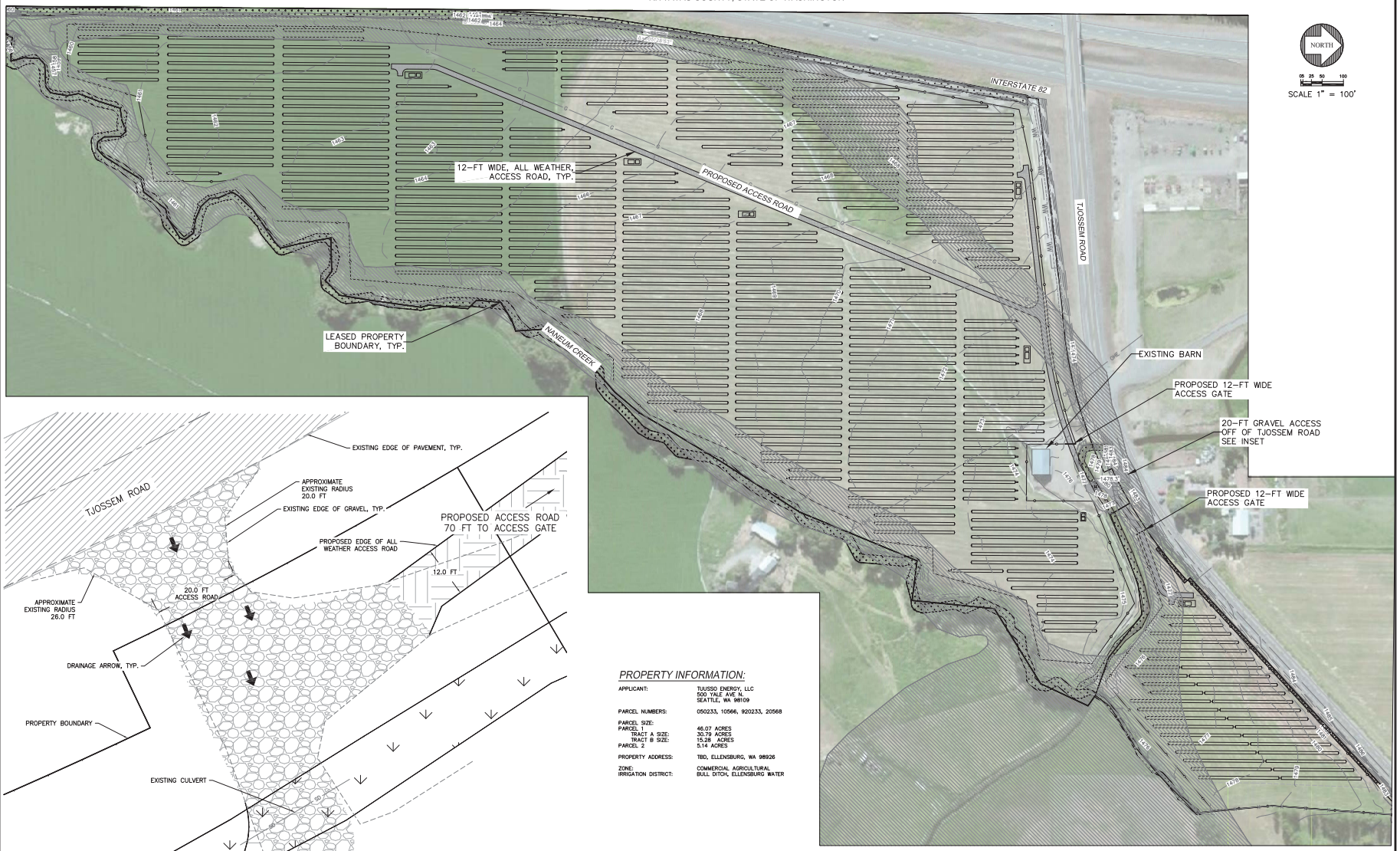
Reviewers Signature Title Date

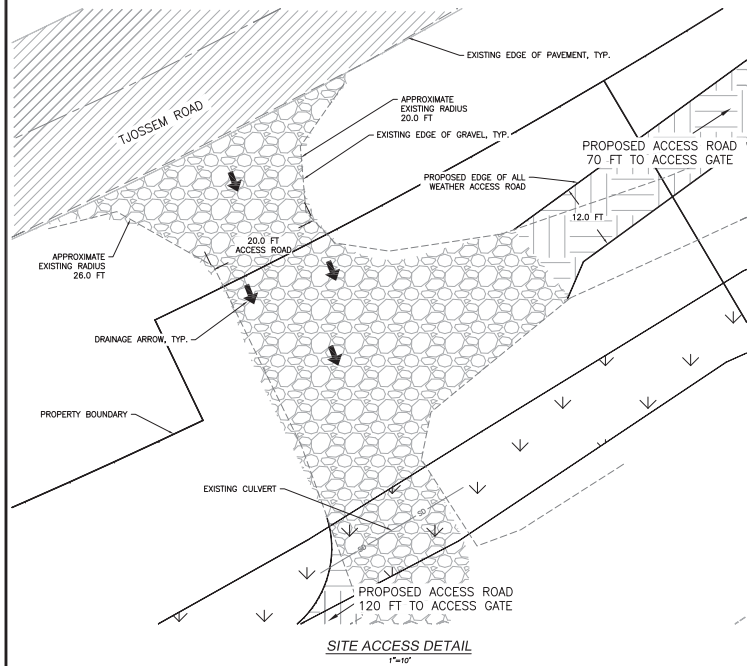
_____

411 N. Ruby St. Suite 1
Ellensburg, WA 98926
TEL (509) 962-7523
FAX (509) 962-7663

TUUSSO ENERGY - CAMAS SITE

A PORTION OF THE SE 1/4 OF SECTION 18 AND THE NE 1/4 OF SECTION 19, T. 17 N., R. 19 E. W.M.
KITTITAS COUNTY, STATE OF WASHINGTON





SITE ACCESS DETAIL
1"=10'

PROPERTY INFORMATION:

APPLICANT:	TUUSSO ENERGY, LLC 500 YALE AVE N. SEATTLE, WA 98109
PARCEL NUMBERS:	050233, 10566, 920233, 20568
PARCEL SIZE:	
PARCEL 1	46.07 ACRES
TRACT A SIZE:	30.79 ACRES
TRACT B SIZE:	15.28 ACRES
PARCEL 2	5.14 ACRES
PROPERTY ADDRESS:	TBD, ELLENSBURG, WA 98926
ZONE:	COMMERCIAL AGRICULTURAL
IRRIGATION DISTRICT:	BULL DITCH, ELLENSBURG WATER

REVISIONS

DESCRIPTION	BY	DATE

© THE PLANS SET FORTH ON THIS SHEET ARE AND SHALL REMAIN THE PROPERTY OF ENCOMPASS ENGINEERING & SURVEYING

NOT FOR CONSTRUCTION

TUUSSO ENERGY, LLC
CAMAS SITE
ACCESS SITE PLAN

Encompass
ENGINEERING & SURVEYING
Western Washington Division
165 NE Juniper Street, Suite 201 ■ Issaquah, WA 98027 ■ Phone: (425) 392-0250 ■ Fax: (425) 391-3055
Eastern Washington Division
407 Southeaster Blvd ■ Cle Elum, WA 98922 ■ Phone: (509) 674-7433 ■ Fax: (509) 674-7419

JOB NO.	17017
DATE	JULY 2017
SCALE	AS SHOWN
DESIGNED	SF
DRAWN	SF
CHECKED	TML
APPROVED	TML
SHEET	EX-1

G-3-3

KITTITAS COUNTY
COMMUNITY DEVELOPMENT SERVICES
411 NORTH RUBY STREET SUITE #2 ■ ELLENSBURG, WA 98926
PHONE (509) 962-7506 ■ FAX (509) 962-7682

General Application for Construction

Assessor Map Number:	Official Use Only:
(Use http://www.co.kittitas.wa.us/assessor/property.asp if needed) Example 21-12-35000-0021 1 7 - 1 9 - 1 8 0 4 0 - ___ ___ ___ ___	**Permit #:**
Short Plat/ Subdivision: / Lot #:	**Date Applied:**
	Intake:

Site Address: 4561 No. 6 Road and 2100 Tjossem Road, Ellensburg, WA 98926			
Project Description/ Nature of Work: Camas 5-MW Solar Project		~~Square Foot~~ Total:	
Specific Use of Structure: To generate renewable electricity		No. of Bedrooms: 0	
Heating System Type & Location: N/A	Heating System Fuel Type: N/A	Fireplace Fuel Type: N/A	Hot Water Location & Fuel: N/A
☐ New Residential ☐ Residential Alteration ☐ Residential Addition ☐ Foundation	☐ New Commercial ☐ Commercial Alteration ☐ Commercial Addition ☐ Tenant Improvement	☐ Multi-Family ☐ Demolition ☐ Mobile Home ☐ Accessory Building	☐ Accessory Building Alteration ☐ Agricultural Building ■ Other New Industrial

PROPERTY OWNER:	Valley Land Company, LLC	Day Phone: 509-962-2840
Mailing Address:	1585 Tjossem Road	
City, State, ZIP:	Ellensburg, WA 98926	
E-mail:	jbrunson@fairpoint.net	Cell Phone: 509-899-2840
CONTRACTOR:		Day Phone:
Contact:		
Address, City, State, ZIP:		
E-mail:		Cell Phone:
Contractor License #:		Expiration Date:
ARCHITECT/ ENGINEER/ DESIGNER:		Day Phone:
Contact:		
Address, City, State, ZIP:		
E-mail:		Cell Phone:
Professional License No.:		Expiration Date:

APPLICANT/ AGENT:	Jason Evans	Day Phone: 206-708-6055
Company (if any):	TUUSSO Energy LLC	
Address, City, State, ZIP:	500 Yale Avenue North, Seattle, WA 98109	
E-mail:	Jason.evans@tuusso.com	Cell Phone: 206-303-0198

This Section To Be Completed For Construction Permits Only

Pursuant to RCW 19.27.095 (2)(i-ii) The requirements for a fully completed construction application shall include:

i. The name, address, and phone number of the office of the lender administering the interim construction financing, if any: OR

ii. The name and address of the firm that has issued a payment bond, if any, on behalf of the prime contractor for the protection of the owner, if the bond is for an amount not less than 50% of the total amount of the construction project.

If for any reason the information requested below is not available at the time of application, the applicant shall provide the information as soon as it can be reasonably be obtained.

☐ Lending Agency Name: Phone:

Mailing Address: City: State: ZIP:

☐ I acknowledge by checking this box that this project has no lending agency for construction financing.

☐ Bonding Agency Name: Phone:

Mailing Address: City: State: ZIP

☐ I acknowledge by checking this box that this project has no bonding agency.

If you are the Owner and Acting As Your Own Contractor, please complete the following declaration:

I acknowledge that I am applying for a construction permit through the Kittitas County Community Development Services. I also acknowledge that I *am* not a licensed contractor, specialty or general, or that I am not acting as a contractor and wish to be exempt from the requirements of the Washington State Contractor's Act, per RCW 18.27.090, and will abide by all provisions and conditions of the exemption as stated. I agree that if I use the assistance of any person(s) to provide labor and/or assistance, I will retain only contractors registered and currently licensed as required under the laws of the State of Washington.

I (print name) _____ certify under penalty of perjury under the laws of the State of Washington that the foregoing is true and correct.

Owner Signature: _____ Date: _____

1. All permits shall expire by limitation and be declared void if any one of the following apply:
   a. Work is not started within 365 days of obtaining a permit.
   b. Work is abandoned for 365 days or more after beginning work.
   c. An inspection and approval of work completed has not been performed by Kittitas County Community Development Services for 365 days.
2. The building permit card and approved construction plans shall be kept on the site of work until completion of the project.
3. It shall be the duty of the permit holder or their agent to notify the building official that such work is ready for inspection. It shall by the duty of the person requesting any inspections required by code to provide access to and means for inspection of such work. Work shall not be done beyond the point indicated in each successive inspection without first obtaining the approval of the building official. Any portion that does not comply shall be corrected and such portion shall not be covered or concealed until authorized by the building official.
4. No building or structure shall be used or occupied, and no change in the existing occupancy classification of a building or structure or portion thereof shall be made until the building official has issued a Certificate of Occupancy.
5. Work shall be installed in accordance with the approved construction documents, and any changes made during construction that are not in compliance with the approved construction documents shall be resubmitted for approval as an amended set of construction documents.

I hereby acknowledge that I have read this application and certify under penalty of perjury under the laws of the State of Washington that the above answers are true and complete to the best of my knowledge. I agree to comply with all current codes, laws, regulations and permit requirements related to this project. I hereby certify that I will pay all fees as required by law, including any applicable review fees if I do not purchase the permit. I further agree to, and hereby grant to Kittitas County Community Development Services and Department of Public Works a right to enter onto the premises as described for this permit application, for the purpose of making such inspections and tests as may be required. By signing this application, the Owner certifies that they are the legal owner of the property. All permit fees are non-refundable.

Owners Signature: (Required)		Authorized Agent Signature:	
Print Name:		Print Name:	
Date:		Date:	

Tuusso Energy: Camas Solar Project

NOI Application

September 5, 2017

SECTION 1. CONTACT INFO

Contact Information Section Help

This Notice of Intent application requires the following contact types: **Permittee, Site Owner, and Site Contact**. Please use the table below to fill in your required contacts. You may add additional contact types that are not pre-listed.

Note: Please remember you are responsible for notifying the Department of Ecology when your contact information changes.

Contact Type	First Name	Last Name	Organization Name	Action
Permittee	Jason	Evans	Tuusso Energy, LLC	Edit - Remove
Site Contact	Jason	Evans	Tuusso Energy, LLC	Edit - Remove
Site Owner	Jeff	Brunson	Valley Land Company LLC	Edit - Remove

Your mailing address will be standardized against the postal service (USPS) mailing database when you click on the "Update" button. Verfication may be necessary.

Honorific: **Contact Type:** Permittee
First Name: Jason **Last Name:** Evans
Organization Name: Tuusso Energy, LLC Title:
Mailing Address: 500 Yale Ave N
Country: UNITED STATES
City: Seattle **State:** WA **Zip:** 98109 - 5680
Email Address: jason.evans@tuusso.com
Business Phone: 206 - 708 - 6055 Ext. Fax Number: - -
Cell Phone: 206 - 303 - 0198 UBI Number:

Your mailing address will be standardized against the postal service (USPS) mailing database when you click on the "Update" button. Verfication may be necessary.

Honorific: **Contact Type:** Site Owner
First Name: Jeff **Last Name:** Brunson
Organization Name: Valley Land Company LL Title:
Mailing Address: 1585 Tjossem Rd
Country: UNITED STATES
City: Ellensburg **State:** WA **Zip:** 98926 - 8925
Email Address: jbrunson@fairpoint.net
Business Phone: 509 - 962 - 2840 Ext. Fax Number: - -
Cell Phone: - - UBI Number:

Copy From... My Profile Save Contact Cancel

SECTION 2. FACILITY/SITE INFO

Facility/Site Information Section Help

Your facility address will be standardized against the postal service (USPS) mailing database when you click on the "Select facility from map" link. Verfication may be necessary.

This Facility/Site's Ownership Type is: Private

Facility/Site Name: Camas Solar Project

Street Address:

City: Zip: 98926

Or

If the site lacks a street address, list its specific location. Example: Intersection of Highway 61 and 34.

Location Description: TBD (near 2100 Tjossem Rd), Ellensburg, WA 98926

Find my facility/site on a map

Please use the pop up map to complete the latitude, longitude and county information below. Use the pencil tool on the map to locate your facility at the front door or site entrance. *(The map may take a second to pop up.)*

Select facility/site from map

Latitude: 46.959015 **Longitude:** -120.502881 **County:** Kittitas

SECTION 3. SITE/PROJECT INFO

Project Information

Section Help

Type of Construction Activity: *(check all that apply)*

☐ Highway or Road (city, county, state) ☐ Residential ☐ Commercial ☐ Industrial

☐ Utilities ☑ Other *(specify):* Photovoltaic solar panel s

Project/Site Size: 51.21 acres

The total size of the project site in acres. This is all land that is owned or controlled by the permittee.

Soil Disturbance Size: 42.91 acres

Total area of soil disturbance for your site/project over the life of the project. Include grading, equipment staging, excavation, borrow pit, material storage areas, dump areas, haul roads, side-cast areas, off-site construction support areas, and all other soil disturbance acreage associated with the project. (Note: 1 acre = 43,500 ft²).

Estimated Project Start Date: 4/1/2018

Estimated Project End Date: 10/31/2018

Will 1,000 cubic yards or more of poured concrete or recycled concrete be used over the life of the project? ○ Yes ◉ No

Site Conditions

Are you aware of contaminated soils present on the site? ○ Yes ◉ No

Are you aware of groundwater contamination located within the site boundary? ○ Yes ◉ No

Other Permits

Please enter other permits issued by Water Quality for this site.

Permit Number	Action
	Add

SECTION 4. DISCHARGE LOCATION

Discharge Location/Outfall Information

Section Help

Will water discharge directly or indirectly (through a storm drain system or roadside ditch) into one or more surface waterbodies (wetlands, creeks, lakes, and all other surface waters and water courses)?

No, no discharge to surface waters (100% infiltration) ▼

If your project includes dewatering, you must include dewatering plans and discharge locations in your site Stormwater Pollution Prevention Plan.

Location of Discharge into Surface Waterbody (Outfall Location)

Select the waterbody location (outfall) on the pop up map where the site has the potential to discharge into a waterbody (enter all locations). If you have 100% infiltration, you must select where the infiltration point is as your outfall. *(The map may take a second to pop up.)*

Outfall Number	Outfall Name	Lat/Long	Action
1	Infiltration	46.952226/-120.506818	Edit - Remove

Add Outfall

SECTION 5. NOI INFORMATION

Stormwater Pollution Prevention Plan (SWPPP)

You must develop a SWPPP prior to starting construction. Do **not** submit your SWPPP with your application. The exception is that Ecology may request a copy of all or part of your SWPPP if you answered yes to the questions under the Site Conditions heading on the Site/Project Info tab.

☑ I have read and agree to the information above

Best Management Practices (BMPs)

You must use the BMPs listed in the Stormwater Management Manual for Western Washington or the Stormwater Management Manual for Eastern Washington or other manuals approved by Ecology. Alternatively, you may use demonstrably equivalent BMPs on the basis of permit condition S9.C.4. If you intend to use a BMP at your site that is not included in these manuals, but that you believe meets the definition of a demostrably equivalent BMP, you must notify the appropriate regional office. (See Definitions in the Construction Stormwater General Permit).

Note that if you receive permit coverage without indicating the preference for a demostrably equivalent BMP and later decide to use one, you must provide Ecology with notice of the selection of an equivalent BMP no less than 60 days before the intended use of the equivalent BMP.

http://www.ecy.wa.gov/programs/wq/stormwater/construction/contacts.html

☑ I have read and agree to the information above

SECTION 6. DMR

Discharge Monitoring Reports (DMRs)

Permittees must submit monitoring data using Ecology's WQWebDMR program.

To sign up for WQWebDMR, or to register a new site, go to http://www.ecy.wa.gov/programs/wq/permits/paris/webdmr.html. If you are unable to submit your DMRs electronically, you may contact Ecology to request a waiver. Ecology will generally only grant waiver requests to those permittees without internet access. Only a permittee or representative, designated in writing, may request access to or a waiver from WQWebDMR. If you have questions on this process, contact Ecology's WQWebDMR staff at WQWebPortal@ecy.wa.gov or 1-800-633-6193, Option 3 (toll free).

☑ I have read and agree to the information above

SECTION 7. SEPA

State Environmental Policy Act (SEPA)

Section Help

This Notice of Intent (NOI) is incomplete and cannot be approved until the applicable SEPA requirements under Chapter 197-11 WAC are met.

Who is the SEPA lead agency on your site? Energy Facility Site Evaluation Council

Has the SEPA lead agency issued a final decision on your checklist? ○ No ○ Yes ○ Exempt

More SEPA information is available at: http://www.ecy.wa.gov/programs/sea/sepa/e-review.html

SECTION 8. PUBLIC NOTICE

Public Notice

Section Help

You must publish a public notice at least **once** a week for **two** consecutive weeks with **seven days** between publications, in at least a **single** newspaper of general circulation in the county in which the construction is to take place. Ecology cannot grant permit coverage sooner than the end of the 30-day public comment period, which begins on the date of the **second** public notice.

You may choose to use a system generated public notice and download it below. If not, you need to upload the public notice used.

- (•) I will use the system generated public notice document
- ( ) I will upload my own public notice

```
Tuusso Energy, LLC, Jason Evans, 500 Yale Ave N Seattle, WA 98109, is seeking coverage under the
Washington State Department of Ecology's Construction Stormwater NPDES and State Waste Discharge
General Permit.
The proposed project, Camas Solar Project, is located at  TBD (near 2100 Tjossem Rd), Ellensburg,
WA 98926 in  in Kittitas county.
This project involves 42.91 acres of soil disturbance for Other (Photovoltaic solar panel site)
construction activities.
All discharges and runoff goes to ground water.
Any persons desiring to present their views to the Washington State Department of Ecology regarding
this Application, or interested in Ecology's action on this Application, may notify Ecology in
writing no later than 30 days of the last date of publication of this notice. Ecology reviews
public comments and considers whether discharges from this project would cause a measurable change
in receiving water quality, and, if so, whether the project is necessary and in the overriding
public interest according to Tier II antidegradation requirements under WAC 173-201A-320.

Comments can be submitted to:
Department of Ecology
Attn: Water Quality Program, Construction Stormwater
P.O. Box 47696, Olympia, WA 98504-7696
```

Clicking the text will copy it to your clipboard, if allowed. Open notice in a new window for printing.

To add a public notice to your application, select the newspaper name and enter your public notice dates, then click on the "Add" link. If you do not click the "Add" link, the public notice entry will be lost.

Note: This system does not publish your public notice in the newspaper for you. You must submit your public notice text to your selected newspaper.

Newspaper Name	First Notice	Second Notice	Action
Ellensburg - Daily Record ▼	*	*	Add

* First notice date is required.
* Second notice date is required.

SECTION 9. QUESTIONS

For Questions...

Please contact the following staff per your construction site's location.

If your construction site is located in:	Contact the following staff:
City of Seattle, Kitsap, Pierce, or Thurston County	Josh Klimek 360-407-7451 josh.klimek@ecy.wa.gov
Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Skagit, Snohomish, Spokane, Stevens, Walla Walla, Whatcom, or Whitman County	Shawn Hopkins 360-407-6442 shawn.hopkins@ecy.wa.gov
Benton, Chelan, Clallam, Clark, Cowlitz, Douglas, Grays Harbor, Jefferson, Kittitas, Klickitat, Lewis, Mason, Okanogan, Pacific, Skamania, Wahkiakum, or Yakima County	Joyce Smith 360-407-6858 joyce.smith@ecy.wa.gov
Island, King, or San Juan County	RaChelle Stane 360-407-6556 rachelle.stane@ecy.wa.gov

Tuusso Energy, LLC, Jason Evans, 500 Yale Ave N Seattle, WA 98109, is seeking coverage under the Washington State Department of Ecology's Construction Stormwater NPDES and State Waste Discharge General Permit.

The proposed project, Camas Solar Project, is located at TBD (near 2100 Tjossem Rd), Ellensburg, WA 98926 in in Kittitas county.

This project involves 42.91 acres of soil disturbance for Other (Solar panel farm) construction activities.

All discharges and runoff goes to ground water.

Any persons desiring to present their views to the Washington State Department of Ecology regarding this application, or interested in Ecology's action on this application, may notify Ecology in writing no later than 30 days of the last date of publication of this notice. Ecology reviews public comments and considers whether discharges from this project would cause a measurable change in receiving water quality, and, if so, whether the project is necessary and in the overriding public interest according to Tier II antidegradation requirements under WAC 173-201A-320.

Comments can be submitted to:

Department of Ecology

Attn: Water Quality Program, Construction Stormwater

P.O. Box 47696, Olympia, WA 98504-7696

Construction Stormwater General Permit

Stormwater Pollution Prevention Plan (SWPPP)

for

Tuusso Energy: Camas Solar Project

Prepared for:

The Washington State Department of Ecology

Central Regional Office

Permittee / Owner	Developer	Operator / Contractor
Tuusso Energy LLC	Jason Evans	TBD

TBD (Near 2100 Tjossem Rd), Ellensburg, WA 98926

Certified Erosion and Sediment Control Lead (CESCL)

Name	Organization	Contact Phone Number
TBD	TBD	TBD

SWPPP Prepared By

Name	Organization	Contact Phone Number
Sarah Foster, EI	Encompass Engineering & Surveying	(509)-674-7433

SWPPP Preparation Date

July 28, 2017

Project Construction Dates

Activity / Phase	Start Date	End Date
Phase 1	4/1/2018	10/31/2018

Table of Contents

1 Project Information 4
1.1 Existing Conditions 4
1.2 Proposed Construction Activities 4
2 Construction Stormwater Best Management Practices (BMPs) 6
2.1 The 13 Elements 6
2.1.1 Element 1: Preserve Vegetation / Mark Clearing Limits 6
2.1.2 Element 2: Establish Construction Access 6
2.1.3 Element 3: Control Flow Rates 7
2.1.4 Element 4: Install Sediment Controls 7
2.1.5 Element 5: Stabilize Soils 8
2.1.6 Element 6: Protect Slopes 8
2.1.7 Element 7: Protect Drain Inlets 9
2.1.8 Element 8: Stabilize Channels and Outlets 9
2.1.9 Element 9: Control Pollutants 9
2.1.10 Element 10: Control Dewatering 11
2.1.11 Element 11: Maintain BMPs 11
2.1.12 Element 12: Manage the Project 12
2.1.13 Element 13: Protect Low Impact Development (LID) BMPs 13
3 Pollution Prevention Team 14
4 Monitoring and Sampling Requirements 15
4.1 Site Inspection 15
4.2 Stormwater Quality Sampling 15
4.2.1 Turbidity Sampling 15
4.2.2 pH Sampling 17
5 Discharges to 303(d) or Total Maximum Daily Load (TMDL) Waterbodies 18
5.1 303(d) Listed Waterbodies 18
5.2 TMDL Waterbodies 18
6 Reporting and Record Keeping 19
6.1 Record Keeping 19
6.1.1 Site Log Book 19
6.1.2 Records Retention 19
6.1.3 Updating the SWPPP 19
6.2 Reporting 19
6.2.1 Discharge Monitoring Reports 19
6.2.2 Notification of Noncompliance 20

List of Tables

Table 1 – Summary of Site Pollutant Constituents 4
Table 2 – Pollutants 9
Table 3 – pH-Modifying Sources 10
Table 4 – Dewatering BMPs 11
Table 5 – Management 12
Table 7 – Team Information 14
Table 8 – Turbidity Sampling Method 15
Table 9 – pH Sampling Method 17

List of Appendices

A. Site Map
B. BMP Details
C. Correspondance
D. Site Inspection Form
E. Construction Stormwater General Permit
F. 303(d) List Waterbodies / TMDL Waterbodies Information
G. Contaminated Site Information
H. Engineering Calculations

List of Acronyms and Abbreviations

Acronym / Abbreviation	Explanation
303(d)	Section of the Clean Water Act pertaining to Impaired Waterbodies
BFO	Bellingham Field Office of the Department of Ecology
BMP(s)	Best Management Practice(s)
CESCL	Certified Erosion and Sediment Control Lead
CO_2	Carbon Dioxide
CRO	Central Regional Office of the Department of Ecology
CSWGP	Construction Stormwater General Permit
CWA	Clean Water Act
DMR	Discharge Monitoring Report
DO	Dissolved Oxygen
Ecology	Washington State Department of Ecology
EPA	United States Environmental Protection Agency
ERO	Eastern Regional Office of the Department of Ecology
ERTS	Environmental Report Tracking System
ESC	Erosion and Sediment Control
GULD	General Use Level Designation
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Units
NWRO	Northwest Regional Office of the Department of Ecology
pH	Power of Hydrogen
RCW	Revised Code of Washington
SPCC	Spill Prevention, Control, and Countermeasure
su	Standard Units
SWMMEW	Stormwater Management Manual for Eastern Washington
SWMMWW	Stormwater Management Manual for Western Washington
SWPPP	Stormwater Pollution Prevention Plan
TESC	Temporary Erosion and Sediment Control
SWRO	Southwest Regional Office of the Department of Ecology
TMDL	Total Maximum Daily Load
VFO	Vancouver Field Office of the Department of Ecology
WAC	Washington Administrative Code
WSDOT	Washington Department of Transportation
WWHM	Western Washington Hydrology Model

1 Project Information

Project/Site Name: Camas Solar Project
Street/Location: TBD (Near 2100 Tjossem Rd)
City: Ellensburg State: WA Zip code: 98926
Subdivision: NA
Receiving waterbody: Existing irrigation network

1.1 Existing Conditions

Total acreage (including support activities such as off-site equipment staging yards, material storage areas, borrow areas).

Total acreage:	51.21
Disturbed acreage:	42.91
Existing structures:	1
Landscape topography:	Gently sloped grassland to the south/southwest.
Drainage patterns:	Flows generally south/southwest
Existing Vegetation:	Range/grassland
Critical Areas (wetlands, streams, high erosion risk, steep or difficult to stabilize slopes):	Portions on the east and west boundaries of the site are within the 100-yr floodplain. An irrigation water ditch flows south along the property's western border. Naneum Creek flows southwest along the properties eastern border.

List of known impairments for 303(d) listed or Total Maximum Daily Load (TMDL) for the receiving waterbody: None

Table 1 includes a list of suspected and/or known contaminants associated with the construction activity.

No known contamination on site or associated with construction activity.

Table 1 – Summary of Site Pollutant Constituents

Constituent (Pollutant)	Location	Depth	Concentration
NA	NA	NA	NA

1.2 Proposed Construction Activities

Description of site development (example: subdivision):
Photovoltaic solar facility project site with all weather-access roads, inverter stations, and modular trackers with solar panels

Description of construction activities (example: site preparation, demolition, excavation):

1. Pre-construction meeting

2. Grade and install construction entrance
3. Install perimeter protection
4. Grade and stabilize construction roads
5. Install vibratory driven H piles for wide flange steel beams
6. Install electrical underground and mechanical trackers
7. Install panels
8. Perform any required site restoration.

Description of site drainage including flow from and onto adjacent properties. Must be consistent with Site Map in Appendix A:
Flows from stormwater are principally infiltrated on-site. Any excess runoff from the site during large storm events will follow the existing natural ground slope towards the south/southwest. The flow will enter the existing irrigation system via Naneum Creek.

Description of final stabilization (example: extent of revegetation, paving, landscaping):
The site will be revegetated with native vegetation.

Contaminated Site Information:
Proposed activities regarding contaminated soils or groundwater (example: on-site treatment system, authorized sanitary sewer discharge):
No contamination is known to be on site.

2 Construction Stormwater Best Management Practices (BMPs)

The SWPPP is a living document reflecting current conditions and changes throughout the life of the project. These changes may be informal (i.e., hand-written notes and deletions). Update the SWPPP when the CESCL has noted a deficiency in BMPs or deviation from original design.

2.1 The 13 Elements

2.1.1 Element 1: Preserve Vegetation / Mark Clearing Limits

List and describe BMPs:

BMP C101: Preserving Natural Vegetation

Natural vegetation will be preserved along Naneum Creek on the southeast boundary of the site and along the existing irrigation ditch along the western boundary of the site.

BMP C102: Buffer Zones

Buffer zones will be established at the limits of the proposed facility to protect existing wetlands and relieve downstream impacts. Existing vegetation will be maintained within the buffer zones throughout construction.

Installation Schedules: TBD

Inspection and Maintenance plan: TBD

Responsible Staff: TBD

2.1.2 Element 2: Establish Construction Access

List and describe BMPs:

BMP C105 – Stabilized Construction Entrance

Two stabilized construction entrances will be provided off of Tjossem Rd, one providing access to the northeast portion of the site and one providing access to the remaining southern portion of the site. These are where vehicles will be entering/exiting, in order to prevent tracking out from the site.

Installation Schedules: TBD

Inspection and Maintenance plan: TBD

Responsible Staff: TBD

2.1.3 Element 3: Control Flow Rates

Will you construct stormwater retention and/or detention facilities?
☐ Yes ☒ No

Will you use permanent infiltration ponds or other low impact development (example: rain gardens, bio-retention, porous pavement) to control flow during construction?
☐ Yes ☒ No

Project will not impair or alter downstream conveyance systems. Full dispersion on site will be used to account for increased flows due to proposed impervious areas. Per Chapter 2.2.6 of the SWMMEW there are exemptions for new development when flow control is not required as long as certain conditions are met. Per exemption 1, “Any project able to disperse, without discharging to surface waters, the total 25-year runoff volume for the proposed development condition” is exempt from meeting the flow control requirements. The Camas project will use full dispersion as the main way to handle increased flows due to impervious areas. As outlined in SWMMEW Chapter 6.5, BMP F6.42, full dispersion allows up to 10% of the site that is impervious to be characterized as non-effective impervious area by dispersing runoff into the native vegetation area. On the Camas site, the impervious areas may conservatively make up to 4.0% of the site while the rest of the site maintains plantings similar to existing vegetation. This is under the 10% threshold, making full dispersion a viable option.

List and describe BMPs:

BMP F6.42- Full dispersion: Runoff from impervious areas within the site will be dispersed within the site utilizing the native vegetation.

BMP C102 – Buffer Zones (See Element 1)

BMP C233 – Silt Fence will also control flow rates from the site during construction (See Element 4).

Installation Schedules: TBD

Inspection and Maintenance plan: TBD

Responsible Staff: TBD

2.1.4 Element 4: Install Sediment Controls

List and describe BMPs:

BMP C233- Silt Fence: Silt Fence will surround the site at all areas downslope of all disturbed areas and will be placed upslope of any existing water bodies. The silt fence will also serve to mark the clearing limits per Element 1 above.

Installation Schedules: TBD

Inspection and Maintenance plan: TBD

Responsible Staff: TBD

2.1.5 Element 5: Stabilize Soils

The Central Basin*, East of the Cascade Mountain Crest

Season	Dates	Number of Days Soils Can be Left Exposed
During the Dry Season	July 1 – September 30	30 days
During the Wet Season	October 1 – June 30	15 days

*Note: The Central Basin is defined as the portions of Eastern Washington with mean annual precipitation of less than 12 inches.

Soils must be stabilized at the end of the shift before a holiday or weekend if needed based on the weather forecast.

Anticipated project dates: Start date: 4/1/2018 End date: 10/31/2018

Will you construct during the wet season?
☒ Yes ☐ No

List and describe BMPs:

BMP C123- Plastic Covering: Plastic covering will be used as necessary to protect any soil stockpiles that are produced from construction activity.

Installation Schedules: TBD

Inspection and Maintenance plan: TBD

Responsible Staff: TBD

2.1.6 Element 6: Protect Slopes

Will steep slopes be present at the site during construction?
☐ Yes ☒ No
The site is relatively flat and is not expected to require protection for slopes.

List and describe BMPs: None

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

2.1.7 Element 7: Protect Drain Inlets

There are no storm drain inlets on the site.

List and describe BMPs: None

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

2.1.8 Element 8: Stabilize Channels and Outlets

Provide stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent stream banks, slopes, and downstream reaches, will be installed at the outlets of all conveyance systems.

As mentioned previously in Element 3, full dispersion will be in effect at the project site and off-site runoff will be minimal. Due to this there will be no on-site conveyance channels or outlets to account for.

List and describe BMPs: None

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

2.1.9 Element 9: Control Pollutants

The following pollutants are anticipated to be present on-site: No known pollutants

Table 2 – Pollutants

Pollutant (List pollutants and source, if applicable)
NA

List and describe BMPs: None

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

Will maintenance, fueling, and/or repair of heavy equipment and vehicles occur on-site?

☒ Yes ☐ No

Contractor is required to keep a spill kit on site and use spill prevention measures throughout the construction process, in order to address any potential fuel spills or equipment breakdowns.

List and describe BMPs: None

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

Will wheel wash or tire bath system BMPs be used during construction?
☐ Yes ☒ No

List and describe BMPs: Wheel wash is not proposed at this time; however, if construction activities are such that sediment may be tracked with tires off-site a wheel wash will be used and any wastewater generated would be disposed at a local permitted facility.

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

Will pH-modifying sources be present on-site?
☐ Yes ☒ No

Table 3 – pH-Modifying Sources

☒	None
☐	Bulk cement
☐	Cement kiln dust
☐	Fly ash
☐	Other cementitious materials
☐	New concrete washing or curing waters
☐	Waste streams generated from concrete grinding and sawing
☐	Exposed aggregate processes
☐	Dewatering concrete vaults
☐	Concrete pumping and mixer washout waters
☐	Recycled concrete
☐	Recycled concrete stockpiles
☐	Other (i.e., calcium lignosulfate) [please describe:]

List and describe BMPs: None

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

Concrete trucks must not be washed out onto the ground, or into storm drains, open ditches, streets, or streams. Excess concrete must not be dumped on-site, except in designated concrete washout areas with appropriate BMPs installed.

Will uncontaminated water from water-only based shaft drilling for construction of building, road, and bridge foundations be infiltrated provided the wastewater is managed in a way that prohibits discharge to surface waters?
☐ Yes ☒ No

List and describe BMPs: None

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

2.1.10 Element 10: Control Dewatering

No dewatering is proposed or expected to occur as part of this project.

Table 4 – Dewatering BMPs

☐	Infiltration
☐	Transport off-site in a vehicle (vacuum truck for legal disposal)
☐	Ecology-approved on-site chemical treatment or other suitable treatment technologies
☐	Sanitary or combined sewer discharge with local sewer district approval (last resort)
☐	Use of sedimentation bag with discharge to ditch or swale (small volumes of localized dewatering)

List and describe BMPs: None

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

2.1.11 Element 11: Maintain BMPs

All temporary and permanent Erosion and Sediment Control (ESC) BMPs shall be maintained and repaired as needed to ensure continued performance of their intended function.

Maintenance and repair shall be conducted in accordance with each particular BMP specification (see *Volume II of the SWMMWW or Chapter 7 of the SWMMEW*).

Visual monitoring of all BMPs installed at the site will be conducted at least once every calendar week and within 24 hours of any stormwater or non-stormwater discharge from the site. If the site becomes inactive and is temporarily stabilized, the inspection frequency may be reduced to once every calendar month.

All temporary ESC BMPs shall be removed within 30 days after final site stabilization is achieved or after the temporary BMPs are no longer needed.

Trapped sediment shall be stabilized on-site or removed. Disturbed soil resulting from removal of either BMPs or vegetation shall be permanently stabilized.

Additionally, protection must be provided for all BMPs installed for the permanent control of stormwater from sediment and compaction. BMPs that are to remain in place following completion of construction shall be examined and restored to full operating condition. If sediment enters these BMPs during construction, the sediment shall be removed and the facility shall be returned to conditions specified in the construction documents.

2.1.12 Element 12: Manage the Project

The project will be managed based on the following principles:

- Projects will be phased to the maximum extent practicable and seasonal work limitations will be taken into account.
- Inspection and monitoring:
    - Inspection, maintenance and repair of all BMPs will occur as needed to ensure performance of their intended function.
    - Site inspections and monitoring will be conducted in accordance with Special Condition S4 of the CSWGP. Sampling locations are indicated on the Site Map. Sampling station(s) are located in accordance with applicable requirements of the CSWGP.
- Maintain an updated SWPPP.
    - The SWPPP will be updated, maintained, and implemented in accordance with Special Conditions S3, S4, and S9 of the CSWGP.

As site work progresses the SWPPP will be modified routinely to reflect changing site conditions. The SWPPP will be reviewed monthly to ensure the content is current.

Table 5 – Management

☒	Design the project to fit the existing topography, soils, and drainage patterns
☒	Emphasize erosion control rather than sediment control
☒	Minimize the extent and duration of the area exposed
☒	Keep runoff velocities low
☒	Retain sediment on-site
☒	Thoroughly monitor site and maintain all ESC measures
☐	Schedule major earthwork during the dry season
☐	Other (please describe)

2.1.13 Element 13: Protect Low Impact Development (LID) BMPs

There are no existing or proposed LID facilities associated with the project site. Buffer zones will be established during construction to protect on-site wetlands, irrigation ditches, and Naneum Creek.

3 Pollution Prevention Team

Table 7 – Team Information

Title	Name(s)	Phone Number
Certified Erosion and Sediment Control Lead (CESCL)	TBD	TBD
Resident Engineer	TBD	TBD
Emergency Ecology Contact	TBD	TBD
Emergency Permittee/ Owner Contact	TBD	TBD
Non-Emergency Owner Contact	TBD	TBD
Monitoring Personnel	TBD	TBD
Ecology Regional Office	Central Regional Office	(509)-575-2490

4 Monitoring and Sampling Requirements

Monitoring includes visual inspection, sampling for water quality parameters of concern, and documentation of the inspection and sampling findings in a site log book. A site log book will be maintained for all on-site construction activities and will include:

- A record of the implementation of the SWPPP and other permit requirements
- Site inspections
- Stormwater sampling data

File a blank form under Appendix D.

The site log book must be maintained on-site within reasonable access to the site and be made available upon request to Ecology or the local jurisdiction.

Numeric effluent limits may be required for certain discharges to 303(d) listed waterbodies. See CSWGP Special Condition S8 and Section 5 of this template.

4.1 Site Inspection

Site inspections will be conducted at least once every calendar week and within 24 hours following any discharge from the site. For sites that are temporarily stabilized and inactive, the required frequency is reduced to once per calendar month.

The discharge point(s) are indicated on the Site Map (see Appendix A) and in accordance with the applicable requirements of the CSWGP.

4.2 Stormwater Quality Sampling

4.2.1 Turbidity Sampling

Requirements include calibrated turbidity meter or transparency tube to sample site discharges for compliance with the CSWGP. Sampling will be conducted at all discharge points at least once per calendar week.

Method for sampling turbidity:

Table 8 – Turbidity Sampling Method

☒	Turbidity Meter/Turbidimeter (required for disturbances 5 acres or greater in size)
☐	Transparency Tube (option for disturbances less than 1 acre and up to 5 acres in size)

The benchmark for turbidity value is 25 nephelometric turbidity units (NTU) and a transparency less than 33 centimeters.

If the discharge's turbidity is 26 to 249 NTU **or** the transparency is less than 33 cm but equal to or greater than 6 cm, the following steps will be conducted:

1. Review the SWPPP for compliance with Special Condition S9. Make appropriate revisions within 7 days of the date the discharge exceeded the benchmark.

2. Immediately begin the process to fully implement and maintain appropriate source control and/or treatment BMPs as soon as possible. Address the problems within 10 days of the date the discharge exceeded the benchmark. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when the Permittee requests an extension within the initial 10-day response period.
3. Document BMP implementation and maintenance in the site log book.

If the turbidity exceeds 250 NTU **or** the transparency is 6 cm or less at any time, the following steps will be conducted:

1. Telephone or submit an electronic report to the applicable Ecology Region's Environmental Report Tracking System (ERTS) within 24 hours.
    - **Central Region** (Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, Yakima): (509) 575-2490 or http://www.ecy.wa.gov/programs/spills/forms/nerts_online/CRO_nerts_online.html
    - **Eastern Region** (Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman): (509) 329-3400 or http://www.ecy.wa.gov/programs/spills/forms/nerts_online/ERO_nerts_online.html
    - **Northwest Region** (King, Kitsap, Island, San Juan, Skagit, Snohomish, Whatcom): (425) 649-7000 or http://www.ecy.wa.gov/programs/spills/forms/nerts_online/NWRO_nerts_online.html
    - **Southwest Region** (Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Lewis, Mason, Pacific, Pierce, Skamania, Thurston, Wahkiakum,): (360) 407-6300 or http://www.ecy.wa.gov/programs/spills/forms/nerts_online/SWRO_nerts_online.html
2. Immediately begin the process to fully implement and maintain appropriate source control and/or treatment BMPs as soon as possible. Address the problems within 10 days of the date the discharge exceeded the benchmark. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when the Permittee requests an extension within the initial 10-day response period
3. Document BMP implementation and maintenance in the site log book.
4. Continue to sample discharges daily until one of the following is true:
    - Turbidity is 25 NTU (or lower).
    - Transparency is 33 cm (or greater).
    - Compliance with the water quality limit for turbidity is achieved.
        - 1 - 5 NTU over background turbidity, if background is less than 50 NTU
        - 1% - 10% over background turbidity, if background is 50 NTU or greater
    - The discharge stops or is eliminated.

4.2.2 pH Sampling

pH monitoring is required for “Significant concrete work” (i.e., greater than 1000 cubic yards poured concrete over the life of the project). The use of recycled concrete or engineered soils (soil amendments including but not limited to Portland cement-treated base [CTB], cement kiln dust [CKD] or fly ash) also requires pH monitoring.

For significant concrete work, pH sampling will start the first day concrete is poured and continue until it is cured, typically three (3) weeks after the last pour.

For engineered soils and recycled concrete, pH sampling begins when engineered soils or recycled concrete are first exposed to precipitation and continues until the area is fully stabilized.

If the measured pH is 8.5 or greater, the following measures will be taken:

1. Prevent high pH water from entering storm sewer systems or surface water.
2. Adjust or neutralize the high pH water to the range of 6.5 to 8.5 su using appropriate technology such as carbon dioxide (CO_2) sparging (liquid or dry ice).
3. Written approval will be obtained from Ecology prior to the use of chemical treatment other than CO_2 sparging or dry ice.

Method for sampling pH: None required

Table 9 – pH Sampling Method

☐	pH meter
☐	pH test kit
☐	Wide range pH indicator paper

5 Discharges to 303(d) or Total Maximum Daily Load (TMDL) Waterbodies

5.1 303(d) Listed Waterbodies

Circle the applicable answer, if necessary:

Is the receiving water 303(d) (Category 5) listed for turbidity, fine sediment, phosphorus, or pH?

☐ Yes ☒ No

List the impairment(s):

NA

5.2 TMDL Waterbodies

Waste Load Allocation for CWSGP discharges:

NA

List and describe BMPs:

NA

Discharges to TMDL receiving waterbodies will meet in-stream water quality criteria at the point of discharge.

The Construction Stormwater General Permit Proposed New Discharge to an Impaired Water Body form is included in Appendix F.

6 Reporting and Record Keeping

6.1 Record Keeping

6.1.1 Site Log Book

A site log book will be maintained for all on-site construction activities and will include:

- A record of the implementation of the SWPPP and other permit requirements
- Site inspections
- Sample logs

6.1.2 Records Retention

Records will be retained during the life of the project and for a minimum of three (3) years following the termination of permit coverage in accordance with Special Condition S5.C of the CSWGP.

Permit documentation to be retained on-site:

- CSWGP
- Permit Coverage Letter
- SWPPP
- Site Log Book

Permit documentation will be provided within 14 days of receipt of a written request from Ecology. A copy of the SWPPP or access to the SWPPP will be provided to the public when requested in writing in accordance with Special Condition S5.G.2.b of the CSWGP.

6.1.3 Updating the SWPPP

The SWPPP will be modified if:

- Found ineffective in eliminating or significantly minimizing pollutants in stormwater discharges from the site.
- There is a change in design, construction, operation, or maintenance at the construction site that has, or could have, a significant effect on the discharge of pollutants to waters of the State.

The SWPPP will be modified within seven (7) days if inspection(s) or investigation(s) determine additional or modified BMPs are necessary for compliance. An updated timeline for BMP implementation will be prepared.

6.2 Reporting

6.2.1 Discharge Monitoring Reports

Cumulative soil disturbance is one (1) acre or larger; therefore, Discharge Monitoring Reports (DMRs) will be submitted to Ecology monthly. If there was no discharge during a given monitoring period the DMR will be submitted as required, reporting "No Discharge". The DMR due date is fifteen (15) days following the end of each calendar month.

DMRs will be reported online through Ecology's WQWebDMR System.

6.2.2 Notification of Noncompliance

If any of the terms and conditions of the permit is not met, and the resulting noncompliance may cause a threat to human health or the environment, the following actions will be taken:

1. Ecology will be notified within 24-hours of the failure to comply by calling the applicable Regional office ERTS phone number (Regional office numbers listed below).
2. Immediate action will be taken to prevent the discharge/pollution or otherwise stop or correct the noncompliance. If applicable, sampling and analysis of any noncompliance will be repeated immediately and the results submitted to Ecology within five (5) days of becoming aware of the violation.
3. A detailed written report describing the noncompliance will be submitted to Ecology within five (5) days, unless requested earlier by Ecology.

Anytime turbidity sampling indicates turbidity is 250 NTUs or greater, or water transparency is 6 cm or less, the Ecology Regional office will be notified by phone within 24 hours of analysis as required by Special Condition S5.A of the CSWGP.

- **Central Region** at (509) 575-2490 for Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, or Yakima County
- **Eastern Region** at (509) 329-3400 for Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, or Whitman County
- **Northwest Region** at (425) 649-7000 for Island, King, Kitsap, San Juan, Skagit, Snohomish, or Whatcom County
- **Southwest Region** at (360) 407-6300 for Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Lewis, Mason, Pacific, Pierce, Skamania, Thurston, or Wahkiakum

Include the following information:

1. Your name and / Phone number
2. Permit number
3. City / County of project
4. Sample results
5. Date / Time of call
6. Date / Time of sample
7. Project name

In accordance with Special Condition S4.D.5.b of the CSWGP, the Ecology Regional office will be notified if chemical treatment other than CO_2 sparging is planned for adjustment of high pH water.

A. **Site Map-** See attached plans

B. BMP Details

7.3.1 Source Control BMPs

BMP C101: Preserving Natural Vegetation Purpose

Purpose: The purpose of preserving natural vegetation is to reduce erosion wherever practicable. Limiting site disturbance is the single most effective method for reducing erosion. For example, conifers can hold up to about 50 percent of all rain that falls during a storm. Up to 20-30 percent of this rain may never reach the ground but is taken up by the tree or evaporates. Another benefit is that the rain held in the tree can be released slowly to the ground after the storm.

Conditions of Use:

- Natural vegetation should be preserved on steep slopes, near perennial and intermittent watercourses or swales, and on building sites in wooded areas.
- As required by jurisdiction.

Design and Installation Specifications: Natural vegetation can be preserved in natural clumps or as individual trees, shrubs and vines.

The preservation of individual plants is more difficult because heavy equipment is generally used to remove unwanted vegetation. The points to remember when attempting to save individual plants are:

- Is the plant worth saving? Consider the location, species, size, age, vigor, and the work involved. Local governments may also have ordinances to save natural vegetation and trees.
- Fence or clearly mark areas around trees that are to be saved. It is preferable to keep ground disturbance away from the trees at least as far out as the dripline.

Plants need protection from three kinds of injuries:

- Construction Equipment - This injury can be above or below the ground level. Damage results from scarring, cutting of roots, and compaction of the soil. Placing a fenced buffer zone around plants to be saved prior to construction can prevent construction equipment injuries.
- Grade Changes - Changing the natural ground level will alter grades, which affects the plant's ability to obtain the necessary air, water, and minerals. Minor fills usually do not cause problems although sensitivity between species does vary and should be checked. Trees can tolerate fill of 6 inches or less. For shrubs and other plants, the fill should be less.

  When there are major changes in grade, it may become necessary to supply air to the roots of plants. This can be done by placing a layer of gravel and a tile system over the roots before the fill is made. A tile system protects a tree from a raised grade. The tile system should be laid out on the original grade leading from a dry well around the tree trunk. The system should then be covered with small stones to allow air to circulate over the root area.

  Lowering the natural ground level can seriously damage trees and shrubs.

The highest percentage of the plant roots are in the upper 12 inches of the soil and cuts of only 2-3 inches can cause serious injury. To protect the roots it may be necessary to terrace the immediate area around the plants to be saved. If roots are exposed, construction of retaining walls may be needed to keep the soil in place. Plants can also be preserved by leaving them on an undisturbed, gently sloping mound. To increase the chances for survival, it is best to limit grade changes and other soil disturbances to areas outside the dripline of the plant.

- Excavations - Protect trees and other plants when excavating for drainfields and power, water, and sewer lines. Where possible, the trenches should be routed around trees and large shrubs. When this is not possible, it is best to tunnel under them. This can be done with hand tools or with power augers. If it is not possible to route the trench around plants to be saved, then the following should be observed:
  - Cut as few roots as possible. When you have to cut, cut clean. Paint cut root ends with a wood dressing like asphalt base paint.
  - Backfill the trench as soon as possible.
  - Tunnel beneath root systems as close to the center of the main trunk to preserve most of the important feeder roots.

Some problems that can be encountered are:

- In general, most trees native to Eastern Washington do not readily adjust to major changes in environment and special care should be taken to protect these trees.
- The danger of windthrow increases where dense stands of coniferous trees have been thinned.
- Cottonwoods, maples, and willows have water-seeking roots. These can cause trouble in sewer lines and infiltration fields. On the other hand, they thrive in high moisture conditions that other trees would not.
- Thinning operations in pure or mixed stands of Grand fir, Pacific silver fir, Noble fir, Sitka spruce, Western red cedar, Western hemlock, Pacific dogwood, and Red alder can cause serious disease problems. Disease can become established through damaged limbs, trunks, roots, and freshly cut stumps. Diseased and weakened trees are also susceptible to insect attack.

Maintenance Standards:

- Inspect flagged and/or fenced areas regularly to make sure flagging or fencing has not been removed or damaged. If the flagging or fencing has been damaged or visibility reduced, it shall be repaired or replaced immediately and visibility restored.
- If tree roots have been exposed or injured, “prune” cleanly with an appropriate pruning saw or loppers directly above the damaged roots and recover with native soils.

BMP C102: Buffer Zones

Purpose: An undisturbed area or strip of natural vegetation or an established suitable planting that will provide a living filter to reduce soil erosion and runoff velocities.

Conditions of Use: Natural buffer zones are used along streams, wetlands and other bodies of water that need protection from erosion and sedimentation. Vegetative buffer zones can be used to protect natural swales and can be incorporated into the natural landscaping of an area.

Critical-areas buffer zones should not be used as sediment treatment areas. These areas shall remain completely undisturbed. The jurisdiction may expand the buffer widths temporarily to allow the use of the expanded area for removal of sediment.

Design and Installation Specifications

- Preserving natural vegetation or plantings in clumps, blocks, or strips is generally the easiest and most successful method.
- Leave all unstable steep slopes in natural vegetation.
- Mark clearing limits and keep all equipment and construction debris out of the natural areas. Steel construction fencing is the most effective method in protecting sensitive areas and buffers. Alternatively, wire-backed silt fence on steel posts is marginally effective. Flagging alone is typically not effective.
- Keep all excavations outside the dripline of trees and shrubs.
- Do not push debris or extra soil into the buffer zone area because it will cause damage from burying and smothering.
- Vegetative buffer zones for streams, lakes or other waterways shall be established by the jurisdiction or other state or federal permits or approvals.

Maintenance Standards:

- Inspect the area frequently to make sure flagging remains in place and the area remains undisturbed.

BMP C105: Stabilized Construction Entrance

Purpose: Construction entrances are stabilized to reduce the amount of sediment transported onto paved roads by vehicles or equipment by constructing a stabilized pad of quarry spalls at entrances to construction sites.

Conditions of Use:

- Construction entrances shall be stabilized wherever traffic will be leaving a construction site and traveling on paved roads or other paved areas within 1,000 feet of the site.
- On large commercial, highway, and road projects, the designer should include enough extra materials in the contract to allow for additional stabilized entrances not shown in the initial Construction SWPPP. It is difficult to determine exactly where access to these projects will take place; additional materials will enable the contractor to install them where needed.

Design and Installation:

- See Figure 7.3.2 for details.
- The surface material shall be 4"-8" quarry spalls. Smaller crushed rock such as base course may be appropriate in some situations but, since it is more likely to be tracked off-site, must be approved by the local jurisdiction.
- A separation geotextile shall be placed under the spalls to prevent fine sediment from pumping up into the rock pad. The geotextile shall meet the following standards:

Grab Tensile Strength (ASTM D4751)	200 psi min.
Grab Tensile Elongation (ASTM D4632)	30% max.
Mullen Burst Strength (ASTM D3786-80a)	400 psi min.
AOS (ASTM D4751)	20-45 (U.S. standard sieve size)

- If site conditions do not warrant the use of geotextile, it is not required.

Maintenance Standards: Quarry spalls (or hog fuel) shall be added if the pad is no longer in accordance with the specifications.

- If the entrance is not preventing sediment from being tracked onto pavement, then alternative measures to keep the streets free of sediment shall be used. This may include street sweeping, an increase in the dimensions of the entrance, or the installation of a wheel wash.
- Any sediment that is tracked onto pavement shall be removed by shoveling or street sweeping. The sediment collected by sweeping shall be removed or stabilized on site. The pavement shall not be cleaned by washing down the street, except when sweeping is ineffective and there is a threat to public safety. If it is necessary to wash the streets, the construction of a small sump shall be considered. The sediment would then be washed into the sump where it can be controlled.

- Any quarry spalls that are loosened from the pad, which end up on the roadway shall be removed immediately.
- If vehicles are entering or exiting the site at points other than the construction entrance(s), fencing (see BMPs C103 and C104) shall be installed to control traffic.
- Upon project completion and site stabilization, all construction accesses intended as permanent access for maintenance shall be permanently stabilized.

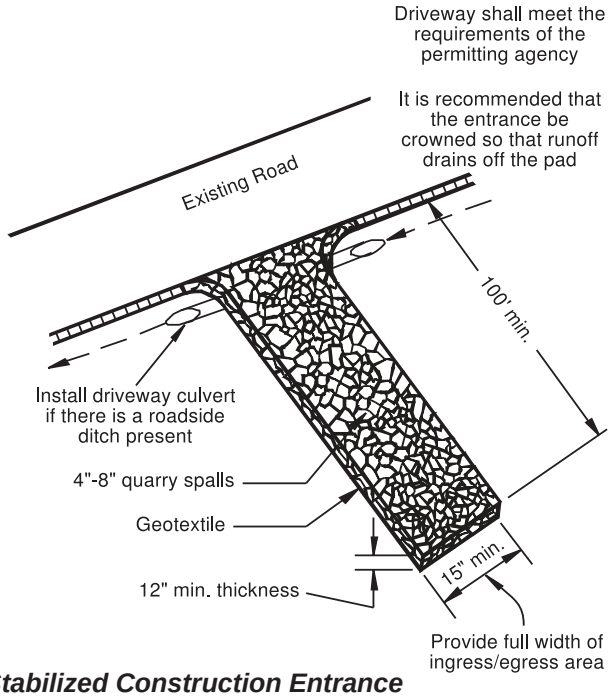


Figure 7.3.2 - Stabilized Construction Entrance

BMP C106: Wheel Wash

Purpose: Wheel washes reduce the amount of sediment transported onto paved roads by motor vehicles.

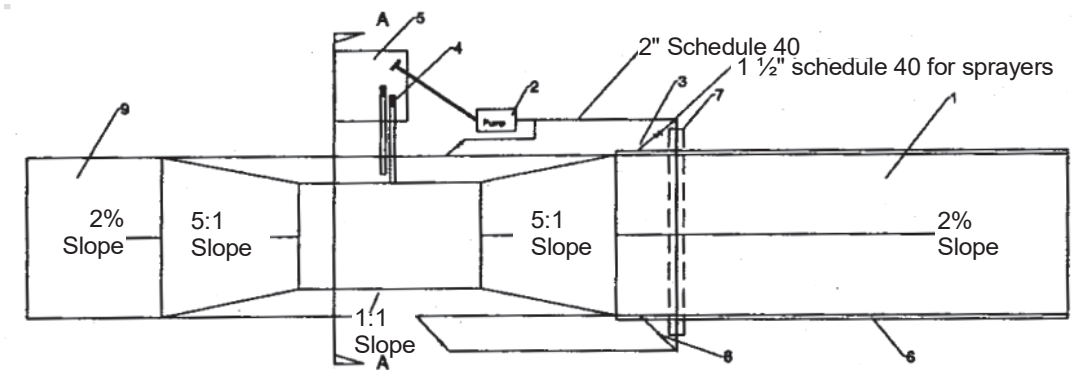
Conditions of Use:

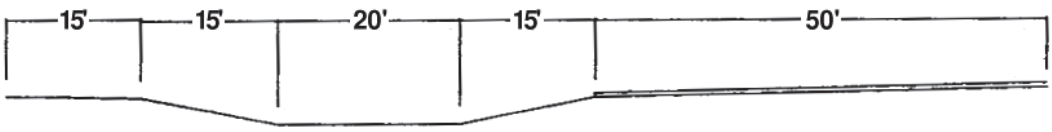
- When a stabilized construction entrance (see BMP C105) is not preventing sediment from being tracked onto pavement.
- Wheel washing is generally an effective BMP when installed with careful attention to topography. For example, a wheel wash can be detrimental if installed at the top of a slope abutting a right-of-way where the water from the dripping truck can run unimpeded into the street.
- Pressure washing combined with an adequately sized and surfaced pad with direct drainage to a large 10-foot x 10-foot sump can be very effective.

Design and Installation Specifications: Suggested details are shown in Figure 7.3.3. The Jurisdiction may allow other designs. A minimum of 6 inches of asphalt treated base (ATB) over crushed base material or 8 inches over a good subgrade is recommended to pave the wheel wash.

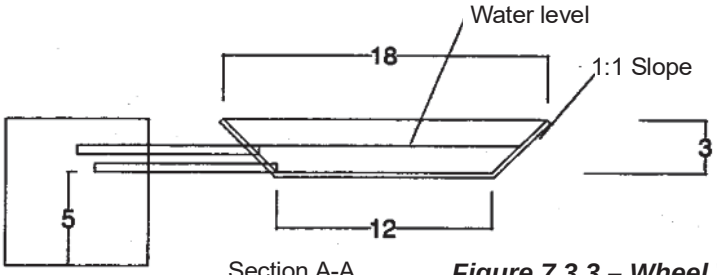
Maintenance Standards:

- The wheel wash should start out the day with fresh water.
- The wash water should be changed a minimum of once per day. On large earthwork jobs where more than 10-20 trucks per hour are expected, the wash water will need to be changed more often.
- Wheel wash or tire bath wastewater shall be discharged to a separate on-site treatment system, such as closed-loop recirculation or land application, or to the sanitary sewer with proper local sewer district approval.





Elevation View



Section A-A
N.T.S.

Figure 7.3.3 – Wheel Wash

Notes for Figure 7.3.3 – Wheel Wash:

1. Asphalt construction entrance 6 in. asphalt treated base (ATB).
2. 3-inch trash pump with floats on the suction hose.
3. Midpoint spray nozzles, if needed.
4. 6-inch sewer pipe with butterfly valves. Bottom one is a drain. Locate top pipe's invert 1 foot above bottom of wheel wash.
5. 8 foot x 8 foot sump with 5 feet of catch. Build so can be cleaned with trackhoe.
6. Asphalt curb on the low road side to direct water back to pond.
7. 6-inch sleeve under road.
8. Ball valves.
9. 15 foot. ATB apron to protect ground from splashing water.

BMP C123: Plastic Covering

Purpose: Plastic covering provides immediate, short-term erosion protection to slopes and disturbed areas.

Conditions of Use:

- Plastic covering may be used on disturbed areas that require cover measures for less than 30 days, except as stated below.
- Plastic is particularly useful for protecting cut and fill slopes and stockpiles. Note: The relatively rapid breakdown of most polyethylene sheeting makes it unsuitable for long-term (greater than six months) applications.
- Clear plastic sheeting can be used over newly-seeded areas to create a greenhouse effect and encourage grass growth if the hydroseed was installed too late in the season to establish 75 percent grass cover, or if the wet season started earlier than normal. Clear plastic should not be used for this purpose during the summer months because the resulting high temperatures can kill the grass.
- Due to rapid runoff caused by plastic sheeting, this method shall not be used upslope of areas that might be adversely impacted by concentrated runoff. Such areas include steep and/or unstable slopes.
- While plastic is inexpensive to purchase, the added cost of installation, maintenance, removal, and disposal make this an expensive material, up to $1.50-2.00 per square yard.
- Whenever plastic is used to protect slopes, water collection measures must be installed at the base of the slope. These measures include plastic-covered berms, channels, and pipes used to covey clean rainwater away from bare soil and disturbed areas. At no time is clean runoff from a plastic covered slope to be mixed with dirty runoff from a project.
- Other uses for plastic include:
  - Temporary ditch liner;
  - Pond liner in temporary sediment pond;
  - Liner for bermed temporary fuel storage area if plastic is not reactive to the type of fuel being stored;
  - Emergency slope protection during heavy rains; and,
  - Temporary drainpipe ("elephant trunk") used to direct water.

Design and Installation Specifications:

- Plastic slope cover must be installed as follows:
  1. Run plastic up and down slope, not across slope;
  2. Plastic may be installed perpendicular to a slope if the slope length is less than 10 feet;

3. Minimum of 8-inch overlap at seams;
4. On long or wide slopes, or slopes subject to wind, all seams should be taped;
5. Place plastic into a small (12-inch wide by 6-inch deep) slot trench at the top of the slope and backfill with soil to keep water from flowing underneath;
6. Place sand filled burlap or geotextile bags every 3 to 6 feet along seams and pound a wooden stake through each to hold them in place;
7. Inspect plastic for rips, tears, and open seams regularly and repair immediately. This prevents high velocity runoff from contacting bare soil which causes extreme erosion;
8. Sandbags may be lowered into place tied to ropes. However, all sandbags must be staked in place.

- Plastic sheeting shall have a minimum thickness of 0.06 millimeters.
- If erosion at the toe of a slope is likely, a gravel berm, riprap, or other suitable protection shall be installed at the toe of the slope in order to reduce the velocity of runoff.

Maintenance Standards:

- Torn sheets must be replaced and open seams repaired.
- If the plastic begins to deteriorate due to ultraviolet radiation, it must be completely removed and replaced.
- When the plastic is no longer needed, it shall be completely removed.
- Dispose of old tires appropriately.

BMP C233: Silt Fence

Purpose: Use of a silt fence reduces the transport of coarse sediment from a construction site by providing a temporary physical barrier to sediment and reducing the runoff velocities of overland flow. See Figure 7.3.20 for details on silt fence construction.

Conditions of Use:

- Silt fence may be used downslope of all disturbed areas. Silt fence is not intended to treat concentrated flows, nor is it intended to treat substantial amounts of overland flow. Any concentrated flows must be conveyed through the drainage system to a sediment pond. The only circumstance in which overland flow can be treated solely by a silt fence, rather than by a sediment pond, is when the area draining to the fence is one acre or less and flow rates are less than 0.5 cfs.
- Silt fences should not be constructed in streams or used in V-shaped ditches. They are not an adequate method of silt control for anything deeper than sheet or overland flow.

Design and Installation Specifications: Drainage area of 1 acre or less or in combination with sediment basin in a larger site.

- Maximum slope steepness (normal (perpendicular) to fence line) 1:1.
- Maximum sheet or overland flow path length to the fence of 100 feet.
- No flows greater than 0.5 cfs.
- The geotextile used shall meet the following standards. All geotextile properties listed below are minimum average roll values (i.e., the test result for any sampled roll in a lot shall meet or exceed the values shown in Table 7.3.10).

Table 7.3.10 Geotextile Standards

Polymeric Mesh AOS (ASTM D4751)	0.60 mm maximum for slit film wovens (#30 sieve). 0.30 mm maximum for all other geotextile types (#50 sieve). 0.15 mm minimum for all fabric types (#100 sieve).
Water Permittivity (ASTM D4491)	0.02 sec^{-1} minimum
Grab Tensile Strength (ASTM D4632)	180 lbs. Minimum for extra strength fabric. 100 lbs minimum for standard strength fabric.
Grab Tensile Strength (ASTM D4632)	30% maximum
Ultraviolet Resistance (ASTM D4355)	70% minimum

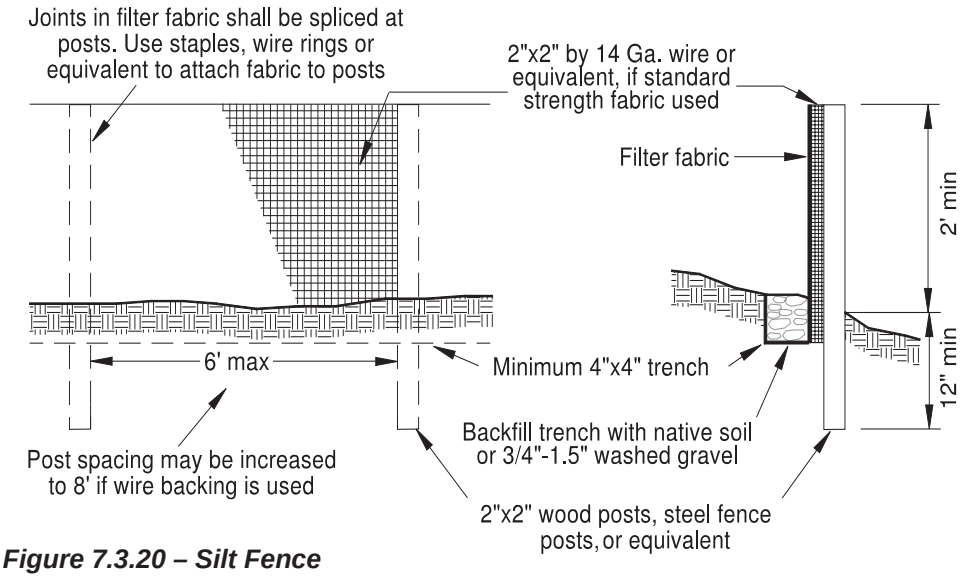


Figure 7.3.20 – Silt Fence

Design and Installation Specifications:

- Standard strength fabrics shall be supported with wire mesh, chicken wire, 2-inch x 2-inch wire, safety fence, or jute mesh to increase the strength of the fabric. Silt fence materials are available that have synthetic mesh backing attached.
- Filter fabric material shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0°F. to 120°F.
- 100 percent biodegradable silt fence is available that is strong, long lasting, and can be left in place after the project is completed, if permitted by local regulations.
- The contractor shall install and maintain temporary silt fences at the locations shown in the Plans. The silt fences shall be constructed in the areas of clearing, grading, or drainage prior to starting those activities. A silt fence shall not be considered temporary if the silt fence must function beyond the life of the contract. The silt fence shall prevent soil carried by runoff water from going beneath, through, or over the top of the silt fence, but shall allow the water to pass through the fence.
- The minimum height of the top of silt fence shall be 2 feet and the maximum height shall be 2½ feet above the original ground surface.
- The geotextile shall be sewn together at the point of manufacture, or at an approved location as determined by the Engineer, to form geotextile lengths as required. All sewn seams shall be located at a support post. Alternatively, two sections of silt fence can be overlapped, provided the Contractor can

demonstrate, to the satisfaction of the Engineer, that the overlap is long enough and that the adjacent fence sections are close enough together to prevent silt laden water from escaping through the fence at the overlap.

- The geotextile shall be attached on the up-slope side of the posts and support system with staples, wire, or in accordance with the manufacturer's recommendations. The geotextile shall be attached to the posts in a manner that reduces the potential for geotextile tearing at the staples, wire, or other connection device. Silt fence back-up support for the geotextile in the form of a wire or plastic mesh is dependent on the properties of the geotextile selected for use. If wire or plastic back-up mesh is used, the mesh shall be fastened securely to the up-slope of the posts with the geotextile being up-slope of the mesh back-up support.
- The geotextile at the bottom of the fence shall be buried in a trench to a minimum depth of 4 inches below the ground surface. The trench shall be backfilled and the soil tamped in place over the buried portion of the geotextile, such that no flow can pass beneath the fence and scouring can not occur. When wire or polymeric back-up support mesh is used, the wire or polymeric mesh shall extend into the trench a minimum of 3 inches.
- The fence posts shall be placed or driven a minimum of 18 inches. A minimum depth of 12 inches is allowed if topsoil or other soft subgrade soil is not present and a minimum depth of 18 inches cannot be reached. Fence post depths shall be increased by 6 inches if the fence is located on slopes of 3:1 or steeper and the slope is perpendicular to the fence. If required post depths cannot be obtained, the posts shall be adequately secured by bracing or guying to prevent overturning of the fence due to sediment loading.
- Silt fences shall be located on contour as much as possible, except at the ends of the fence, where the fence shall be turned uphill such that the silt fence captures the runoff water and prevents water from flowing around the end of the fence.
- If the fence must cross contours, with the exception of the ends of the fence, gravel check dams placed perpendicular to the back of the fence shall be used to minimize concentrated flow and erosion along the back of the fence. The gravel check dams shall be approximately 1-foot deep at the back of the fence. It shall be continued perpendicular to the fence at the same elevation until the top of the check dam intercepts the ground surface behind the fence. The gravel check dams shall consist of crushed surfacing base course, gravel backfill for walls, or shoulder ballast. The gravel check dams shall be located every 10 feet along the fence where the fence must cross contours. The slope of the fence line where contours must be crossed shall not be steeper than 3:1.
- Wood, steel or equivalent posts shall be used. Wood posts shall have minimum dimensions of 2 inches by 2 inches by 3 feet minimum length, and shall be free of defects such as knots, splits, or gouges. Steel posts shall consist of either size No. 6 rebar or larger, ASTM A 120 steel pipe with a

minimum diameter of 1-inch, U, T, L, or C shape steel posts with a minimum weight of 1.35 lbs./ft. or other steel posts having equivalent strength and bending resistance to the post sizes listed. The spacing of the support posts shall be a maximum of 6 feet.

- Fence back-up support, if used, shall consist of steel wire with a maximum mesh spacing of 2 inches, or a prefabricated polymeric mesh. The strength of the wire or polymeric mesh shall be equivalent to or greater than 180 lbs. grab tensile strength. The polymeric mesh must be as resistant to ultraviolet radiation as the geotextile it supports.
- Silt fence installation using the slicing method specification details follow. Refer to Figure 7.3.21 for slicing method details.
- The base of both end posts must be at least 2 to 4 inches above the top of the silt fence fabric on the middle posts for ditch checks to drain properly. Use a hand level or string level, if necessary, to mark base points before installation.
- Install posts 3 to 4 feet apart in critical retention areas and 6 to 7 feet apart in standard applications.
- Install posts 24 inches deep on the downstream side of the silt fence, and as close as possible to the fabric, enabling posts to support the fabric from upstream water pressure.
- Install posts with the nipples facing away from the silt fence fabric.
- Attach the fabric to each post with three ties, all spaced within the top 8 inches of the fabric. Attach each tie diagonally 45 degrees through the fabric, with each puncture at least 1 inch vertically apart. In addition, each tie should be positioned to hang on a post nipple when tightening to prevent sagging.
- Wrap approximately 6 inches of fabric around the end posts and secure with 3 ties.
- No more than 24 inches of a 36-inch fabric is allowed above ground level.
- The rope lock system must be used in all ditch check applications.
- The installation should be checked and corrected for any deviation before compaction. Use a flat-bladed shovel to tuck fabric deeper into the ground if necessary.
- Compaction is vitally important for effective results. Compact the soil immediately next to the silt fence fabric with the front wheel of the tractor, skid steer, or roller exerting at least 60 pounds per square inch. Compact the upstream side first and then each side twice for a total of four trips.

Maintenance Standards:

- Any damage shall be repaired immediately.
- If concentrated flows are evident uphill of the fence, they must be intercepted and conveyed to a sediment pond.

- It is important to check the uphill side of the fence for signs of the fence clogging and acting as a barrier to flow and then causing channelization of flows parallel to the fence. If this occurs, replace the fence or remove the trapped sediment.
- Sediment deposits shall either be removed when the deposit reaches approximately one-third the height of the silt fence, or a second silt fence shall be installed.
- If the filter fabric (geotextile) has deteriorated due to ultraviolet breakdown, it shall be replaced.

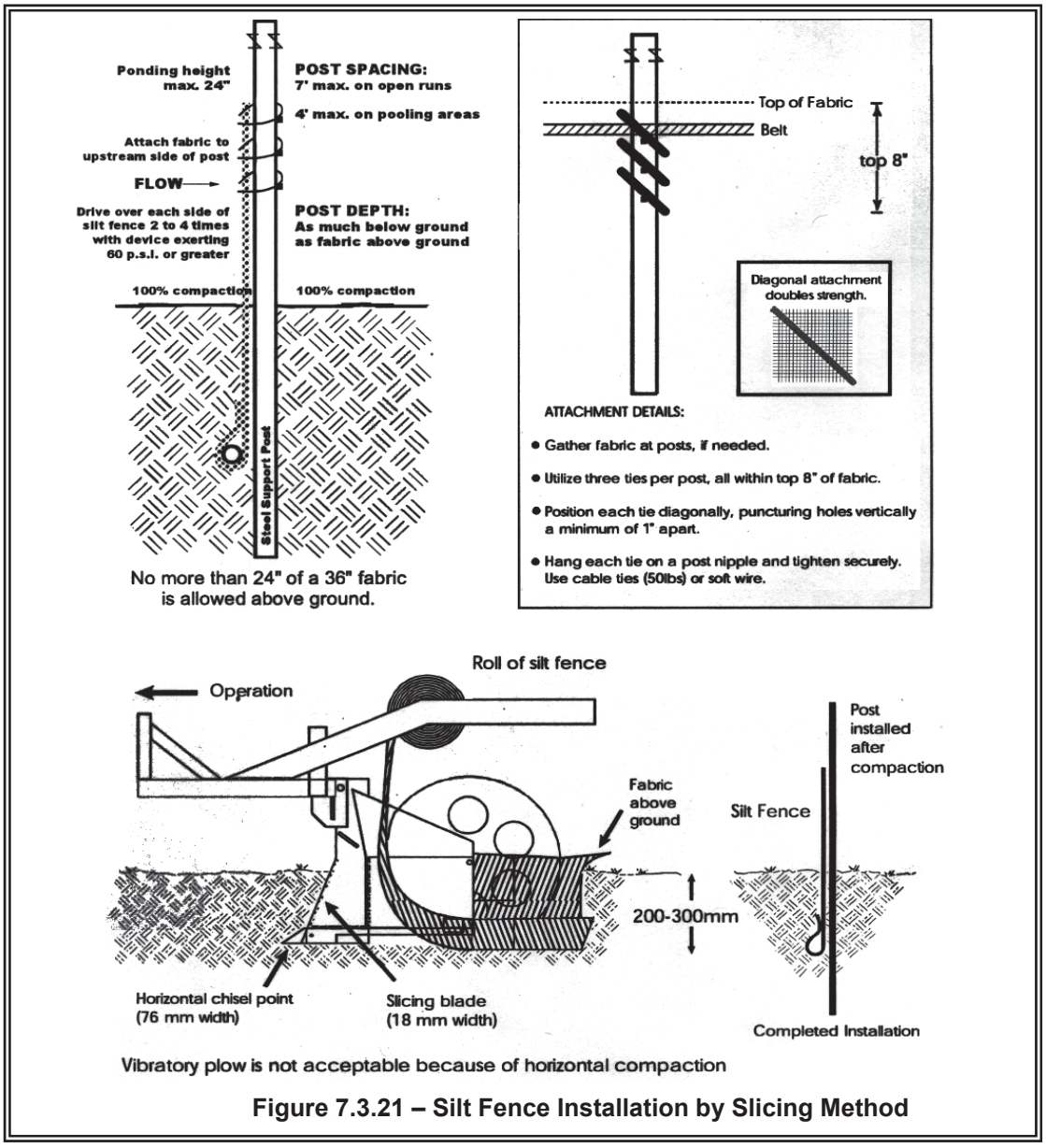


Figure 7.3.21 – Silt Fence Installation by Slicing Method

BMP F6.42 Full Dispersion

Purpose and Definition

This BMP allows for "fully dispersing" runoff from impervious surfaces and cleared areas of commercial and residential development sites that protect a portion of the site (or for large sites, a portion of an area within a sub-basin drainage on the site) in a natural, native vegetation cover condition. Natural vegetation is preserved and maintained in accordance with guidelines. Runoff from roofs, driveways, and roads within the development is dispersed within the site by utilizing the areas of preserved vegetation.

This BMP is primarily intended for areas of new development. A sliding scale for the amount of preserved vegetated area is provided to allow application to other sites. A dispersion BMP for road projects may be developed and included in the next revised version of the WSDOT *Highway Runoff Manual*.

Full dispersion is not subject to UIC regulations. However, Figure 6.5.3 shows a standard dispersion trench which is subject to UIC regulations; see Chapter 5.6.

Applications and Limitations

- Up to 10% of the site that is impervious surface can be rendered non-effective impervious area by dispersing runoff from it into the native vegetation area. Any additional impervious areas (this BMP recommends limiting additional impervious areas to not more than another 10% for rural areas) are considered effective impervious surfaces with the exception of roofs served by drywells.
- Types of development that retain a percentage of the site (or for large sites, a portion of an area within a sub-basin drainage on the site) in a natural forested or other native vegetation cover condition may also use these BMPs to avoid triggering the flow control facility requirement or to minimize its use at the site.

Design Guidelines

Impervious areas of residential developments can meet treatment and flow control requirements by distributing runoff into native vegetation areas that meet the limitations and design guidelines below if the ratio of impervious area to native vegetation area does not exceed 15%. Vegetation must be preserved and maintained according to the following requirements:

- The preserved area should be situated to minimize the clearing of existing natural vegetative cover, to maximize the preservation of wetlands, and to buffer stream corridors.
- The preserved area should be placed in a separate tract or protected through recorded easements for individual lots.

- If feasible, the preserved area should be located downslope from the building sites, since flow control and water quality are enhanced by flow dispersion through undisturbed soils and native vegetation.
- The preserved area should be shown on all property maps and should be clearly marked during clearing and construction on the site.
- Vegetation and trees should not be removed from the natural growth retention area, except for the removal of dangerous and diseased trees.

The requirement operates on a "sliding scale" comparing the percentage of the site with undisturbed native vegetation to the percentage of the site with impervious surface that drains into those areas of preserved native vegetation:

% of site with impervious surface that drains into native vegetation area	% of site with undisturbed native vegetation
10.0	65
9.0	60
8.25	55
7.5	50
6.75	45
6.0	40
5.25	35
4.5	30
3.75	25
3.0	20

Roof Downspouts: Roof surfaces that are connected to drywells are considered "fully dispersed" provided that they are designed according to local requirements. Otherwise, the roof runoff is assumed to run into the street, and that volume must be added to the volume dispersed in the roadway dispersion component of this BMP.

Driveway Dispersion: Driveway surfaces are considered to be "fully dispersed" if the site meets the required ratio of impervious surfaces to preserved native vegetation above, and if they comply with the driveway dispersion BMPs – BMP T6.40 and BMP T6.41 - and have flow paths through native vegetation exceeding 100 feet. This also holds true for any driveway surfaces that comply with the roadway dispersion BMPs described below.

Roadway Dispersion BMPs: Roadway surfaces are considered to be "fully dispersed" if the site meets the required ratio of impervious surfaces to preserved native vegetation above, and if they comply with the following dispersion requirements:

- Roadway runoff dispersion is allowed only on rural neighborhood collectors and local access streets. To the extent feasible, driveways should be dispersed to the same standards as roadways to ensure adequate water quality protection of downstream resources.

- The road section shall be designed to minimize collection and concentration of roadway runoff. Sheet flow over roadway fill slopes (i.e., where roadway subgrade is above adjacent right-of-way) should be used wherever possible to avoid concentration.
- When it is necessary to collect and concentrate runoff from the roadway and adjacent upstream areas (e.g., in a ditch on a cut slope), concentrated flows shall be incrementally discharged from the ditch via cross culverts or at the ends of cut sections. These incremental discharges of newly concentrated flows shall not exceed 0.5 cfs at any one discharge point from a ditch for the 100-year runoff event. Where flows at a particular ditch discharge point were already concentrated under existing site conditions (e.g., in a natural channel that crosses the roadway alignment), the 0.5-cfs limit would be in addition to the existing concentrated peak flows.
- Ditch discharge points with up to 0.2 cfs discharge for the peak 100-year flow shall use rock pads or dispersion trenches to disperse flows. Ditch discharge points with between 0.2 and 0.5 cfs discharge for the 100-year peak flow shall use only dispersion trenches to disperse flows.
- Dispersion trenches shall be designed to accept surface flows (free discharge) from a pipe, culvert, or ditch end, shall be aligned perpendicular to the flowpath, and shall be minimum 2 feet by 2 feet in section, 50 feet in length, filled with ¾-inch to 1½-inch washed rock, and provided with a level notched grade board (see Figure 6.5.3). Manifolds may be used to split flows up to 2 cfs discharge for the 100-year peak flow between up to 4 trenches. Dispersion trenches shall have a minimum spacing of 50 feet.
- After being dispersed with rock pads or trenches, flows from ditch discharge points must traverse a minimum of 100 feet of undisturbed native vegetation before leaving the project site, or entering an existing onsite channel carrying existing concentrated flows across the road alignment.
  Note: In order to provide the 100-foot flowpath length to an existing channel, some roadway runoff may unavoidably enter the channel undispersed. Also note that water quality treatment may be waived for roadway runoff dispersed through 100 feet of undisturbed native vegetation.
- Flowpaths from adjacent discharge points must not intersect within the 100-foot flowpath lengths, and dispersed flow from a discharge point must not be intercepted by another discharge point. To enhance the flow control and water quality effects of dispersion, the flowpath shall not exceed 15% slope, and shall be located within designated open space.
  Note: Runoff may be conveyed to an area meeting these flowpath criteria.
- Ditch discharge points shall be located a minimum of 100 feet upgradient of steep slopes (i.e., slopes steeper than 40%), wetlands, and streams.

- Where the local jurisdiction determines there is a potential for significant adverse impacts downstream (e.g., erosive steep slopes or existing downstream drainage problems), dispersion of roadway runoff may not be allowed, or other measures may be required.

Cleared Area Dispersion BMPs: The runoff from cleared areas that are comprised of bare soil, non-native landscaping, lawn, and/or pasture is considered to be "fully dispersed" if it is dispersed through at least 25 feet of native vegetation in accordance with the following criteria:

- The contributing flowpath of cleared area being dispersed must be no more than 150 feet, and
- Slopes within the 25-foot minimum flowpath through native vegetation should be no steeper than 8%. If this criterion can not be met due to site constraints, the 25-foot flowpath length must be increased 1.5 feet for each percent increase in slope above 8%.

C. Correspondence- NA

D. Site Inspection Form

Construction Stormwater Site Inspection Form

Project Name _____ Permit # _____ Inspection Date _____ Time _____

Name of Certified Erosion Sediment Control Lead (CESCL) or qualified inspector if *less than one acre*
Print Name: _____

Approximate rainfall amount since the last inspection (in inches): _____

Approximate rainfall amount in the last 24 hours (in inches): _____

Current Weather Clear ☐ Cloudy ☐ Mist ☐ Rain ☐ Wind ☐ Fog ☐

A. Type of inspection: Weekly ☐ Post Storm Event ☐ Other ☐

B. Phase of Active Construction (*check all that apply*):

Pre Construction/installation of erosion/sediment controls	☐	Clearing/Demo/Grading	☐	Infrastructure/storm/roads	☐
Concrete pours	☐	Vertical Construction/buildings	☐	Utilities	☐
Offsite improvements	☐	Site temporary stabilized	☐	Final stabilization	☐

C. Questions:

1. Were all areas of construction and discharge points inspected? Yes ___ No ___
2. Did you observe the presence of suspended sediment, turbidity, discoloration, or oil sheen Yes ___ No ___
3. Was a water quality sample taken during inspection? (*refer to permit conditions S4 & S5*) Yes ___ No ___
4. Was there a turbid discharge 250 NTU or greater, or Transparency 6 cm or less?* Yes ___ No ___
5. If yes to #4 was it reported to Ecology? Yes ___ No ___
6. Is pH sampling required? pH range required is 6.5 to 8.5. Yes ___ No ___

If answering yes to a discharge, describe the event. Include when, where, and why it happened; what action was taken, and when.

_____

_____

_____

_____

*If answering yes to # 4 record NTU/Transparency with continual sampling daily until turbidity is 25 NTU or less/ transparency is 33 cm or greater.

Sampling Results: Date: _____

Parameter	Method (circle one)	Result			Other/Note
		NTU	cm	pH	
Turbidity	tube, meter, laboratory				
pH	Paper, kit, meter				

D. Check the observed status of all items. Provide "Action Required "details and dates.

Element #	Inspection	BMPs Inspected			BMP needs maintenance	BMP failed	Action required (describe in section F)
		yes	no	n/a			
1 Clearing Limits	Before beginning land disturbing activities are all clearing limits, natural resource areas (streams, wetlands, buffers, trees) protected with barriers or similar BMPs? (high visibility recommended)						
2 Construction Access	Construction access is stabilized with quarry spalls or equivalent BMP to prevent sediment from being tracked onto roads?						
	Sediment tracked onto the road way was cleaned thoroughly at the end of the day or more frequent as necessary.						
3 Control Flow Rates	Are flow control measures installed to control stormwater volumes and velocity during construction and do they protect downstream properties and waterways from erosion?						
	If permanent infiltration ponds are used for flow control during construction, are they protected from siltation?						
4 Sediment Controls	All perimeter sediment controls (e.g. silt fence, wattles, compost socks, berms, etc.) installed, and maintained in accordance with the Stormwater Pollution Prevention Plan (SWPPP).						
	Sediment control BMPs (sediment ponds, traps, filters etc.) have been constructed and functional as the first step of grading.						
	Stormwater runoff from disturbed areas is directed to sediment removal BMP.						
5 Stabilize Soils	Have exposed un-worked soils been stabilized with effective BMP to prevent erosion and sediment deposition?						

Construction Stormwater Site Inspection Form

Element #	Inspection	BMPs Inspected			BMP needs maintenance	BMP failed	Action required (describe in section F)
		yes	no	n/a			
5 Stabilize Soils Cont.	Are stockpiles stabilized from erosion, protected with sediment trapping measures and located away from drain inlet, waterways, and drainage channels?						
	Have soils been stabilized at the end of the shift, before a holiday or weekend if needed based on the weather forecast?						
6 Protect Slopes	Has stormwater and ground water been diverted away from slopes and disturbed areas with interceptor dikes, pipes and or swales?						
	Is off-site storm water managed separately from stormwater generated on the site?						
	Is excavated material placed on uphill side of trenches consistent with safety and space considerations?						
	Have check dams been placed at regular intervals within constructed channels that are cut down a slope?						
7 Drain Inlets	Storm drain inlets made operable during construction are protected.						
	Are existing storm drains within the influence of the project protected?						
8 Stabilize Channel and Outlets	Have all on-site conveyance channels been designed, constructed and stabilized to prevent erosion from expected peak flows?						
	Is stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent stream banks, slopes and downstream conveyance systems?						
9 Control Pollutants	Are waste materials and demolition debris handled and disposed of to prevent contamination of stormwater?						
	Has cover been provided for all chemicals, liquid products, petroleum products, and other material?						
	Has secondary containment been provided capable of containing 110% of the volume?						
	Were contaminated surfaces cleaned immediately after a spill incident?						
	Were BMPs used to prevent contamination of stormwater by a pH modifying sources?						

Construction Stormwater Site Inspection Form

Element #	Inspection	BMPs Inspected			BMP needs maintenance	BMP failed	Action required (describe in section F)
		yes	no	n/a			
9 Cont.	Wheel wash wastewater is handled and disposed of properly.						
10 Control Dewatering	Concrete washout in designated areas. No washout or excess concrete on the ground.						
	Dewatering has been done to an approved source and in compliance with the SWPPP.						
	Were there any clean non turbid dewatering discharges?						
11 Maintain BMP	Are all temporary and permanent erosion and sediment control BMPs maintained to perform as intended?						
12 Manage the Project	Has the project been phased to the maximum degree practicable?						
	Has regular inspection, monitoring and maintenance been performed as required by the permit?						
	Has the SWPPP been updated, implemented and records maintained?						
13 Protect LID	Is all Bioretention and Rain Garden Facilities protected from sedimentation with appropriate BMPs?						
	Is the Bioretention and Rain Garden protected against over compaction of construction equipment and foot traffic to retain its infiltration capabilities?						
	Permeable pavements are clean and free of sediment and sediment laden-water runoff. Muddy construction equipment has not been on the base material or pavement.						
	Have soiled permeable pavements been cleaned of sediments and pass infiltration test as required by stormwater manual methodology?						
	Heavy equipment has been kept off existing soils under LID facilities to retain infiltration rate.						

E. Check all areas that have been inspected. ✔

All in place BMPs ☐ All disturbed soils ☐ All concrete wash out area ☐ All material storage areas ☐
All discharge locations ☐ All equipment storage areas ☐ All construction entrances/exits ☐

F. Elements checked "Action Required" (section D) describe corrective action to be taken. List the element number; be specific on location and work needed. Document, initial, and date when the corrective action has been completed and inspected.

Element #	Description and Location	Action Required	Completion Date	Initials

Attach additional page if needed

Sign the following certification:

"I certify that this report is true, accurate, and complete, to the best of my knowledge and belief"

Inspected by: (print) _____ (Signature) _____ Date: _____

Title/Qualification of Inspector: _____

E. Construction Stormwater General Permit (CSWGP)

Issuance Date: November 18, 2015
Effective Date: January 1, 2016
Expiration Date: December 31, 2020

Modification Issuance Date: March 22, 2017
Modification Effective Date: May 5, 2017

CONSTRUCTION STORMWATER GENERAL PERMIT

National Pollutant Discharge Elimination System (NPDES) and State Waste Discharge General Permit for Stormwater Discharges Associated with Construction Activity

State of Washington
Department of Ecology
Olympia, Washington 98504

In compliance with the provisions of
Chapter 90.48 Revised Code of Washington
(State of Washington Water Pollution Control Act)
and
Title 33 United States Code, Section 1251 et seq.
The Federal Water Pollution Control Act (The Clean Water Act)

Until this permit expires, is modified, or revoked, Permittees that have properly obtained coverage under this general permit are authorized to discharge in accordance with the special and general conditions that follow.

Heather R. Bartlett
Water Quality Program Manager
Washington State Department of Ecology

TABLE OF CONTENTS

LIST OF TABLES 3

SUMMARY OF PERMIT REPORT SUBMITTALS 4

SPECIAL CONDITIONS 5

S1. PERMIT COVERAGE 5

S2. APPLICATION REQUIREMENTS 8

S3. COMPLIANCE WITH STANDARDS 12

S4. MONITORING REQUIREMENTS, BENCHMARKS, AND REPORTING TRIGGERS 13

S5. REPORTING AND RECORDKEEPING REQUIREMENTS 20

S6. PERMIT FEES 23

S7. SOLID AND LIQUID WASTE DISPOSAL 23

S8. DISCHARGES TO 303(d) OR TMDL WATERBODIES 23

S9. STORMWATER POLLUTION PREVENTION PLAN 27

S10. NOTICE OF TERMINATION 37

GENERAL CONDITIONS 38

G1. DISCHARGE VIOLATIONS 38

G2. SIGNATORY REQUIREMENTS 38

G3. RIGHT OF INSPECTION AND ENTRY 39

G4. GENERAL PERMIT MODIFICATION AND REVOCATION 39

G5. REVOCATION OF COVERAGE UNDER THE PERMIT 39

G6. REPORTING A CAUSE FOR MODIFICATION 40

G7. COMPLIANCE WITH OTHER LAWS AND STATUTES 40

G8. DUTY TO REAPPLY 40

G9. TRANSFER OF GENERAL PERMIT COVERAGE 41

G10. REMOVED SUBSTANCES 41

G11. DUTY TO PROVIDE INFORMATION 41

G12. OTHER REQUIREMENTS OF 40 CFR 41

G13. ADDITIONAL MONITORING 41

G14. PENALTIES FOR VIOLATING PERMIT CONDITIONS 41

G15. UPSET 42

G16. PROPERTY RIGHTS 42

G17. DUTY TO COMPLY 42
G18. TOXIC POLLUTANTS....42
G19. PENALTIES FOR TAMPERING 43
G20. REPORTING PLANNED CHANGES 43
G21. REPORTING OTHER INFORMATION....43
G22. REPORTING ANTICIPATED NON-COMPLIANCE....43
G23. REQUESTS TO BE EXCLUDED FROM COVERAGE UNDER THE PERMIT 44
G24. APPEALS 44
G25. SEVERABILITY 44
G26. BYPASS PROHIBITED....44
APPENDIX A – DEFINITIONS 47
APPENDIX B – ACRONYMS 55

LIST OF TABLES

Table 1: Summary of Required Submittals 4
Table 2: Summary of Required On-site Documentation.... 4
Table 3: Summary of Primary Monitoring Requirements 15
Table 4: Monitoring and Reporting Requirements 17
Table 5: Turbidity, Fine Sediment & Phosphorus Sampling and Limits for 303(d)-Listed Waters.... 25
Table 6: pH Sampling and Limits for 303(d)-Listed Waters 26

SUMMARY OF PERMIT REPORT SUBMITTALS

Refer to the Special and General Conditions within this permit for additional submittal requirements. Appendix A provides a list of definitions. Appendix B provides a list of acronyms.

Table 1: Summary of Required Submittals

Permit Section	Submittal	Frequency	First Submittal Date
S5.A and S8	High Turbidity/Transparency Phone Reporting	As Necessary	Within 24 hours
S5.B	Discharge Monitoring Report	Monthly*	Within 15 days following the end of each month
S5.F and S8	Noncompliance Notification – Telephone Notification	As necessary	Within 24-hours
S5.F	Noncompliance Notification – Written Report	As necessary	Within 5 Days of non-compliance
S9.C	Request for Chemical Treatment Form	As necessary	Written approval from Ecology is required prior to using chemical treatment (with the exception of dry ice or CO_2 to adjust pH)
G2	Notice of Change in Authorization	As necessary	
G6	Permit Application for Substantive Changes to the Discharge	As necessary	
G8	Application for Permit Renewal	1/permit cycle	No later than 180 days before expiration
G9	Notice of Permit Transfer	As necessary	
G20	Notice of Planned Changes	As necessary	
G22	Reporting Anticipated Non-compliance	As necessary	

SPECIAL NOTE: *Permittees must submit electronic Discharge Monitoring Reports (DMRs) to the Washington State Department of Ecology monthly, regardless of site discharge, for the full duration of permit coverage. Refer to Section S5.B of this General Permit for more specific information regarding DMRs.

Table 2: Summary of Required On-site Documentation

Document Title	Permit Conditions
Permit Coverage Letter	See Conditions S2, S5
Construction Stormwater General Permit	See Conditions S2, S5
Site Log Book	See Conditions S4, S5
Stormwater Pollution Prevention Plan (SWPPP)	See Conditions S9, S5

SPECIAL CONDITIONS

S1. PERMIT COVERAGE

A. Permit Area

This Construction Stormwater General Permit (CSWGP) covers all areas of Washington State, except for federal operators and Indian Country as specified in Special Condition S1.E.3.

B. Operators Required to Seek Coverage Under this General Permit:

1. Operators of the following construction activities are required to seek coverage under this CSWGP:

   a. Clearing, grading and/or excavation that results in the disturbance of one or more acres (including off-site disturbance acreage authorized in S1.C.2) and discharges stormwater to surface waters of the State; and clearing, grading and/or excavation on sites smaller than one acre that are part of a larger common plan of development or sale, if the common plan of development or sale will ultimately disturb one acre or more and discharge stormwater to surface waters of the State.

      i. This includes forest practices (including, but not limited to, class IV conversions) that are part of a construction activity that will result in the disturbance of one or more acres, and discharge to surface waters of the State (that is, forest practices that prepare a site for construction activities); and

   b. Any size construction activity discharging stormwater to waters of the State that the Washington State Department of Ecology (Ecology):

      i. Determines to be a significant contributor of pollutants to waters of the State of Washington.

      ii. Reasonably expects to cause a violation of any water quality standard.

2. Operators of the following activities are not required to seek coverage under this CSWGP (unless specifically required under Special Condition S1.B.1.b. above):

   a. Construction activities that discharge all stormwater and non-stormwater to ground water, sanitary sewer, or combined sewer, and have no point source discharge to either surface water or a storm sewer system that drains to surface waters of the State.

   b. Construction activities covered under an Erosivity Waiver (Special Condition S2.C).

   c. Routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of a facility.

C. Authorized Discharges:

1. *Stormwater Associated with Construction Activity*. Subject to compliance with the terms and conditions of this permit, Permittees are authorized to discharge stormwater associated with construction activity to surface waters of the State or to a storm sewer system that drains to surface waters of the State. (Note that "surface waters of the State" may exist on a construction site as well as off site; for example, a creek running through a site.)

2. *Stormwater Associated with Construction Support Activity*. This permit also authorizes stormwater discharge from support activities related to the permitted construction site (for example, an on-site portable rock crusher, off-site equipment staging yards, material storage areas, borrow areas, etc.) provided:

   a. The support activity relates directly to the permitted construction site that is required to have an NPDES permit; and

   b. The support activity is not a commercial operation serving multiple unrelated construction projects, and does not operate beyond the completion of the construction activity; and

   c. Appropriate controls and measures are identified in the Stormwater Pollution Prevention Plan (SWPPP) for the discharges from the support activity areas.

3. *Non-Stormwater Discharges*. The categories and sources of non-stormwater discharges identified below are authorized conditionally, provided the discharge is consistent with the terms and conditions of this permit:

   a. Discharges from fire-fighting activities.

   b. Fire hydrant system flushing.

   c. Potable water, including uncontaminated water line flushing.

   d. Hydrostatic test water.

   e. Uncontaminated air conditioning or compressor condensate.

   f. Uncontaminated ground water or spring water.

   g. Uncontaminated excavation dewatering water (in accordance with S9.D.10).

   h. Uncontaminated discharges from foundation or footing drains.

   i. Uncontaminated or potable water used to control dust. Permittees must minimize the amount of dust control water used.

   j. Routine external building wash down that does not use detergents.

   k. Landscape irrigation water.

The SWPPP must adequately address all authorized non-stormwater discharges, except for discharges from fire-fighting activities, and must comply with Special Condition S3.

At a minimum, discharges from potable water (including water line flushing), fire hydrant system flushing, and pipeline hydrostatic test water must undergo the following: dechlorination to a concentration of 0.1 parts per million (ppm) or less, and pH adjustment to within 6.5 – 8.5 standard units (su), if necessary.

D. Prohibited Discharges:

The following discharges to waters of the State, including ground water, are prohibited.

1. Concrete wastewater.
2. Wastewater from washout and clean-up of stucco, paint, form release oils, curing compounds and other construction materials.
3. Process wastewater as defined by 40 Code of Federal Regulations (CFR) 122.2 (see Appendix A of this permit).
4. Slurry materials and waste from shaft drilling, including process wastewater from shaft drilling for construction of building, road, and bridge foundations unless managed according to Special Condition S9.D.9.j.
5. Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance.
6. Soaps or solvents used in vehicle and equipment washing.
7. Wheel wash wastewater, unless managed according to Special Condition S9.D.9.
8. Discharges from dewatering activities, including discharges from dewatering of trenches and excavations, unless managed according to Special Condition S9.D.10.

E. Limits on Coverage

Ecology may require any discharger to apply for and obtain coverage under an individual permit or another more specific general permit. Such alternative coverage will be required when Ecology determines that this CSWGP does not provide adequate assurance that water quality will be protected, or there is a reasonable potential for the project to cause or contribute to a violation of water quality standards.

The following stormwater discharges are not covered by this permit:

1. Post-construction stormwater discharges that originate from the site after completion of construction activities and the site has undergone final stabilization.
2. Non-point source silvicultural activities such as nursery operations, site preparation, reforestation and subsequent cultural treatment, thinning, prescribed burning, pest and fire control, harvesting operations, surface drainage, or road construction and maintenance, from which there is natural runoff as excluded in 40 CFR Subpart 122.
3. Stormwater from any federal operator.

4. Stormwater from facilities located on "Indian Country" as defined in 18 U.S.C.§1151, except portions of the Puyallup Reservation as noted below.

   Indian Country includes:

   a. All land within any Indian Reservation notwithstanding the issuance of any patent, and, including rights-of-way running through the reservation. This includes all federal, tribal, and Indian and non-Indian privately owned land within the reservation.

   b. All off-reservation Indian allotments, the Indian titles to which have not been extinguished, including rights-of-way running through the same.

   c. All off-reservation federal trust lands held for Native American Tribes.

      Puyallup Exception: Following the *Puyallup Tribes of Indians Land Settlement Act of 1989*, 25 U.S.C. §1773; the permit does apply to land within the Puyallup Reservation except for discharges to surface water on land held in trust by the federal government.

5. Stormwater from any site covered under an existing NPDES individual permit in which stormwater management and/or treatment requirements are included for all stormwater discharges associated with construction activity.

6. Stormwater from a site where an applicable Total Maximum Daily Load (TMDL) requirement specifically precludes or prohibits discharges from construction activity.

S2. APPLICATION REQUIREMENTS

A. Permit Application Forms

1. Notice of Intent Form/Timeline

   a. Operators of new or previously unpermitted construction activities must submit a complete and accurate permit application (Notice of Intent, or NOI) to Ecology.

   b. Operators must apply using the electronic application form (NOI) available on Ecology's website http://www.ecy.wa.gov/programs/wq/stormwater/construction/index.html. Permittees unable to submit electronically (for example, those who do not have an internet connection) must contact Ecology to request a waiver and obtain instructions on how to obtain a paper NOI.

      Department of Ecology
      Water Quality Program - Construction Stormwater
      PO Box 47696
      Olympia, Washington 98504-7696

c. The operator must submit the NOI at least 60 days before discharging stormwater from construction activities and must submit it on or before the date of the first public notice (see Special Condition S2.B below for details). The 30-day public comment period begins on the publication date of the second public notice. Unless Ecology responds to the complete application in writing, based on public comments, or any other relevant factors, coverage under the general permit will automatically commence on the thirty-first day following receipt by Ecology of a completed NOI, or the issuance date of this permit, whichever is later; unless Ecology specifies a later date in writing as required by WAC173-226-200(2).

d. If an applicant intends to use a Best Management Practice (BMP) selected on the basis of Special Condition S9.C.4 ("demonstrably equivalent" BMPs), the applicant must notify Ecology of its selection as part of the NOI. In the event the applicant selects BMPs after submission of the NOI, it must provide notice of the selection of an equivalent BMP to Ecology at least 60 days before intended use of the equivalent BMP.

e. Permittees must notify Ecology regarding any changes to the information provided on the NOI by submitting an updated NOI. Examples of such changes include, but are not limited to:

    i. Changes to the Permittee's mailing address,

    ii. Changes to the on-site contact person information, ***and***

    iii. Changes to the area/acreage affected by construction activity.

f. Applicants must notify Ecology if they are aware of contaminated soils and/or groundwater associated with the construction activity. Provide detailed information with the NOI (as known and readily available) on the nature and extent of the contamination (concentrations, locations, and depth), as well as pollution prevention and/or treatment BMPs proposed to control the discharge of soil and/or groundwater contaminants in stormwater. Examples of such detail may include, but are not limited to:

    i. List or table of all known contaminants with laboratory test results showing concentration and depth,

    ii. Map with sample locations,

    iii. Temporary Erosion and Sediment Control (TESC) plans,

    iv. Related portions of the Stormwater Pollution Prevention Plan (SWPPP) that address the management of contaminated and potentially contaminated construction stormwater and dewatering water,

    v. Dewatering plan and/or dewatering contingency plan.

2. Transfer of Coverage Form

   The Permittee can transfer current coverage under this permit to one or more new operators, including operators of sites within a Common Plan of Development, provided the Permittee submits a Transfer of Coverage Form in accordance with General Condition G9. Transfers do not require public notice.

B. Public Notice

For new or previously unpermitted construction activities, the applicant must publish a public notice at least one time each week for two consecutive weeks, at least 7 days apart, in a newspaper with general circulation in the county where the construction is to take place. The notice must contain:

1. A statement that "The applicant is seeking coverage under the Washington State Department of Ecology's Construction Stormwater NPDES and State Waste Discharge General Permit".

2. The name, address and location of the construction site.

3. The name and address of the applicant.

4. The type of construction activity that will result in a discharge (for example, residential construction, commercial construction, etc.), and the number of acres to be disturbed.

5. The name of the receiving water(s) (that is, the surface water(s) to which the site will discharge), or, if the discharge is through a storm sewer system, the name of the operator of the system.

6. The statement: "Any persons desiring to present their views to the Washington State Department of Ecology regarding this application, or interested in Ecology's action on this application, may notify Ecology in writing no later than 30 days of the last date of publication of this notice. Ecology reviews public comments and considers whether discharges from this project would cause a measurable change in receiving water quality, and, if so, whether the project is necessary and in the overriding public interest according to Tier II antidegradation requirements under WAC 173-201A-320. Comments can be submitted to: Department of Ecology, PO Box 47696, Olympia, Washington 98504-7696 Attn: Water Quality Program, Construction Stormwater."

C. Erosivity Waiver

Construction site operators may qualify for an erosivity waiver from the CSWGP if the following conditions are met:

1. The site will result in the disturbance of fewer than 5 acres and the site is not a portion of a common plan of development or sale that will disturb 5 acres or greater.

2. Calculation of Erosivity "R" Factor and Regional Timeframe:

   a. The project's rainfall erosivity factor ("R" Factor) must be less than 5 during the period of construction activity, as calculated (see the CSWGP homepage http://www.ecy.wa.gov/programs/wq/stormwater/construction/index.html for a link to the EPA's calculator and step by step instructions on computing the "R" Factor in the EPA Erosivity Waiver Fact Sheet). The period of construction activity starts when the land is first disturbed and ends with final stabilization. In addition:

   b. The entire period of construction activity must fall within the following timeframes:

      i. For sites west of the Cascades Crest: June 15 – September 15.

      ii. For sites east of the Cascades Crest, excluding the Central Basin: June 15 – October 15.

      iii. For sites east of the Cascades Crest, within the Central Basin: no additional timeframe restrictions apply. The Central Basin is defined as the portions of Eastern Washington with mean annual precipitation of less than 12 inches. For a map of the Central Basin (Average Annual Precipitation Region 2), refer to http://www.ecy.wa.gov/programs/wq/stormwater/construction/resourcesguidance.html.

3. Construction site operators must submit a complete Erosivity Waiver certification form at least one week before disturbing the land. Certification must include statements that the operator will:

   a. Comply with applicable local stormwater requirements; ***and***

   b. Implement appropriate erosion and sediment control BMPs to prevent violations of water quality standards.

4. This waiver is not available for facilities declared significant contributors of pollutants as defined in Special Condition S1.B.1.b. or for any size construction activity that could reasonably expect to cause a violation of any water quality standard as defined in Special Condition S1.B.1.b.ii.

5. This waiver does not apply to construction activities which include non-stormwater discharges listed in Special Condition S1.C.3.

6. If construction activity extends beyond the certified waiver period for any reason, the operator must either:

    a. Recalculate the rainfall erosivity "R" factor using the original start date and a new projected ending date and, if the "R" factor is still under 5 *and* the entire project falls within the applicable regional timeframe in Special Condition S2.C.2.b, complete and submit an amended waiver certification form before the original waiver expires; ***or***

    b. Submit a complete permit application to Ecology in accordance with Special Condition S2.A and B before the end of the certified waiver period.

S3. COMPLIANCE WITH STANDARDS

A. Discharges must not cause or contribute to a violation of surface water quality standards (Chapter 173-201A WAC), ground water quality standards (Chapter 173-200 WAC), sediment management standards (Chapter 173-204 WAC), and human health-based criteria in the National Toxics Rule (40 CFR Part 131.36). Discharges not in compliance with these standards are not authorized.

B. Prior to the discharge of stormwater and non-stormwater to waters of the State, the Permittee must apply all known, available, and reasonable methods of prevention, control, and treatment (AKART). This includes the preparation and implementation of an adequate SWPPP, with all appropriate BMPs installed and maintained in accordance with the SWPPP and the terms and conditions of this permit.

C. Ecology presumes that a Permittee complies with water quality standards unless discharge monitoring data or other site-specific information demonstrates that a discharge causes or contributes to a violation of water quality standards, when the Permittee complies with the following conditions. The Permittee must fully:

    1. Comply with all permit conditions, including planning, sampling, monitoring, reporting, and recordkeeping conditions.

    2. Implement stormwater BMPs contained in stormwater management manuals published or approved by Ecology, or BMPs that are demonstrably equivalent to BMPs contained in stormwater technical manuals published or approved by Ecology, including the proper selection, implementation, and maintenance of all applicable and appropriate BMPs for on-site pollution control. (For purposes of this section, the stormwater manuals listed in Appendix 10 of the Phase I Municipal Stormwater Permit are approved by Ecology.)

D. Where construction sites also discharge to ground water, the ground water discharges must also meet the terms and conditions of this CSWGP. Permittees who discharge to ground water through an injection well must also comply with any applicable requirements of the Underground Injection Control (UIC) regulations, Chapter 173-218 WAC.

S4. MONITORING REQUIREMENTS, BENCHMARKS AND REPORTING TRIGGERS

A. Site Log Book

The Permittee must maintain a site log book that contains a record of the implementation of the SWPPP and other permit requirements, including the installation and maintenance of BMPs, site inspections, and stormwater monitoring.

B. Site Inspections

The Permittee's site inspections must include all areas disturbed by construction activities, all BMPs, and all stormwater discharge points under the Permittee's operational control. (See Special Conditions S4.B.3 and B.4 below for detailed requirements of the Permittee's Certified Erosion and Sediment Control Lead [CESCL].)

Construction sites one acre or larger that discharge stormwater to surface waters of the State must have site inspections conducted by a certified CESCL. Sites less than one acre may have a person without CESCL certification conduct inspections.

1. The Permittee must examine stormwater visually for the presence of suspended sediment, turbidity, discoloration, and oil sheen. The Permittee must evaluate the effectiveness of BMPs and determine if it is necessary to install, maintain, or repair BMPs to improve the quality of stormwater discharges.

   Based on the results of the inspection, the Permittee must correct the problems identified by:

   a. Reviewing the SWPPP for compliance with Special Condition S9 and making appropriate revisions within 7 days of the inspection.

   b. Immediately beginning the process of fully implementing and maintaining appropriate source control and/or treatment BMPs as soon as possible, addressing the problems no later than within 10 days of the inspection. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when an extension is requested by a Permittee within the initial 10-day response period.

   c. Documenting BMP implementation and maintenance in the site log book.

2. The Permittee must inspect all areas disturbed by construction activities, all BMPs, and all stormwater discharge points at least once every calendar week and within 24 hours of any discharge from the site. (For purposes of this condition, individual discharge events that last more than one day do not require daily inspections. For example, if a stormwater pond discharges continuously over the course of a week, only one inspection is required that week.) The Permittee may reduce the inspection frequency for temporarily stabilized, inactive sites to once every calendar month.

3. The Permittee must have staff knowledgeable in the principles and practices of erosion and sediment control. The CESCL (sites one acre or more) or inspector (sites less than one acre) must have the skills to assess the:

   a. Site conditions and construction activities that could impact the quality of stormwater, ***and***

   b. Effectiveness of erosion and sediment control measures used to control the quality of stormwater discharges.

4. The SWPPP must identify the CESCL or inspector, who must be present on site or on-call at all times. The CESCL must obtain this certification through an approved erosion and sediment control training program that meets the minimum training standards established by Ecology (see BMP C160 in the manual referred to in Special Condition S9.C.1 and 2).

5. The Permittee must summarize the results of each inspection in an inspection report or checklist and enter the report/checklist into, or attach it to, the site log book. At a minimum, each inspection report or checklist must include:

   a. Inspection date and time.

   b. Weather information, the general conditions during inspection and the approximate amount of precipitation since the last inspection, and precipitation within the last 24 hours.

   c. A summary or list of all implemented BMPs, including observations of all erosion/sediment control structures or practices.

   d. A description of the locations:

      i. Of BMPs inspected;

      ii. Of BMPs that need maintenance and why;

      iii. Of BMPs that failed to operate as designed or intended; ***and***

      iv. Where additional or different BMPs are needed, and why.

   e. A description of stormwater discharged from the site. The Permittee must note the presence of suspended sediment, turbidity, discoloration, and oil sheen, as applicable.

   f. Any water quality monitoring performed during inspection.

   g. General comments and notes, including a brief description of any BMP repairs, maintenance or installations made following the inspection.

   h. A summary report and a schedule of implementation of the remedial actions that the Permittee plans to take if the site inspection indicates that the site is out of compliance. The remedial actions taken must meet the requirements of the SWPPP and the permit.

i. The name, title, and signature of the person conducting the site inspection, a phone number or other reliable method to reach this person, and the following statement: "I certify that this report is true, accurate, and complete to the best of my knowledge and belief."

Table 3: Summary of Primary Monitoring Requirements

Size of Soil Disturbance[1]	Weekly Site Inspections	Weekly Sampling w/ Turbidity Meter	Weekly Sampling w/ Transparency Tube	Weekly pH Sampling[2]	CESCL Required for Inspections?
Sites that disturb less than 1 acre, but are part of a larger Common Plan of Development	Required	Not Required	Not Required	Not Required	No
Sites that disturb 1 acre or more, but fewer than 5 acres	Required	Sampling Required – either method[3]		Required	Yes
Sites that disturb 5 acres or more	Required	Required	Not Required[4]	Required	Yes

[1] Soil disturbance is calculated by adding together all areas that will be affected by construction activity. Construction activity means clearing, grading, excavation, and any other activity that disturbs the surface of the land, including ingress/egress from the site.

[2] If construction activity results in the disturbance of 1 acre or more, and involves significant concrete work (1,000 cubic yards of poured concrete or recycled concrete over the life of a project) or the use of engineered soils (soil amendments including but not limited to Portland cement-treated base [CTB], cement kiln dust [CKD], or fly ash), and stormwater from the affected area drains to surface waters of the State or to a storm sewer stormwater collection system that drains to other surface waters of the State, the Permittee must conduct pH sampling in accordance with Special Condition S4.D.

[3] Sites with one or more acres, but fewer than 5 acres of soil disturbance, must conduct turbidity or transparency sampling in accordance with Special Condition S4.C.

[4] Sites equal to or greater than 5 acres of soil disturbance must conduct turbidity sampling using a turbidity meter in accordance with Special Condition S4.C.

C. Turbidity/Transparency Sampling Requirements

1. Sampling Methods

   a. If construction activity involves the disturbance of 5 acres or more, the Permittee must conduct turbidity sampling per Special Condition S4.C.

   b. If construction activity involves 1 acre or more but fewer than 5 acres of soil disturbance, the Permittee must conduct either transparency sampling **or** turbidity sampling per Special Condition S4.C.

2. Sampling Frequency

   a. The Permittee must sample all discharge points at least once every calendar week when stormwater (or authorized non-stormwater) discharges from the site or enters any on-site surface waters of the state (for example, a creek running through a site); sampling is not required on sites that disturb less than an acre.

   b. Samples must be representative of the flow and characteristics of the discharge.

   c. Sampling is not required when there is no discharge during a calendar week.

   d. Sampling is not required outside of normal working hours or during unsafe conditions.

   e. If the Permittee is unable to sample during a monitoring period, the Permittee must include a brief explanation in the monthly Discharge Monitoring Report (DMR).

   f. Sampling is not required before construction activity begins.

   g. The Permittee may reduce the sampling frequency for temporarily stabilized, inactive sites to once every calendar month.

3. Sampling Locations

   a. Sampling is required at all points where stormwater associated with construction activity (or authorized non-stormwater) is discharged off site, including where it enters any on-site surface waters of the state (for example, a creek running through a site).

   b. The Permittee may discontinue sampling at discharge points that drain areas of the project that are fully stabilized to prevent erosion.

   c. The Permittee must identify all sampling point(s) on the SWPPP site map and clearly mark these points in the field with a flag, tape, stake or other visible marker.

   d. Sampling is not required for discharge that is sent directly to sanitary or combined sewer systems.

e. The Permittee may discontinue sampling at discharge points in areas of the project where the Permittee no longer has operational control of the construction activity.

4. Sampling and Analysis Methods

a. The Permittee performs turbidity analysis with a calibrated turbidity meter (turbidimeter) either on site or at an accredited lab. The Permittee must record the results in the site log book in nephelometric turbidity units (NTUs).

b. The Permittee performs transparency analysis on site with a 1¾-inch-diameter, 60-centimeter (cm)-long transparency tube. The Permittee will record the results in the site log book in centimeters (cm).

Table 4: Monitoring and Reporting Requirements

Parameter	Unit	Analytical Method	Sampling Frequency	Benchmark Value	Phone Reporting Trigger Value
Turbidity	NTU	SM2130	Weekly, if discharging	25 NTUs	250 NTUs
Transparency	cm	Manufacturer instructions, or Ecology guidance	Weekly, if discharging	33 cm	6 cm

5. Turbidity/Transparency Benchmark Values and Reporting Triggers

The benchmark value for turbidity is 25 NTUs or less. The benchmark value for transparency is 33 centimeters (cm). Note: Benchmark values do not apply to discharges to segments of water bodies on Washington State's 303(d) list (Category 5) for turbidity, fine sediment, or phosphorus; these discharges are subject to a numeric effluent limit for turbidity. Refer to Special Condition S8 for more information.

a. Turbidity 26 – 249 NTUs, or Transparency 32 – 7 cm:

If the discharge turbidity is 26 to 249 NTUs; or if discharge transparency is less than 33 cm, but equal to or greater than 6 cm, the Permittee must:

i. Review the SWPPP for compliance with Special Condition S9 and make appropriate revisions within 7 days of the date the discharge exceeded the benchmark.

ii. Immediately begin the process to fully implement and maintain appropriate source control and/or treatment BMPs as soon as possible, addressing the problems within 10 days of the date the discharge exceeded the benchmark. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when the Permittee requests an extension within the initial 10-day response period.

iii. Document BMP implementation and maintenance in the site log book.

b. Turbidity 250 NTUs or greater, or Transparency 6 cm or less:

If a discharge point's turbidity is 250 NTUs or greater, or if discharge transparency is less than or equal to 6 cm, the Permittee must complete the reporting and adaptive management process described below.

i. Telephone or submit an electronic report to the applicable Ecology Region's Environmental Report Tracking System (ERTS) number (or through Ecology's Water Quality Permitting Portal [WQWebPortal] – Permit Submittals when the form is available) within 24 hours, in accordance with Special Condition S5.A.

- **Central Region** (Okanogan, Chelan, Douglas, Kittitas, Yakima, Klickitat, Benton): (509) 575-2490
- **Eastern Region** (Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman): (509) 329-3400
- **Northwest Region** (Kitsap, Snohomish, Island, King, San Juan, Skagit, Whatcom): (425) 649-7000
- **Southwest Region** (Grays Harbor, Lewis, Mason, Thurston, Pierce, Clark, Cowlitz, Skamania, Wahkiakum, Clallam, Jefferson, Pacific): (360) 407-6300

Links to these numbers and the ERTS reporting page are located on the following web site: http://www.ecy.wa.gov/programs/wq/stormwater/construction/index.html.

ii. Review the SWPPP for compliance with Special Condition S9 and make appropriate revisions within 7 days of the date the discharge exceeded the benchmark.

iii. Immediately begin the process to fully implement and maintain appropriate source control and/or treatment BMPs as soon as possible, addressing the problems within 10 days of the date the discharge exceeded the benchmark. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when the Permittee requests an extension within the initial 10-day response period.

iv. Document BMP implementation and maintenance in the site log book.

v. Sample discharges daily until:

a) Turbidity is 25 NTUs (or lower); ***or***

b) Transparency is 33 cm (or greater); ***or***

c) The Permittee has demonstrated compliance with the water quality limit for turbidity:

1) No more than 5 NTUs over background turbidity, if background is less than 50 NTUs, ***or***

2) No more than 10% over background turbidity, if background is 50 NTUs or greater; ***or***

d) The discharge stops or is eliminated.

D. pH Sampling Requirements – Significant Concrete Work or Engineered Soils

If construction activity results in the disturbance of 1 acre or more, ***and*** involves significant concrete work (significant concrete work means greater than 1000 cubic yards poured concrete or recycled concrete used over the life of a project) or the use of engineered soils (soil amendments including but not limited to Portland cement-treated base [CTB], cement kiln dust [CKD], or fly ash), and stormwater from the affected area drains to surface waters of the State or to a storm sewer system that drains to surface waters of the State, the Permittee must conduct pH sampling as set forth below. Note: In addition, discharges to segments of water bodies on Washington State's 303(d) list (Category 5) for high pH are subject to a numeric effluent limit for pH; refer to Special Condition S8.

1. For sites with significant concrete work, the Permittee must begin the pH sampling period when the concrete is first poured and exposed to precipitation, and continue weekly throughout and after the concrete pour and curing period, until stormwater pH is in the range of 6.5 to 8.5 (su).

2. For sites with recycled concrete where monitoring is required, the Permittee must begin the weekly pH sampling period when the recycled concrete is first exposed to precipitation and must continue until the recycled concrete is fully stabilized with the stormwater pH in the range of 6.5 to 8.5 (su).

3. For sites with engineered soils, the Permittee must begin the pH sampling period when the soil amendments are first exposed to precipitation and must continue until the area of engineered soils is fully stabilized.

4. During the applicable pH monitoring period defined above, the Permittee must obtain a representative sample of stormwater and conduct pH analysis at least once per week.

5. The Permittee must sample pH in the sediment trap/pond(s) or other locations that receive stormwater runoff from the area of significant concrete work or engineered soils before the stormwater discharges to surface waters.

6. The benchmark value for pH is 8.5 standard units. Anytime sampling indicates that pH is 8.5 or greater, the Permittee must either:

a. Prevent the high pH water (8.5 or above) from entering storm sewer systems or surface waters; ***or***

b. If necessary, adjust or neutralize the high pH water until it is in the range of pH 6.5 to 8.5 (su) using an appropriate treatment BMP such as carbon dioxide (CO_2) sparging or dry ice. The Permittee must obtain written approval from Ecology before using any form of chemical treatment other than CO_2 sparging or dry ice.

7. The Permittee must perform pH analysis on site with a calibrated pH meter, pH test kit, or wide range pH indicator paper. The Permittee must record pH sampling results in the site log book.

S5. REPORTING AND RECORDKEEPING REQUIREMENTS

A. High Turbidity Reporting

Anytime sampling performed in accordance with Special Condition S4.C indicates turbidity has reached the 250 NTUs or more (or transparency less than or equal to 6 cm) high turbidity reporting level, the Permittee must either call the applicable Ecology Region's Environmental Report Tracking System (ERTS) number by phone within 24 hours of analysis or submit an electronic ERTS report (or submit an electronic report through Ecology's Water Quality Permitting Portal (WQWebPortal) – Permit Submittals when the form is available). See the CSWGP web site for links to ERTS and the WQWebPortal: http://www.ecy.wa.gov/programs/wq/stormwater/construction/index.html. Also, see phone numbers in Special Condition S4.C.5.b.i.

B. Discharge Monitoring Reports (DMRs)

Permittees required to conduct water quality sampling in accordance with Special Conditions S4.C (Turbidity/Transparency), S4.D (pH), S8 (303[d]/TMDL sampling), and/or G13 (Additional Sampling) must submit the results to Ecology.

Permittees must submit monitoring data using Ecology's WQWebDMR web application accessed through Ecology's Water Quality Permitting Portal. To find out more information and to sign up for WQWebDMR go to: http://www.ecy.wa.gov/programs/wq/permits/paris/portal.html.

Permittees unable to submit electronically (for example, those who do not have an internet connection) must contact Ecology to request a waiver and obtain instructions on how to obtain a paper copy DMR at:

Department of Ecology
Water Quality Program - Construction Stormwater
PO Box 47696
Olympia, Washington 98504-7696

Permittees who obtain a waiver not to use WQWebDMR must use the forms provided to them by Ecology; submittals must be mailed to the address above. Permittees shall

submit DMR forms to be received by Ecology within 15 days following the end of each month.

If there was no discharge during a given monitoring period, all Permittees must submit a DMR as required with “no discharge" entered in place of the monitoring results. DMRs are required for the full duration of permit coverage (from issuance date to termination). For more information, contact Ecology staff using information provided at the following web site: www.ecy.wa.gov/programs/wq/permits/paris/contacts.html.

C. Records Retention

The Permittee must retain records of all monitoring information (site log book, sampling results, inspection reports/checklists, etc.), Stormwater Pollution Prevention Plan, copy of the permit coverage letter (including Transfer of Coverage documentation), and any other documentation of compliance with permit requirements for the entire life of the construction project and for a minimum of three years following the termination of permit coverage. Such information must include all calibration and maintenance records, and records of all data used to complete the application for this permit. This period of retention must be extended during the course of any unresolved litigation regarding the discharge of pollutants by the Permittee or when requested by Ecology.

D. Recording Results

For each measurement or sample taken, the Permittee must record the following information:

1. Date, place, method, and time of sampling or measurement.
2. The first and last name of the individual who performed the sampling or measurement.
3. The date(s) the analyses were performed.
4. The first and last name of the individual who performed the analyses.
5. The analytical techniques or methods used.
6. The results of all analyses.

E. Additional Monitoring by the Permittee

If the Permittee monitors any pollutant more frequently than required by this permit using test procedures specified by Special Condition S4 of this permit, the results of this monitoring must be included in the calculation and reporting of the data submitted in the Permittee’s DMR.

F. Noncompliance Notification

In the event the Permittee is unable to comply with any part of the terms and conditions of this permit, and the resulting noncompliance may cause a threat to human health or the environment (such as but not limited to spills of fuels or other materials, catastrophic pond or slope failure, and discharges that violate water quality standards), or exceed

numeric effluent limitations (see S8. Discharges to 303(d) or TMDL Waterbodies), the Permittee must, upon becoming aware of the circumstance:

1. Notify Ecology within 24-hours of the failure to comply by calling the applicable Regional office ERTS phone number (refer to Special Condition S4.C.5.b.i. or www.ecy.wa.gov/programs/wq/stormwater/construction/turbidity.html for Regional ERTS phone numbers).

2. Immediately take action to prevent the discharge/pollution, or otherwise stop or correct the noncompliance, and, if applicable, repeat sampling and analysis of any noncompliance immediately and submit the results to Ecology within five (5) days of becoming aware of the violation.

3. Submit a detailed written report to Ecology within five (5) days, of the time the Permittee becomes aware of the circumstances, unless requested earlier by Ecology. The report must be submitted using Ecology's Water Quality Permitting Portal (WQWebPortal) - Permit Submittals, unless a waiver from electronic reporting has been granted according to S5.B. The report must contain a description of the noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and the steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

   The Permittee must report any unanticipated bypass and/or upset that exceeds any effluent limit in the permit in accordance with the 24-hour reporting requirement contained in 40 C.F.R. 122.41(l)(6).

   Compliance with these requirements does not relieve the Permittee from responsibility to maintain continuous compliance with the terms and conditions of this permit or the resulting liability for failure to comply. Upon request of the Permittee, Ecology may waive the requirement for a written report on a case-by-case basis, if the immediate notification is received by Ecology within 24 hours.

G. Access to Plans and Records

1. The Permittee must retain the following permit documentation (plans and records) on site, or within reasonable access to the site, for use by the operator or for on-site review by Ecology or the local jurisdiction:

   a. General Permit

   b. Permit Coverage Letter

   c. Stormwater Pollution Prevention Plan (SWPPP)

   d. Site Log Book

2. The Permittee must address written requests for plans and records listed above (Special Condition S5.G.1) as follows:

a. The Permittee must provide a copy of plans and records to Ecology within 14 days of receipt of a written request from Ecology.

b. The Permittee must provide a copy of plans and records to the public when requested in writing. Upon receiving a written request from the public for the Permittee's plans and records, the Permittee must either:

   i. Provide a copy of the plans and records to the requester within 14 days of a receipt of the written request; ***or***

   ii. Notify the requester within 10 days of receipt of the written request of the location and times within normal business hours when the plans and records may be viewed; and provide access to the plans and records within 14 days of receipt of the written request; ***or***

   iii. Within 14 days of receipt of the written request, the Permittee may submit a copy of the plans and records to Ecology for viewing and/or copying by the requester at an Ecology office, or a mutually agreed location. If plans and records are viewed and/or copied at a location other than at an Ecology office, the Permittee will provide reasonable access to copying services for which a reasonable fee may be charged. The Permittee must notify the requester within 10 days of receipt of the request where the plans and records may be viewed and/or copied.

S6. PERMIT FEES

The Permittee must pay permit fees assessed by Ecology. Fees for stormwater discharges covered under this permit are established by Chapter 173-224 WAC. Ecology continues to assess permit fees until the permit is terminated in accordance with Special Condition S10 or revoked in accordance with General Condition G5.

S7. SOLID AND LIQUID WASTE DISPOSAL

The Permittee must handle and dispose of solid and liquid wastes generated by construction activity, such as demolition debris, construction materials, contaminated materials, and waste materials from maintenance activities, including liquids and solids from cleaning catch basins and other stormwater facilities, in accordance with:

A. Special Condition S3, Compliance with Standards

B. WAC 173-216-110

C. Other applicable regulations

S8. DISCHARGES TO 303(d) OR TMDL WATERBODIES

A. Sampling and Numeric Effluent Limits For Certain Discharges to 303(d)-listed Waterbodies

1. Permittees who discharge to segments of waterbodies listed as impaired by the State of Washington under Section 303(d) of the Clean Water Act for turbidity, fine sediment, high pH, or phosphorus, must conduct water quality sampling according to the requirements of this section, and Special Conditions S4.C.2.b-f and S4.C.3.b-d, and must comply with the applicable numeric effluent limitations in S8.C and S8.D.

2. All references and requirements associated with Section 303(d) of the Clean Water Act mean the most current listing by Ecology of impaired waters (Category 5) that exists on January 1, 2016, or the date when the operator's complete permit application is received by Ecology, whichever is later.

B. Limits on Coverage for New Discharges to TMDL or 303(d)-listed Waters

Operators of construction sites that discharge to a TMDL or 303(d)-listed waterbody are not eligible for coverage under this permit *unless* the operator:

1. Prevents exposing stormwater to pollutants for which the waterbody is impaired, and retains documentation in the SWPPP that details procedures taken to prevent exposure on site; ***or***

2. Documents that the pollutants for which the waterbody is impaired are not present at the site, and retains documentation of this finding within the SWPPP; ***or***

3. Provides Ecology with data indicating the discharge is not expected to cause or contribute to an exceedance of a water quality standard, and retains such data on site with the SWPPP. The operator must provide data and other technical information to Ecology that sufficiently demonstrate:

   a. For discharges to waters without an EPA-approved or -established TMDL, that the discharge of the pollutant for which the water is impaired will meet in-stream water quality criteria at the point of discharge to the waterbody; ***or***

   b. For discharges to waters with an EPA-approved or -established TMDL, that there is sufficient remaining wasteload allocation in the TMDL to allow construction stormwater discharge and that existing dischargers to the waterbody are subject to compliance schedules designed to bring the waterbody into attainment with water quality standards.

   Operators of construction sites are eligible for coverage under this permit if Ecology issues permit coverage based upon an affirmative determination that the *discharge will not cause or contribute to the existing impairment.*

C. Sampling and Numeric Effluent Limits for Discharges to Water Bodies on the 303(d) List for Turbidity, Fine Sediment, or Phosphorus

1. Permittees who discharge to segments of water bodies on the 303(d) list (Category 5) for turbidity, fine sediment, or phosphorus must conduct turbidity sampling in accordance with Special Condition S4.C.2 and comply with either of the numeric effluent limits noted in Table 5 below.

2. As an alternative to the 25 NTUs effluent limit noted in Table 5 below (applied at the point where stormwater [or authorized non-stormwater] is discharged off-site), Permittees may choose to comply with the surface water quality standard for turbidity. The standard is: no more than 5 NTUs over background turbidity when the background turbidity is 50 NTUs or less, or no more than a 10% increase in turbidity when the background turbidity is more than 50 NTUs. In order to use the water quality standard requirement, the sampling must take place at the following locations:

   a. Background turbidity in the 303(d)-listed receiving water immediately upstream (upgradient) or outside the area of influence of the discharge.

   b. Turbidity at the point of discharge into the 303(d)-listed receiving water, inside the area of influence of the discharge.

3. Discharges that exceed the numeric effluent limit for turbidity constitute a violation of this permit.

4. Permittees whose discharges exceed the numeric effluent limit shall sample discharges daily until the violation is corrected and comply with the non-compliance notification requirements in Special Condition S5.F.

Table 5: Turbidity, Fine Sediment & Phosphorus Sampling and Limits for 303(d)-Listed Waters

Parameter identified in 303(d) listing	Parameter Sampled	Unit	Analytical Method	Sampling Frequency	Numeric Effluent Limit[1]
• Turbidity • Fine Sediment • Phosphorus	Turbidity	NTU	SM2130	Weekly, if discharging	25 NTUs, at the point where stormwater is discharged from the site; OR In compliance with the surface water quality standard for turbidity (S8.C.2.a)

[1]Permittees subject to a numeric effluent limit for turbidity may, at their discretion, choose either numeric effluent limitation based on site-specific considerations including, but not limited to, safety, access and convenience.

D. Discharges to Water Bodies on the 303(d) List for High pH

1. Permittees who discharge to segments of water bodies on the 303(d) list (Category 5) for high pH must conduct pH sampling in accordance with the table below, and comply with the numeric effluent limit of pH 6.5 to 8.5 su (Table 6).

Table 6: pH Sampling and Limits for 303(d)-Listed Waters

Parameter identified in 303(d) listing	Parameter Sampled/Units	Analytical Method	Sampling Frequency	Numeric Effluent Limit
High pH	pH /Standard Units	pH meter	Weekly, if discharging	In the range of 6.5 – 8.5

2. At the Permittee's discretion, compliance with the limit shall be assessed at one of the following locations:

   a. Directly in the 303(d)-listed waterbody segment, inside the immediate area of influence of the discharge; or

   b. Alternatively, the Permittee may measure pH at the point where the discharge leaves the construction site, rather than in the receiving water.

3. Discharges that exceed the numeric effluent limit for pH (outside the range of 6.5 – 8.5 su) constitute a violation of this permit.

4. Permittees whose discharges exceed the numeric effluent limit shall sample discharges daily until the violation is corrected and comply with the non-compliance notification requirements in Special Condition S5.F.

E. Sampling and Limits for Sites Discharging to Waters Covered by a TMDL or Another Pollution Control Plan

1. Discharges to a waterbody that is subject to a Total Maximum Daily Load (TMDL) for turbidity, fine sediment, high pH, or phosphorus must be consistent with the TMDL. Refer to http://www.ecy.wa.gov/programs/wq/tmdl/TMDLsbyWria/TMDLbyWria.html for more information on TMDLs.

   a. Where an applicable TMDL sets specific waste load allocations or requirements for discharges covered by this permit, discharges must be consistent with any specific waste load allocations or requirements established by the applicable TMDL.

      i. The Permittee must sample discharges weekly or as otherwise specified by the TMDL to evaluate compliance with the specific waste load allocations or requirements.

      ii. Analytical methods used to meet the monitoring requirements must conform to the latest revision of the Guidelines Establishing Test Procedures for the Analysis of Pollutants contained in 40 CFR Part 136. Turbidity and pH methods need not be accredited or registered unless conducted at a laboratory which must otherwise be accredited or registered.

   b. Where an applicable TMDL has established a general waste load allocation for construction stormwater discharges, but has not identified specific requirements,

compliance with Special Conditions S4 (Monitoring) and S9 (SWPPPs) will constitute compliance with the approved TMDL.

c. Where an applicable TMDL has not specified a waste load allocation for construction stormwater discharges, but has not excluded these discharges, compliance with Special Conditions S4 (Monitoring) and S9 (SWPPPs) will constitute compliance with the approved TMDL.

d. Where an applicable TMDL specifically precludes or prohibits discharges from construction activity, the operator is not eligible for coverage under this permit.

2. Applicable TMDL means a TMDL for turbidity, fine sediment, high pH, or phosphorus that is completed and approved by EPA before January 1, 2016, or before the date the operator's complete permit application is received by Ecology, whichever is later. TMDLs completed after the operator's complete permit application is received by Ecology become applicable to the Permittee only if they are imposed through an administrative order by Ecology, or through a modification of permit coverage.

S9. STORMWATER POLLUTION PREVENTION PLAN

The Permittee must prepare and properly implement an adequate Stormwater Pollution Prevention Plan (SWPPP) for construction activity in accordance with the requirements of this permit beginning with initial soil disturbance and until final stabilization.

A. The Permittee's SWPPP must meet the following objectives:

1. To implement best management practices (BMPs) to prevent erosion and sedimentation, and to identify, reduce, eliminate or prevent stormwater contamination and water pollution from construction activity.

2. To prevent violations of surface water quality, ground water quality, or sediment management standards.

3. To control peak volumetric flow rates and velocities of stormwater discharges.

B. General Requirements

1. The SWPPP must include a narrative and drawings. All BMPs must be clearly referenced in the narrative and marked on the drawings. The SWPPP narrative must include documentation to explain and justify the pollution prevention decisions made for the project. Documentation must include:

a. Information about existing site conditions (topography, drainage, soils, vegetation, etc.).

b. Potential erosion problem areas.

c. The 13 elements of a SWPPP in Special Condition S9.D.1-13, including BMPs used to address each element.

d. Construction phasing/sequence and general BMP implementation schedule.

e. The actions to be taken if BMP performance goals are not achieved—for example, a contingency plan for additional treatment and/or storage of stormwater that would violate the water quality standards if discharged.

f. Engineering calculations for ponds, treatment systems, and any other designed structures. When a treatment system requires engineering calculations, these calculations must be included in the SWPPP. Engineering calculations do not need to be included in the SWPPP for treatment systems that do not require such calculations.

2. The Permittee must modify the SWPPP if, during inspections or investigations conducted by the owner/operator, or the applicable local or state regulatory authority, it is determined that the SWPPP is, or would be, ineffective in eliminating or significantly minimizing pollutants in stormwater discharges from the site. The Permittee must then:

   a. Review the SWPPP for compliance with Special Condition S9 and make appropriate revisions within 7 days of the inspection or investigation.

   b. Immediately begin the process to fully implement and maintain appropriate source control and/or treatment BMPs as soon as possible, addressing the problems no later than 10 days from the inspection or investigation. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when an extension is requested by a Permittee within the initial 10-day response period.

   c. Document BMP implementation and maintenance in the site log book.

   The Permittee must modify the SWPPP whenever there is a change in design, construction, operation, or maintenance at the construction site that has, or could have, a significant effect on the discharge of pollutants to waters of the State.

C. Stormwater Best Management Practices (BMPs)

BMPs must be consistent with:

1. Stormwater Management Manual for Western Washington (most current approved edition at the time this permit was issued), for sites west of the crest of the Cascade Mountains; ***or***

2. Stormwater Management Manual for Eastern Washington (most current approved edition at the time this permit was issued), for sites east of the crest of the Cascade Mountains; ***or***

3. Revisions to the manuals listed in Special Condition S9.C.1. & 2., or other stormwater management guidance documents or manuals which provide an equivalent level of pollution prevention, that are approved by Ecology and incorporated into this permit in accordance with the permit modification requirements of WAC 173-226-230; ***or***

4. Documentation in the SWPPP that the BMPs selected provide an equivalent level of pollution prevention, compared to the applicable Stormwater Management Manuals, including:

    a. The technical basis for the selection of all stormwater BMPs (scientific, technical studies, and/or modeling) that support the performance claims for the BMPs being selected.

    b. An assessment of how the selected BMP will satisfy AKART requirements and the applicable federal technology-based treatment requirements under 40 CFR part 125.3.

D. SWPPP – Narrative Contents and Requirements

The Permittee must include each of the 13 elements below in Special Condition S9.D.1-13 in the narrative of the SWPPP and implement them unless site conditions render the element unnecessary and the exemption from that element is clearly justified in the SWPPP.

1. Preserve Vegetation/Mark Clearing Limits

    a. Before beginning land-disturbing activities, including clearing and grading, clearly mark all clearing limits, sensitive areas and their buffers, and trees that are to be preserved within the construction area.

    b. Retain the duff layer, native topsoil, and natural vegetation in an undisturbed state to the maximum degree practicable.

2. Establish Construction Access

    a. Limit construction vehicle access and exit to one route, if possible.

    b. Stabilize access points with a pad of quarry spalls, crushed rock, or other equivalent BMPs, to minimize tracking sediment onto roads.

    c. Locate wheel wash or tire baths on site, if the stabilized construction entrance is not effective in preventing tracking sediment onto roads.

    d. If sediment is tracked off site, clean the affected roadway thoroughly at the end of each day, or more frequently as necessary (for example, during wet weather). Remove sediment from roads by shoveling, sweeping, or pickup and transport of the sediment to a controlled sediment disposal area.

    e. Conduct street washing only after sediment removal in accordance with Special Condition S9.D.2.d. Control street wash wastewater by pumping back on site or otherwise preventing it from discharging into systems tributary to waters of the State.

3. Control Flow Rates

    a. Protect properties and waterways downstream of development sites from erosion and the associated discharge of turbid waters due to increases in the

velocity and peak volumetric flow rate of stormwater runoff from the project site, as required by local plan approval authority.

b. Where necessary to comply with Special Condition S9.D.3.a, construct stormwater retention or detention facilities as one of the first steps in grading. Assure that detention facilities function properly before constructing site improvements (for example, impervious surfaces).

c. If permanent infiltration ponds are used for flow control during construction, protect these facilities from siltation during the construction phase.

4. Install Sediment Controls

The Permittee must design, install and maintain effective erosion controls and sediment controls to minimize the discharge of pollutants. At a minimum, the Permittee must design, install and maintain such controls to:

a. Construct sediment control BMPs (sediment ponds, traps, filters, infiltration facilities, etc.) as one of the first steps in grading. These BMPs must be functional before other land disturbing activities take place.

b. Minimize sediment discharges from the site. The design, installation and maintenance of erosion and sediment controls must address factors such as the amount, frequency, intensity and duration of precipitation, the nature of resulting stormwater runoff, and soil characteristics, including the range of soil particle sizes expected to be present on the site.

c. Direct stormwater runoff from disturbed areas through a sediment pond or other appropriate sediment removal BMP, before the runoff leaves a construction site or before discharge to an infiltration facility. Runoff from fully stabilized areas may be discharged without a sediment removal BMP, but must meet the flow control performance standard of Special Condition S9.D.3.a.

d. Locate BMPs intended to trap sediment on site in a manner to avoid interference with the movement of juvenile salmonids attempting to enter off-channel areas or drainages.

e. Provide and maintain natural buffers around surface waters, direct stormwater to vegetated areas to increase sediment removal and maximize stormwater infiltration, unless infeasible.

f. Where feasible, design outlet structures that withdraw impounded stormwater from the surface to avoid discharging sediment that is still suspended lower in the water column.

5. Stabilize Soils

a. The Permittee must stabilize exposed and unworked soils by application of effective BMPs that prevent erosion. Applicable BMPs include, but are not limited to: temporary and permanent seeding, sodding, mulching, plastic covering, erosion control fabrics and matting, soil application of polyacrylamide

(PAM), the early application of gravel base on areas to be paved, and dust control.

b. The Permittee must control stormwater volume and velocity within the site to minimize soil erosion.

c. The Permittee must control stormwater discharges, including both peak flow rates and total stormwater volume, to minimize erosion at outlets and to minimize downstream channel and stream bank erosion.

d. Depending on the geographic location of the project, the Permittee must not allow soils to remain exposed and unworked for more than the time periods set forth below to prevent erosion:

West of the Cascade Mountains Crest
During the dry season (May 1 - September 30): 7 days
During the wet season (October 1 - April 30): 2 days

East of the Cascade Mountains Crest, except for Central Basin*
During the dry season (July 1 - September 30): 10 days
During the wet season (October 1 - June 30): 5 days

The Central Basin*, East of the Cascade Mountains Crest
During the dry season (July 1 - September 30): 30 days
During the wet season (October 1 - June 30): 15 days

*Note: The Central Basin is defined as the portions of Eastern Washington with mean annual precipitation of less than 12 inches.

e. The Permittee must stabilize soils at the end of the shift before a holiday or weekend if needed based on the weather forecast.

f. The Permittee must stabilize soil stockpiles from erosion, protected with sediment trapping measures, and where possible, be located away from storm drain inlets, waterways, and drainage channels.

g. The Permittee must minimize the amount of soil exposed during construction activity.

h. The Permittee must minimize the disturbance of steep slopes.

i. The Permittee must minimize soil compaction and, unless infeasible, preserve topsoil.

6. Protect Slopes

a. The Permittee must design and construct cut-and-fill slopes in a manner to minimize erosion. Applicable practices include, but are not limited to, reducing continuous length of slope with terracing and diversions, reducing slope steepness, and roughening slope surfaces (for example, track walking).

b. The Permittee must divert off-site stormwater (run-on) or ground water away from slopes and disturbed areas with interceptor dikes, pipes, and/or swales. Off-site stormwater should be managed separately from stormwater generated on the site.

c. At the top of slopes, collect drainage in pipe slope drains or protected channels to prevent erosion.

   i. West of the Cascade Mountains Crest: Temporary pipe slope drains must handle the peak 10-minute flow rate from a Type 1A, 10-year, 24-hour frequency storm for the developed condition. Alternatively, the 10-year, 1-hour flow rate predicted by an approved continuous runoff model, increased by a factor of 1.6, may be used. The hydrologic analysis must use the existing land cover condition for predicting flow rates from tributary areas outside the project limits. For tributary areas on the project site, the analysis must use the temporary or permanent project land cover condition, whichever will produce the highest flow rates. If using the Western Washington Hydrology Model (WWHM) to predict flows, bare soil areas should be modeled as "landscaped area."

   ii. East of the Cascade Mountains Crest: Temporary pipe slope drains must handle the expected peak flow rate from a 6-month, 3-hour storm for the developed condition, referred to as the short duration storm.

d. Place excavated material on the uphill side of trenches, consistent with safety and space considerations.

e. Place check dams at regular intervals within constructed channels that are cut down a slope.

7. Protect Drain Inlets

   a. Protect all storm drain inlets made operable during construction so that stormwater runoff does not enter the conveyance system without first being filtered or treated to remove sediment.

   b. Clean or remove and replace inlet protection devices when sediment has filled one-third of the available storage (unless a different standard is specified by the product manufacturer).

8. Stabilize Channels and Outlets

   a. Design, construct and stabilize all on-site conveyance channels to prevent erosion from the following expected peak flows:

      i. West of the Cascade Mountains Crest: Channels must handle the peak 10-minute flow rate from a Type 1A, 10-year, 24-hour frequency storm for the developed condition. Alternatively, the 10-year, 1-hour flow rate indicated by an approved continuous runoff model, increased by a factor of 1.6, may be used. The hydrologic analysis must use the existing land

cover condition for predicting flow rates from tributary areas outside the project limits. For tributary areas on the project site, the analysis must use the temporary or permanent project land cover condition, whichever will produce the highest flow rates. If using the WWHM to predict flows, bare soil areas should be modeled as "landscaped area."

ii. East of the Cascade Mountains Crest: Channels must handle the expected peak flow rate from a 6-month, 3-hour storm for the developed condition, referred to as the short duration storm.

b. Provide stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent stream banks, slopes, and downstream reaches at the outlets of all conveyance systems.

9. Control Pollutants

Design, install, implement and maintain effective pollution prevention measures to minimize the discharge of pollutants. The Permittee must:

a. Handle and dispose of all pollutants, including waste materials and demolition debris that occur on site in a manner that does not cause contamination of stormwater.

b. Provide cover, containment, and protection from vandalism for all chemicals, liquid products, petroleum products, and other materials that have the potential to pose a threat to human health or the environment. On-site fueling tanks must include secondary containment. Secondary containment means placing tanks or containers within an impervious structure capable of containing 110% of the volume contained in the largest tank within the containment structure. Double-walled tanks do not require additional secondary containment.

c. Conduct maintenance, fueling, and repair of heavy equipment and vehicles using spill prevention and control measures. Clean contaminated surfaces immediately following any spill incident.

d. Discharge wheel wash or tire bath wastewater to a separate on-site treatment system that prevents discharge to surface water, such as closed-loop recirculation or upland land application, or to the sanitary sewer with local sewer district approval.

e. Apply fertilizers and pesticides in a manner and at application rates that will not result in loss of chemical to stormwater runoff. Follow manufacturers' label requirements for application rates and procedures.

f. Use BMPs to prevent contamination of stormwater runoff by pH-modifying sources. The sources for this contamination include, but are not limited to: bulk cement, cement kiln dust, fly ash, new concrete washing and curing waters, recycled concrete stockpiles, waste streams generated from concrete grinding and sawing, exposed aggregate processes, dewatering concrete vaults, concrete

pumping and mixer washout waters. (Also refer to the definition for "concrete wastewater" in Appendix A--Definitions.)

g. Adjust the pH of stormwater or authorized non-stormwater if necessary to prevent an exceedance of groundwater and/or surface water quality standards.

h. Assure that washout of concrete trucks is performed off-site or in designated concrete washout areas only. Do not wash out concrete truck drums or concrete handling equipment onto the ground, or into storm drains, open ditches, streets, or streams. Washout of concrete handling equipment may be disposed of in a designated concrete washout area or in a formed area awating concrete where it will not contaminate surface or ground water. Do not dump excess concrete on site, except in designated concrete washout areas. Concrete spillage or concrete discharge directly to groundwater or surface waters of the State is prohibited. Do not wash out to formed areas awaiting LID facilities.

i. Obtain written approval from Ecology before using any chemical treatment, with the exception of CO_2 or dry ice used to adjust pH.

j. Uncontaminated water from water-only based shaft drilling for construction of building, road, and bridge foundations may be infiltrated provided the wastewater is managed in a way that prohibits discharge to surface waters. Prior to infiltration, water from water-only based shaft drilling that comes into contact with curing concrete must be neutralized until pH is in the range of 6.5 to 8.5 (su).

10. Control Dewatering

a. Permittees must discharge foundation, vault, and trench dewatering water, which have characteristics similar to stormwater runoff at the site, into a controlled conveyance system before discharge to a sediment trap or sediment pond.

b. Permittees may discharge clean, non-turbid dewatering water, such as well-point ground water, to systems tributary to, or directly into surface waters of the State, as specified in Special Condition S9.D.8, provided the dewatering flow does not cause erosion or flooding of receiving waters. Do not route clean dewatering water through stormwater sediment ponds. Note that “surface waters of the State” may exist on a construction site as well as off site; for example, a creek running through a site.

c. Other dewatering treatment or disposal options may include:

i. Infiltration.

ii. Transport off site in a vehicle, such as a vacuum flush truck, for legal disposal in a manner that does not pollute state waters.

iii. Ecology-approved on-site chemical treatment or other suitable treatment technologies (see S9.D.9.i. regarding chemical treatment written approval).

iv. Sanitary or combined sewer discharge with local sewer district approval, if there is no other option.

v. Use of a sedimentation bag with discharge to a ditch or swale for small volumes of localized dewatering.

d. Permittees must handle highly turbid or contaminated dewatering water separately from stormwater.

11. Maintain BMPs

a. Permittees must maintain and repair all temporary and permanent erosion and sediment control BMPs as needed to assure continued performance of their intended function in accordance with BMP specifications.

b. Permittees must remove all temporary erosion and sediment control BMPs within 30 days after achieving final site stabilization or after the temporary BMPs are no longer needed.

12. Manage the Project

a. Phase development projects to the maximum degree practicable and take into account seasonal work limitations.

b. Inspection and monitoring – Inspect, maintain and repair all BMPs as needed to assure continued performance of their intended function. Conduct site inspections and monitoring in accordance with Special Condition S4.

c. Maintaining an updated construction SWPPP – Maintain, update, and implement the SWPPP in accordance with Special Conditions S3, S4 and S9.

13. Protect Low Impact Development (LID) BMPs

The primary purpose of LID BMPs/On-site LID Stormwater Management BMPs is to reduce the disruption of the natural site hydrology. LID BMPs are permanent facilities.

a. Permittees must protect all Bioretention and Rain Garden facilities from sedimentation through installation and maintenance of erosion and sediment control BMPs on portions of the site that drain into the Bioretention and/or Rain Garden facilities. Restore the facilities to their fully functioning condition if they accumulate sediment during construction. Restoring the facility must include removal of sediment and any sediment-laden Bioretention/Rain Garden soils, and replacing the removed soils with soils meeting the design specification.

b. Permittees must maintain the infiltration capabilities of Bioretention and Rain Garden facilities by protecting against compaction by construction equipment and foot traffic. Protect completed lawn and landscaped areas from compaction due to construction equipment.

c. Permittees must control erosion and avoid introducing sediment from surrounding land uses onto permeable pavements. Do not allow muddy construction equipment on the base material or pavement. Do not allow sediment-laden runoff onto permeable pavements.

d. Permittees must clean permeable pavements fouled with sediments or no longer passing an initial infiltration test using local stormwater manual methodology or the manufacturer's procedures.

e. Permittees must keep all heavy equipment off existing soils under LID facilities that have been excavated to final grade to retain the infiltration rate of the soils.

E. SWPPP – Map Contents and Requirements

The Permittee's SWPPP must also include a vicinity map or general location map (for example, a USGS quadrangle map, a portion of a county or city map, or other appropriate map) with enough detail to identify the location of the construction site and receiving waters within one mile of the site.

The SWPPP must also include a legible site map (or maps) showing the entire construction site. The following features must be identified, unless not applicable due to site conditions:

1. The direction of north, property lines, and existing structures and roads.
2. Cut and fill slopes indicating the top and bottom of slope catch lines.
3. Approximate slopes, contours, and direction of stormwater flow before and after major grading activities.
4. Areas of soil disturbance and areas that will not be disturbed.
5. Locations of structural and nonstructural controls (BMPs) identified in the SWPPP.
6. Locations of off-site material, stockpiles, waste storage, borrow areas, and vehicle/equipment storage areas.
7. Locations of all surface water bodies, including wetlands.
8. Locations where stormwater or non-stormwater discharges off-site and/or to a surface waterbody, including wetlands.
9. Location of water quality sampling station(s), if sampling is required by state or local permitting authority.

10. Areas where final stabilization has been accomplished and no further construction-phase permit requirements apply.

11. Location or proposed location of LID facilities.

S10. NOTICE OF TERMINATION

A. The site is eligible for termination of coverage when it has met any of the following conditions:

1. The site has undergone final stabilization, the Permittee has removed all temporary BMPs (except biodegradable BMPs clearly manufactured with the intention for the material to be left in place and not interfere with maintenance or land use), and all stormwater discharges associated with construction activity have been eliminated; ***or***

2. All portions of the site that have not undergone final stabilization per Special Condition S10.A.1 have been sold and/or transferred (per General Condition G9), and the Permittee no longer has operational control of the construction activity; ***or***

3. For residential construction only, the Permittee has completed temporary stabilization and the homeowners have taken possession of the residences.

B. When the site is eligible for termination, the Permittee must submit a complete and accurate Notice of Termination (NOT) form, signed in accordance with General Condition G2, to:

Department of Ecology
Water Quality Program – Construction Stormwater
PO Box 47696
Olympia, Washington 98504-7696

When an electronic termination form is available, the Permittee may choose to submit a complete and accurate Notice of Termination (NOT) form through the Water Quality Permitting Portal rather than mailing a hardcopy as noted above.

The termination is effective on the thirty-first calendar day following the date Ecology receives a complete NOT form, unless Ecology notifies the Permittee that the termination request is denied because the Permittee has not met the eligibility requirements in Special Condition S10.A.

Permittees are required to comply with all conditions and effluent limitations in the permit until the permit has been terminated.

Permittees transferring the property to a new property owner or operator/Permittee are required to complete and submit the Notice of Transfer form to Ecology, but are not required to submit a Notice of Termination form for this type of transaction.

GENERAL CONDITIONS

G1. DISCHARGE VIOLATIONS

All discharges and activities authorized by this general permit must be consistent with the terms and conditions of this general permit. Any discharge of any pollutant more frequent than or at a level in excess of that identified and authorized by the general permit must constitute a violation of the terms and conditions of this permit.

G2. SIGNATORY REQUIREMENTS

A. All permit applications must bear a certification of correctness to be signed:

1. In the case of corporations, by a responsible corporate officer;
2. In the case of a partnership, by a general partner of a partnership;
3. In the case of sole proprietorship, by the proprietor; ***or***
4. In the case of a municipal, state, or other public facility, by either a principal executive officer or ranking elected official.

B. All reports required by this permit and other information requested by Ecology (including NOIs, NOTs, and Transfer of Coverage forms) must be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

1. The authorization is made in writing by a person described above and submitted to Ecology.
2. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility, such as the position of plant manager, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters.

C. Changes to authorization. If an authorization under paragraph G2.B.2 above is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of paragraph G2.B.2 above must be submitted to Ecology prior to or together with any reports, information, or applications to be signed by an authorized representative.

D. Certification. Any person signing a document under this section must make the following certification:

> "I certify under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering information, the information submitted is, to the best of my

knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

G3. RIGHT OF INSPECTION AND ENTRY

The Permittee must allow an authorized representative of Ecology, upon the presentation of credentials and such other documents as may be required by law:

A. To enter upon the premises where a discharge is located or where any records are kept under the terms and conditions of this permit.

B. To have access to and copy – at reasonable times and at reasonable cost – any records required to be kept under the terms and conditions of this permit.

C. To inspect – at reasonable times – any facilities, equipment (including monitoring and control equipment), practices, methods, or operations regulated or required under this permit.

D. To sample or monitor – at reasonable times – any substances or parameters at any location for purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act.

G4. GENERAL PERMIT MODIFICATION AND REVOCATION

This permit may be modified, revoked and reissued, or terminated in accordance with the provisions of Chapter 173-226 WAC. Grounds for modification, revocation and reissuance, or termination include, but are not limited to, the following:

A. When a change occurs in the technology or practices for control or abatement of pollutants applicable to the category of dischargers covered under this permit.

B. When effluent limitation guidelines or standards are promulgated pursuant to the CWA or Chapter 90.48 RCW, for the category of dischargers covered under this permit.

C. When a water quality management plan containing requirements applicable to the category of dischargers covered under this permit is approved, ***or***

D. When information is obtained that indicates cumulative effects on the environment from dischargers covered under this permit are unacceptable.

G5. REVOCATION OF COVERAGE UNDER THE PERMIT

Pursuant to Chapter 43.21B RCW and Chapter 173-226 WAC, the Director may terminate coverage for any discharger under this permit for cause. Cases where coverage may be terminated include, but are not limited to, the following:

A. Violation of any term or condition of this permit.

B. Obtaining coverage under this permit by misrepresentation or failure to disclose fully all relevant facts.

C. A change in any condition that requires either a temporary or permanent reduction or elimination of the permitted discharge.

D. Failure or refusal of the Permittee to allow entry as required in RCW 90.48.090.

E. A determination that the permitted activity endangers human health or the environment, or contributes to water quality standards violations.

F. Nonpayment of permit fees or penalties assessed pursuant to RCW 90.48.465 and Chapter 173-224 WAC.

G. Failure of the Permittee to satisfy the public notice requirements of WAC 173-226-130(5), when applicable.

The Director may require any discharger under this permit to apply for and obtain coverage under an individual permit or another more specific general permit. Permittees who have their coverage revoked for cause according to WAC 173-226-240 may request temporary coverage under this permit during the time an individual permit is being developed, provided the request is made within ninety (90) days from the time of revocation and is submitted along with a complete individual permit application form.

G6. REPORTING A CAUSE FOR MODIFICATION

The Permittee must submit a new application, or a supplement to the previous application, whenever a material change to the construction activity or in the quantity or type of discharge is anticipated which is not specifically authorized by this permit. This application must be submitted at least sixty (60) days prior to any proposed changes. Filing a request for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not relieve the Permittee of the duty to comply with the existing permit until it is modified or reissued.

G7. COMPLIANCE WITH OTHER LAWS AND STATUTES

Nothing in this permit will be construed as excusing the Permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.

G8. DUTY TO REAPPLY

The Permittee must apply for permit renewal at least 180 days prior to the specified expiration date of this permit. The Permittee must reapply using the electronic application form (NOI) available on Ecology's website. Permittees unable to submit electronically (for example, those who do not have an internet connection) must contact Ecology to request a waiver and obtain instructions on how to obtain a paper NOI.

Department of Ecology
Water Quality Program - Construction Stormwater
PO Box 47696
Olympia, Washington 98504-7696

G9. TRANSFER OF GENERAL PERMIT COVERAGE

Coverage under this general permit is automatically transferred to a new discharger, including operators of lots/parcels within a common plan of development or sale, if:

A. A written agreement (Transfer of Coverage Form) between the current discharger (Permittee) and new discharger, signed by both parties and containing a specific date for transfer of permit responsibility, coverage, and liability (including any Administrative Orders associated with the Permit) is submitted to the Director; and

B. The Director does not notify the current discharger and new discharger of the Director's intent to revoke coverage under the general permit. If this notice is not given, the transfer is effective on the date specified in the written agreement.

When a current discharger (Permittee) transfers a portion of a permitted site, the current discharger must also submit an updated application form (NOI) to the Director indicating the remaining permitted acreage after the transfer.

G10. REMOVED SUBSTANCES

The Permittee must not re-suspend or reintroduce collected screenings, grit, solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of stormwater to the final effluent stream for discharge to state waters.

G11. DUTY TO PROVIDE INFORMATION

The Permittee must submit to Ecology, within a reasonable time, all information that Ecology may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The Permittee must also submit to Ecology, upon request, copies of records required to be kept by this permit [40 CFR 122.41(h)].

G12. OTHER REQUIREMENTS OF 40 CFR

All other requirements of 40 CFR 122.41 and 122.42 are incorporated in this permit by reference.

G13. ADDITIONAL MONITORING

Ecology may establish specific monitoring requirements in addition to those contained in this permit by administrative order or permit modification.

G14. PENALTIES FOR VIOLATING PERMIT CONDITIONS

Any person who is found guilty of willfully violating the terms and conditions of this permit shall be deemed guilty of a crime, and upon conviction thereof shall be punished by a fine of up to ten thousand dollars ($10,000) and costs of prosecution, or by imprisonment at the discretion of the court. Each day upon which a willful violation occurs may be deemed a separate and additional violation.

Any person who violates the terms and conditions of a waste discharge permit shall incur, in addition to any other penalty as provided by law, a civil penalty in the amount of up to ten thousand dollars ($10,000) for every such violation. Each and every such violation shall be a separate and distinct offense, and in case of a continuing violation, every day's continuance shall be deemed to be a separate and distinct violation.

G15. UPSET

Definition – "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limitations if the requirements of the following paragraph are met.

A Permittee who wishes to establish the affirmative defense of upset must demonstrate, through properly signed, contemporaneous operating logs or other relevant evidence that: 1) an upset occurred and that the Permittee can identify the cause(s) of the upset; 2) the permitted facility was being properly operated at the time of the upset; 3) the Permittee submitted notice of the upset as required in Special Condition S5.F, and; 4) the Permittee complied with any remedial measures required under this permit.

In any enforcement proceeding, the Permittee seeking to establish the occurrence of an upset has the burden of proof.

G16. PROPERTY RIGHTS

This permit does not convey any property rights of any sort, or any exclusive privilege.

G17. DUTY TO COMPLY

The Permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Clean Water Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application.

G18. TOXIC POLLUTANTS

The Permittee must comply with effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish those standards or prohibitions, even if this permit has not yet been modified to incorporate the requirement.

G19. PENALTIES FOR TAMPERING

The Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than two years per violation, or by both. If a conviction of a person is for a violation committed after a first conviction of such person under this condition, punishment shall be a fine of not more than $20,000 per day of violation, or imprisonment of not more than four (4) years, or both.

G20. REPORTING PLANNED CHANGES

The Permittee must, as soon as possible, give notice to Ecology of planned physical alterations, modifications or additions to the permitted construction activity. The Permittee should be aware that, depending on the nature and size of the changes to the original permit, a new public notice and other permit process requirements may be required. Changes in activities that require reporting to Ecology include those that will result in:

A. The permitted facility being determined to be a new source pursuant to 40 CFR 122.29(b).

B. A significant change in the nature or an increase in quantity of pollutants discharged, including but not limited to: for sites 5 acres or larger, a 20% or greater increase in acreage disturbed by construction activity.

C. A change in or addition of surface water(s) receiving stormwater or non-stormwater from the construction activity.

D. A change in the construction plans and/or activity that affects the Permittee's monitoring requirements in Special Condition S4.

Following such notice, permit coverage may be modified, or revoked and reissued pursuant to 40 CFR 122.62(a) to specify and limit any pollutants not previously limited. Until such modification is effective, any new or increased discharge in excess of permit limits or not specifically authorized by this permit constitutes a violation.

G21. REPORTING OTHER INFORMATION

Where the Permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to Ecology, it must promptly submit such facts or information.

G22. REPORTING ANTICIPATED NON-COMPLIANCE

The Permittee must give advance notice to Ecology by submission of a new application or supplement thereto at least forty-five (45) days prior to commencement of such discharges, of any facility expansions, production increases, or other planned changes, such as process modifications, in the permitted facility or activity which may result in noncompliance with permit limits or conditions. Any maintenance of facilities, which might necessitate

unavoidable interruption of operation and degradation of effluent quality, must be scheduled during non-critical water quality periods and carried out in a manner approved by Ecology.

G23. REQUESTS TO BE EXCLUDED FROM COVERAGE UNDER THE PERMIT

Any discharger authorized by this permit may request to be excluded from coverage under the general permit by applying for an individual permit. The discharger must submit to the Director an application as described in WAC 173-220-040 or WAC 173-216-070, whichever is applicable, with reasons supporting the request. These reasons will fully document how an individual permit will apply to the applicant in a way that the general permit cannot. Ecology may make specific requests for information to support the request. The Director will either issue an individual permit or deny the request with a statement explaining the reason for the denial. When an individual permit is issued to a discharger otherwise subject to the construction stormwater general permit, the applicability of the construction stormwater general permit to that Permittee is automatically terminated on the effective date of the individual permit.

G24. APPEALS

A. The terms and conditions of this general permit, as they apply to the appropriate class of dischargers, are subject to appeal by any person within 30 days of issuance of this general permit, in accordance with Chapter 43.21B RCW, and Chapter 173-226 WAC.

B. The terms and conditions of this general permit, as they apply to an individual discharger, are appealable in accordance with Chapter 43.21B RCW within 30 days of the effective date of coverage of that discharger. Consideration of an appeal of general permit coverage of an individual discharger is limited to the general permit's applicability or nonapplicability to that individual discharger.

C. The appeal of general permit coverage of an individual discharger does not affect any other dischargers covered under this general permit. If the terms and conditions of this general permit are found to be inapplicable to any individual discharger(s), the matter shall be remanded to Ecology for consideration of issuance of an individual permit or permits.

G25. SEVERABILITY

The provisions of this permit are severable, and if any provision of this permit, or application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit shall not be affected thereby.

G26. BYPASS PROHIBITED

A. Bypass Procedures

Bypass, which is the intentional diversion of waste streams from any portion of a treatment facility, is prohibited for stormwater events below the design criteria for

stormwater management. Ecology may take enforcement action against a Permittee for bypass unless one of the following circumstances (1, 2, 3 or 4) is applicable.

1. Bypass of stormwater is consistent with the design criteria and part of an approved management practice in the applicable stormwater management manual.

2. Bypass for essential maintenance without the potential to cause violation of permit limits or conditions.

   Bypass is authorized if it is for essential maintenance and does not have the potential to cause violations of limitations or other conditions of this permit, or adversely impact public health.

3. Bypass of stormwater is unavoidable, unanticipated, and results in noncompliance of this permit.

   This bypass is permitted only if:

   a. Bypass is unavoidable to prevent loss of life, personal injury, or severe property damage. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass.

   b. There are no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, maintenance during normal periods of equipment downtime (but not if adequate backup equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventative maintenance), or transport of untreated wastes to another treatment facility.

   c. Ecology is properly notified of the bypass as required in Special Condition S5.F of this permit.

4. A planned action that would cause bypass of stormwater and has the potential to result in noncompliance of this permit during a storm event.

   The Permittee must notify Ecology at least thirty (30) days before the planned date of bypass. The notice must contain:

   a. A description of the bypass and its cause.

   b. An analysis of all known alternatives which would eliminate, reduce, or mitigate the need for bypassing.

   c. A cost-effectiveness analysis of alternatives including comparative resource damage assessment.

   d. The minimum and maximum duration of bypass under each alternative.

   e. A recommendation as to the preferred alternative for conducting the bypass.

f. The projected date of bypass initiation.

g. A statement of compliance with SEPA.

h. A request for modification of water quality standards as provided for in WAC 173-201A-110, if an exceedance of any water quality standard is anticipated.

i. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the bypass.

5. For probable construction bypasses, the need to bypass is to be identified as early in the planning process as possible. The analysis required above must be considered during preparation of the Stormwater Pollution Prevention Plan (SWPPP) and must be included to the extent practical. In cases where the probable need to bypass is determined early, continued analysis is necessary up to and including the construction period in an effort to minimize or eliminate the bypass.

   Ecology will consider the following before issuing an administrative order for this type bypass:

   a. If the bypass is necessary to perform construction or maintenance-related activities essential to meet the requirements of this permit.

   b. If there are feasible alternatives to bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, stopping production, maintenance during normal periods of equipment down time, or transport of untreated wastes to another treatment facility.

   c. If the bypass is planned and scheduled to minimize adverse effects on the public and the environment.

   After consideration of the above and the adverse effects of the proposed bypass and any other relevant factors, Ecology will approve, conditionally approve, or deny the request. The public must be notified and given an opportunity to comment on bypass incidents of significant duration, to the extent feasible. Approval of a request to bypass will be by administrative order issued by Ecology under RCW 90.48.120.

B. Duty to Mitigate

The Permittee is required to take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit that has a reasonable likelihood of adversely affecting human health or the environment.

APPENDIX A – DEFINITIONS

AKART is an acronym for "all known, available, and reasonable methods of prevention, control, and treatment." AKART represents the most current methodology that can be reasonably required for preventing, controlling, or abating the *pollutants* and controlling pollution associated with a discharge.

Applicable TMDL means a TMDL for turbidity, fine sediment, high pH, or phosphorus, which was completed and approved by EPA before January 1, 2016, or before the date the operator's complete permit application is received by Ecology, whichever is later.

Applicant means an *operator* seeking coverage under this permit.

Benchmark means a *pollutant* concentration used as a permit threshold, below which a *pollutant* is considered unlikely to cause a water quality violation, and above which it may. When *pollutant* concentrations exceed benchmarks, corrective action requirements take effect. Benchmark values are not water quality standards and are not numeric effluent limitations; they are indicator values.

Best Management Practices (BMPs) means schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural and/or managerial practices to prevent or reduce the pollution of waters of the State. BMPs include treatment systems, operating procedures, and practices to control: *stormwater* associated with construction activity, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

Buffer means an area designated by a local *jurisdiction* that is contiguous to and intended to protect a sensitive area.

Bypass means the intentional diversion of waste streams from any portion of a treatment facility.

Calendar Day A period of 24 consecutive hours starting at 12:00 midnight and ending the following 12:00 midnight.

Calendar Week (same as **Week**) means a period of seven consecutive days starting at 12:01 a.m. (0:01 hours) on Sunday.

Certified Erosion and Sediment Control Lead (CESCL) means a person who has current certification through an approved erosion and sediment control training program that meets the minimum training standards established by Ecology (see BMP C160 in the SWMM).

Chemical Treatment means the addition of chemicals to *stormwater* and/or authorized non-stormwater prior to filtration and discharge to surface waters.

Clean Water Act (CWA) means the Federal Water Pollution Control Act enacted by Public Law 92-500, as amended by Public Laws 95-217, 95-576, 96-483, and 97-117; USC 1251 et seq.

Combined Sewer means a sewer which has been designed to serve as a sanitary sewer and a storm sewer, and into which inflow is allowed by local ordinance.

Common Plan of Development or Sale means a site where multiple separate and distinct *construction activities* may be taking place at different times on different schedules and/or by different contractors, but still under a single plan. Examples include: 1) phased projects and projects with multiple filings or lots, even if the separate phases or filings/lots will be constructed under separate contract or by separate owners (e.g., a development where lots are sold to separate builders); 2) a development plan that may be phased over multiple years, but is still under a consistent plan for long-term development; 3) projects in a contiguous area that may be unrelated but still under the same contract, such as construction of a building extension and a new parking lot at the same facility; and 4) linear projects such as roads, pipelines, or utilities. If the project is part of a common plan of development or sale, the disturbed area of the entire plan must be used in determining permit requirements.

Composite Sample means a mixture of grab samples collected at the same sampling point at different times, formed either by continuous sampling or by mixing discrete samples. May be "time-composite" (collected at constant time intervals) or "flow-proportional" (collected either as a constant sample volume at time intervals proportional to stream flow, or collected by increasing the volume of each aliquot as the flow increases while maintaining a constant time interval between the aliquots.

Concrete Wastewater means any water used in the production, pouring and/or clean-up of concrete or concrete products, and any water used to cut, grind, wash, or otherwise modify concrete or concrete products. Examples include water used for or resulting from concrete truck/mixer/pumper/tool/chute rinsing or washing, concrete saw cutting and surfacing (sawing, coring, grinding, roughening, hydro-demolition, bridge and road surfacing). When *stormwater* comingles with concrete wastewater, the resulting water is considered concrete wastewater and must be managed to prevent discharge to *waters of the State*, including *ground water*.

Construction Activity means land disturbing operations including clearing, grading or excavation which disturbs the surface of the land. Such activities may include road construction, construction of residential houses, office buildings, or industrial buildings, site preparation, soil compaction, movement and stockpiling of topsoils, and demolition activity.

Contaminant means any hazardous substance that does not occur naturally or occurs at greater than natural background levels. See definition of "*hazardous substance*" and WAC 173-340-200.

Contaminated Groundwater means groundwater which contains *contaminants*, *pollutants*, or *hazardous substances* that do not occur naturally or occur at levels greater than natural background.

Contaminated Soil means soil which contains *contaminants*, *pollutants*, or *hazardous substances* that do not occur naturally or occur at levels greater than natural background.

Demonstrably Equivalent means that the technical basis for the selection of all stormwater BMPs is documented within a SWPPP, including:

1. The method and reasons for choosing the stormwater BMPs selected.

2. The *pollutant* removal performance expected from the BMPs selected.
3. The technical basis supporting the performance claims for the BMPs selected, including any available data concerning field performance of the BMPs selected.
4. An assessment of how the selected BMPs will comply with state water quality standards.
5. An assessment of how the selected BMPs will satisfy both applicable federal technology-based treatment requirements and state requirements to use all known, available, and reasonable methods of prevention, control, and treatment (AKART).

Department means the Washington State Department of Ecology.

Detention means the temporary storage of *stormwater* to improve quality and/or to reduce the mass flow rate of discharge.

Dewatering means the act of pumping *ground water* or *stormwater* away from an active construction site.

Director means the Director of the Washington State Department of Ecology or his/her authorized representative.

Discharger means an owner or *operator* of any facility or activity subject to regulation under Chapter 90.48 RCW or the Federal Clean Water Act.

Domestic Wastewater means water carrying human wastes, including kitchen, bath, and laundry wastes from residences, buildings, industrial establishments, or other places, together with such ground water infiltration or surface waters as may be present.

Ecology means the Washington State Department of Ecology.

Engineered Soils means the use of soil amendments including, but not limited, to Portland cement treated base (CTB), cement kiln dust (CKD), or fly ash to achieve certain desirable soil characteristics.

Equivalent BMPs means operational, source control, treatment, or innovative BMPs which result in equal or better quality of stormwater discharge to *surface water* or to *ground water* than BMPs selected from the SWMM.

Erosion means the wearing away of the land surface by running water, wind, ice, or other geological agents, including such processes as gravitational creep.

Erosion and Sediment Control BMPs means BMPs intended to prevent erosion and sedimentation, such as preserving natural vegetation, seeding, mulching and matting, plastic covering, filter fences, sediment traps, and ponds. Erosion and sediment control BMPs are synonymous with stabilization and structural BMPs.

Federal Operator is an entity that meets the definition of "*Operator*" in this permit and is either any department, agency or instrumentality of the executive, legislative, and judicial branches of

the Federal government of the United States, or another entity, such as a private contractor, performing construction activity for any such department, agency, or instrumentality.

Final Stabilization (same as **fully stabilized** or **full stabilization**) means the establishment of a permanent vegetative cover, or equivalent permanent stabilization measures (examples of permanent non-vegetative stabilization methods include, but are not limited to riprap, gabions or geotextiles) which prevents erosion.

Ground Water means water in a saturated zone or stratum beneath the land surface or a surface waterbody.

Hazardous Substance means any dangerous or extremely hazardous waste as defined in RCW 70.105.010 (5) and (6), or any dangerous or extremely dangerous waste as designated by rule under chapter 70.105 RCW; any hazardous substance as defined in RCW 70.105.010(10) or any hazardous substance as defined by rule under chapter 70.105 RCW; any substance that, on the effective date of this section, is a hazardous substance under section 101(14) of the federal cleanup law, 42 U.S.C., Sec. 9601(14); petroleum or petroleum products; and any substance or category of substances, including solid waste decomposition products, determined by the director by rule to present a threat to human health or the environment if released into the environment. The term hazardous substance does not include any of the following when contained in an underground storage tank from which there is not a release: crude oil or any fraction thereof or petroleum, if the tank is in compliance with all applicable federal, state, and local law.

Injection Well means a well that is used for the subsurface emplacement of fluids. (See Well.)

Jurisdiction means a political unit such as a city, town or county; incorporated for local self-government.

National Pollutant Discharge Elimination System (NPDES) means the national program for issuing, modifying, revoking and reissuing, terminating, monitoring, and enforcing permits, and imposing and enforcing pretreatment requirements, under sections 307, 402, 318, and 405 of the Federal Clean Water Act, for the discharge of *pollutants* to surface waters of the State from point sources. These permits are referred to as NPDES permits and, in Washington State, are administered by the Washington State Department of Ecology.

Notice of Intent (NOI) means the application for, or a request for coverage under this general permit pursuant to WAC 173-226-200.

Notice of Termination (NOT) means a request for termination of coverage under this general permit as specified by Special Condition S10 of this permit.

Operator means any party associated with a construction project that meets either of the following two criteria:

- The party has operational control over construction plans and specifications, including the ability to make modifications to those plans and specifications; or

- The party has day-to-day operational control of those activities at a project that are necessary to ensure compliance with a SWPPP for the site or other permit conditions (e.g., they are authorized to direct workers at a site to carry out activities required by the SWPPP or comply with other permit conditions).

Permittee means individual or entity that receives notice of coverage under this general permit.

pH means a liquid's measure of acidity or alkalinity. A pH of 7 is defined as neutral. Large variations above or below this value are considered harmful to most aquatic life.

pH Monitoring Period means the time period in which the pH of *stormwater* runoff from a site must be tested a minimum of once every seven days to determine if *stormwater* pH is between 6.5 and 8.5.

Point Source means any discernible, confined, and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, and container from which *pollutants* are or may be discharged to surface waters of the State. This term does not include return flows from irrigated agriculture. (See Fact Sheet for further explanation.)

Pollutant means dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, domestic sewage sludge (biosolids), munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, and industrial, municipal, and agricultural waste. This term does not include sewage from vessels within the meaning of section 312 of the CWA, nor does it include dredged or fill material discharged in accordance with a permit issued under section 404 of the CWA.

Pollution means contamination or other alteration of the physical, chemical, or biological properties of waters of the State; including change in temperature, taste, color, turbidity, or odor of the waters; or such discharge of any liquid, gaseous, solid, radioactive or other substance into any *waters of the State* as will or is likely to create a nuisance or render such waters harmful, detrimental or injurious to the public health, safety or welfare; or to domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses; or to livestock, wild animals, birds, fish or other aquatic life.

Process Wastewater means any water which, during manufacturing or processing, comes into direct contact with or results from the production or use of any raw material, intermediate product, finished product, byproduct, or waste product. If *stormwater* commingles with process wastewater, the commingled water is considered process wastewater.

Receiving Water means the waterbody at the point of discharge. If the discharge is to a *storm sewer system*, either surface or subsurface, the receiving water is the waterbody to which the storm system discharges. Systems designed primarily for other purposes such as for ground water drainage, redirecting stream natural flows, or for conveyance of irrigation water/return flows that coincidentally convey *stormwater* are considered the receiving water.

Representative means a *stormwater* or wastewater sample which represents the flow and characteristics of the discharge. Representative samples may be a grab sample, a time-proportionate *composite sample*, or a flow proportionate sample. Ecology's Construction Stormwater Monitoring Manual provides guidance on representative sampling.

Responsible Corporate Officer for the purpose of signatory authority means: (i) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation, or (ii) the manager of one or more manufacturing, production, or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures (40 CFR 122.22).

Sanitary Sewer means a sewer which is designed to convey domestic wastewater.

Sediment means the fragmented material that originates from the weathering and erosion of rocks or unconsolidated deposits, and is transported by, suspended in, or deposited by water.

Sedimentation means the depositing or formation of sediment.

Sensitive Area means a waterbody, wetland, stream, aquifer recharge area, or channel migration zone.

SEPA (State Environmental Policy Act) means the Washington State Law, RCW 43.21C.020, intended to prevent or eliminate damage to the environment.

Significant Amount means an amount of a *pollutant* in a discharge that is amenable to available and reasonable methods of prevention or treatment; or an amount of a *pollutant* that has a reasonable potential to cause a violation of surface or ground water quality or sediment management standards.

Significant Concrete Work means greater than 1000 cubic yards poured concrete or recycled concrete used over the life of a project.

Significant Contributor of Pollutants means a facility determined by Ecology to be a contributor of a significant amount(s) of a *pollutant*(s) to waters of the State of Washington.

Site means the land or water area where any "facility or activity" is physically located or conducted.

Source Control BMPs means physical, structural or mechanical devices or facilities that are intended to prevent *pollutants* from entering *stormwater*. A few examples of source control

BMPs are erosion control practices, maintenance of stormwater facilities, constructing roofs over storage and working areas, and directing wash water and similar discharges to the *sanitary sewer* or a dead end sump.

Stabilization means the application of appropriate BMPs to prevent the erosion of soils, such as, temporary and permanent seeding, vegetative covers, mulching and matting, plastic covering and sodding. See also the definition of Erosion and Sediment Control BMPs.

Storm Drain means any drain which drains directly into a *storm sewer system*, usually found along roadways or in parking lots.

Storm Sewer System means a means a conveyance, or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains designed or used for collecting or conveying *stormwater*. This does not include systems which are part of a *combined sewer* or Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2.

Stormwater means that portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes, and other features of a stormwater drainage system into a defined surface waterbody, or a constructed infiltration facility.

Stormwater Management Manual (SWMM) or **Manual** means the technical Manual published by Ecology for use by local governments that contain descriptions of and design criteria for BMPs to prevent, control, or treat *pollutants* in *stormwater*.

Stormwater Pollution Prevention Plan (SWPPP) means a documented plan to implement measures to identify, prevent, and control the contamination of point source discharges of *stormwater*.

Surface Waters of the State includes lakes, rivers, ponds, streams, inland waters, salt waters, and all other surface waters and water courses within the jurisdiction of the State of Washington.

Temporary Stabilization means the exposed ground surface has been covered with appropriate materials to provide temporary stabilization of the surface from water or wind erosion. Materials include, but are not limited to, mulch, riprap, erosion control mats or blankets and temporary cover crops. Seeding alone is not considered stabilization. Temporary stabilization is not a substitute for the more permanent "*final stabilization.*"

Total Maximum Daily Load (TMDL) means a calculation of the maximum amount of a *pollutant* that a waterbody can receive and still meet state water quality standards. Percentages of the total maximum daily load are allocated to the various pollutant sources. A TMDL is the sum of the allowable loads of a single *pollutant* from all contributing point and nonpoint sources. The TMDL calculations must include a "margin of safety" to ensure that the waterbody can be protected in case there are unforeseen events or unknown sources of the *pollutant*. The calculation must also account for seasonable variation in water quality.

Transfer of Coverage (TOC) means a request for transfer of coverage under this general permit as specified by General Condition G9 of this permit.

Treatment BMPs means BMPs that are intended to remove *pollutants* from *stormwater*. A few examples of treatment BMPs are detention ponds, oil/water separators, biofiltration, and constructed wetlands.

Transparency means a measurement of water clarity in centimeters (cm), using a 60 cm transparency tube. The transparency tube is used to estimate the relative clarity or transparency of water by noting the depth at which a black and white Secchi disc becomes visible when water is released from a value in the bottom of the tube. A transparency tube is sometimes referred to as a "turbidity tube."

Turbidity means the clarity of water expressed as nephelometric turbidity units (NTUs) and measured with a calibrated turbidimeter.

Uncontaminated means free from any contaminant. See definition of "*contaminant*" and WAC 173-340-200.

Waste Load Allocation (WLA) means the portion of a receiving water's loading capacity that is allocated to one of its existing or future point sources of pollution. WLAs constitute a type of water quality based effluent limitation (40 CFR 130.2[h]).

Water-only Based Shaft Drilling is a shaft drilling process that uses water only and no additives are involved in the drilling of shafts for construction of building, road, or bridge foundations.

Water quality means the chemical, physical, and biological characteristics of water, usually with respect to its suitability for a particular purpose.

Waters of the State includes those waters as defined as "waters of the United States" in 40 CFR Subpart 122.2 within the geographic boundaries of Washington State and "waters of the State" as defined in Chapter 90.48 RCW, which include lakes, rivers, ponds, streams, inland waters, underground waters, salt waters, and all other surface waters and water courses within the jurisdiction of the state of Washington.

Well means a bored, drilled or driven shaft, or dug hole whose depth is greater than the largest surface dimension. (See Injection well.)

Wheel Wash Wastewater means any water used in, or resulting from the operation of, a tire bath or wheel wash (BMP C106: Wheel Wash), or other structure or practice that uses water to physically remove mud and debris from vehicles leaving a construction site and prevent track-out onto roads. When *stormwater* comingles with wheel wash wastewater, the resulting water is considered wheel wash wastewater and must be managed according to Special Condition S9.D.9.

APPENDIX B – ACRONYMS

AKART	All Known, Available, and Reasonable Methods of Prevention, Control, and Treatment
BMP	Best Management Practice
CESCL	Certified Erosion and Sediment Control Lead
CFR	Code of Federal Regulations
CKD	Cement Kiln Dust
cm	Centimeters
CTB	Cement-Treated Base
CWA	Clean Water Act
DMR	Discharge Monitoring Report
EPA	Environmental Protection Agency
ERTS	Environmental Report Tracking System
ESC	Erosion and Sediment Control
FR	Federal Register
LID	Low Impact Development
NOI	Notice of Intent
NOT	Notice of Termination
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Unit
RCW	Revised Code of Washington
SEPA	State Environmental Policy Act
SWMM	Stormwater Management Manual
SWPPP	Stormwater Pollution Prevention Plan
TMDL	Total Maximum Daily Load
UIC	Underground Injection Control
USC	United States Code
USEPA	United States Environmental Protection Agency
WAC	Washington Administrative Code
WQ	Water Quality
WWHM	Western Washington Hydrology Model

F. 303(d) List Waterbodies / TMDL Waterbodies Information-NA

G. Contaminated Site Information-NA

H. Engineering Calculations

Appendix G-4: Camas Solar Project Geotechnical Engineering Study

Swiftwater
Environmental & Geotechnical

Geotechnical Engineering Study, Phase 1
Camas Solar Array Site
4561 NE 6 Road
Ellensburg, Washington
Project No. 170019:GES

Site Description

The subject site is a single tax lot, Kittitas County Tax Parcel No. 10566, and is located at 4561 No. 6 Road in Ellensburg, Washington. The site is roughly elongate in shape with the long axis oriented roughly northeast to southwest with the west property line abutting Highway 97 and comprises 45.08 acres. The site is currently being used to cultivate hay. The site is bounded to the west by Highway 97 and to the east by a perennial creek that drains from the northeast to the southwest. The site is bounded to the north by Tjossem Road. A high-pressure gas main extends across the property from northeast to southwest across the eastern one-third of the property. The site is sloped gently from north to south with an overall inclination of about four percent. Access to the lot is from the northeast corner onto a gravel lot that contains an older wood-framed barn with storage for flood-irrigation pipe and other accoutrements.

Proposed Site Development

It is our understanding that a series of linear solar panel racks will be constructed on the property along with access/maintenance roads and power infrastructure for distribution to the power grid. Locations for the racks have not been selected and we have not been provided with detailed plans and specifications for installation of the solar panels nor have we been provided with a grading plan. However, based on review of similar projects, we believe that very little grading will be required to construct the solar panel racks. We understand that the solar panels are attached end to end on horizontal steel rods that are supported on driven H-beams. The solar panels are attached to the horizontal supports which are oriented north-south. The panels rotate so that they are always exposed to the sun as it moves from east to west. We assume that the maintenance roads will run between the racks, provide access to the electrical infrastructure elements, and will probably run around the perimeter of the array.

If development plans should change or if our assumptions regarding development are incorrect, Swiftwater Environmental and Geotechnical (SEG) should be contacted as soon as possible to review and/or revise the recommendations contained herein. SEG should be provided an opportunity to review final plans and specifications to confirm that these recommendations have been incorporated into the plans.

Subsurface Conditions

On April 26, 2017, SEG personnel observed the installation of two test borings using a track-mounted vibratory drilling rig – a GeoProbe 8140 LC – also known as a sonic rig. A four-inch steel hollow-stem drill string is driven into the soil under high-frequency vibratory loading. Standard Penetration Testing (SPT) is then carried out at standard depths for this type of report. For this project, we directed the drillers to complete at least one SPT at the surface before drilling commenced to collect N-values for the surficial soils. SPTs were then variously carried out at standard depths of 2.5', 5.0', 7.5', 10.0', 12.5' and 15.0'. Based on hardness of drilling during advancement of the core barrel, we decided to forego some of the intermediate samples since we would be reviewing a complete sample after drilling was completed and would be able to identify unusual strata within the samples. Samples were collected from the SPT split-spoons at the appropriate depths and prepared for storage and removal from the site

One of the advantages of using the sonic drill rig is that a continuous four-inch diameter sample is collected in the hollow stem drill string as it is advanced. The continuous soil sample is then extruded into polyethylene bags and removed from the immediate area of the drill rig. The continuous sample can then be examined by cutting the bag open to expose the entire 2.4 to 4-foot sample. We were thus able to closely examine the soil profile and to identify bearing soils with unusual precision. The borings were advanced to a maximum depth of 16.5 feet below existing grade. We understand that standard H-beam penetration for this type of installation is six to eight feet below grade. Boring locations are shown on the attached Boring Location Plan (Figure 2) along with the Boring Logs on subsequent pages. Please refer to the Boring Logs for detailed descriptions of the site soils. A general description of soils and groundwater conditions is provided below.

The boring locations were selected to attempt to be representative of the entire site. Boring C-1 was completed in the north-northwest quadrant of the site, immediately to the south and west of the barn and staging area and Boring C-2 was located in the southeast quadrant of the site about 100 meters west of the creek alignment as shown on the attached Boring Location Plan. The soil profiles in both borings were very consistent and we believe that based on the depositional environment in available mapping and also on the locally flat topography, that the soil profile across the site will be similar to the profiles found in the borings.

In Boring C-1, we observed less than six inches of very dark brown highly organic sod underlain by a brown, moist medium dense "topsoil" like loam soil with varying amounts of fine gravel. We encountered this material to a depth of about four feet below grade. The driller reported an extensive change to very hard drilling at about 4.5 to 5 feet below grade and the SPT sample at 5.0 feet revealed a gray to dark gray silty sandy, partially cemented gravel with thin (<l" fine sand seams) that contained perched groundwater. N-values in this material was in excess of 40 and remained above that until termination of the hole at 16.5 feet below grade.

In Boring C-2, we observed a soil profile that was nearly identical to that found in C-1. Boring C-2 was terminated in this unit at 16.5 feet below grade.

In both borings, we observed that drilling was difficult with depth beginning at about three and a half to four feet below grade indicating that adequate embedment soils are present from about three to four feet below grade down to the depth of our test borings.

Groundwater

We encountered minor seepage in both borings from about eight and a half to 10 feet below grade. This water was encountered in thin relative clean sand seams and appears to have been "perched" within the seams as additional groundwater was not noted below these depths. Additional groundwater flow may be observed during the wetter winter months.

If grading and/or construction is carried out during the winter or spring months, the contractor should anticipate that possible groundwater seepage might be present and should plan accordingly. The entire profile of the site soils is moisture sensitive and those soils will be difficult to use as structural fill during the rainy winter and spring months. The underlying partially cemented sandy gravel soils will be less moisture-sensitive, but natural variability of the fine-grained fraction (e.g. silts and clay minerals) might cause these soils to be moisture-sensitive as well. In any case, if excavated site soils are to be used as structural fill, they should be protected from moisture while stock-piled.

Geologic Setting

According to the USGS Open File Report 1127, *Late Cenozoic Deposits, Landforms, Stratigraphy, and Tectonism in Kittitas Valley, Washington*, Richard B. Waitt, Jr., 1979, the subject site and surrounding area are underlain by Qs (Quaternary Alluvium, Sidestream Facies) which is characterized as downstream aggradation deposits with their source being upstream glacial moraines located to the west and northwest areas of the Kittitas Valley. These deposits consist primarily of basaltic gravels and sands with varying amounts of silt and clay minerals. The gravel varies from fine to coarse with occasional specimens in excess of one and a half meters. These undifferentiated sandy GRAVEL deposits are overlain by varying thicknesses of topsoil, weathered sandy gravel horizons, and loessal (wind) deposits that comprise the silty SAND and sandy SILT units that we observed from the surface down to the relatively un-weathered, partially cemented gravel. The gravel deposits consistently displayed some level of cementation that is most likely caused by breakdown of the basaltic rock to silt and clay minerals and then subsequent re-lithification under normal loading. The soils we observed in our borings at the subject site are consistent with this mapping.

In Boring C-2, we encountered a fine-grained, reddish brown to tan silty clay to clayey silt unit underlying the sandy gravel deposits. We contacted Dr. Nick Zentner, Professor of Geological Sciences at Central Washington University about this unit. Dr. Zentner indicated that it is probably an alluvial deposit that develops in slow-water areas and ox-bows proximate to streams and to the Yakima River. Dr. Zentner stated that these deposits are horizontally discontinuous and are found throughout the valley. The deposit on the subject site is thus likely limited in lateral extent, especially given that we did not encounter it in Boring C-1.

General Discussion and Recommendations

Based on the results of our site investigation, construction of the proposed solar panel array is feasible from a geotechnical standpoint provided that strong enough vertical H-beam supports are provided. The density of the soil matrix combined with the weight of the hammer might possibly damage the pile leading to less than satisfactory bearing capacity values. In this case, it would be prudent to complete several test borings to determine if the piles can be placed with damage.

We understand that the site will be developed by constructing linear racks of structural members to which the solar panels will be attached. The racks will be oriented north to south, which support the solar panels on east to west oscillating horizontal members. Those horizontal members are in turn supported on a series of driven steel H-beams. We have reviewed plans for similar installations and it appears that there is variation in the length of the horizontal supports meaning there will be variation on the total loading for each individual H-beam. For example, some H-beams will support eight solar panels along with their mounting and support equipment while others will support six panels, etc. This means that for a design bearing capacity, pile embedment depths will vary or possibly, the H-beam sizing will need to be increased. *In either case, it is critical that final plans be reviewed by SEG to ensure that appropriate bearing capacities and embedment lengths have been incorporated into the plans and specifications.* Further, SEG should be retained to provide construction monitoring to ensure that the H-beams are installed in accordance with the plans and specifications and to document that adequate bearing capacity is developed.

Final bearing capacities and embedment lengths can be computed once the loading for the piles has been provided to us. Alternatively, we can estimate the loading for each pile if we are provided with information about the weight of the panels, supporting members and ancillary equipment. In either case, we have been informed that this information will be forthcoming and we can then complete the pile designs. We have attached a figure that shows the appropriate embedment zone for the H-beams.

We strongly recommend that once the bearing capacities and embedment lengths have been determined, a series of test piles should be driven using the same equipment that will be used during construction. The purpose of this testing is two-fold: 1) it is necessary to determine that the piles can be driven into the bearing soils to the required embedment depth without damaging the pile and, 2) it is required in order to load test the resulting piles to determine that adequate bearing capacity is being developed.

Wind Loading

The Kittitas Valley, particularly the Ellensburg area, is known for year-around windy conditions. We understand that the solar panels that will be used for this project are 32-square-foot panels mounted immediately adjacent to one another in linear "bays" of seven or eight panels. Therefore, for purposes of computing wind-loading, each bay will effectively be a single panel of 224 or 256 square feet.

We computed the maximum wind load for a 32-square-foot panel using the Uniform Building Code (UBC, 1997) formula with the preferred alternate methodology for computing wind pressure. We also used the Enigneering News Record (ENR) methodology in or order to check consistency across methodology. The following are wind loads for a four-foot by eight-foot panel erected vertically that is exposed to wind that is moving over a flat surface with few obstructions. Wind speeds were obtained from the Applied Technology Council (ATC) website wherein maximum wind speeds are obtained by location. The ASCE site-specific wind speed values are obtained from the ASCE manuals noted, but were retrieved from the

ATC Windspeed by Location website. The wind speed values were then used in the UBC formula to calculate the following values for wind pressure in pounds for a single four-foot by eight-foot solar panel.

• ASCE 7-93 Wind speed (fastest mile in mph	70 mph	593 lbs
• ASCE 7-05 Wind speed (3 second peak gust)	85 mph	878 lbs
• ASCE 7-10 100-year Mean Recurrence Interval	91 mph	1006 lbs
• ASCE 7-10 Risk Category II	110 mph	1470 lbs

The wind pressure values are the functional equivalent of lateral pressure on the H-beams. These values are maximum values. Wind pressure and equivalent lateral pressure will be less than the values shown because the solar panels are rarely, or never, in a vertical position and presumably can be rotated to a horizontal position before or during high-wind events to "spill" wind over time. Further, we believe that end to end placement of the panels will lead to an overall increase in per-panel value due to the failure of the wind to "spill" over the panel edges. Once we have received the H-beam size information, we can compute actual lateral loads based on the wind pressure values above.

Site Preparation and Earthwork

We anticipate that site preparation for the subject site will consist of installation of Temporary Erosion and Sedimentation Control (TESC) measures, installation of grade staking, establishing clearing and grading limits, site clearing and stripping, and possible stockpiling of strippings and organic material in non-structural areas. Once these activities have been completed, installation of underground utilities and final grading can occur and construction of the solar panel array can commence.

Infiltration and Temporary Erosion and Sedimentation Control (TESC)

It is important to understand and utilize Low Impact Development (LID) practices and LID Best Management Practices (BMP) in Eastern Washington to reduce or eliminate concentrated storm water runoff and erosion. BMP also help limit the introduction of pollutants/contamination into Eastern Washington's arid land soils and rangeland soils. BMP that address these issues can be found in the Washington State Department of Ecology (DOE) publication 13-10-036, *Eastern Washington Low Impact Development Guidance Manual*, June 13, 2013.

Construction of the solar array will tend to create a *variable* increase in the total *and effective* impervious area of the site that is equivalent to the area of the solar panels and associated infrastructure. The increase is variable because the panels move in accordance with the position of the sun and are tilted most of the time. There will also be an increase in less pervious area because of the proposed gravel access roads.

Based on the results of our subsurface investigation, we believe that infiltration into the upper, topsoil-like silty sand/sandy silt soils is not only feasible, but is ongoing. This site, like many others in the vicinity of Ellensburg, have been cultivated using flood irrigation methods. This consists of running a perforated PVC pipe along the upslope side of a site and simply flooding the entire area. Irrigation water percolates into the soil and is stored above the underlying relatively impervious layer found throughout the area. Based on our observations at several of these sites and on publications and anecdotal testimonies, it is clear that these soils are quite capable of infiltrating storm water during an average year. According to the referenced DOE publication, Ellensburg is located in Climate Region 2 – Central Basin – and receives

an average of about eight inches of precipitation per year, some of it in the form of snow. Given the variable nature of the solar panel position, and relatively low precipitation in the area, combined with the natural permeability of the upper soil horizon, it is our opinion that infiltration of normal storm water amounts will occur and that normal levels of storm water will not be concentrated to a significant extent.

Based on the texture and class of the soil types that we encountered, and on a review of various documents related to storm water control in Eastern Washington, it is our opinion that it is reasonable to assume an infiltration rate of 1.02 inches/hour for the upper, silty sand unit and 0.27 inches/hour for the underlying sandy gravel. The rate for the sandy gravel unit is assumed to be low because of the presence of fine-grained silt and clay minerals in the interstitial spaces and fractures of this partially cemented unit.

Temporary construction ingress and egress should be completed prior to the start of on-going construction traffic. A temporary construction entrance should be constructed of 8-12 inches of quarry spalls. If the soils in the entrance location are soft, a layer of geotextile fabric can be laid down as a barrier prior to placement of quarry spalls. The quarry spalls will provide a stable entrance/exit to the site and will limit tracking of mud onto Tjossem Road during and after wet weather. TESC measures consist of installation of silt fencing *as needed* around the site entrance, around the perimeter of the low side of the site, and at discharge points where sediment-laden surface water may enter off-site drainage features. Because the subject site is flat and slopes very gently to the south, silt fencing will probably not be required at the south perimeter unless desired by Kittitas County.

Stripping

No well-developed sod or heavily organic topsoil layer was observed at this site because of ongoing cultivation, thus stripping should not be required. If a topsoil horizon is observed in areas where maintenance roads are proposed, the topsoil should be removed down to mineral soil and replaced with crushed rock or structural fill. It is important that all deleterious material is removed prior to placement of structural fill. Topsoil strippings can be stockpiled for use in non-structural areas, as desired, but should not be allowed to mix with soils that will be used for structural fill.

Native Soils and Imported Soils

Native site soils encountered below the surface contain significant fines and are very moisture sensitive. However, if moisture content is near optimum, the soil can be used as compacted structural fill. Excavated site soils should be stockpiled and covered immediately if they are to be saved and used as structural fill. If the soils are above optimum moisture content, it may be possible to aerate them to reduce moisture content. This is possible during the warmer summer months, but it is difficult to achieve uniform moisture content. It may also be possible to use Portland cement as an admixture to reduce moisture content. If the site soils cannot be adequately compacted, it may be necessary to use imported soil for structural fill. Imported soil should be a well-graded granular mineral soil with fines content below five percent (i.e. less than five percent passing the No. 200 sieve) and should be at or slightly above the optimum moisture content. If construction is scheduled to occur during periods where precipitation is expected, a contingency should be built into the project budget for imported soil/crushed rock base (CRB) and other costs associated with placement of imported structural fill.

Subgrade Preparation

Once the site has been prepared for construction of the maintenance roads and placement of the H-beams, a SEG representative should observe subgrade conditions to confirm that they are as expected and to provide additional recommendations, if necessary. If disturbed native soil is encountered in structural areas (e.g. maintenance road prism or foundations for solar panel infrastructure) the fill should re-compacted in accordance with the specifications for structural fill or should be removed and replaced with structural fill as required to reach design grade. As an alternative, CRB can be placed and compacted. SEG should observe and confirm subgrade conditions as construction progresses. The contractor should be prepared to retain a local materials testing firm to sample soils to be used as structural fill, collect samples for Proctor testing, and to provide compaction testing as structural fill is placed, as needed.

Structural Fill

Structural fill is fill that is deliberately placed in thin lifts and compacted to a design specification. Structural fill is intended to support overlying structures in a manner that produces little or no post-construction movement. It is typically used under foundations, slabs, in utility trenches, roads, behind retaining walls, and in constructed slopes. Structural fill should be placed in loose lifts that do not exceed 12 inches and compacted to a relative compaction of 95 percent of maximum dry density as determined by Modified Proctor (ASTM D1557). Compaction specifications may vary, especially in utility trenches in public or private roads as specified by the local jurisdiction. Moisture content is critical to achieving adequate densification (compaction) and the upper unit of the site soils is very moisture sensitive, e.g. a small change in moisture content can make them unusable as structural fill. *If the soils are stockpiled and not covered, precipitation will make them difficult or impossible to use as structural fill.*

Foundations

We believe that foundations for the electrical infrastructure elements of the project can be supported on undisturbed, competent, native sandy gravel soils found below the upper topsoil-like horizon, on re-compacted native soils, on structural fill, or on CRB. Where loose or unsuitable soils are encountered at design subgrade, it will be necessary to re-compact the native soils to structural fill specifications or to over-excavate down to competent native soils then place structural fill or CRB up to design subgrade.

If the subgrade is prepared as described above, the following parameters may be used for design:

- Allowable soil bearing capacity — 1,500 psf
- Passive earth pressure — 300 pcf (equivalent fluid)
- Coefficient of friction — 0.35

A one-third increase in the allowable soil bearing capacity may be assumed for short-term wind and seismic loading conditions. The passive pressure and friction values above include a factor-of-safety of at least 1.5. With anticipated structural loads, total settlement of one inch and differential settlement of one-half inch is anticipated. Most settlement should occur during construction, as dead loads are applied.

Seismic Design

The 2015 International Building Code recognizes the American Society of Civil Engineers (ASCE) for seismic site class definitions. In accordance with Table 20.3-1 of the ASCE Minimum Design Loads for Buildings and Other Structures manual, Site Class D should be used for design.

Based on our observations of the upper native silty sand soils and the underlying partially cemented sandy gravels, it is our opinion that the subject site has very low susceptibility to liquefaction. Liquefaction is a phenomenon wherein loose, saturated soils suddenly lose shear strength and begin to behave as a fluid. Liquefaction typically occurs under seismic loading conditions and if structures are supported on soils that liquefy, structural damage can occur. The site groundwater and native soil conditions we observed in the test borings have allowed us to reach this conclusion.

Drainage

We observed minor seepage in both borings but it appears to have been water in a "perched" condition in thin fine sand seams. We do not anticipate appreciable amounts of seepage during any excavation however, during the rainy winter months, it is prudent to anticipate seepage in excavations and groundwater control measures should be on-site or readily available, including trash pumps, sumps and discharge ditches. Seepage may create instability in the walls of excavations – SEG should be notified if seepage is observed in excavations so that control measures may be discussed with the contractor and properly implemented. The site should be graded such that surface water is directed away from structures and slopes. Surface water must never be allowed to pond near the tops or toes of slopes. Based on the soil types observed in our test pits, it is our opinion that infiltration is not feasible at this site. Storm water discharge BMPs should be implemented to control runoff from the site. Sediment-laden surface water must be treated such that water discharged from the site meet all water quality requirements. Storm water should not be discharged over the slope to the north of the site.

Excavations/Slopes

Soils observed in the upper one and a half to two feet of the test borings would be classified as OSHA/WISHA Type C. Temporary excavations like utility excavations and foundation excavations with heights in excess of four feet must be sloped no steeper than 1.5H:1V. If seepage is observed in these excavations, they may need to be sloped at 2H:1V to prevent sloughing due to seepage pressure. The dense native sandy gravel soil observed below about two feet would be considered OSHA/WISHA Type B soils and can be laid back at 1H:1V.

SEG should be contacted to observe temporary slopes and utility excavations as they are constructed or excavated to assess slope stability and recommend additional measures, if necessary.

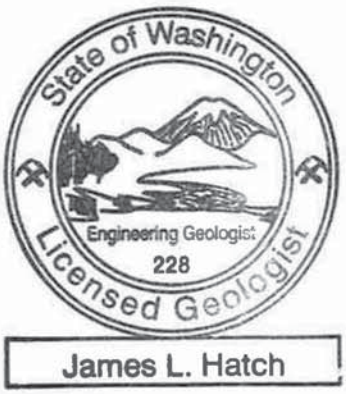
Utility Support, Trenches, and Trench Backfill

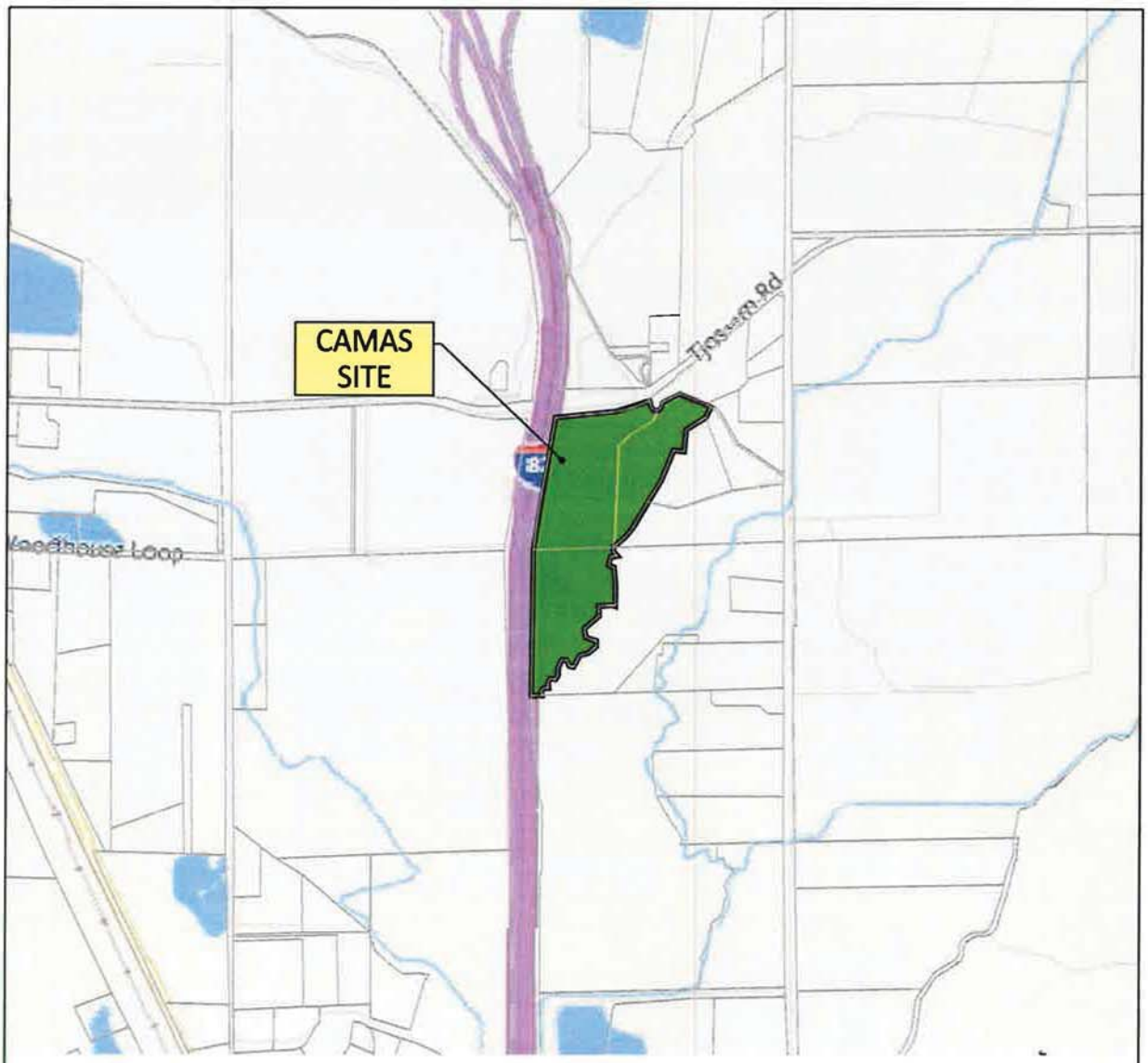
Site soils should be suitable for support of solar panel infrastructure and utilities. In shallower trenches, particularly shallower than about two feet, it may be necessary to over-excavate loose or wet soil down to suitable, stable soils, and then replace them with compacted structural fill or CRB. Groundwater seepage may be encountered in trench walls, particularly if deeper than two to three feet. Seepage may cause caving of the trench walls and temporary shoring may be required. Dewatering measures may also be needed to control seepage and SEG should be contacted to assess the need for such measures.

Site soils may be suitable for use as backfill provided the moisture content is optimal as determined in the laboratory. Trench backfill should be placed and compacted in accordance with the specifications for structural fill as described above or in accordance with specifications provided by the local jurisdiction. CRB should be placed in six to eight inch lifts and compacted with a plate compactor or other compaction device.

Limitations

This report is an instrument of service and has been prepared for the exclusive use of Tuusso Energy, LLC and their representatives and agents. The recommendations and conclusions provided in this study are professional opinions consistent with the level of care and skill that is typical of other members of the profession currently practicing in this area. A warranty is neither expressed nor implied. Variations in the soil and groundwater conditions observed in the test boring locations may exist and may not become apparent until construction commences. SEG should reevaluate the conclusions contained in this study if such variations are encountered.







NOT TO SCALE

CAMAS VICINITY MAP

Swiftwater
Environmental & Geotechnical
Western Washington Division
165 NE Juniper Street, Suite 201A • Issaquah, WA 98027 • Phone: (425) 321-0787
Eastern Washington Division
407 Swiftwater Blvd., Suite A • Cle Elum, WA 98922 • Phone: (425) 321-0787

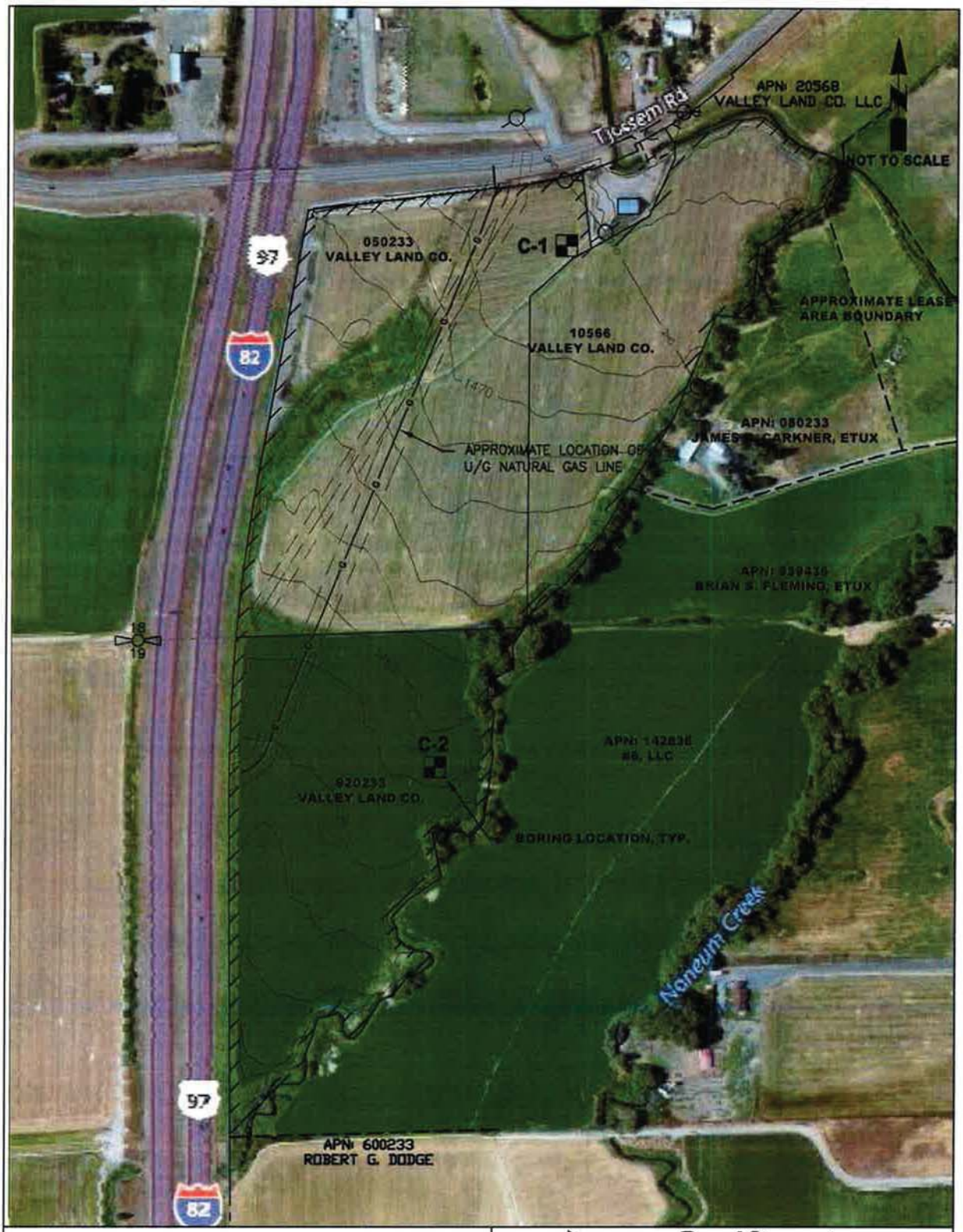


FIG. 2
CAMAS SITE
TEST BORING LOCATIONS

Swiftwater
Environmental & Geotechnical
Western Washington Division
165 NE Juniper Street, Suite 201A • Issaquah, WA 98027 • Phone: (425) 321-0787
Eastern Washington Division
407 Swiftwater Blvd., Suite A • Cle Elum, WA 98922 • Phone: (425) 321-0787

Swiftwater
Environmental & Geotechnical

Project:	Tuusso Energy - CAMAS Site	170019	Date: 4/26/2017
Location	4561 No. 6 Road	Surface Elevation	Groundwater 8.5'
Earthwork Contractor	Excavation Equip.	Logged By	
Holocene Drilling	GeoProbe 8104 LC	JH	

Depth (feet) From	Depth (feet) To	Tests	USCS Soil Class.	
0.0	4.5 +/-	n - 8	SM	Dark brown silty fine SAND to sandy SILT, moist, loose to medium dense.
4.5	5.0	N - 3	SM/GP	Gray to bown silty sandy GRAVEL to gravelly SAND, moist, medium dense grading to very dense with depth. Some cementation
10.0	11.5	N - 43	SM/GP	Same
15.0	16.5	N - 43	SM/GP	Same - Test boring terminated at 16.5 feet below grade

Notes: 3-6" Topsoil / Sod @ Surface

Minor seepate noted at -8.5

TEST BORING NO.	C-1
Page	1 OF 1

Swiftwater
Environmental & Geotechnical

Project:	Tuusso Energy - CAMAS Site	170019	Date: 4/26/2017
Location	4561 No. 6 Road	Surface Elevation	Groundwater 8.5'
Earthwork Contractor	Excavation Equip.	Logged By	
Holocene Drilling	GeoProbe 8104 LC	JH	

Depth (feet) From	Depth (feet) To	Tests	USCS Soil Class.	
0.0	4.5 +/-	n - 7	SM	Dark brown silty fine SAND to sandy SILT, moist, loose to medium dense.
4.5	5.0	N - 4	SM/GP	Gray to bown silty sandy GRAVEL to gravelly SAND, moist, medium dense grading to very dense with depth. Minor cementation
10.0	11.5	N - 32	SM/GP	Same - 6 inch silt seam with minor perched seepage
15.0	16.5	N - 30	SM/GP	Same - Test boring terminated at 16.5 feet below grade

Notes: 3-6" Topsoil / Sod @ Surface

Minor seepate noted at -8.5

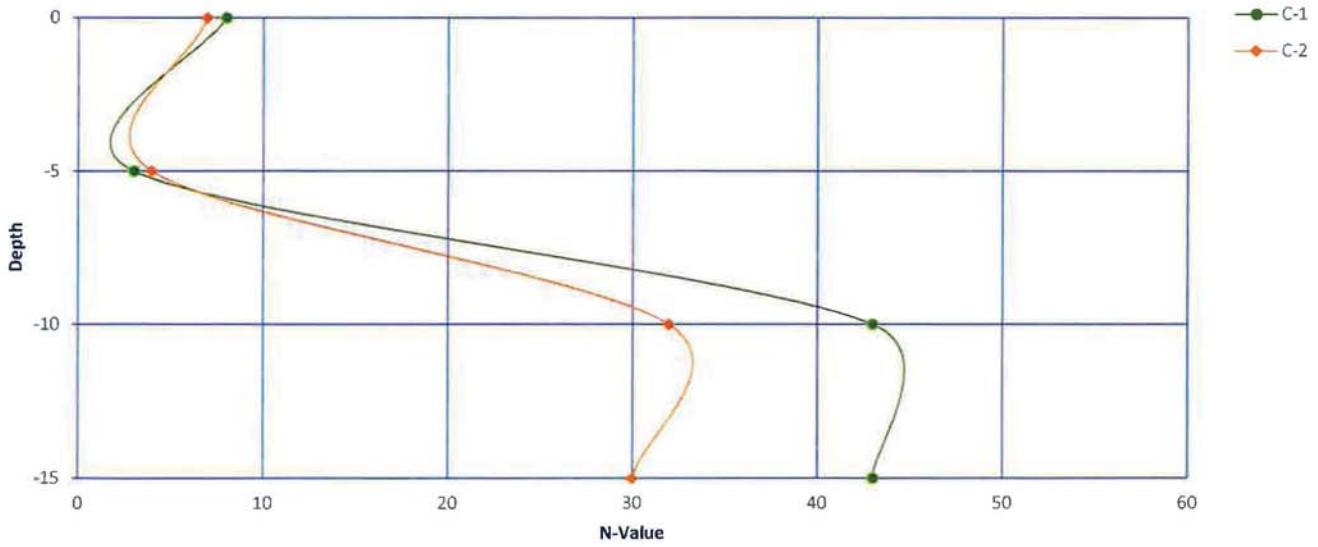
TEST BORING NO.	C-2
Page	1 OF 1

Swiftwater
Environmental & Geotechnical

Project:	Tuusso - Camas Site	Project No.	170019:GES	Date:	6/6/2017
Location	4561 No. 6 Road	Surface Elevation		Groundwater	N/A
Earthwork Contractor	Excavation Equip.	Logged By			
Holocene Driling	Geoprobe 8104	JH			

C-1		C-2	
Depth (ft)	N	Depth (ft)	N
0.0	8.0	0.0	7.0
-5.0	3.0	-5.0	4.0
-10.0	43.0	-10.0	32.0
-15.0	43.0	-15.0	30.0

Approximate Embedment Depth



Note: Tests conducted per ASTM D1586-11 (Standard test method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils)

Page	1 OF 1

Appendix G-5: Camas Solar Project Drainage Report

Tuusso Energy
Camas Solar Project:
DRAINAGE REPORT

Date: July 2017

Prepared by:
Encompass Engineering & Surveying
407 Swiftwater Blvd
Cle Elum, WA 98922

Table of Contents

I. INTRODUCTION 2
II. EXISTING CONDITIONS 2
a. Drainage Basins 3
b. Downstream Analysis 3
c. Soil Report 3
III. PROPOSED CONDITIONS 3
a. Solar Panel Array 4
b. Drainage Basin 4
IV. HYDROLOGIC MODELING- SANTA BARBARA URBAN HYDROGRAPH METHOD 4
a. Precipitation 4
b. Curve Number 4
c. Time of Concentration 5
d. Flow Calculations 5
V. HYDROLOGIC ANALYSIS 5
VI. COMPLIANCE WITH SWMMEW CORE ELEMENTS 6
VII. CONCLUSION 7

List of Figures

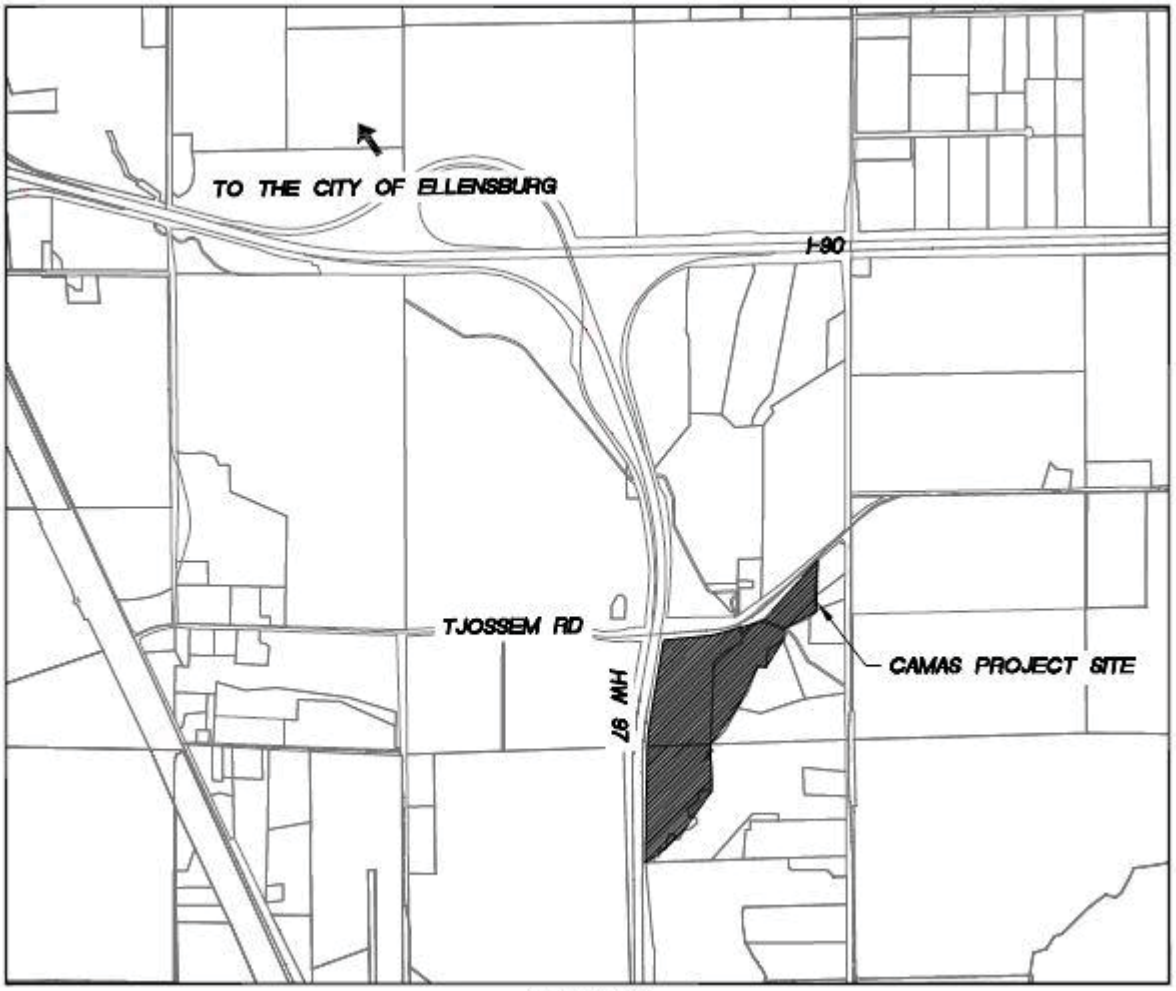
Figure 1- Existing Conditions Exhibit
Figure 2- Proposed Conditions Exhibit

Appendix

Appendix A- NRCS Web Soil Survey
Appendix B- *SWMMEW* Isopluvial Maps
Appendix C- Curve Number Calculations
Appendix D- HydroCAD Report: Existing Basin
Appendix E- HydroCAD Report: Proposed Basin

I. INTRODUCTION

Per Kittitas County assessor records the Tuusso Energy: Camas Solar Project site is comprised of Tax Parcel Nos. 50233, 10566, 20568, and 920233, at 2100 Tjossem Road in Ellensburg, WA, in the SE ¼ of Section 18 and the NE ¼ of Section 19, Township 17 North, Range 19 East W.M. The project site is 51.21 acres and currently used as agricultural land to produce hay. See Vicinity Map below.



VICINITY MAP

The purpose of this project is to convert the site to photovoltaic solar project with minimal change to the existing topography and site features. The proposed site will consist of rows of modular trackers with solar panels, all-weather access roads, and inverter stations to convert power from the solar panels. The solar panels are attached to horizontal supports that run north-south, and the panels themselves rotate east to west, in order to maximize sun exposure. Access to the site is from the north of the site, off of Tjossem Road.

II. EXISTING CONDITIONS

The site is currently an open field used to make hay using flood irrigation methods. The overall topography of the site gently slopes to the south. The surface water that does not infiltrate flows to

the south. The western edge of the site is bordered by an irrigation ditch flowing to the south, while a second irrigation ditch flows southwest along the southeastern edge of the site. These irrigation ditches meet at the southwest corner of the site before crossing under HWY 82 in existing irrigation infrastructure. A third irrigation ditch runs southeast through the northern portion of the site. Existing conditions can be seen in Figure 1.

a. Drainage Basins

For the purpose of this report, the site is considered to be made up of two drainage basins, which can be seen in Figure 1. Drainage Basin 1 captures the majority of the site, and it includes everything that is south and west or the irrigation ditch that runs through the northern portion of the site. Drainage Basin 2 is the small, northeast portion of the site that is separated from the rest of the site by a prominent irrigation ditch, as previously mentioned. All of the runoff is either infiltrated on-site or flows to the south/southwest. The existing drainage currently has a barn on it which results in 0.06 acres of impervious area on the site, while the remaining 51.15 acres are pervious.

b. Downstream Analysis

As noted above, all runoff from the site flows into the existing irrigation ditch that leaves the site at the southwest corner of the site and flows under HWY 82. This ditch is currently maintained by the current landowner. The irrigation ditch is part of a larger irrigation network that serves the rural areas south of Ellensburg. As this ditch is an irrigation facility, the flow rates are currently controlled as needed. The ditch flows south from the site for approximately ½ mile before discharging into Naneum Creek and then Wilson Creek. No issues have been brought up in relation to the existing irrigation infrastructure downstream of the project site.

c. Soil Report

An NRCS Web Soil Survey was performed for the site in order to obtain onsite soil types. The results of the reports give descriptions of the soils found in the project area and the corresponding hydrologic soil groups. The results can be seen in APPENDIX A. The site is composed of Opnish ashy loam, Mitta ashy silt loam, and Nosal ashy silt loam, all with 0-2% slopes. Opnish ashy loam and Mitta ashy silt loam belong to Hydrologic Soil Group C. Nosal ashy silt loam is classified as Group C for drained areas and Group D for undrained areas. For this study, it is considered Group D, which is the more conservative classification.

III. PROPOSED CONDITIONS

The proposed development on this site consists of adding solar trackers, access roads, fencing, and associated electrical infrastructure. The new impervious surface will be a portion of the solar trackers (described below), the proposed all-weather access roads (which may be compacted soil or gravel) that will run northeast/southwest through the site, and the electrical infrastructure that is made up of five inverters and one utility disconnect with a project metering location. Each inverter and the utility disconnect, resides on its own concrete pad. The access roads were conservatively modeled as gravel roads.

a. Solar Panel Array

A series of modular trackers will be installed throughout the site. Each tracker is essentially a long horizontal support (of various lengths), held in place by evenly spaced driven H-beams. The trackers are oriented north-south, with solar panels attached to the entire length of the tracker. The solar panels rotate and tilt east to west to maximize sun exposure. The panels will generate runoff within the site, however, due to the way the panels tilt and that they are not continuous structures, they are not considered impervious in the proposed conditions calculations. The panels do not reduce available ground surface for infiltration. The ground below the solar panels will have native plantings, and therefore it will continue to intercept and infiltrate runoff water from the panels. The only impervious area due to the solar panels is from the posts in the ground upon which the solar panels are attached. For impervious calculations, the posts are conservatively estimated to make up 5% of the total area of the solar tracker configuration.

b. Drainage Basin

Minimal grading and ground disturbance will take place as part of this project. The access roads, concrete pads for the electrical infrastructure, and solar tracker posts are the only impervious surfaces proposed for the site. The portion of the solar panel array installation that actually disturbs the ground is very minimal as well. Because of this, existing topography and drainage patterns will remain relatively undisturbed, and the proposed drainage basins encompass the same area as the existing drainage basins. Proposed conditions can be seen in Figure 2.

IV. HYDROLOGIC MODELING- SANTA BARBARA URBAN HYDROGRAPH METHOD

Hydrologic analysis for the proposed project is consistent with Title 12 of the Kittitas County Code and the 2004 *SWMMEW*. In order to properly analyze the impacts of the proposed development on the watershed, runoff modeling was done using the Santa Barbara Urban Hydrograph method (SBUH), SCS Type 1A 24-hour storm event for Region 2 per the 2004 *SWMMEW*. This was done to determine peak runoff during the 2-year, 10-year, 25-year and 100-year storm events. Calculations were performed utilizing HydroCAD version 10.00-18, which is accepted by the Department of Ecology as a proper simulation modeling program.

a. Precipitation

The precipitation information used for the pre-development and post-development run-off calculations is based on the isopluvial maps provided in the 2004 *SWMMEW* and can be seen in APPENDIX B. The inputs for this project site south of Ellensburg are seen below:

P_{2yr} = 1.0”
P_{10yr} = 1.2”
P_{25yr} = 1.6”
P_{100yr} = 2.0”

b. Curve Number

The SCS Curve Number (CN) is a function of the soil type and ground cover. It is used to determine the portion of the precipitation depth that will be conveyed as runoff. The curve numbers are pulled from *Technical Release 55 Urban Hydrology for Small Watersheds*, and the curve numbers used can be seen in Table 1.

Table 1: Curve Numbers Used

DESCRIPTION	HYDROLOGIC SOIL GROUP			
	A	B	C	D
Meadow	30	58	71	78
Impervious areas	98	98	98	98
Gravel Roads	76	85	89	91

Using the soils report and the curve number table, a composite curve number was determined for the proposed and existing basins. A detailed curve number breakdown can be seen in APPENDIX C. Calculations can also be seen in APPENDIX D and E as part of the HydroCAD report.

c. Time of Concentration

Time of concentration is the time it takes for the runoff to get from the most hydrologically distant location to the point of collection for the basin. The flow path is broken up into three segments, with the hydrologic travel time calculated separate for each segment.

- Sheet flow- flow over plane surfaces which usually occurs at the headwaters of a catchment area. The maximum allowable length for sheet flow is 300-ft
- Shallow concentrated flow-flow in headwater areas where flow begins to concentrate in small rills or rough channels
- Channel flow- flow that is concentrated in defined channels

The time of concentration is the total of the travel times for each flow segment. Time of concentration calculations can be seen in APPENDIX D and E as part of the HydroCAD report.

d. Flow Calculations

HydroCAD uses all of the inputs described above in order to determine the peak flows for various storm events. All the inputs are combined to create an instantaneous hydrograph which is then routed through a modeled reservoir with a time delay equal to the time of concentration in order to generate the runoff hydrograph. The runoff hydrograph can be found in APPENDIX D and E as part of the HydroCAD report. The peak runoff values for the 2, 10, 25 and 100-year storms can be seen below in Table 2.

Table 2: Flow rates

Q (cfs)				
Time Span	**2-yr**	10-yr	**25-yr**	100-yr
Existing Basin 1	**0.07**	0.17	**0.50**	1.09
Existing Basin 2	**0.01**	0.02	**0.06**	0.13
Proposed Basin 1	**0.09**	0.20	**0.57**	1.20
Proposed Basin 2	**0.01**	0.02	**0.07**	0.15

V. HYDROLOGIC ANALYSIS

As seen in the calculated peak flow rates, the increased runoff due to proposed site development is minimal. The 2-yr peak flow is increased by 0.02 cfs for Basin 1, while it remains unchanged for Basin 2. The 25-yr peak flow is increased by 0.07 cfs and 0.01 cfs for Basins 1 and 2 respectively. Typically,

SWMMEW requires developments to release runoff at or below one half of the existing 2-yr peak flow and at or below the existing 25-yr peak flow, as well as for that runoff to be treated.

Per Chapter 2.2.6 of the *SWMMEW* there are exemptions for new development when flow control is not required as long as certain conditions are met. Per chapter 2.6.6 exemption 1, states: "Any project able to disperse, without discharging to surface waters, the total 25-year runoff volume for the proposed development condition" is exempt from meeting the flow control requirements. The Camas project will use full dispersion as the main way to handle increased flows due to impervious areas. As outlined in *SWMMEW* Chapter 6.5, BMP F6.42, full dispersion allows up to 10% of the site that is impervious to be characterized as non-effective impervious area by dispersing runoff into the native vegetation area. On the Camas site, the impervious areas conservatively make up to 4.0% of the site while the rest of the site maintains plantings similar to existing vegetation. This is under the 10% threshold, making full dispersion a viable option.

Chapter 2.2.5 of the *SWMMEW* summarizes the requirements for treating storm water runoff to reduce pollutant loads and concentrations. Runoff treatment is required for all projects creating 5,000 square feet or more of pollutant-generating impervious surfaces (PGIS). The Camas site is not classified as a high use site and all of the proposed impervious surfaces are considered Non-Pollutant Generating Impervious Surfaces (NPGIS). Infrequently used maintenance access roads are classified as NPGIS, and thus are exempt from basic treatment requirements. The solar panels are detached impervious surfaces which the water flows off of and into natural vegetation below. The inverter pads are concrete pads, which the inverters and transformers sit on. The inverters contain no fluids. The transformers may be "dry", meaning they contain no fluids, or they may contain fluids, that has not been finalized yet. If they do contain fluid, it would be Envirotemp or a similar biodegradable vegetable based coolant. Therefore, the inverter pads will be considered NPGIS as well, however if that classification is challenged, they make up no more than 3,600 square feet, which is below the 5,000 square feet threshold. The Camas site meets the exemption requirement, and therefore no treatment measures will be necessary or put in place.

While analyzing the effects of increased storm water runoff, it is also important to note any other changes that will occur on the site due to the development. One thing of note on the Camas site is that it is currently cultivated using flood irrigation methods. In this method, an excess amount of water is applied to the site for irrigation, and the general assumption is that half of the applied water actually goes to the crop while the other half is lost to evaporation, runoff, infiltration or transpiration (*Alliance for Water Efficiency: Flood Irrigation Introduction*). With the construction of this project, the flood irrigation will be minimized, if not stopped completely. The net loss of surface water due to reducing flood irrigation will be greater than the minimal increases in stormwater runoff due to the construction associated with the solar panel farm. Therefore, the additional runoff of the peak 2-yr and 25-yr storms of 0.02 and 0.07 cfs respectively, is considered negligible when analyzing the site as a whole.

VI. COMPLIANCE WITH *SWMMEW* CORE ELEMENTS

All new development projects must comply with the 8 Core Elements outlined in Chapter 2 in the *SWMMEW* when applicable. Exemptions exist for each Core Element and vary depending on

requirements that must be met. The Core Elements are listed below in relation to the proposed development of the Tuusso Energy: Camas Solar Project, and exemptions are noted when applicable

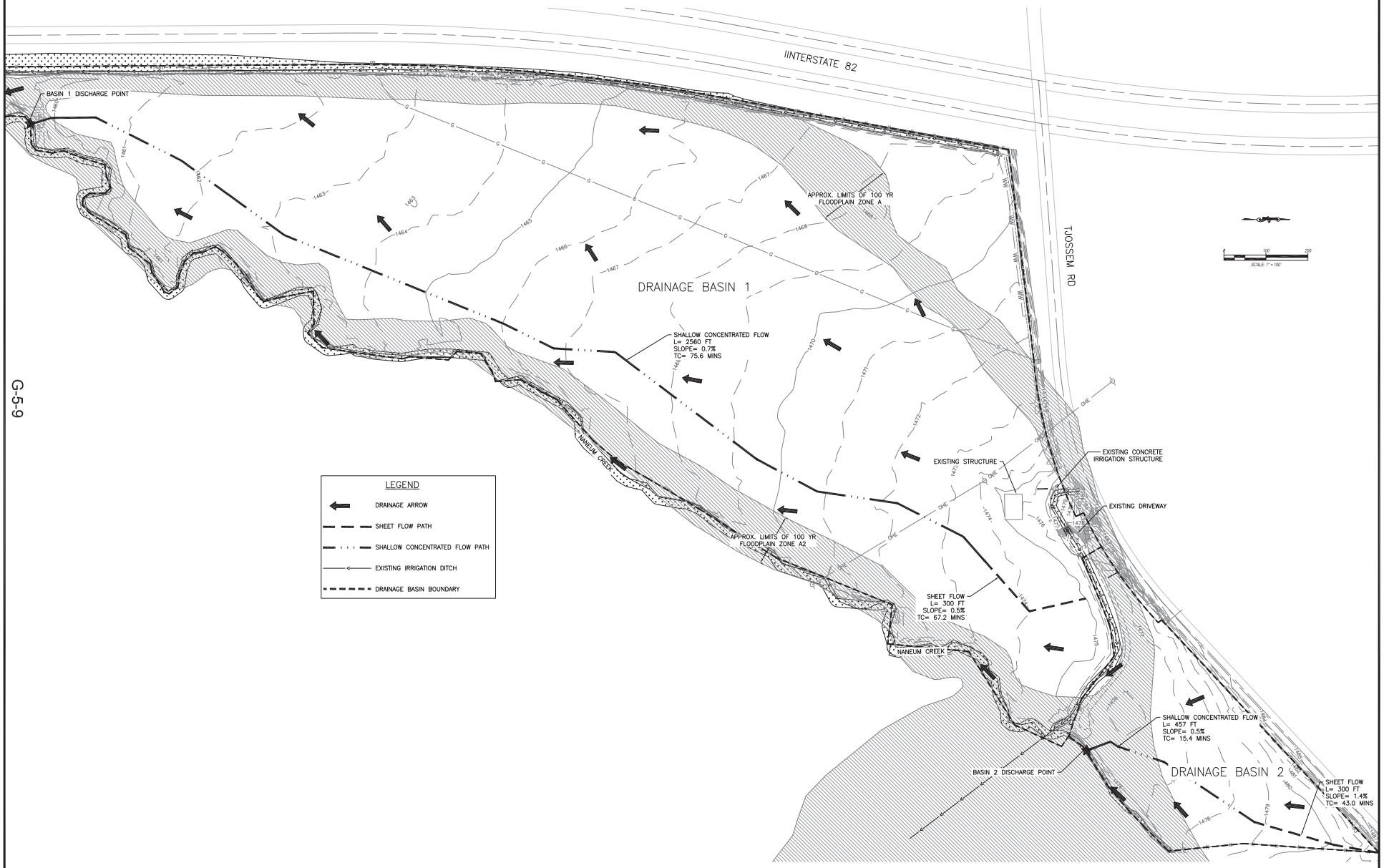
1. Preparation of a Stormwater Site Plan:
    - This can be seen in Figure 2- Proposed Drainage Basin Map, and will be included in the civil plans.
2. Construction Stormwater Pollution Prevention:
    - This will be included as part of the SWPPP submittal.
3. Source Control Pollution
    - The only potential fluid on the site is a biodegradable vegetable based coolant, which is not classified as a pollutant. Therefore, no point source pollutants are on the site.
4. Preservation of Natural Drainage Systems
    - Minimal grading will occur on site and natural drainage patterns will be maintained.
5. Runoff Treatment
    - The site satisfies the requirement for full dispersion and is not a high use site, making it exempt from runoff treatment.
6. Flow Control
    - Per Exemption 1 in chapter 2.6.6 of *SWMMEW*, the site will use full dispersion to control the 2 and 25-yr flows.
7. Operation and Maintenance
    - No on-site maintenance is required for full dispersion. Maintenance of existing off-site drainage ditches will be performed by the current landowner.
8. Local Requirements
    - There are no local ordinances above and beyond what is outlined in *SWMMEW*

VII. CONCLUSION

The Tuusso Energy: Camas Solar Project involves transforming 51.21 acres of an existing hay field, into a solar project. The project consists of adding an array of solar panels, access roads, and the associated electrical infrastructure. Existing topography will be preserved to the maximum extent possible and native plantings will be made throughout the site. From a stormwater and drainage standpoint, the biggest impacts of the project will be from converting 2.06 acres into impervious surfaces in the form of all-weather access roads, electrical infrastructure, and posts for the solar trackers. 2.06 acres is an overestimate of impervious area, as it maxes out the percentage of impervious to pervious surfaces based on the design of the solar panel trackers. All site and location factors were taken into account in order to perform the SBUH hydrologic modelling method. The calculations from the modelling showed that the runoff generated from the 2-yr storm increased from 0.07 cfs to 0.09 cfs for Basin 1 while it remained at 0.01 cfs for Basin 2. Runoff generated from the 25-yr storm increased from 0.50 cfs to 0.57 cfs for Basin 1 and from 0.06 cfs to 0.07 cfs for Basin 2. This increased runoff can be handled by full dispersion throughout the site, due to protecting a majority of the existing vegetation. The increased runoff is also considered negligible, due to the reduction of flood irrigation to the site which will accompany the project.

TUUSSO ENERGY - CAMAS SITE

A PORTION OF THE SE 1/4 OF SECTION 18 AND THE NE 1/4 OF SECTION 19, T. 17 N., R. 19 E., W.M.
KITTITAS COUNTY, STATE OF WASHINGTON



G-5-9

TUUSSO ENERGY, LLC
CAMAS SITE

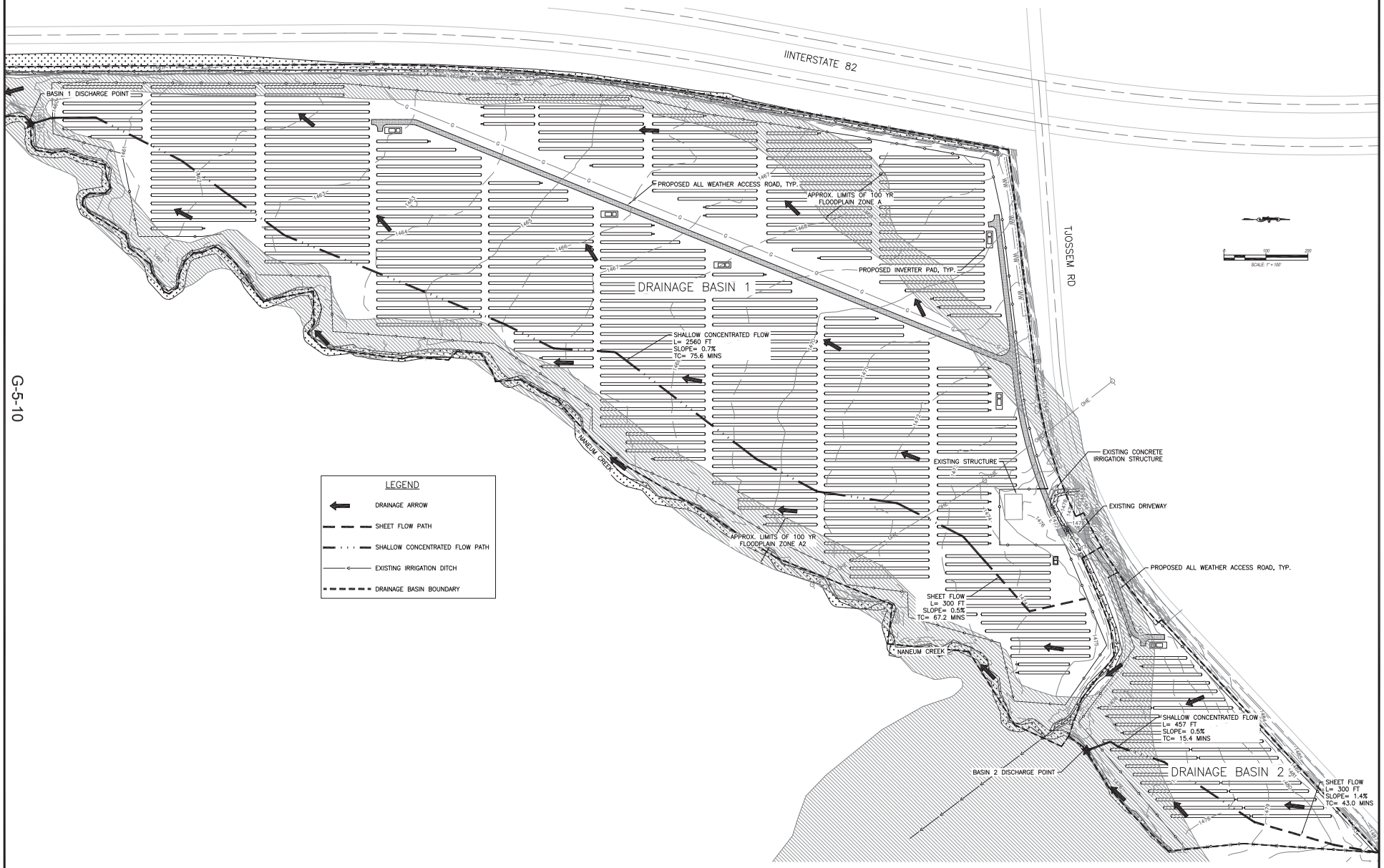
EXISTING DRAINAGE CONDITIONS

Encompass
ENGINEERING & SURVEYING
165 NE Juniper Street, Suite 201 ▪ Issaquah, WA 98027 ▪ Phone: (425) 392-0250 ▪ Fax: (425) 391-3055
Eastern Washington Division
107 Southwest Blvd ▪ Ste. Ellum, WA 99362 ▪ Phone: (509) 925-7013 ▪ Fax: (509) 624-7999

JOB NO.	17017
DATE	July 2017
SCALE	AS SHOWN
DESIGNED	SF
DRAWN	SF
CHECKED	TML
APPROVED	TML
SHEET	FIG-1

TUUSSO ENERGY - CAMAS SITE

A PORTION OF THE SE 1/4 OF SECTION 18 AND THE NE 1/4 OF SECTION 19, T. 17 N., R. 19 E., W.M.
KITTITAS COUNTY, STATE OF WASHINGTON



G-5-10

TUUSSO ENERGY, LLC
CAMAS SITE

PROPOSED DRAINAGE CONDITIONS

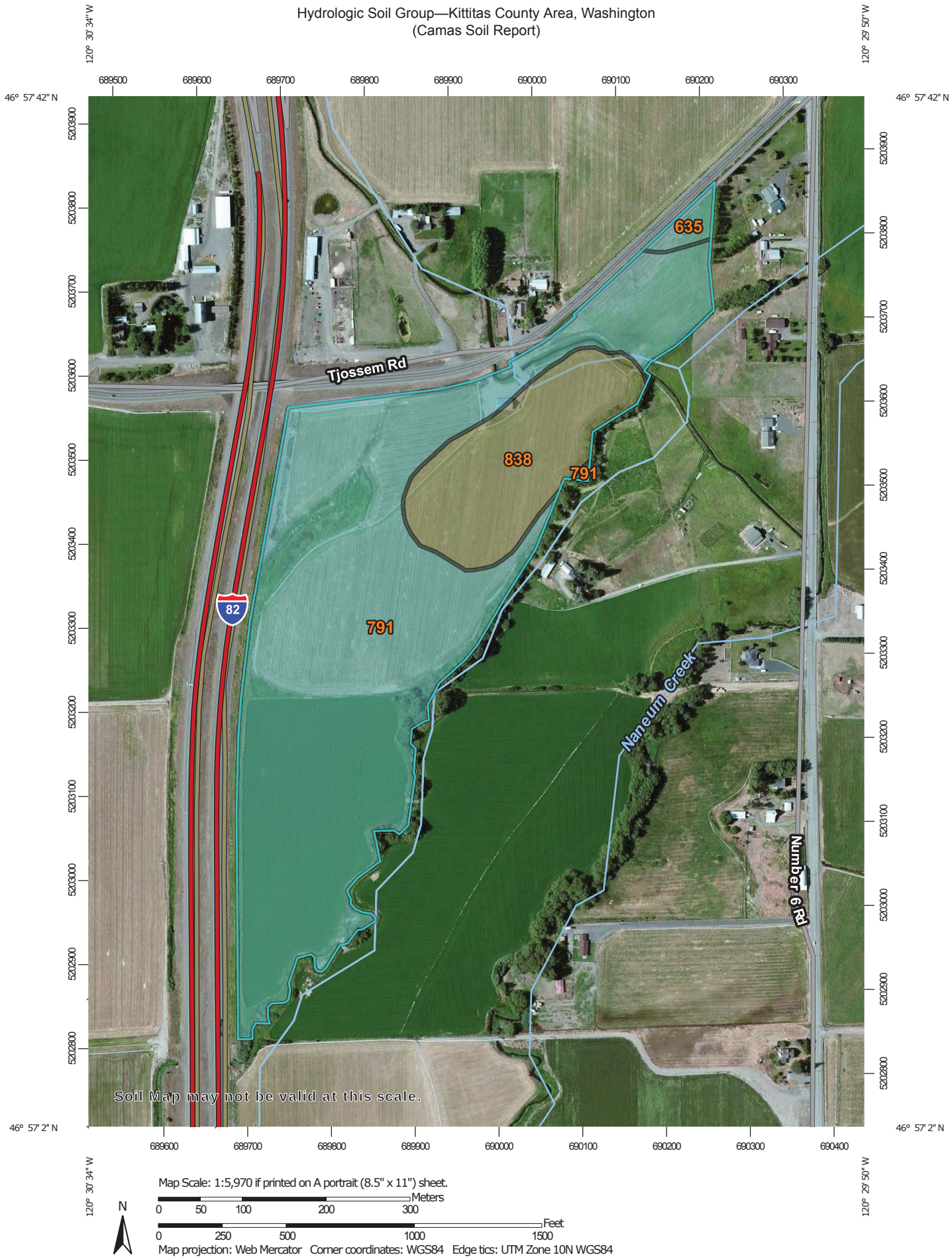
Encompass
ENGINEERING & SURVEYING
165 NE Juniper Street, Suite 201 ▪ Issaquah, WA 98027 ▪ Phone: (425) 392-0250 ▪ Fax: (425) 391-3055
Eastern Washington Division
107 Southwest Blvd ▪ E. Ellum, WA 99362 ▪ Phone: (509) 474-7013 ▪ Fax: (509) 474-7019

JOB NO.	17017
DATE	July 2017
SCALE	AS SHOWN
DESIGNED	SF
DRAWN	SF
CHECKED	TML
APPROVED	TML
SHEET	FIG-2

Appendix A:

NRCS WEB SOIL SURVEY

Hydrologic Soil Group—Kittitas County Area, Washington
(Camas Soil Report)



Map Scale: 1:5,970 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 50 100 200 300

Feet
0 250 500 1000 1500

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Soil Rating Lines

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Soil Rating Points

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Water Features

Streams and Canals

Transportation

Rails
Interstate Highways
US Routes
Major Roads
Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Kittitas County Area, Washington
Survey Area Data: Version 9, Sep 9, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 19, 2010—Aug 19, 2010

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

G-5-13

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Kittitas County Area, Washington (WA637)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
635	Opnish ashy loam, 0 to 2 percent slopes	C	0.8	1.5%
791	Mitta ashy silt loam, drained, 0 to 2 percent slopes	C	41.1	80.3%
838	Nosal ashy silt loam, 0 to 2 percent slopes	C/D	9.3	18.3%
Totals for Area of Interest			**51.2**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

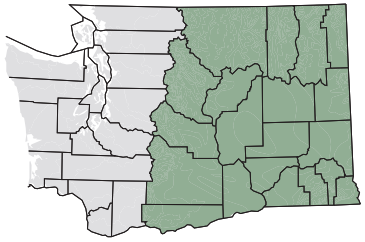
Tie-break Rule: Higher

Appendix B:

SWMMEW ISOPLUVIAL MAPS



Eastern Washington Stormwater Manual



2-Year 24-Hour Isopluvials

Source: NOAA Atlas 2, Volume IX, 1973
Precipitation in inches

County(2003, 1:24,000)
City(2003, 1:24,000)
Latitude/Longitude(1/10 degree)
Isopluvial(1973, 1:2,000,000)
NOAA/NWS Station(1931-1998)

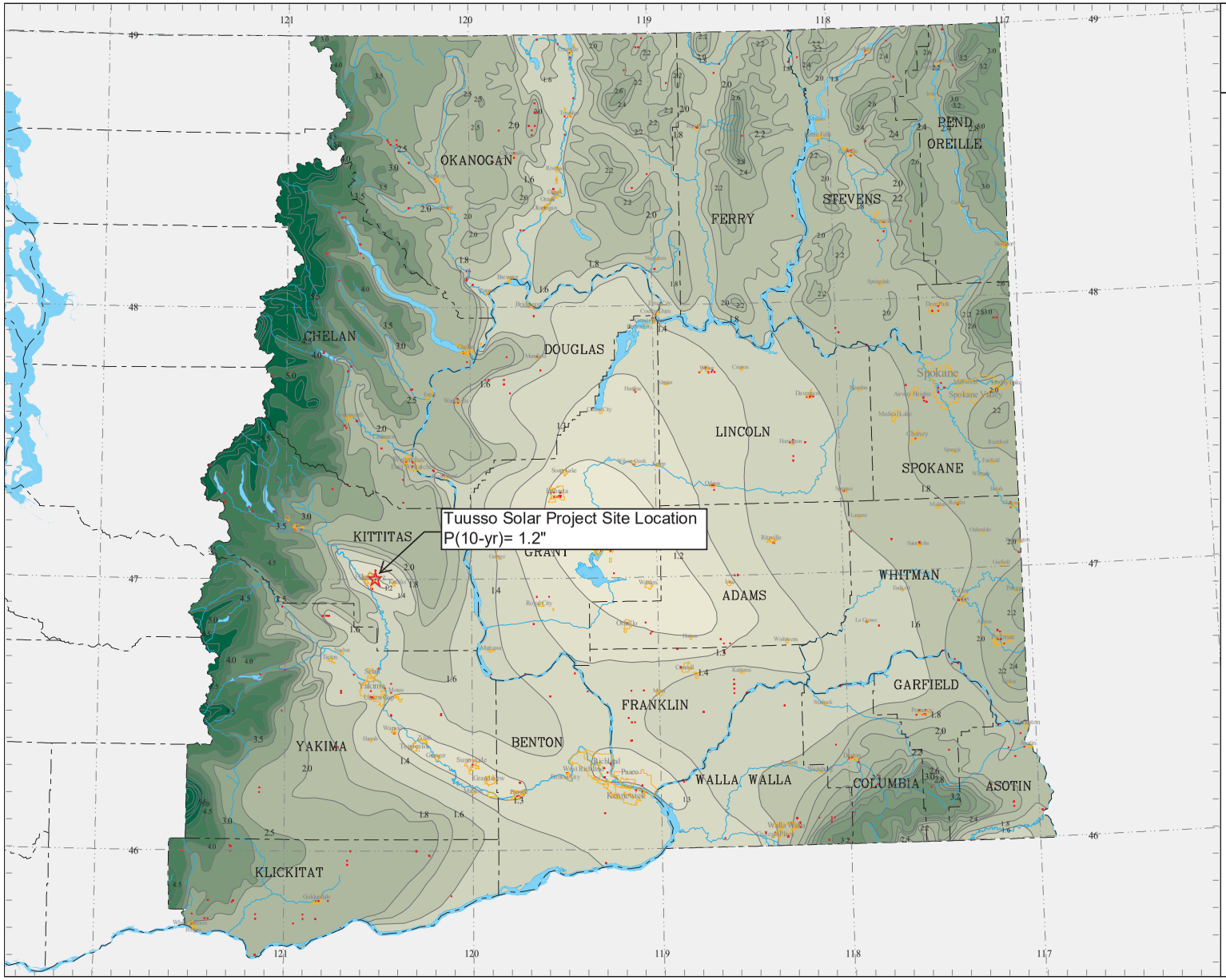
N

Scale 1:1,600,000
Miles
0 16.5 33

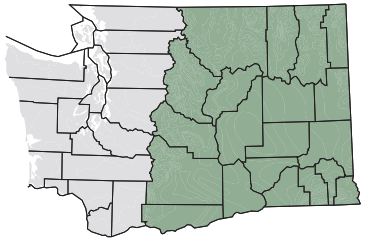
Water Quality Program

WASHINGTON STATE DEPARTMENT OF ECOLOGY

GIS Technical Services
02/25/04
Figure_4.3.3



Eastern Washington Stormwater Manual



10-Year 24-Hour Isopluvials

Source: NOAA Atlas 2, Volume IX, 1973
Precipitation in inches

- County(2003, 1:24,000)
- City(2003, 1:24,000)
- Latitude/Longitude(1/10 degree)
- Isopluvial(1973, 1:2,000,000)
- NOAA/NWS Station(1931-1998)

N

Scale 1:1,600,000
Miles
0 16.5 33

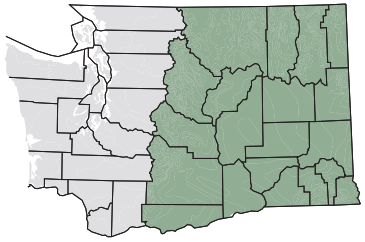
Water Quality Program

WASHINGTON STATE DEPARTMENT OF ECOLOGY

GIS Technical Services
02/25/04
Figure_4.3.4



Eastern Washington Stormwater Manual



25-Year 24-Hour Isopluvials

Source: NOAA Atlas 2, Volume IX, 1973
Precipitation in inches

County(2003, 1:24,000)
City(2003, 1:24,000)
Latitude/Longitude(1/10 degree)
Isopluvial(1973, 1:2,000,000)
NOAA/NWS Station(1931-1998)

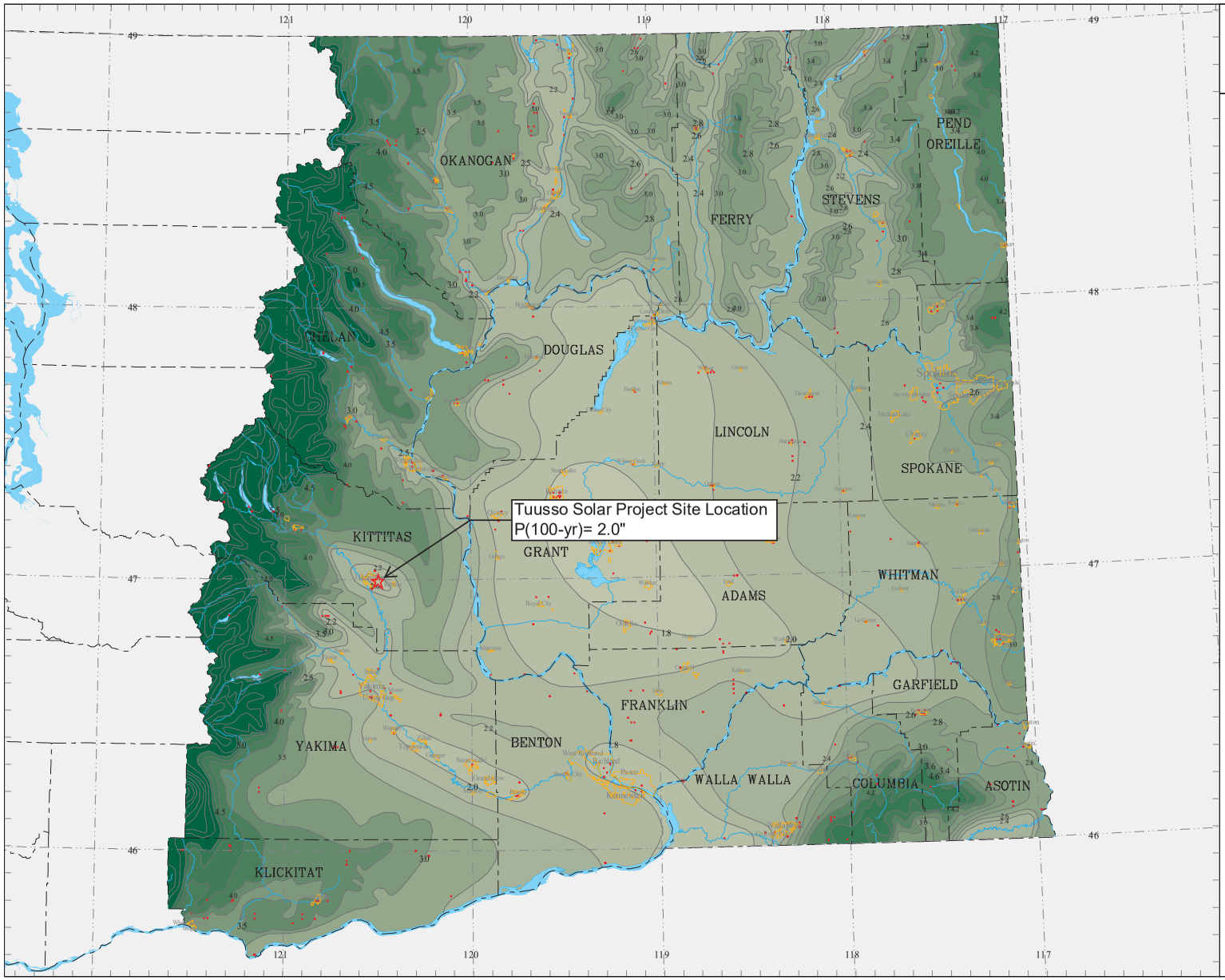
N

Scale 1:1,600,000
Miles
0 16.5 33

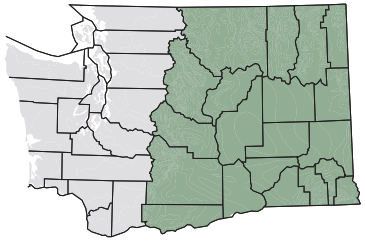
Water Quality Program

WASHINGTON STATE DEPARTMENT OF ECOLOGY

GIS Technical Services
02/25/04
Figure_4.3.5



Eastern Washington Stormwater Manual



100-Year 24-Hour Isopluvials

Source: NOAA Atlas 2, Volume IX, 1973
Precipitation in inches

County(2003, 1:24,000)
City(2003, 1:24,000)
Latitude/Longitude(1/10 degree)
Isopluvial(1973, 1:2,000,000)
NOAA/NWS Station(1931-1998)

Scale 1:1,600,000
Miles
0 16.5 33

Water Quality Program

WASHINGTON STATE DEPARTMENT OF ECOLOGY

GIS Technical Services
02/25/04
Figure_4.3.7

Appendix C:

CURVE NUMBER CALCULATIONS

Predevelopment Conditions															
Basin Name	Total Area (sf)	Total Area (ac)	Impervious Area (sf)	Impervious Area (ac)	HSG	CN	Meadow (sf)	Meadow (ac)	HSG	CN	Meadow (sf)	Meadow (ac)	HSG	CN	**Composite CN**
Existing Basin 1	2006809.2	46.07	2540	0.06	C	98	1602833.8	36.80	C	71	401361.84	9.21	D	78	**72**
Existing Basin 2	223852	5.14	0	0.00	C	98	220718	5.07	C	71	3133.9	0.07	D	78	**71**

Postdevelopment Conditions															
Basin Name	Total Area (sf)	Total Area (ac)	Impervious Area (sf)	Impervious Area (ac)	HSG	CN	Meadow (sf)	Meadow (ac)	HSG	CN	Meadow (sf)	Meadow (ac)	HSG	CN	**Composite CN**
Proposed Basin 1	2006809.2	46.07	81487.75	1.87	D	93	1538331.8	35.32	C	71	386989.6	8.88	D	78	**73**
Proposed Basin 2	223852	5.14	8385.75	0.19	D	93	212332.3	4.87	C	71	3133.9	0.0719	D	78	**72**

Impervious Area Break Down							Basin 1 Post Area					Basin 2 Post Area				
	Basin 1			Basin 2			Solar Trackers	Length	Width	#	area (sf)	Solar Trackers	Length	Width	#	area (sf)
Lot or Tract	Area (sf)	CN classification	CN	Area (sf)	CN classification	CN	72 ft trackers	248	6.5	197	317564	72 ft trackers	248	6.5	2	3224
Road	56020	Gravel	91	5800	Gravel	91	52 ft trackers	188	6.5	32	39104	52 ft trackers	188	6.5	26	31772
Inverters	3600	Impervious	98	600	Impervious	98	36 ft traclers	121	6.5	38	29887	36 ft traclers	121	6.5	6	4719
Post	19328	Impervious	98	1986	Impervious	98				Total	386555				Total	39715
Building	2540	Impervious	98	0	Impervious	98				assumed % impervious (posts)	5%				assumed % impervious (posts)	5%
		Composite CN	93		Composite CN	93				impervious area	19327.75				impervious area	1985.75

Appendix D:

HydroCAD REPORT:
EXISTING BASINS

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.060	98	Impervious (1S)
36.800	71	Meadow: HSG C (1S)
9.210	78	Meadow: HSG D (1S)
46.070	**72**	**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.000	0.060	0.060	Impervious	1S
0.000	0.000	36.800	9.210	0.000	46.010	Meadow:	1S
0.000	**0.000**	**36.800**	**9.210**	**0.060**	**46.070**	**TOTAL AREA**	

Summary for Subcatchment 1S: Existing Drainage Basin 1

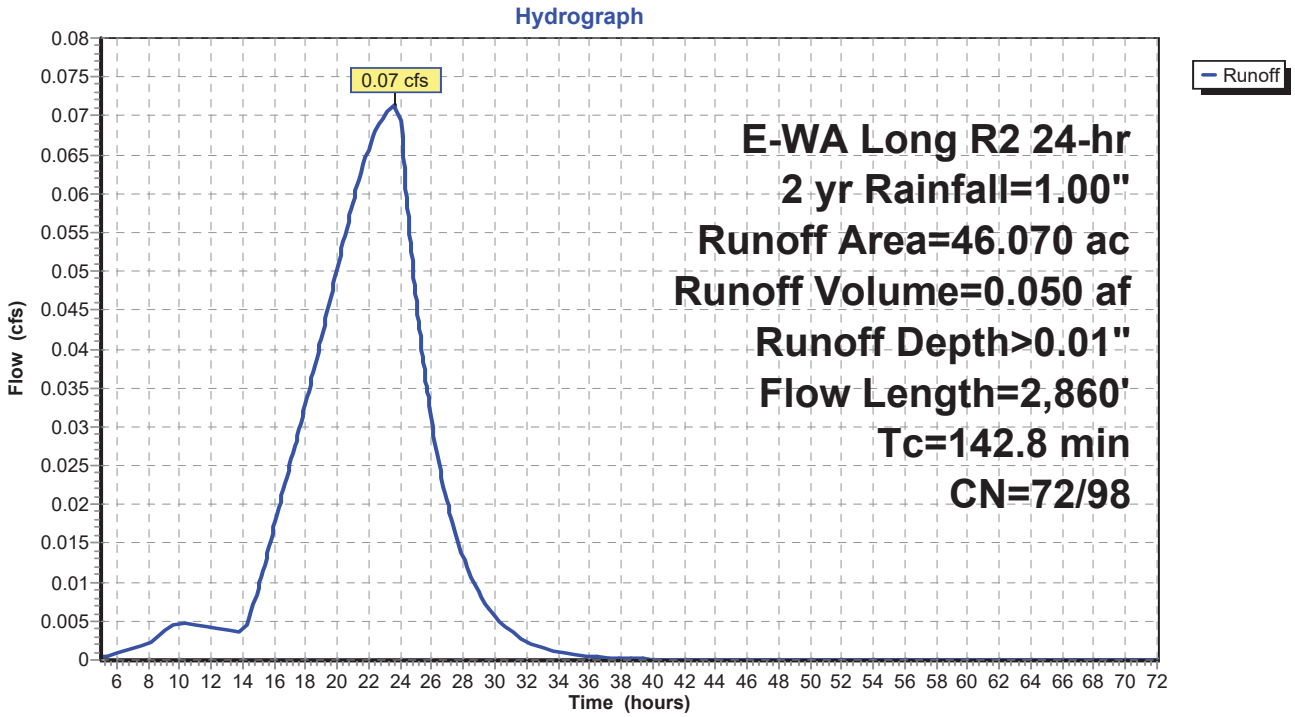
Runoff = 0.07 cfs @ 23.60 hrs, Volume= 0.050 af, Depth> 0.01"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 2 yr Rainfall=1.00"

	Area (ac)	CN	Description
*	36.800	71	Meadow: HSG C
*	9.210	78	Meadow: HSG D
*	0.060	98	Impervious
	46.070	72	Weighted Average
	46.010	72	99.87% Pervious Area
	0.060	98	0.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
67.2	300	0.0047	0.07		**Sheet Flow,** Range n= 0.130 P2= 1.00"
75.6	2,560	0.0065	0.56		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
142.8	2,860	Total			

Subcatchment 1S: Existing Drainage Basin 1



Summary for Subcatchment 1S: Existing Drainage Basin 1

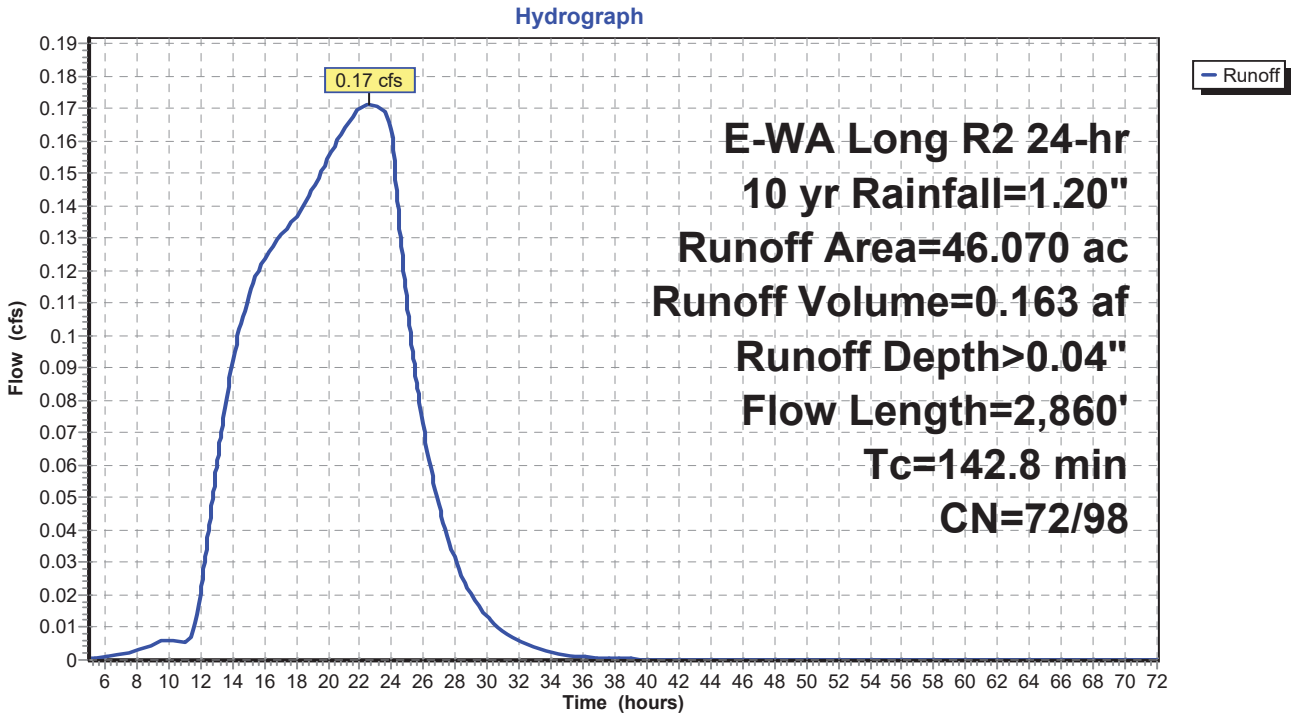
Runoff = 0.17 cfs @ 22.60 hrs, Volume= 0.163 af, Depth> 0.04"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 10 yr Rainfall=1.20"

	Area (ac)	CN	Description
*	36.800	71	Meadow: HSG C
*	9.210	78	Meadow: HSG D
*	0.060	98	Impervious
	46.070	72	Weighted Average
	46.010	72	99.87% Pervious Area
	0.060	98	0.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
67.2	300	0.0047	0.07		**Sheet Flow,** Range n= 0.130 P2= 1.00"
75.6	2,560	0.0065	0.56		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
142.8	2,860	Total			

Subcatchment 1S: Existing Drainage Basin 1



Summary for Subcatchment 1S: Existing Drainage Basin 1

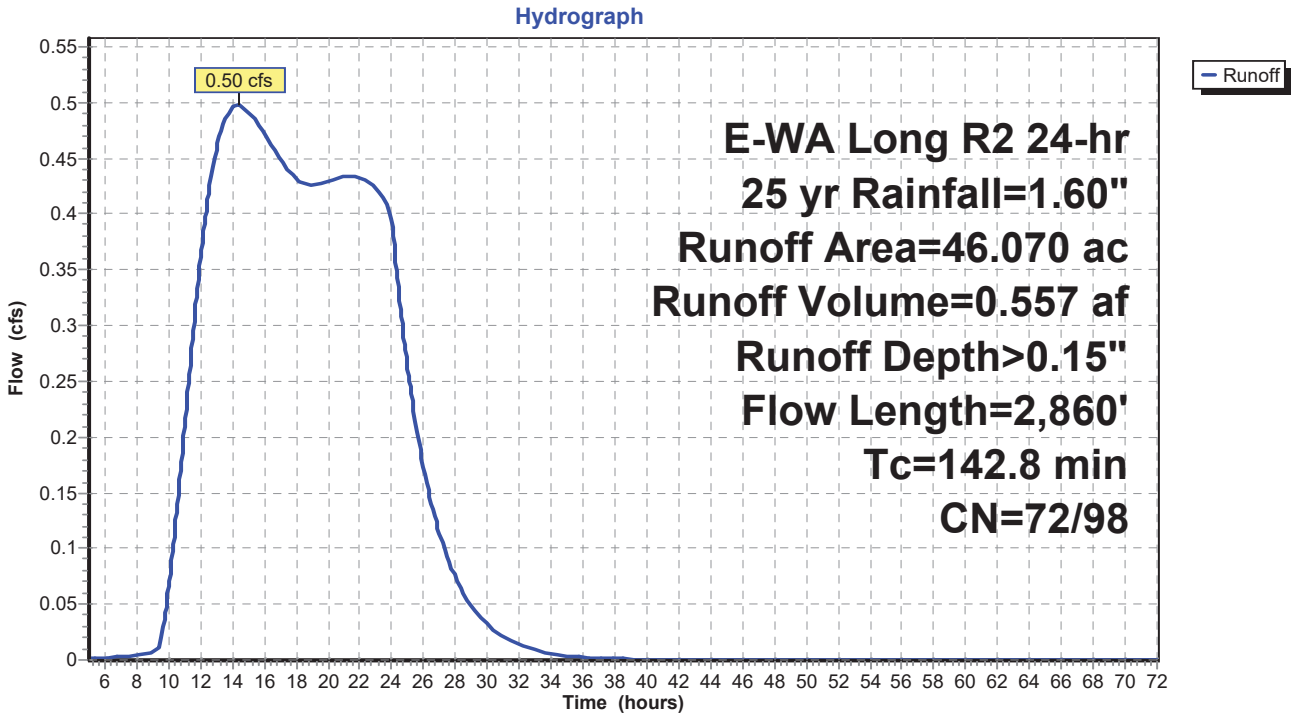
Runoff = 0.50 cfs @ 14.35 hrs, Volume= 0.557 af, Depth> 0.15"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 25 yr Rainfall=1.60"

	Area (ac)	CN	Description
*	36.800	71	Meadow: HSG C
*	9.210	78	Meadow: HSG D
*	0.060	98	Impervious
	46.070	72	Weighted Average
	46.010	72	99.87% Pervious Area
	0.060	98	0.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
67.2	300	0.0047	0.07		**Sheet Flow,** Range n= 0.130 P2= 1.00"
75.6	2,560	0.0065	0.56		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
142.8	2,860	Total			

Subcatchment 1S: Existing Drainage Basin 1



Summary for Subcatchment 1S: Existing Drainage Basin 1

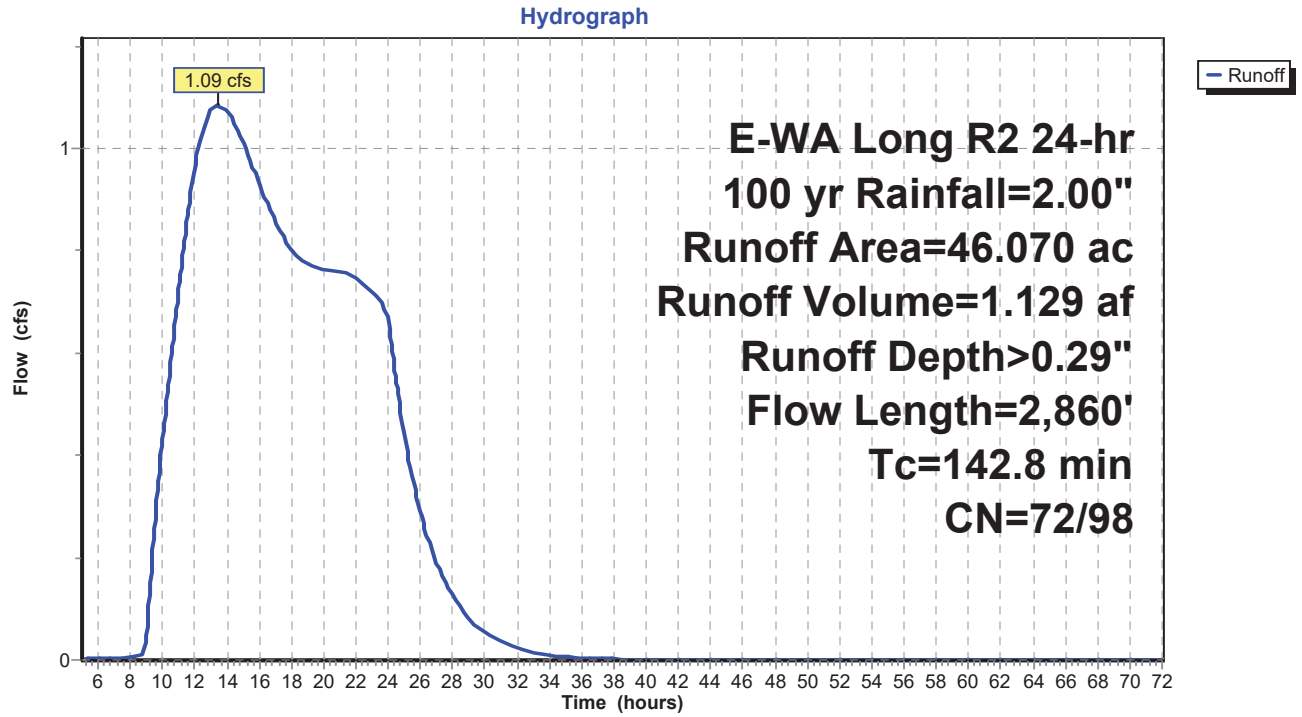
Runoff = 1.09 cfs @ 13.45 hrs, Volume= 1.129 af, Depth> 0.29"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 100 yr Rainfall=2.00"

	Area (ac)	CN	Description
*	36.800	71	Meadow: HSG C
*	9.210	78	Meadow: HSG D
*	0.060	98	Impervious
	46.070	72	Weighted Average
	46.010	72	99.87% Pervious Area
	0.060	98	0.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
67.2	300	0.0047	0.07		**Sheet Flow,** Range n= 0.130 P2= 1.00"
75.6	2,560	0.0065	0.56		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
142.8	2,860	Total			

Subcatchment 1S: Existing Drainage Basin 1



Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
5.070	71	Meadow: HSG C (3S)
0.070	78	Meadow: HSG D (3S)
5.140	**71**	**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	5.070	0.070	0.000	5.140	Meadow:	3S
0.000	**0.000**	**5.070**	**0.070**	**0.000**	**5.140**	**TOTAL AREA**	

Summary for Subcatchment 3S: Existing Drainage Basin 2

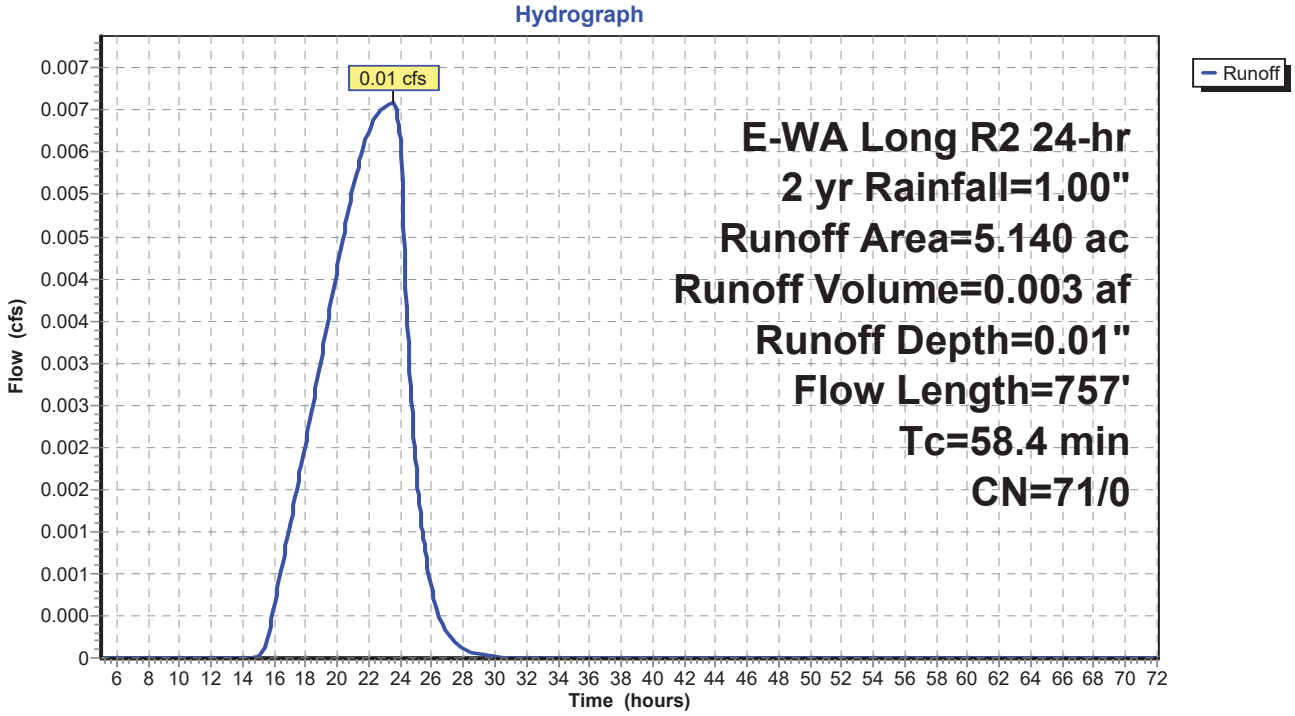
Runoff = 0.01 cfs @ 23.48 hrs, Volume= 0.003 af, Depth= 0.01"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 2 yr Rainfall=1.00"

	Area (ac)	CN	Description
*	5.070	71	Meadow: HSG C
*	0.070	78	Meadow: HSG D
	5.140	71	Weighted Average
	5.140	71	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
43.0	300	0.0143	0.12		**Sheet Flow,** Range n= 0.130 P2= 1.00"
15.4	457	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
58.4	757	Total			

Subcatchment 3S: Existing Drainage Basin 2



Summary for Subcatchment 3S: Existing Drainage Basin 2

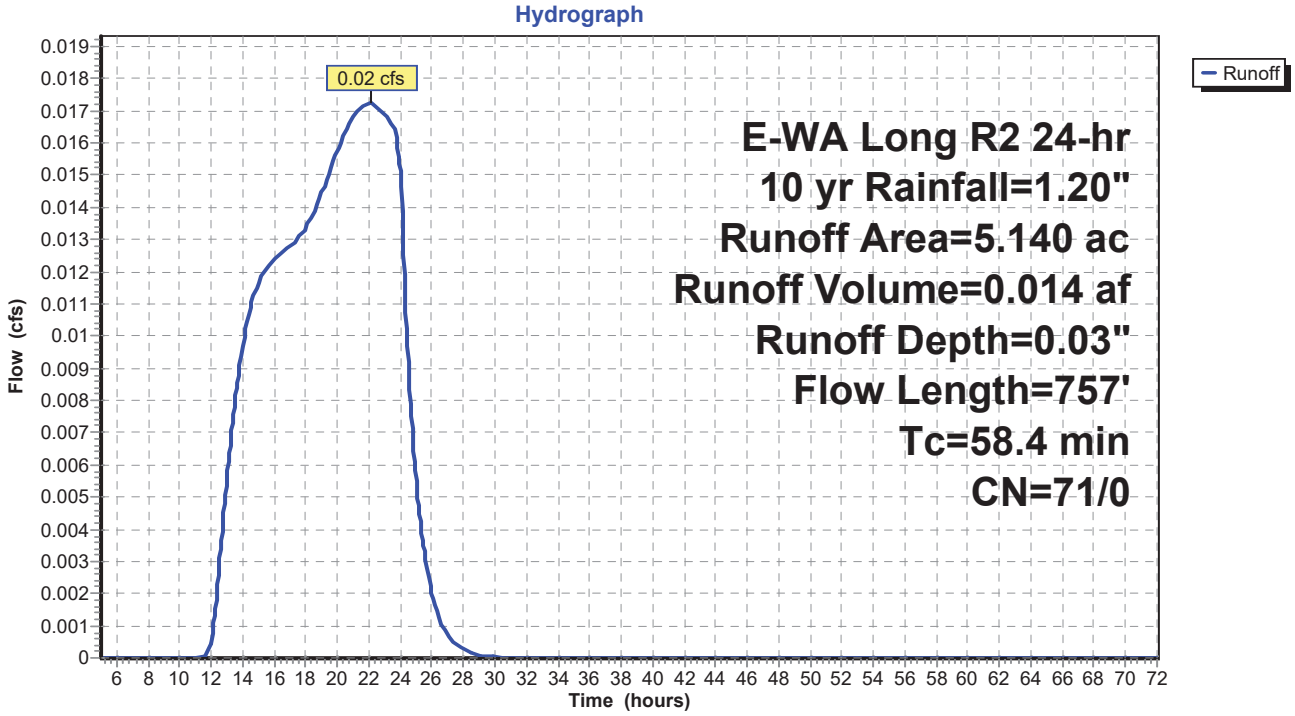
Runoff = 0.02 cfs @ 22.10 hrs, Volume= 0.014 af, Depth= 0.03"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 10 yr Rainfall=1.20"

	Area (ac)	CN	Description
*	5.070	71	Meadow: HSG C
*	0.070	78	Meadow: HSG D
	5.140	71	Weighted Average
	5.140	71	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
43.0	300	0.0143	0.12		**Sheet Flow,** Range n= 0.130 P2= 1.00"
15.4	457	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
58.4	757	Total			

Subcatchment 3S: Existing Drainage Basin 2



Summary for Subcatchment 3S: Existing Drainage Basin 2

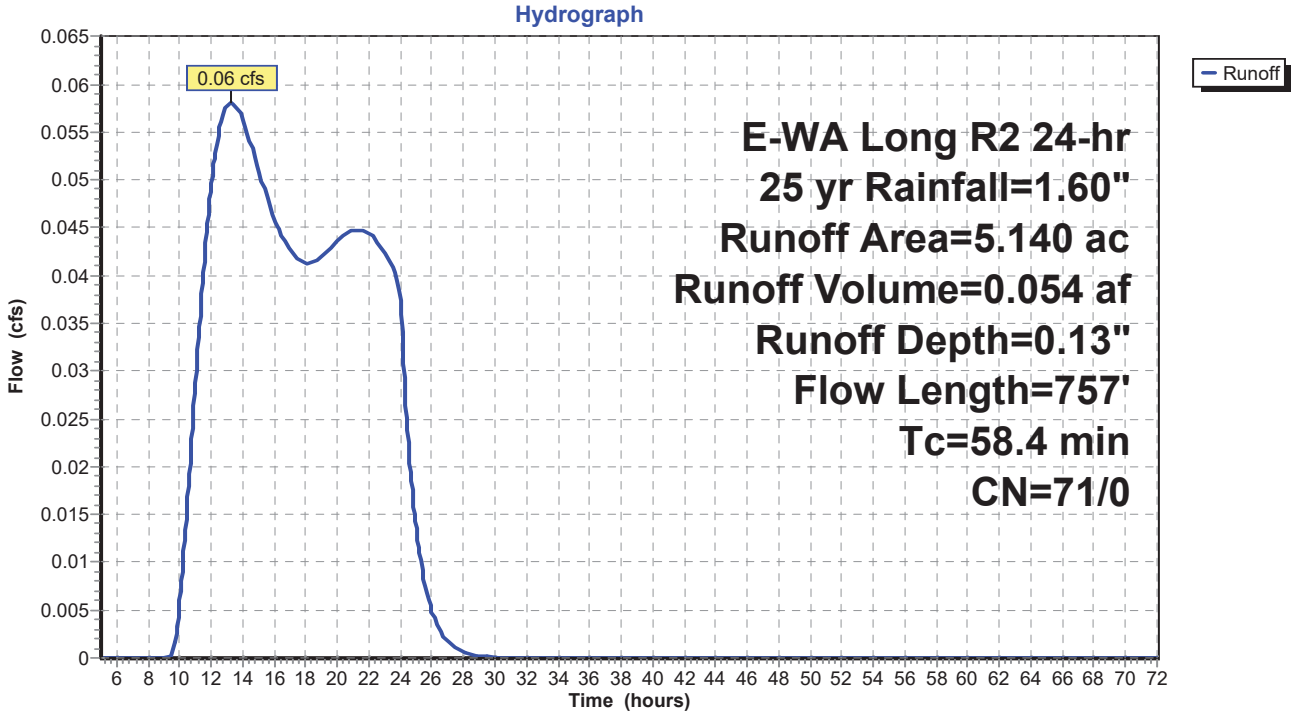
Runoff = 0.06 cfs @ 13.27 hrs, Volume= 0.054 af, Depth= 0.13"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 25 yr Rainfall=1.60"

	Area (ac)	CN	Description
*	5.070	71	Meadow: HSG C
*	0.070	78	Meadow: HSG D
	5.140	71	Weighted Average
	5.140	71	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
43.0	300	0.0143	0.12		**Sheet Flow,** Range n= 0.130 P2= 1.00"
15.4	457	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
58.4	757	Total			

Subcatchment 3S: Existing Drainage Basin 2



Summary for Subcatchment 3S: Existing Drainage Basin 2

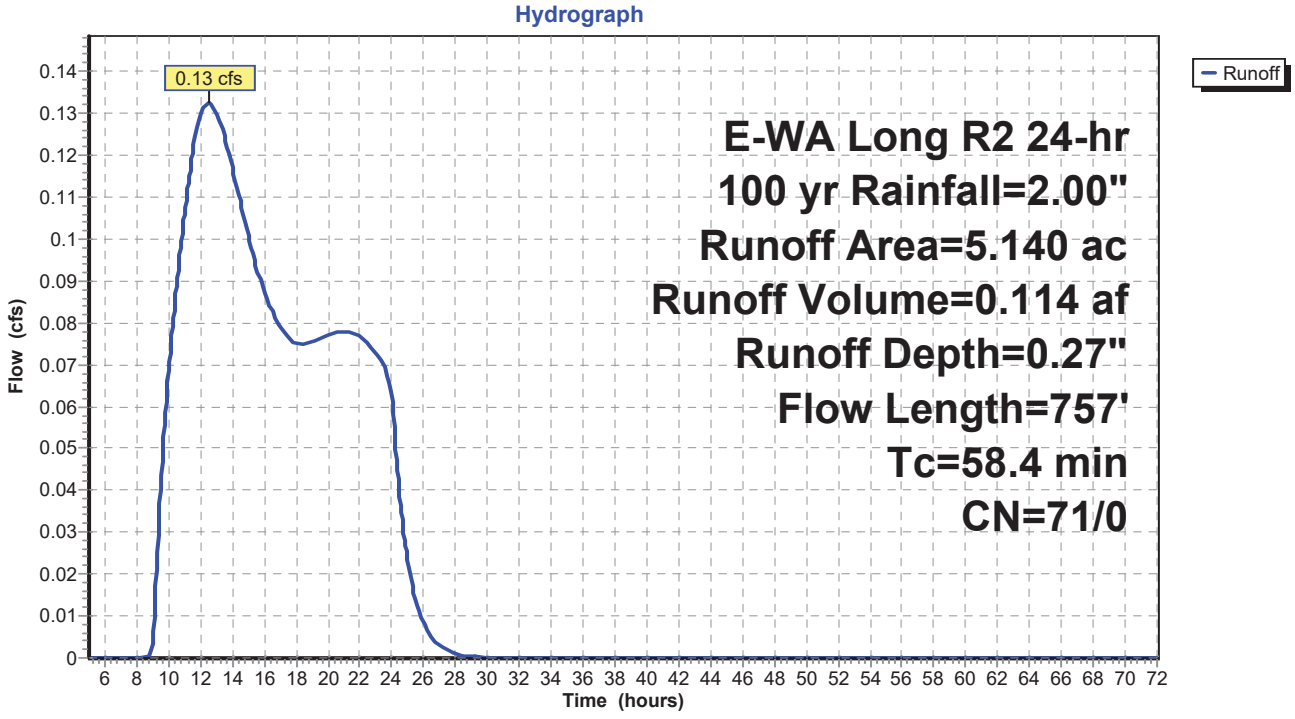
Runoff = 0.13 cfs @ 12.48 hrs, Volume= 0.114 af, Depth= 0.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 100 yr Rainfall=2.00"

	Area (ac)	CN	Description
*	5.070	71	Meadow: HSG C
*	0.070	78	Meadow: HSG D
	5.140	71	Weighted Average
	5.140	71	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
43.0	300	0.0143	0.12		**Sheet Flow,** Range n= 0.130 P2= 1.00"
15.4	457	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
58.4	757	Total			

Subcatchment 3S: Existing Drainage Basin 2



Appendix E:

HydroCAD REPORT:
PROPOSED BASINS

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.870	93	Impervious Area (2S)
35.320	71	Meadow: HSG C (2S)
8.880	78	Meadow: HSG D (2S)
46.070	**73**	**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.000	1.870	1.870	Impervious Area	2S
0.000	0.000	35.320	8.880	0.000	44.200	Meadow:	2S
0.000	**0.000**	**35.320**	**8.880**	**1.870**	**46.070**	**TOTAL AREA**	

Summary for Subcatchment 2S: Proposed Drainage Basin 1

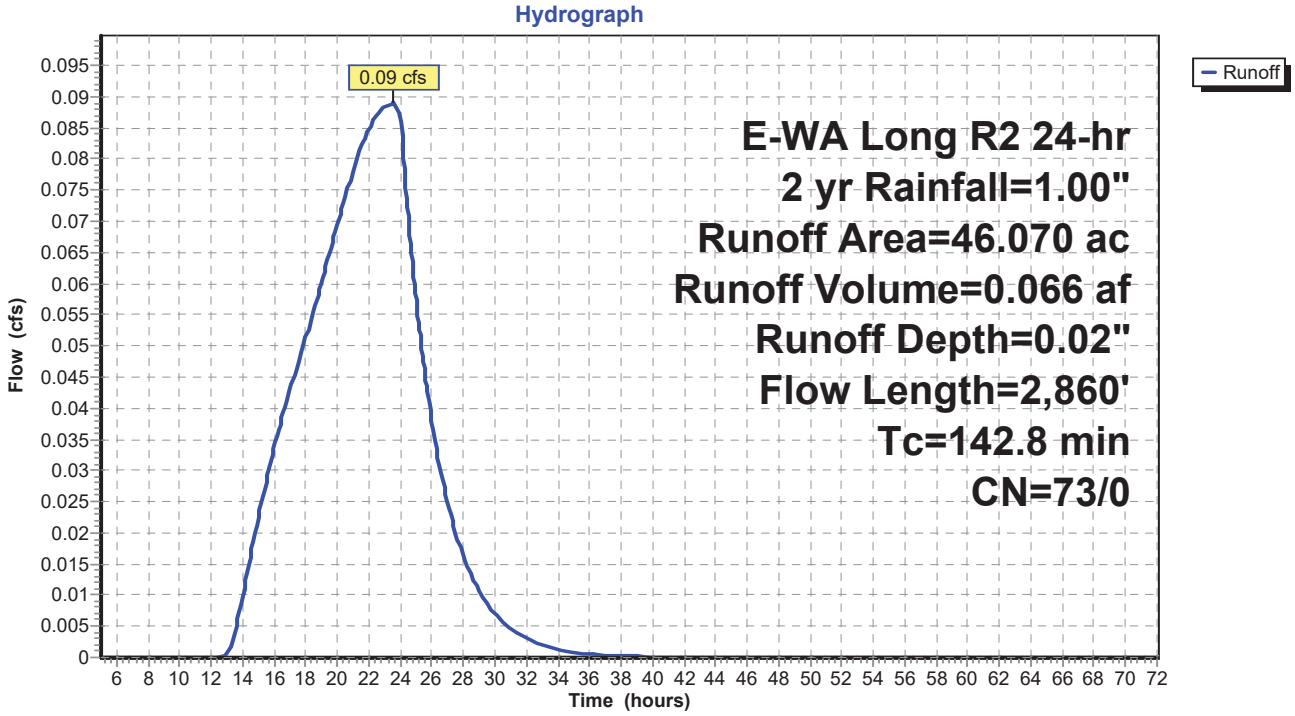
Runoff = 0.09 cfs @ 23.54 hrs, Volume= 0.066 af, Depth= 0.02"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 2 yr Rainfall=1.00"

	Area (ac)	CN	Description
*	1.870	93	Impervious Area
*	35.320	71	Meadow: HSG C
*	8.880	78	Meadow: HSG D
	46.070	73	Weighted Average
	46.070	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
67.2	300	0.0047	0.07		**Sheet Flow,** Range n= 0.130 P2= 1.00"
75.6	2,560	0.0065	0.56		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
142.8	2,860	Total			

Subcatchment 2S: Proposed Drainage Basin 1



Summary for Subcatchment 2S: Proposed Drainage Basin 1

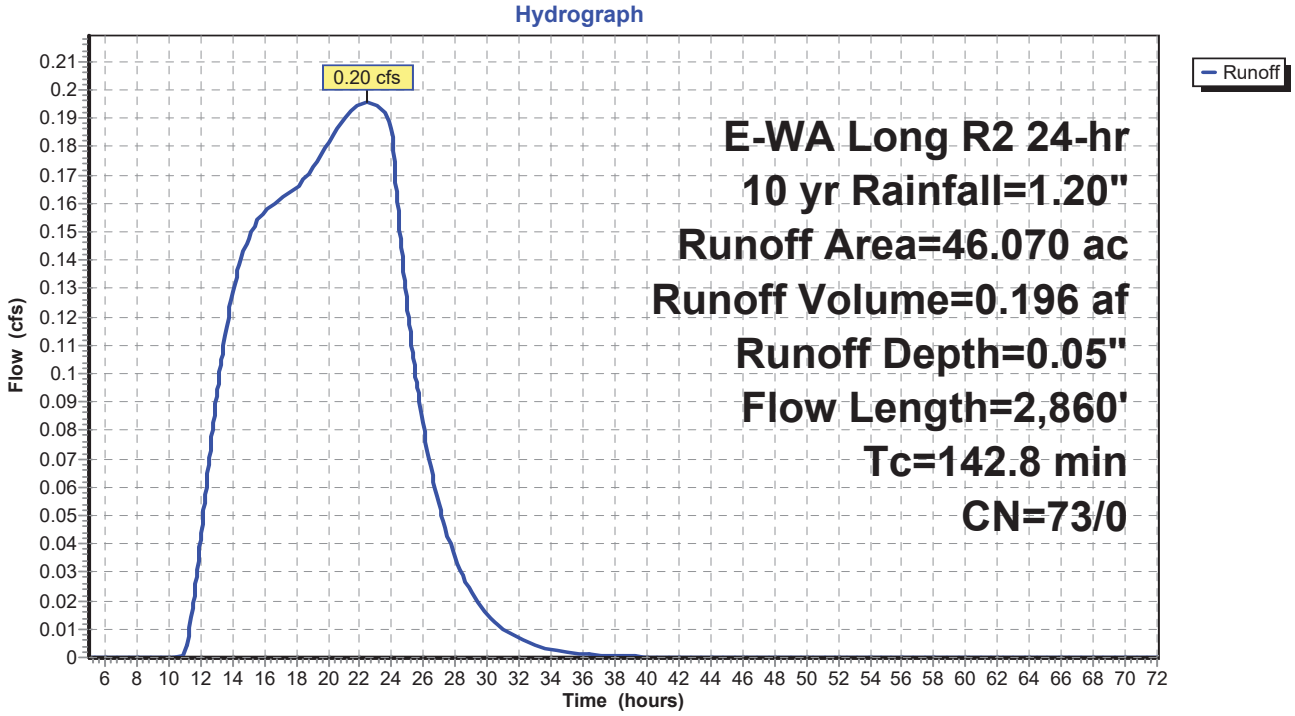
Runoff = 0.20 cfs @ 22.38 hrs, Volume= 0.196 af, Depth= 0.05"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 10 yr Rainfall=1.20"

	Area (ac)	CN	Description
*	1.870	93	Impervious Area
*	35.320	71	Meadow: HSG C
*	8.880	78	Meadow: HSG D
	46.070	73	Weighted Average
	46.070	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
67.2	300	0.0047	0.07		**Sheet Flow,** Range n= 0.130 P2= 1.00"
75.6	2,560	0.0065	0.56		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
142.8	2,860	Total			

Subcatchment 2S: Proposed Drainage Basin 1



Summary for Subcatchment 2S: Proposed Drainage Basin 1

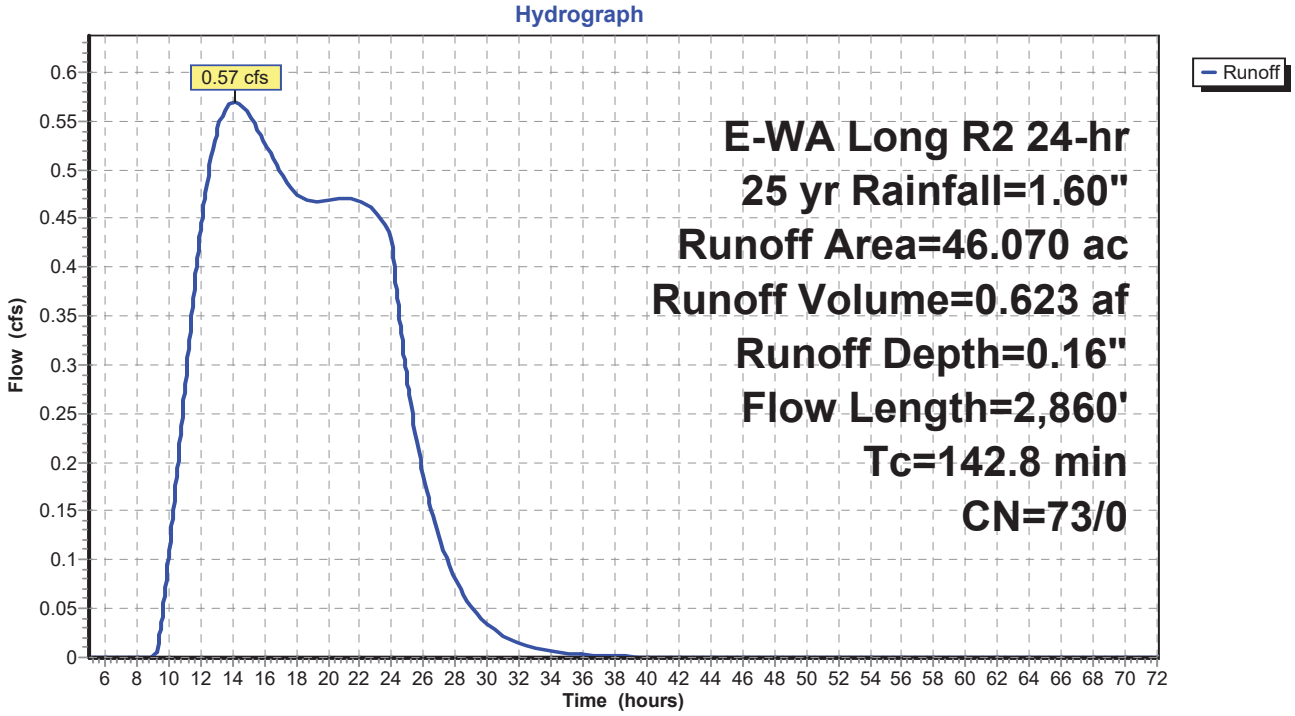
Runoff = 0.57 cfs @ 14.12 hrs, Volume= 0.623 af, Depth= 0.16"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 25 yr Rainfall=1.60"

	Area (ac)	CN	Description
*	1.870	93	Impervious Area
*	35.320	71	Meadow: HSG C
*	8.880	78	Meadow: HSG D
	46.070	73	Weighted Average
	46.070	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
67.2	300	0.0047	0.07		**Sheet Flow,** Range n= 0.130 P2= 1.00"
75.6	2,560	0.0065	0.56		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
142.8	2,860	Total			

Subcatchment 2S: Proposed Drainage Basin 1



Summary for Subcatchment 2S: Proposed Drainage Basin 1

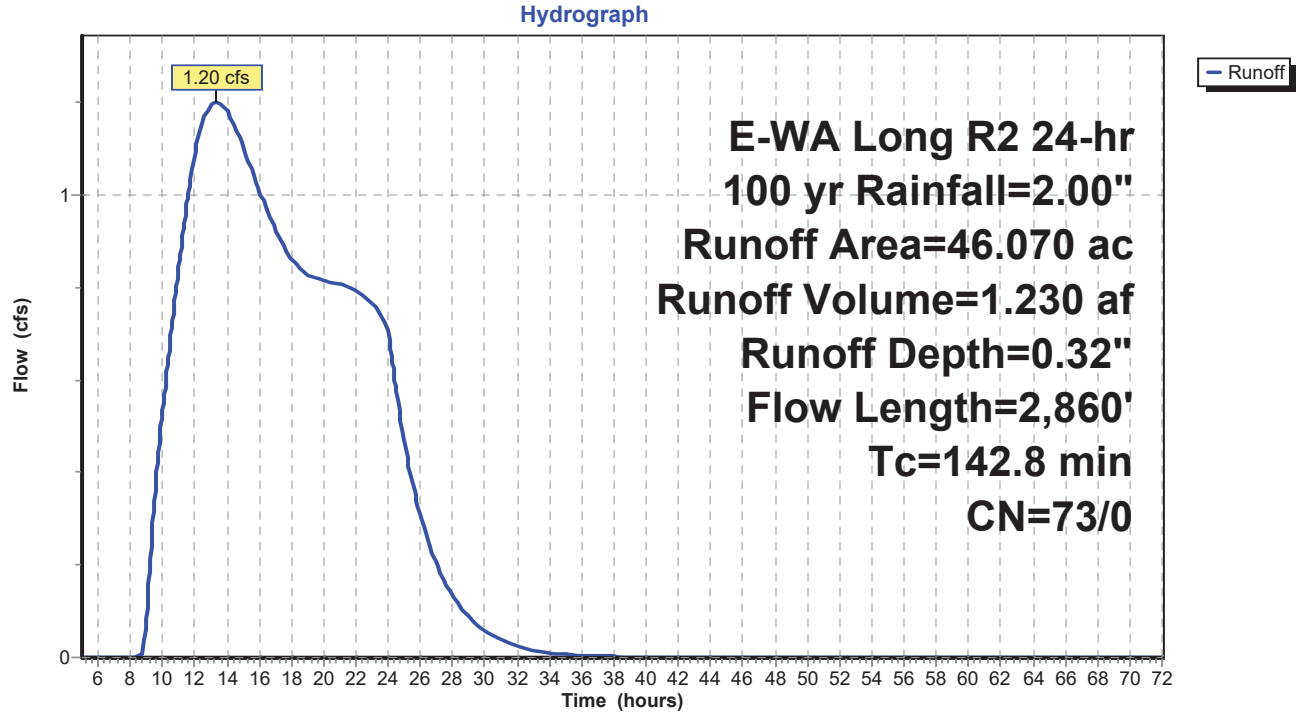
Runoff = 1.20 cfs @ 13.33 hrs, Volume= 1.230 af, Depth= 0.32"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 100 yr Rainfall=2.00"

	Area (ac)	CN	Description
*	1.870	93	Impervious Area
*	35.320	71	Meadow: HSG C
*	8.880	78	Meadow: HSG D
	46.070	73	Weighted Average
	46.070	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
67.2	300	0.0047	0.07		**Sheet Flow,** Range n= 0.130 P2= 1.00"
75.6	2,560	0.0065	0.56		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
142.8	2,860	Total			

Subcatchment 2S: Proposed Drainage Basin 1



Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.193	93	Impervious Area (4S)
4.874	71	Meadow: HSG C (4S)
0.072	78	Meadow: HSG D (4S)
5.139	**72**	**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.000	0.193	0.193	Impervious Area	4S
0.000	0.000	4.874	0.072	0.000	4.946	Meadow:	4S
0.000	**0.000**	**4.874**	**0.072**	**0.193**	**5.139**	**TOTAL AREA**	

Summary for Subcatchment 4S: Proposed Drainage Basin 2

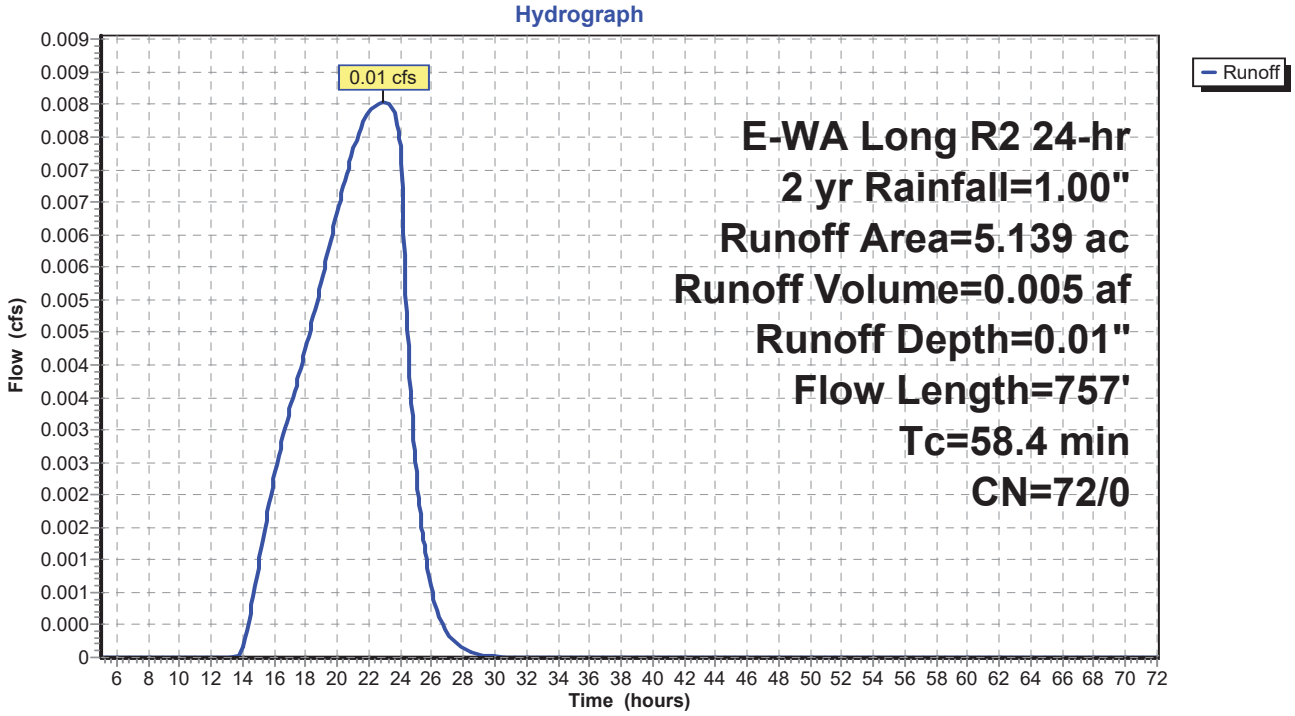
Runoff = 0.01 cfs @ 22.94 hrs, Volume= 0.005 af, Depth= 0.01"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 2 yr Rainfall=1.00"

	Area (ac)	CN	Description
*	4.874	71	Meadow: HSG C
*	0.072	78	Meadow: HSG D
*	0.193	93	Impervious Area
	5.139	72	Weighted Average
	5.139	72	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
43.0	300	0.0143	0.12		**Sheet Flow,** Range n= 0.130 P2= 1.00"
15.4	457	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
58.4	757	Total			

Subcatchment 4S: Proposed Drainage Basin 2



Summary for Subcatchment 4S: Proposed Drainage Basin 2

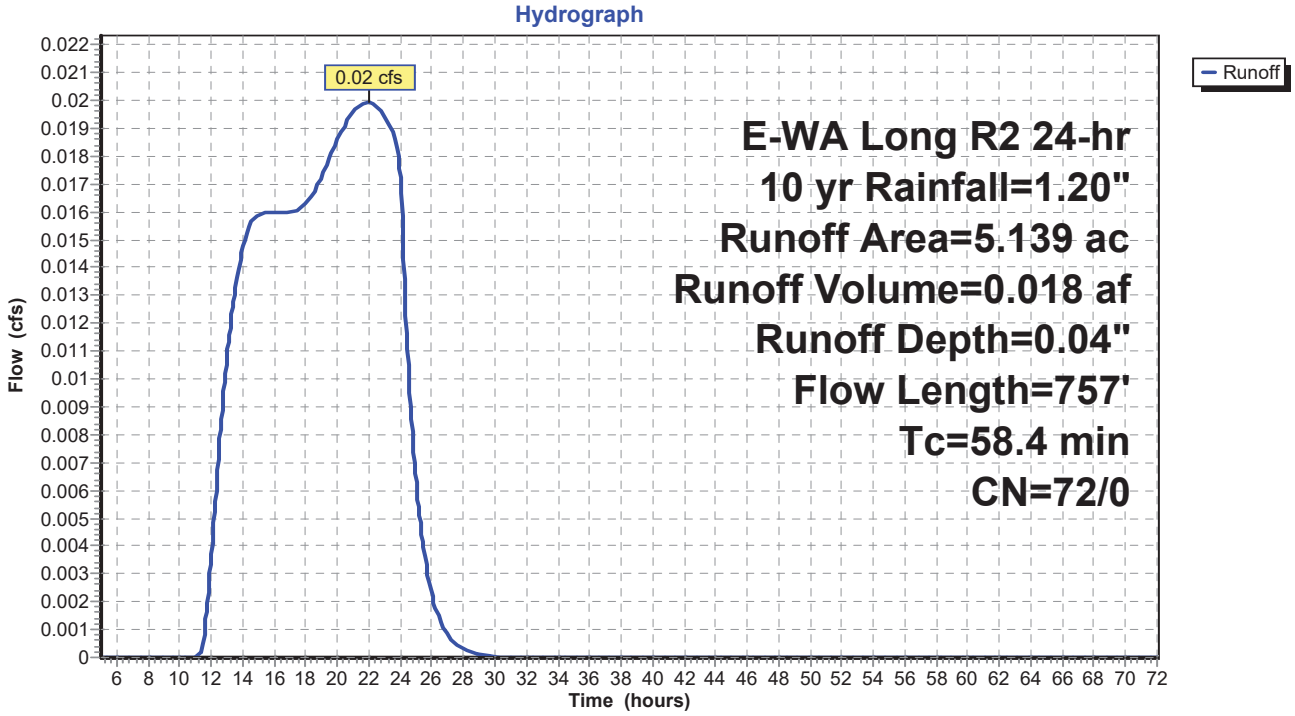
Runoff = 0.02 cfs @ 21.96 hrs, Volume= 0.018 af, Depth= 0.04"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 10 yr Rainfall=1.20"

	Area (ac)	CN	Description
*	4.874	71	Meadow: HSG C
*	0.072	78	Meadow: HSG D
*	0.193	93	Impervious Area
	5.139	72	Weighted Average
	5.139	72	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
43.0	300	0.0143	0.12		**Sheet Flow,** Range n= 0.130 P2= 1.00"
15.4	457	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
58.4	757	Total			

Subcatchment 4S: Proposed Drainage Basin 2



Summary for Subcatchment 4S: Proposed Drainage Basin 2

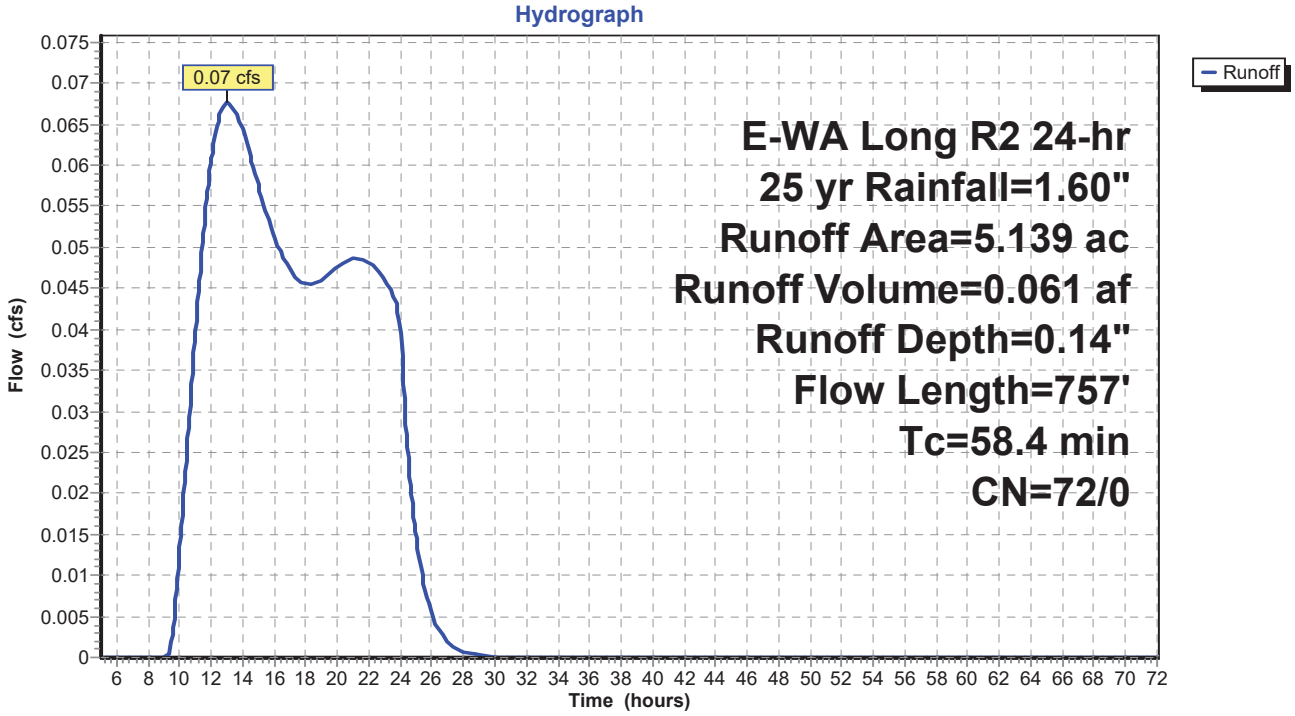
Runoff = 0.07 cfs @ 13.05 hrs, Volume= 0.061 af, Depth= 0.14"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 25 yr Rainfall=1.60"

	Area (ac)	CN	Description
*	4.874	71	Meadow: HSG C
*	0.072	78	Meadow: HSG D
*	0.193	93	Impervious Area
	5.139	72	Weighted Average
	5.139	72	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
43.0	300	0.0143	0.12		**Sheet Flow,** Range n= 0.130 P2= 1.00"
15.4	457	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
58.4	757	Total			

Subcatchment 4S: Proposed Drainage Basin 2



Summary for Subcatchment 4S: Proposed Drainage Basin 2

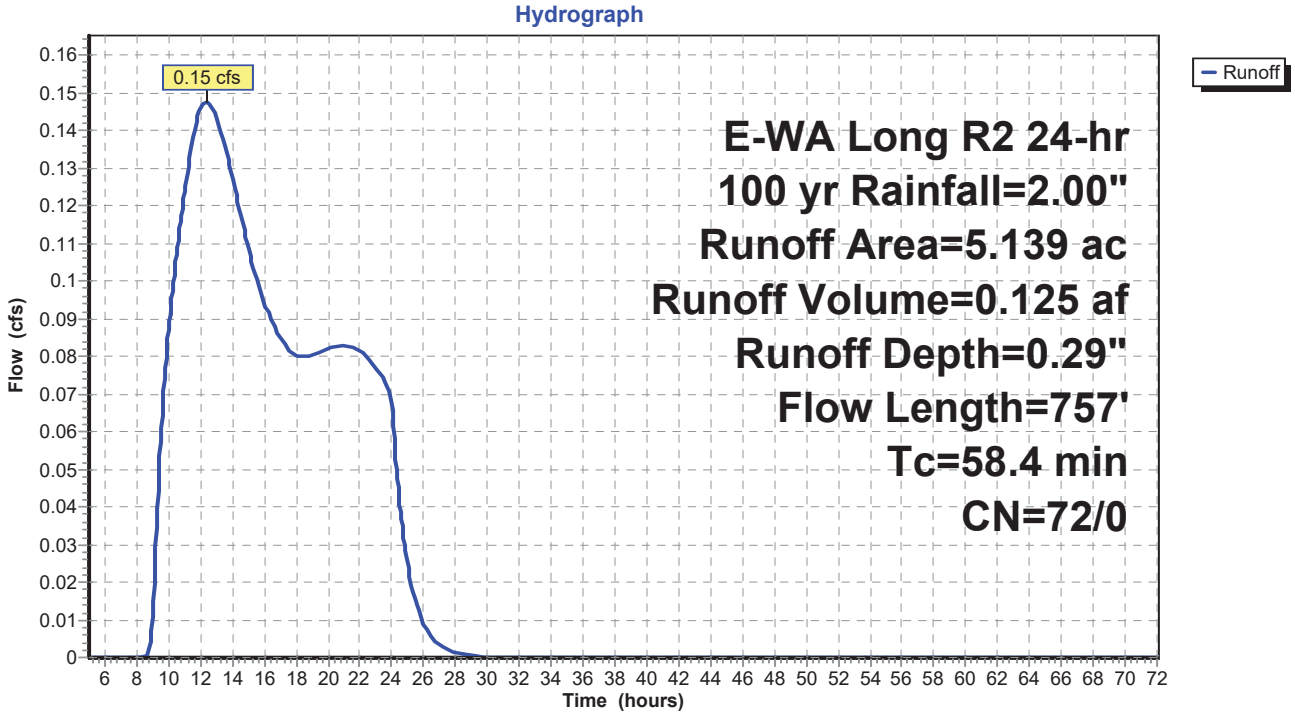
Runoff = 0.15 cfs @ 12.36 hrs, Volume= 0.125 af, Depth= 0.29"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 100 yr Rainfall=2.00"

	Area (ac)	CN	Description
*	4.874	71	Meadow: HSG C
*	0.072	78	Meadow: HSG D
*	0.193	93	Impervious Area
	5.139	72	Weighted Average
	5.139	72	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
43.0	300	0.0143	0.12		**Sheet Flow,** Range n= 0.130 P2= 1.00"
15.4	457	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
58.4	757	Total			

Subcatchment 4S: Proposed Drainage Basin 2



Appendix H: Fumaria Solar Project Site Reports and Permit Applications

H-1: Fumaria Solar Project Critical Areas Report

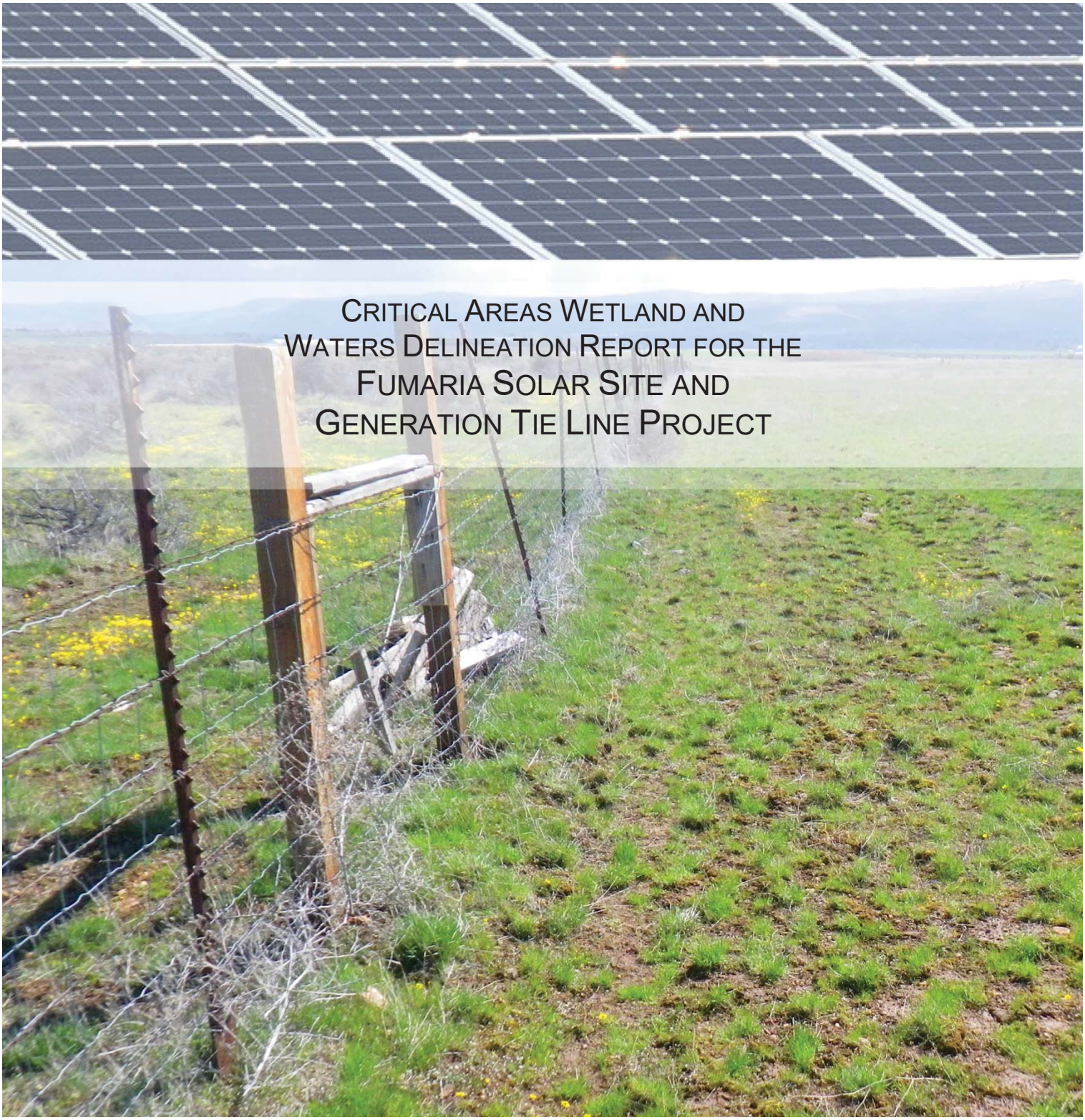
H-2: Fumaria Solar Project Cultural Resources Report

H-3: Fumaria Solar Project Permit Applications

H-4: Fumaria Solar Project Geotechnical Engineering Study

H-5: Fumaria Solar Project Drainage Report

Appendix H-1: Fumaria Solar Project Critical Areas Report



CRITICAL AREAS WETLAND AND WATERS DELINEATION REPORT FOR THE FUMARIA SOLAR SITE AND GENERATION TIE LINE PROJECT

July 10, 2017

SWCA ENVIRONMENTAL CONSULTANTS
SEATTLE, WASHINGTON

CRITICAL AREAS WETLAND AND WATERS DELINEATION REPORT FOR THE FUMARIA SOLAR SITE AND GENERATION TIE LINE PROJECT KITTITAS COUNTY, WASHINGTON

Sections 09, 16, 17, 20, 21, Township 18 North, Range 18 East
Parcel Numbers 14031, 14032, 14033, 15472, 26033, 279433, 459433, 213936, 499433, 929433, 956498, 956502, 957539, 529433, 10583, 61436, 769433, 194736, 269433, and 629433

Report Prepared for

TUUSSO Energy, LLC

By
Evan Dulin

July 10, 2017

Project Number 38727.05

SWCA Environmental Consultants
221 1st Ave W, Suite 205
Seattle, Washington 98119

TABLE OF CONTENTS

1 INTRODUCTION 1
1.1 Background 1
1.2 Project Setting 1
2 METHODS 1
2.1 Study Area 1
2.2 Review of Existing Information 3
2.3 Field Investigation 3
2.3.1 Wetlands 6
2.3.2 Riparian Habitats 15
3 RESULTS AND DISCUSSION 16
3.1 Wetlands 16
3.1.1 Wetland FW01 18
3.1.2 Wetland FW02 18
3.1.3 Wetland FW03 19
3.1.4 Wetland FW04 20
3.1.5 Wetland FW05 21
3.1.6 Wetland FW06 21
3.2 Frequently Flooded Areas 22
3.3 Geologically Hazardous Areas 22
3.4 Habitats 22
3.4.1 Riparian Habitat 22
3.4.2 Priority Habitats and Species 24
3.5 Aquifer Recharge Areas 24
4 CONCLUSIONS AND RECOMMENDATIONS 25
5 DISCLAIMER 26
6 LITERATURE CITED AND REVIEWED 27
APPENDIX A: WETLAND DELINEATION METHODOLOGY A-1
APPENDIX B: VEGETATION LIST B-1
APPENDIX C: WETLAND DATA SHEETS C-1
APPENDIX D: WETLAND AND STREAM PHOTOGRAPHS D-1
APPENDIX E: ECOLOGY RATING FORMS E-1
APPENDIX F: KITTITAS COUNTY WETLAND BUFFER GUIDANCE F-1

LIST OF TABLES

Table 1. Precipitation for 3 Months Prior to Site Visits (in inches) 6
Table 2. Precipitation 2 Weeks Prior to Site Visits (in inches) 6
Table 3. Washington State Department of Ecology Wetland Rating System 7
Table 4. Summary of the Water Typing System 15
Table 5. Soil Mapping within the Study Area 17
Table 6. Wetland Size, Rating, and Classification for Wetlands within the Study Area 17
Table 7. Summary of Streams in the Study Area 23
Table 8. Wetland and Waters Summary 25

LIST OF FIGURES

Figure 1. Project vicinity map. 2
Figure 2. NWI, NHD, and floodplain mapping. 4
Figure 3. Soils and PHS mapping. 5
Figure 4. Wetland and waters delineation map, north portion of site. 8
Figure 5. Wetland and waters delineation map, south portion of site. 9
Figure 6. Wetland and waters delineation map, north portion of generation tie line. 10
Figure 7. Wetland and waters delineation map, northern middle portion of generation tie line. 11
Figure 8. Wetland and waters delineation map, middle portion of generation tie line. 12
Figure 9. Wetland and waters delineation map, southern middle portion generation tie line. 13
Figure 10. Wetland and waters delineation map, south portion of generation tie line. 14

1 INTRODUCTION

This report describes the methods and findings of wetland, stream, and other critical areas delineation for the proposed Fumaria Solar Site and Generation Tie Line Project (Fumaria Solar Project). The report was prepared by SWCA Environmental Consultants (SWCA), and is intended to address permitting requirements under Energy Facility Site Evaluation Council (EFSEC) Washington Administrative Code (WAC) 463-60-322, -332, and -333, and to show compliance of the proposed project with Kittitas County's Code for Critical Areas Ordinance (KCC Chapter 17A).

1.1 Background

TUUSSO Energy, LLC (TUUSSO) is proposing to construct a new photovoltaic solar facility installation on approximately 41.6 acres of fallow pastoral land, including the construction of a switchyard with a short (2.6-mile-long, 25.4-acre) generation tie line into an existing Puget Sound Energy (PSE) substation or the existing PSE distribution transmission line adjacent to the substation, located northwest of Ellensburg, Kittitas County, Washington. The Fumaria Solar Project is intended to provide up to 5 MW of solar energy to PSE for use within their service area.

1.2 Project Setting

The Fumaria Solar Project site primarily consists of fallow pastoral land located northwest of Ellensburg, in unincorporated Kittitas County, Washington. The Fumaria Solar Project would be located approximately 1.5 miles northwest of the intersection of Hungry Junction Road and Reece Creek Road, in Sections 9, 16, 17, 20, and 21 of Township 18 North, Range 18 East, Willamette Meridian (Figure 1). The generation tie line would originate from the southwestern project site boundary corner and follow Clarke Road, along one of two proposed alignments, to Faust Road, where it would parallel Faust Road south along existing power poles on the east side of the road right-of-way (ROW) to Hungry Junction Road, where it would turn west and travel along the north side of the road ROW to U.S. Highway 97, where it would travel south along the west side of the road ROW down to just south of McManamy Road, where it would turn northwest to connect into the existing PSE substation (a total of 2.6 miles). There are two proposed alignments along Clarke Road, one that was surveyed during the site visits and that traverses the north side of the road and existing power poles (ROW A), and one that was not surveyed that traverses the south side of the road (ROW B).

The Fumaria Solar Project site is approximately 41.6 acres and the generation tie line is approximately 25.4 acres, totaling 67.0 acres for the overall project. Topography of the site generally slopes to the south toward the Kittitas Reclamation District (KRD) Canal. Surface elevation within the project area ranges from 1,750 to 1,600 feet above mean sea level, the lowest elevation being along the southern portion of the proposed distribution route near the existing PSE substation and the highest elevation being at the northern end of the solar site.

2 METHODS

2.1 Study Area

The Fumaria Solar Project site is approximately 41.6 acres and the generation tie line is approximately 25.4 acres, totaling 67.0 acres for the overall project. The generation tie line portion of the project is 80 feet wide centered on the existing power poles and the new proposed line connecting the solar site to the existing poles (Figure 1). Wetlands and streams outside of the project site and generation tie line but that occur within 200 feet of these boundaries and had the potential to have buffers extend into the project were included in the study area. Wetlands and streams outside of the project site and within the study area were visually inspected but not formally delineated.

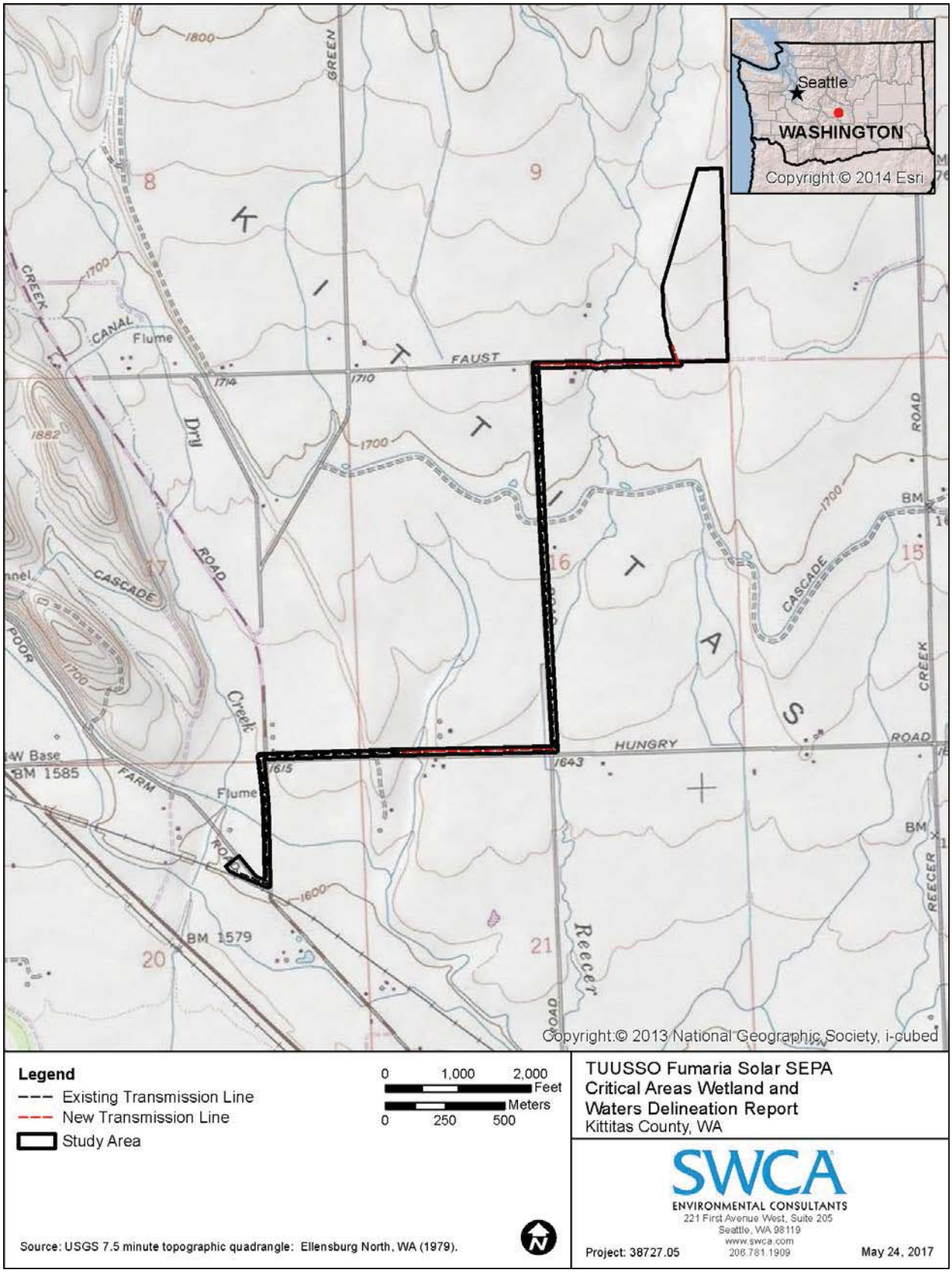


Figure 1. Project vicinity map.

2.2 Review of Existing Information

Prior to conducting fieldwork, background materials were reviewed to determine the potential for wetlands, floodplains, habitats, and other critical areas and their buffers to occur within the study area. Materials referenced during the desktop study are listed below. The following checklist follows the KCC Critical Areas required checklist outlined in KCC Chapter 17A.03.035.

Wetlands (KCC Chapter 17A.04)

- Historical Google Earth aerial photography (2000–2015).
- U.S. Department of Agriculture (USDA) historical imagery (USDA 1954).
- U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle map for Ellensburg North, Washington, included in Figure 1.
- USFWS National Wetlands Inventory (NWI) data and USGS National Hydrography Dataset (NHD), included in Figure 2.
- Natural Resources Conversation Service (NRCS) Soil Survey of Kittitas County Area, Washington and NRCS Web Soil Survey map of the study area, included in Figure 3.

Frequently flooded areas (KCC Chapter 17A.05)

- Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Panels 5300950436B and 5300950437B (as cited by Kittitas County 2017), included in Figure 2.

Geologically hazardous areas (KCC Chapter 17A.06)

- Includes erosion, landslide, mine, and seismic hazard areas.
- Kittitas County COMPAS mapping tool.

Habitats (KCC Chapter 17A.07)

- Includes riparian habitats and streams and rivers.
- Washington State Department of Fish and Wildlife (WDFW) SalmonScape online mapper.
- WDFW Priority Habitats and Species (PHS) online mapper, included in Figure 3.

Aquifer recharge areas (KCC Chapter 17A.08)

- No critical aquifer recharge locations have been identified in Kittitas County.

Spatial data obtained during the review of existing information were incorporated into Fumaria Solar Project base maps (Figures 1 through 3).

2.3 Field Investigation

Following the desktop review of existing information, a team of two biologists conducted site visits on April 5, 6, and 11, 2017, to assess the study area for the presence of wetland and waterbody features and to record data relevant to the Washington State Department of Ecology's (Ecology's) most recently approved version of the *Washington State Wetland Rating System for Eastern Washington, 2014 Update* (Hruby 2014). Visual observations were recorded within 200 feet of the project site and generation tie line, and included wildlife and habitat data.

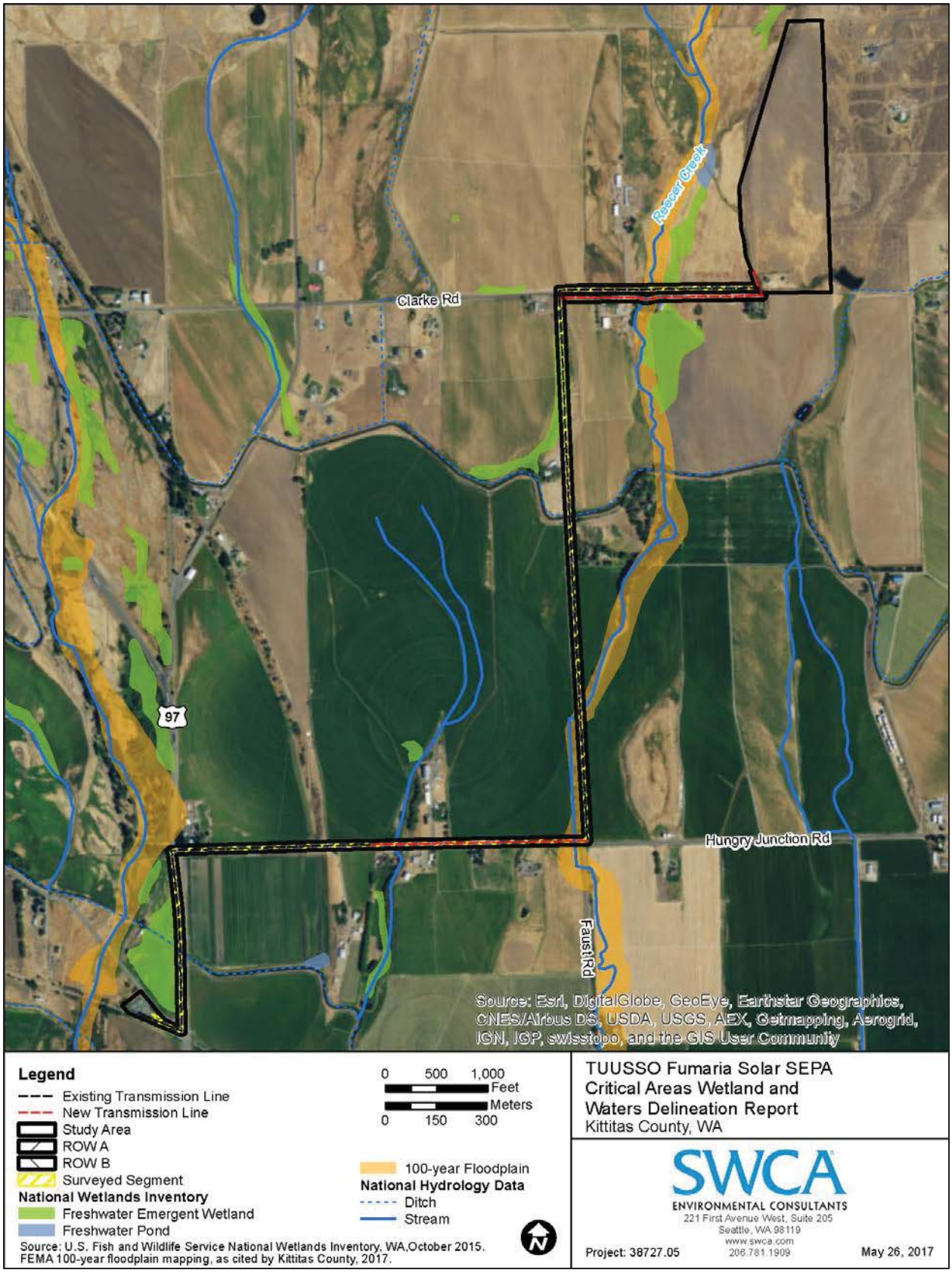


Figure 2. NWI, NHD, and floodplain mapping.

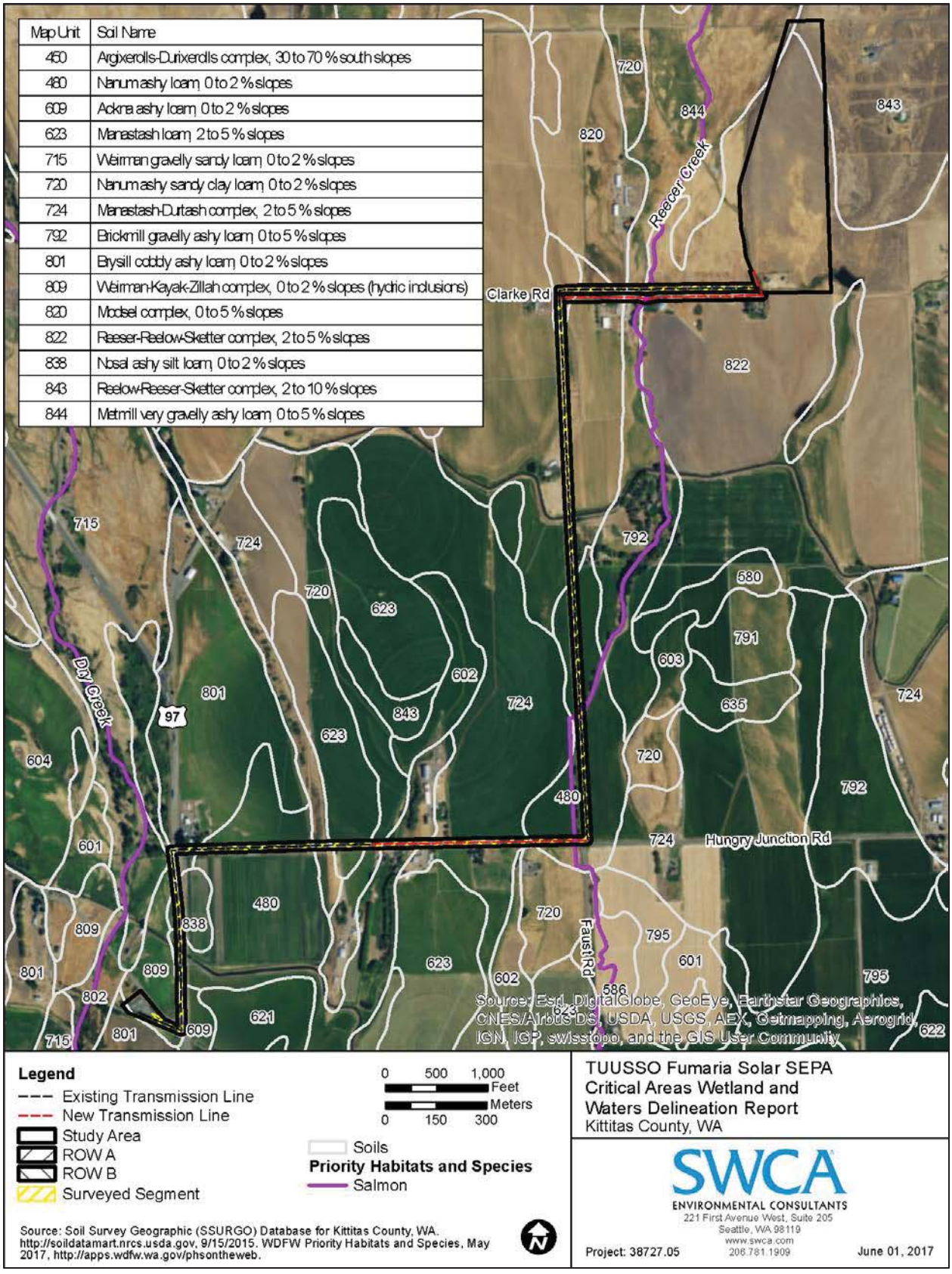


Figure 3. Soils and PHS mapping.

Precipitation data were obtained from the closest wetlands climate analysis (WETS) climate station, the Ellensburg National Weather Service (NWS) station (ELBW1), approximately 5.5 miles to the southeast of the project site in southern Ellensburg, Washington. Historical (1971–2000) average annual rainfall is listed as 8.96 inches. Table 1 shows the monthly precipitation at the Ellensburg NWS weather station for the 3 months prior to the April 5, 6, and 11, 2017, site visits. Table 2 shows the rainfall received 2 weeks prior to the site visits, and the water-year-to-date (WYTD) rainfall. Rainfall recorded 3 months prior to fieldwork was wetter than normal.

Table 1. Precipitation for 3 Months Prior to Site Visits (in inches)

Month	Average	30% Chance Will Have		Observed Precipitation	Within Normal Range?
		Less Than	More Than		
March	0.76	0.36	0.93	1.49	Above
February	0.91	0.59	1.10	2.04	Above
January	1.19	0.65	1.45	1.54	Above

Source: NRCS 2017b.

Table 2. Precipitation 2 Weeks Prior to Site Visits (in inches)

Field Study	Precipitation 2 Weeks Prior	WYTD	Inches Above or Below Normal WYTD*
April 4–March 22, 2017	0.70	8.93	2.76 above
April 5–March 23, 2017	0.48	8.93	2.74 above
April 10–March 28, 2017	0.61	9.38	3.10 above

*Based on average precipitation from 1981 to 2010.
Source: NRCS 2017b.

2.3.1 Wetlands

The Fumaria Solar Project study area was investigated for wetlands in accordance with the current methodology of the U.S. Army Corps of Engineers' (USACE's) 2008 *Arid West Regional Supplement (Version 2)* and the *Wetlands Delineation Manual* (Environmental Laboratory 1987). A detailed description of the field methods used in this study is provided in Appendix A.

A Trimble Geo XT global positioning system (GPS) unit was used by the field team to assist in identifying the project site and generation tie line boundaries and to record site spatial data. This device is capable of submeter accuracy. The full extent of the study area was covered by the team of biologists. Photographs were collected and vegetation, soil, and hydrology characteristics were documented. The boundaries for wetlands located outside of the project site and generation tie line but within the study area were approximated using field observations and aerial imagery to determine the extent of on-site wetland buffers.

Geographic information system (GIS) software were used to analyze data and to produce the report figures (Figures 4 through 10). Per WAC 463-60-333 and KCC Chapter 17A, wetlands were rated using the *Washington State Wetland Rating System for Eastern Washington, 2014 Update*. Per KCC 17A.04.020, the resulting wetland ratings were used to determine the County-prescribed range of wetland buffers for each wetland. Table 3 lists Ecology's wetland rating criteria.

Table 3. Washington State Department of Ecology Wetland Rating System

Category			
I	**II**	**III**	**IV**
Category I wetlands: Represent a unique or rare wetland type; are more sensitive to disturbance than most wetlands; are relatively undisturbed and contain ecological attributes that are impossible to replace within a human lifetime; or provide a high level of functions. Specific wetlands that meet the Category I criteria include: 1. alkali wetlands, characterized by the presence of shallow saline water with a high pH; 2. natural heritage wetlands, specifically, wetlands identified by the Washington Natural Heritage Program/DNR as high quality relatively undisturbed wetlands; and wetlands that support state-listed threatened or endangered plants; 3. bogs and calcareous fens; 4. mature and old-growth forested wetlands with slow growing trees that are over 0.25 acre in size; and 5. wetlands that perform many functions very well, as indicated by a score of 22 or more points out of 27 on the wetland rating form.	Category II wetlands: Wetlands that are difficult, though not impossible, to replace, and provide high levels of some functions. Specific wetlands that meet the Category II criteria include: 1. forested wetlands in the floodplains of rivers; 2. mature and old-growth forested wetlands with fast growing trees that are over 0.25 acre in size; 3. vernal pool that are located in a landscape with other wetlands and that are relatively undisturbed during the early spring; and 4. wetlands scoring between 19 and 21 points, out of 27, on the wetland rating form.	Category III wetlands: Wetlands that provide a moderate level of functions. Specific wetlands that meet the Category III criteria include: 1. wetlands scoring between 16 and 18 points, out of 27, on the wetland rating form.	Category IV wetlands: Wetlands that have the lowest levels of functions and are heavily disturbed. Specific wetlands that meet the Category IV criteria include: 1. wetlands scoring less than 16 points out of 27 on the wetland rating form.

Source: Hruby (2014).
Kittitas County wetland category definitions defer to Washington Administrative Code for guidance.
Appendix F includes the County-issued guidance.

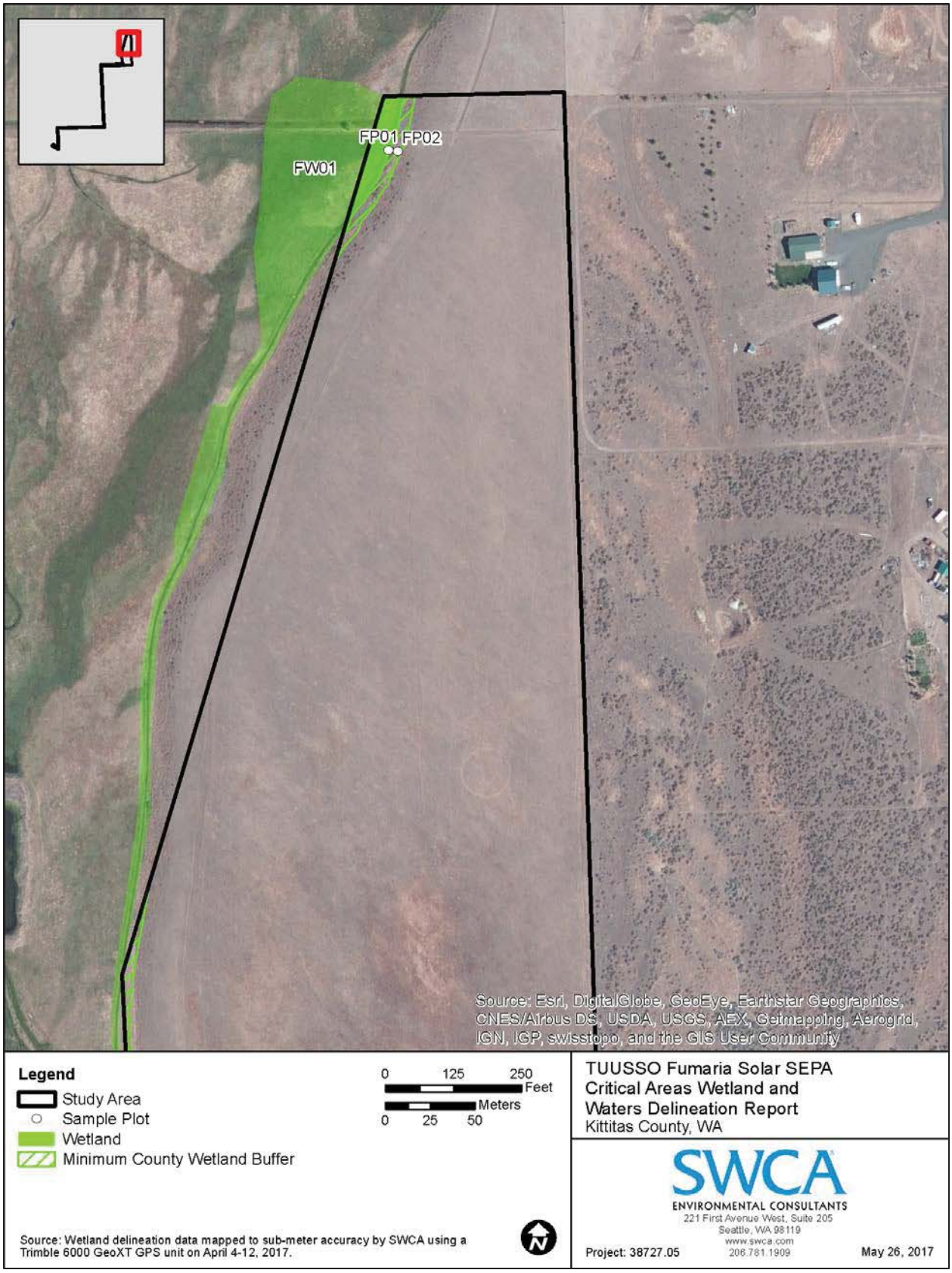


Figure 4. Wetland and waters delineation map, north portion of site.

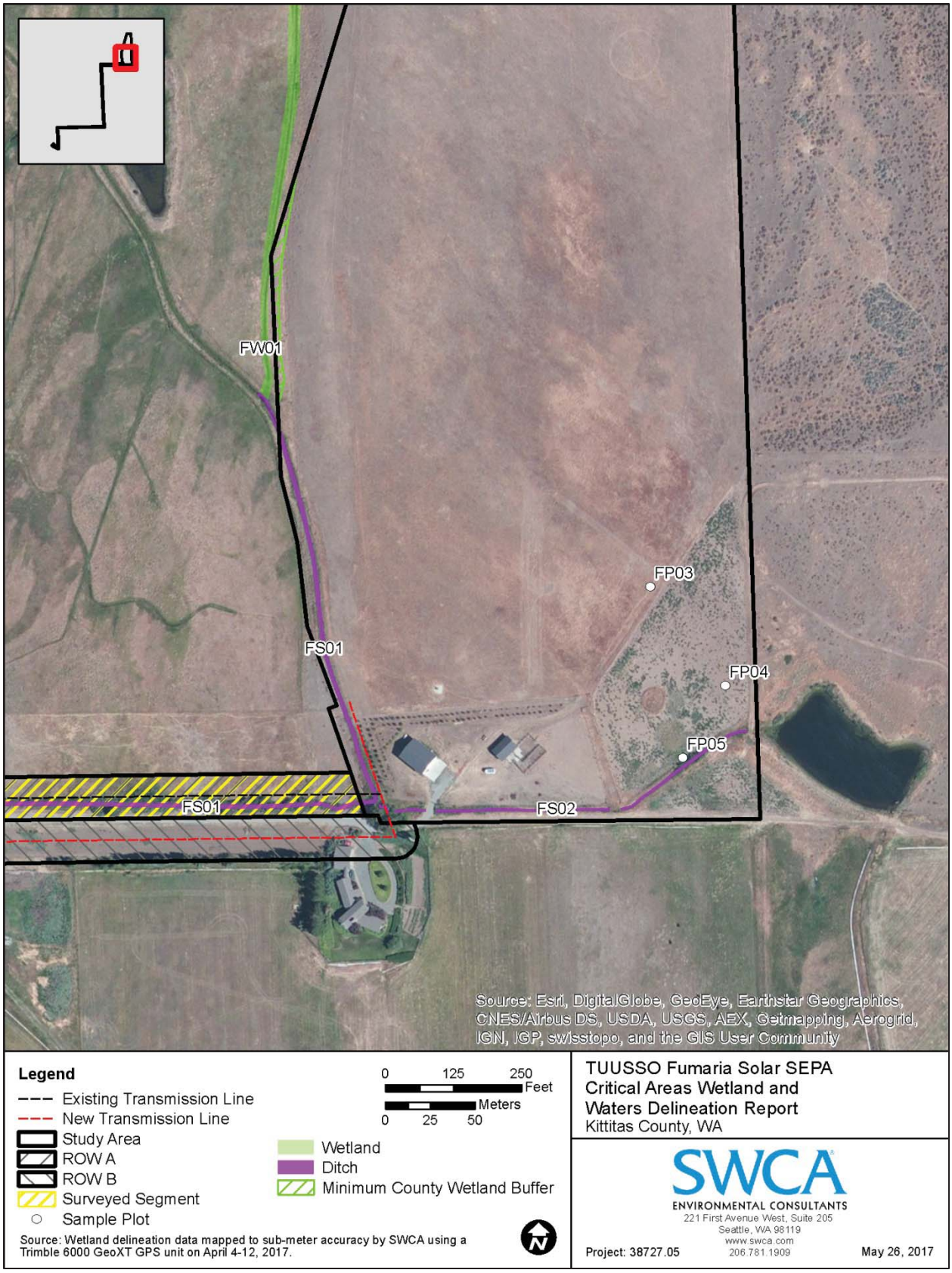


Figure 5. Wetland and waters delineation map, south portion of site.

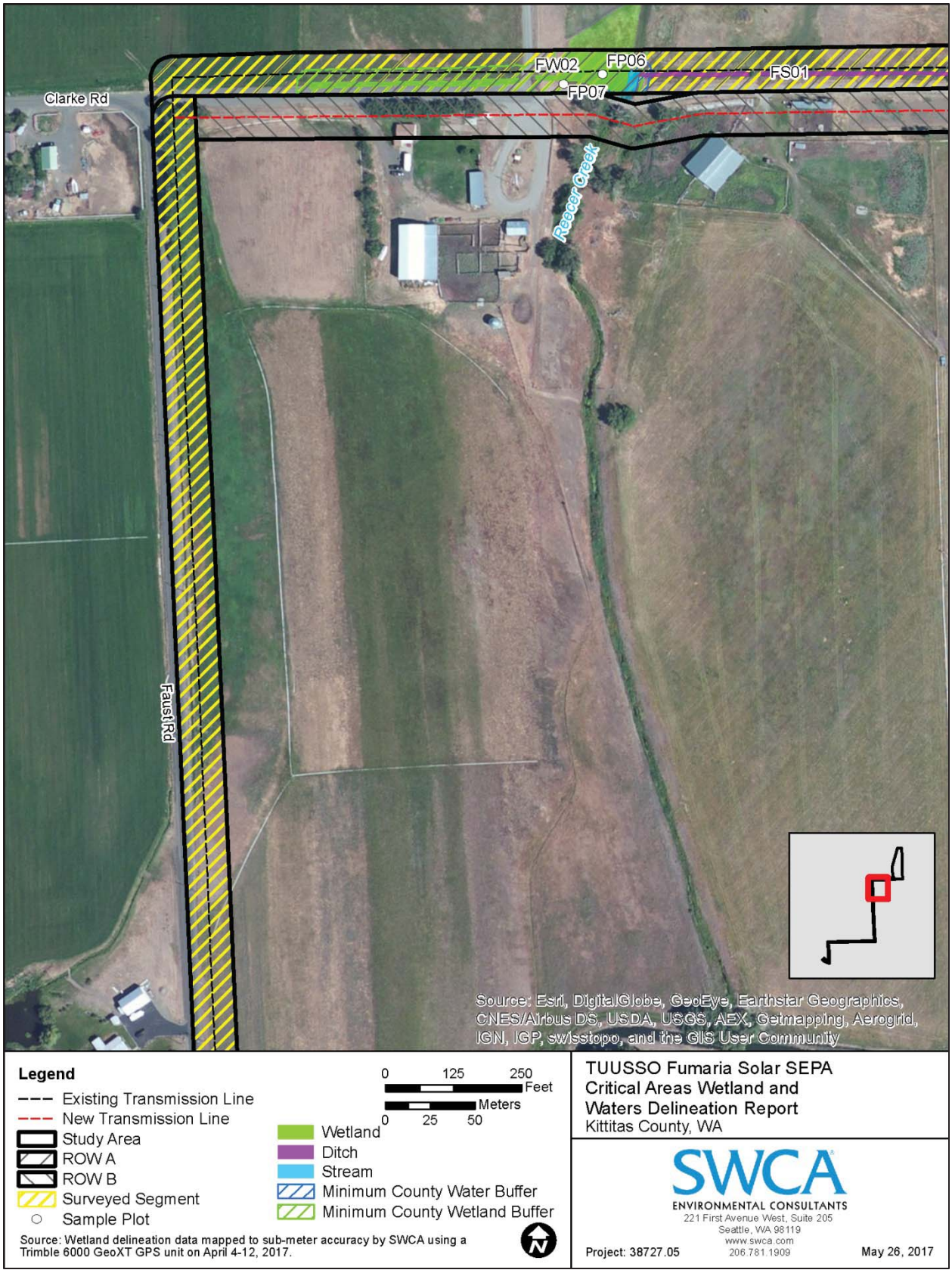


Figure 6. Wetland and waters delineation map, north portion of generation tie line.

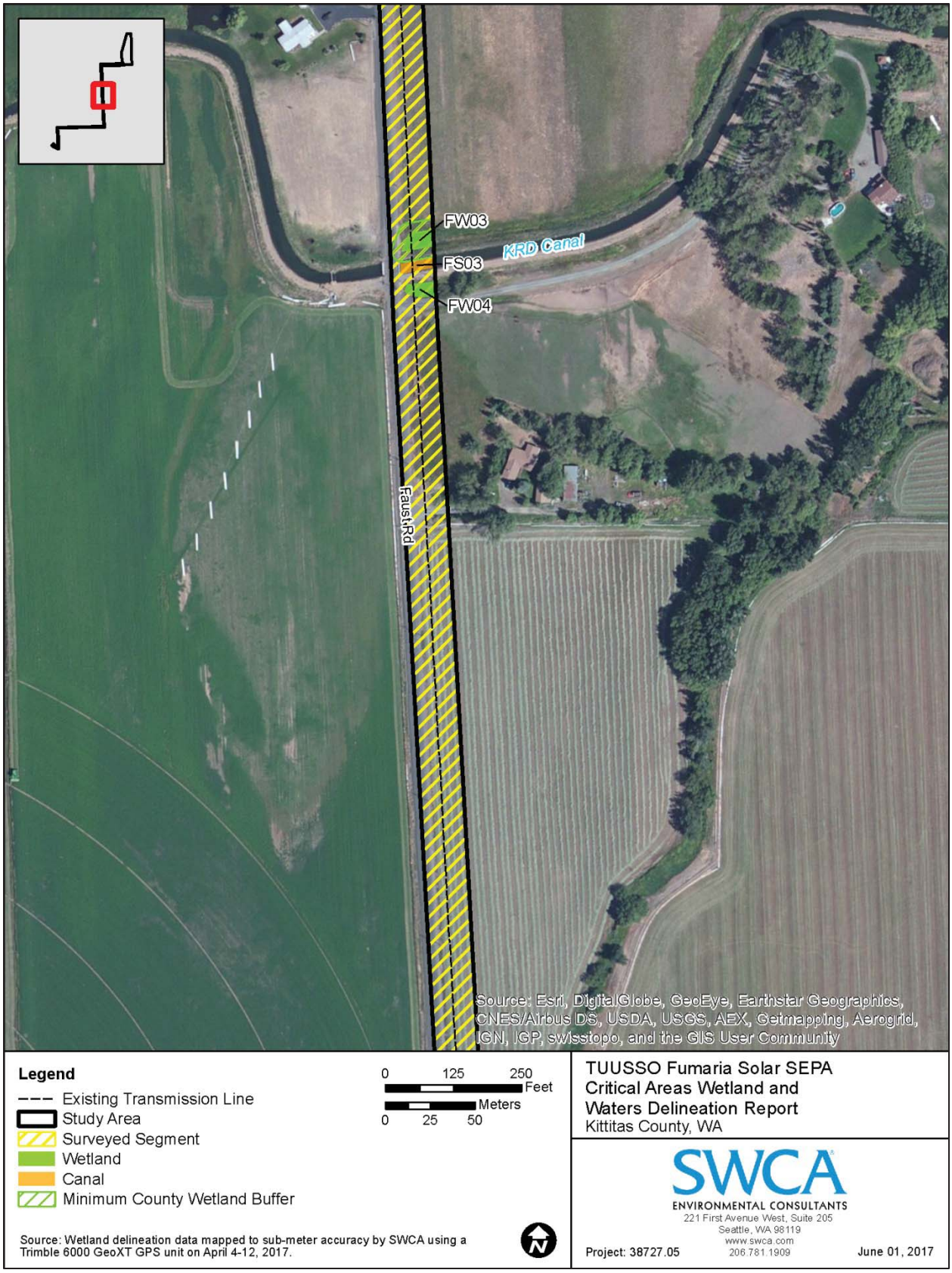


Figure 7. Wetland and waters delineation map, northern middle portion of generation tie line.

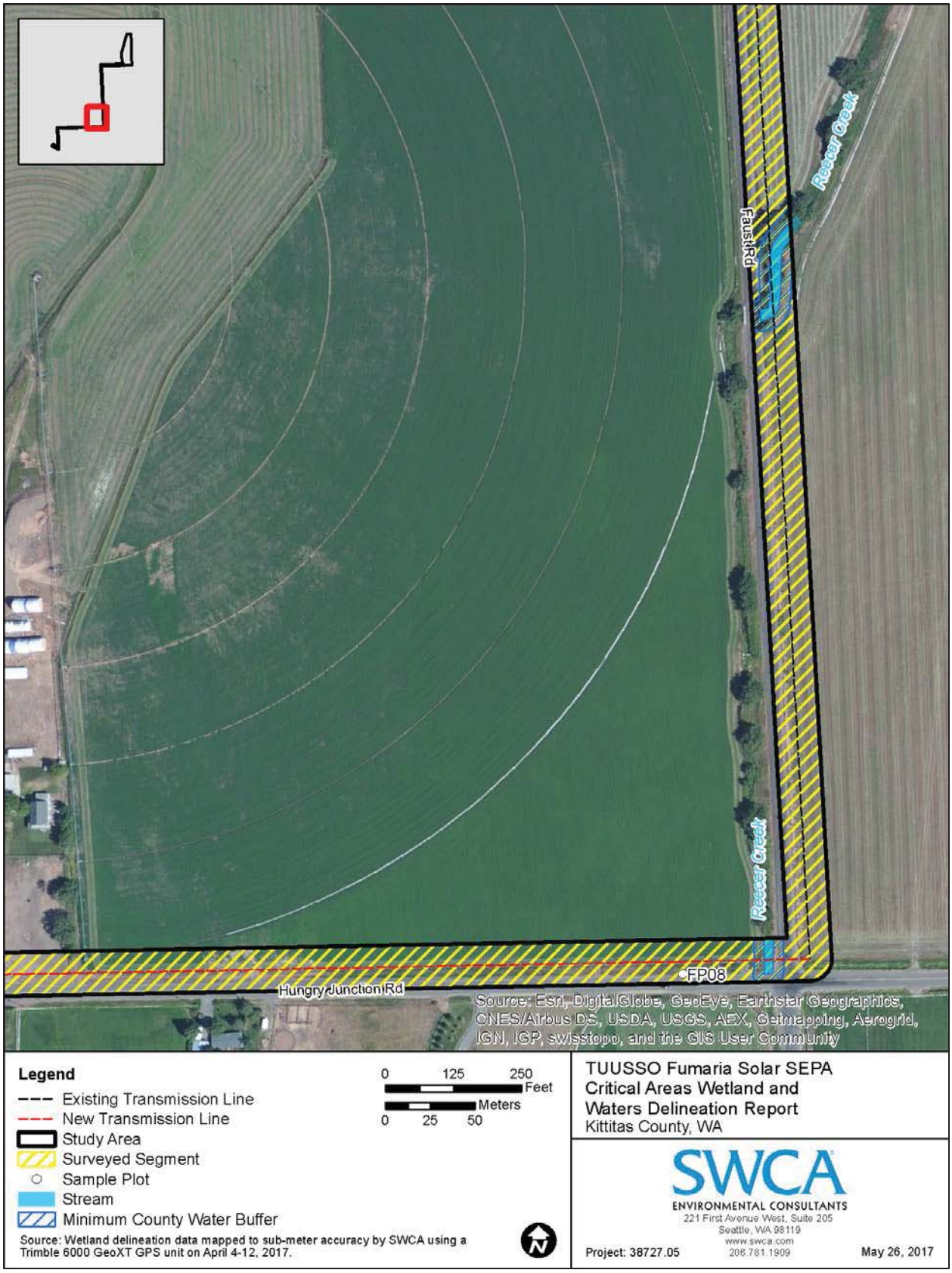


Figure 8. Wetland and waters delineation map, middle portion of generation tie line.

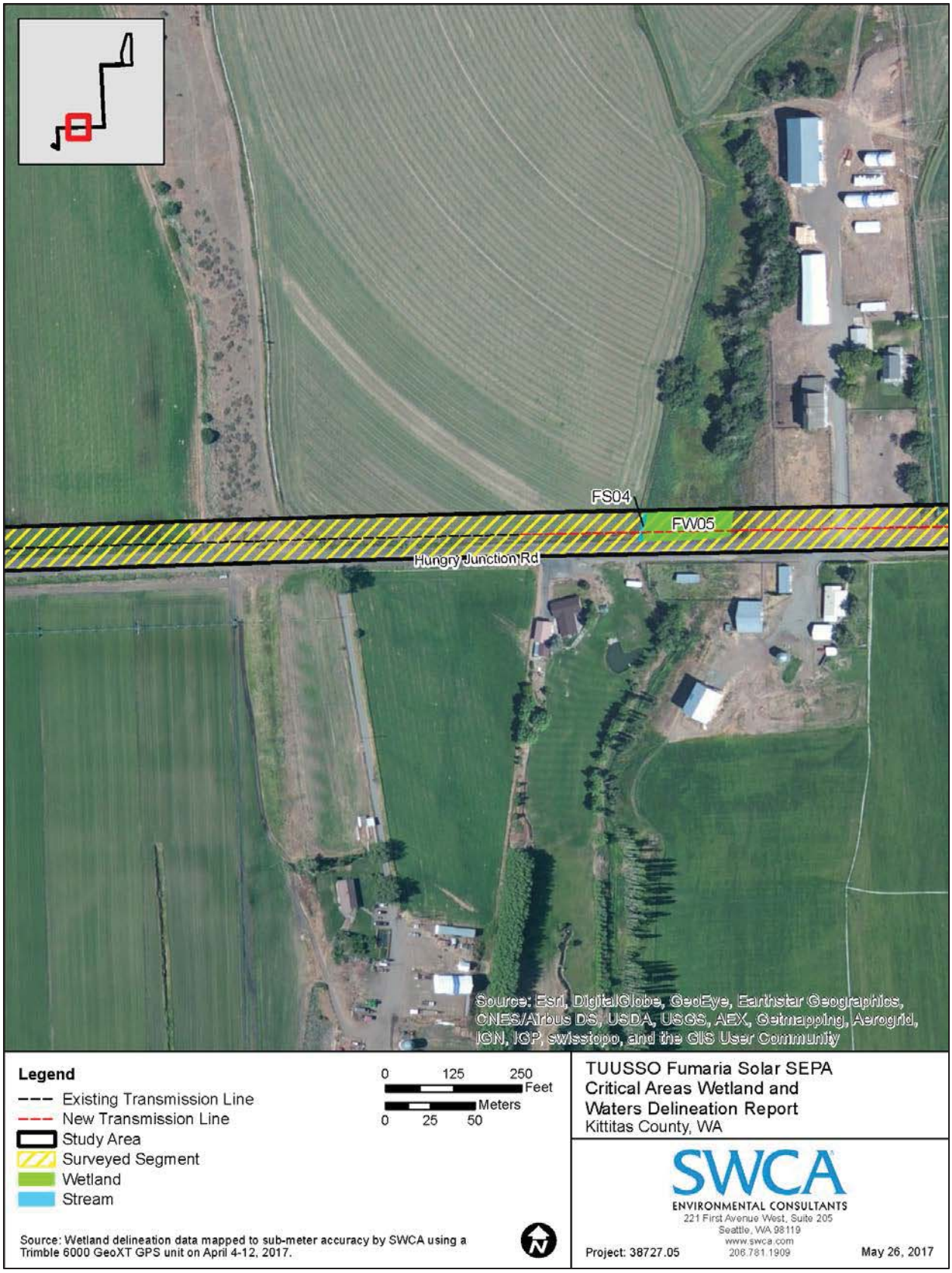


Figure 9. Wetland and waters delineation map, southern middle portion generation tie line.

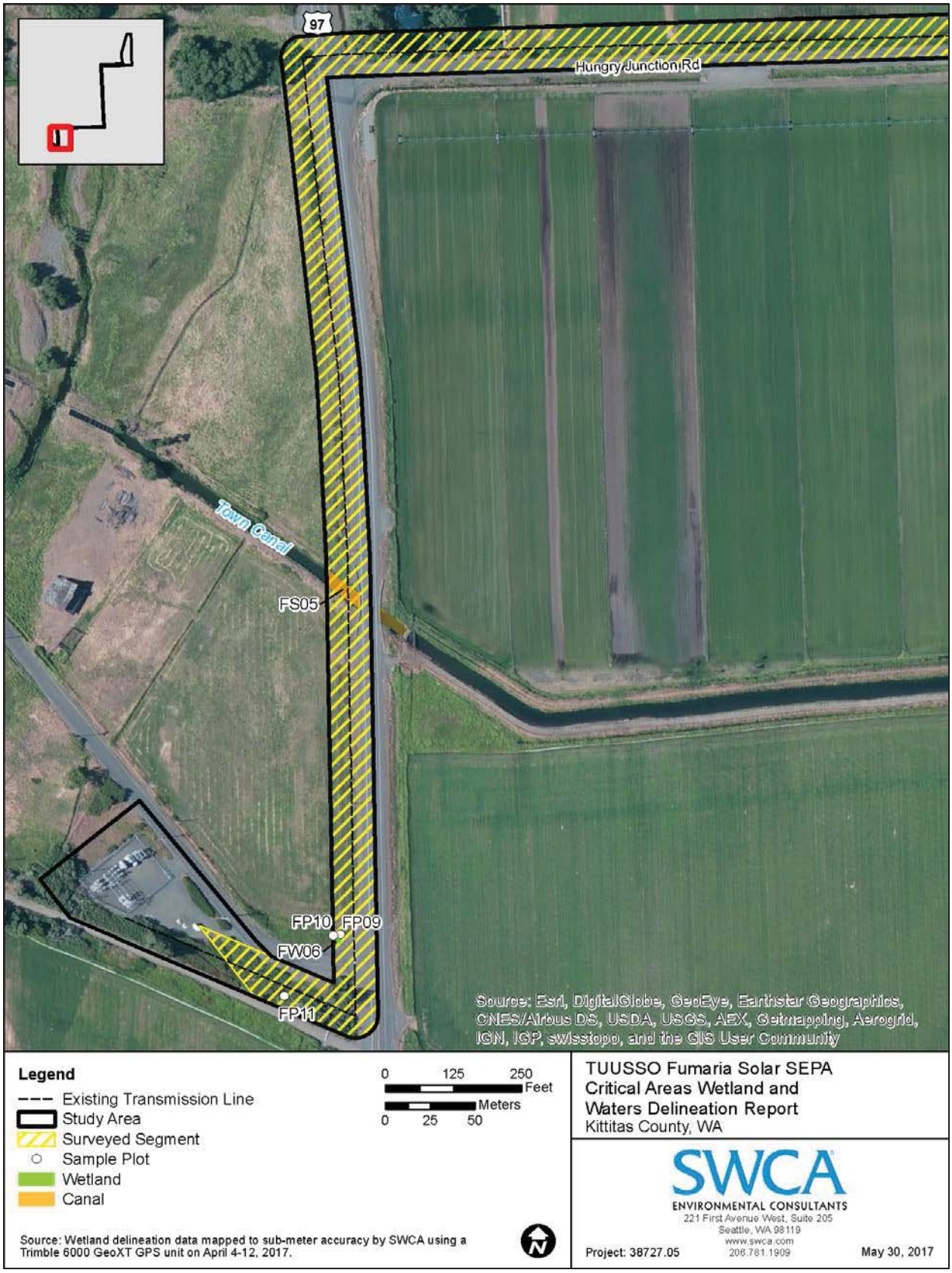


Figure 10. Wetland and waters delineation map, south portion of generation tie line.

Kittitas County's definition of a wetland is based on the Revised Code of Washington (RCW) 36.70A.030, which states:

> *(21) "Wetland" or "wetlands" means areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Wetlands do not include those artificial wetlands intentionally created from nonwetland sites, including, but not limited to, irrigation and drainage ditches, grass-lined swales, canals, detention facilities, wastewater treatment facilities, farm ponds, and landscape amenities, or those wetlands created after July 1, 1990, that were unintentionally created as a result of the construction of a road, street, or highway. Wetlands may include those artificial wetlands intentionally created from nonwetland areas created to mitigate conversion of wetlands.*

A detailed analysis of wetland functions is not included in this report; however, a brief description of wetland functions is provided as part of the general description for each wetland.

2.3.2 Riparian Habitats

Biologists also investigated the Fumaria Solar Project study area for the presence of non-wetland waters and used a GPS device to delineate the ordinary high water marks (OHWMs) of streams per the definitions in WAC 173-22-030 (Figures 4 through 10). The OHWMs of streams and rivers outside of the project site and generation tie line but within the study area were approximated using field observations and aerial imagery to determine the extent of on-site stream buffers.

Streams identified in the Fumaria Solar Project study areas were classified according to the WAC stream typing system (WAC 222-16-030). Criteria for this typing system are described in Table 4. The stream types described in this report are based on the stream reaches within the study area; downstream reaches may be rated higher.

Table 4. Summary of the Water Typing System

Stream Type	Definition [a]
S	All waters, within their bankfull width, as inventoried as "shorelines of the state" under Chapter 90.58 RCW and the rules promulgated pursuant to Chapter 90.58 RCW including periodically inundated areas of their associated wetlands.
F	All segments of natural waters that are not Type S waters, and that contain fish or fish habitat, including: 1) waters diverted for domestic use by more than 10 residential or camping units or by a public accommodation facility; 2) waters diverted for use by a federal, state, or Tribal fish hatchery from the point of diversion for 1,500 feet or the entire tributary if the tributary is highly significant for protection of downstream water quality; 3) waters that are within a federal, state, local, or private campground having more than 10 camping units; or 4) riverine ponds, wall-based channels, and other channel features that are used by fish for off-channel habitat.
Np	All segments of natural waters within the bankfull width of defined channels that are perennial non–fish habitat streams. Perennial streams are flowing waters that do not go dry any time of a year of normal rainfall and include the intermittent dry portions of the perennial channel below the uppermost point of perennial flow.
Ns	All segments of natural waters within the bankfull width of the defined channels that are not Type S, F, or Np waters. These are seasonal, non–fish habitat streams in which surface flow is not present for at least some portion of a year of normal rainfall and the stream is not located downstream from any stream reach that is a Type Np water. Ns waters must be physically connected by an above-ground channel system to Type S, F, or Np waters.

[a] Definitions are summarized from WAC 222-16-030. Kittitas County stream type definitions defer to WAC for guidance.

3 RESULTS AND DISCUSSION

The Fumaria Solar Project site is an upland terrace that was previously heavily grazed. There is a garage and horse corral in the southwest corner of the project site. Irrigation ditches border the project site on the west and south. The plant community is dominated by weeds and non-native herbaceous species in upland areas, including tall false rye grass (*Schedonorus arundinaceus*), bluegrass (*Poa* spp.), alfalfa (*Medicago sativa*), Shepard's-purse (*Capsella bursa-pastoris*), garden yellow rocket (*Barbarea vulgaris*), prickly lettuce (*Lactuca serriola*), yellow salsify (*Tragopogon dubius*), chicory (*Cichorium intybus*), common dandelion (*Taraxacum officinale*), and downy cheat grass (*Bromus tectorum*). However, much of the project site is beginning to return to native sagebrush habitat with the establishment of native species, including bitter-brush (*Purshia tridentata*), big sagebrush (*Artemisia tridentata*), common spring-gold (*Crocidium multicaule*), spring draba (*Draba verna*), yellow bell (*Fritillaria pudica*), Gorman's desert-parsley (*Lomatium gormanii*), and Rainier violet (*Viola trinervata*). In addition, the site has patches of noxious weeds, including hairy cat's-ear (*Hypochaeris radicata*), spotted knapweed (*Centaurea stoebe*), Canadian thistle (*Cirsium arvense*), Fuller's teasel (*Dipsacus fullonum*), and reed canary grass (*Phalaris arundinacea*).

The generation tie line crosses areas of rural residential use, pastoral lands, turf farms, existing driveways and access roads, irrigation canals, roadside ditches, and ruderal roadside corridors. Plant communities along this area were typically dominated by weeds and non-native species often found in road right-of-ways, including bluegrass, tall false rye grass, reed canary grass, and common dandelion. Refer to Appendix B for a complete list of vegetation observed within the study area.

According to NRCS, the project site encompasses three different soil map units, and the generation tie line encompasses 11 map units (Table 5). These soil map units range from somewhat poorly drained to well drained soils that occur on terraces, floodplains, valleys, fans, escarpments, hills, and hillslopes. The Weirman-Kayak-Zillah complex soil unit is on the National Hydric Soils list (NRCS 2015), which is a list of soils that can be indicative of saturated, flooded, or ponded areas that could meet the definition of a hydric soil.

3.1 Wetlands

Six wetlands were delineated within the Fumaria Solar Project study area (one on the solar site and five along the generation tie line). Wetlands were distinguished from adjoining uplands by the presence or absence of indicators for wetland hydrology, hydric soils, and hydrophytic vegetation. Wetland delineation data sheets are provided in Appendix C, photographs are provided in Appendix D, and wetland rating forms are provided in Appendix E.

Table 6 summarizes the size, rating, and classification of wetlands found within the Fumaria Solar Project study area. All delineated wetlands would fall under the jurisdiction of the USACE, Ecology, and Kittitas County. Figures 4 through 10 show the locations of the wetlands, streams, data plots, and their associated minimum protection buffers. The minimum wetland protection buffers were calculated per KCC guidance based on Ecology's Wetland Rating for each wetland. Detailed descriptions of each wetland are provided in the following sections.

Table 5. Soil Mapping within the Study Area

Map Unit Symbol	Map Unit Name	Hydric
450	Argixerolls-Durixerolls complex, 30%–70% south slopes	No
480	Nanum ashy loam, 0%–2% slopes	No
609	Ackna ashy loam, 0%–2% slope	No
623	Manastash loam, 2%–5% slopes	No
720	Nanum ashy sandy clay loam, 0%–2% slopes	No
724	Manastash-Durtash complex, 2%–5% slopes	No
792	Brickmill gravelly ashy loam, 0%–5% slopes	No
801	Brysill cobbly ashy loam, 0%–2% slopes	No
809	Weirman-Kayak-Zillah complex, 0%–2% slopes	Yes
820	Modsel complex, 0%–5% slopes	No
822	Reeser-Reelow-Sketter complex, 2%–5% slopes	No
838	Nosal ashy silt loam, 0%–2% slopes	No
843	Reelow-Reeser-Sketter complex, 2%–10% slopes	No
844	Metmill very gravelly ashy loam, 0%–5% slopes	No

Source: NRCS 2015 and 2017b.

Table 6. Wetland Size, Rating, and Classification for Wetlands within the Study Area

Wetland Name	Delineated Area within the Project (Wetland Rating Unit Size) [a] (acres)	Wetland Rating [b]	Hydrogeomorphic Classification	Cowardin Classification [c]	Dominant Species Observed within Wetland
Solar Site					
FW01	0.18 (estimated 5.57)	III	Slope	PEM	Reed canary grass, Fuller's teasel, sedge species
Generation Tie Line					
FW02	0.24 (estimated 2.15)	II	Riverine	PEM	creeping wild rye, dock-leaf smartweed, yellow nutsedge, curly dock
FW03	0.03 (estimated 0.58)	III	Depressional	PEM	Reed canary grass, broad-leaf cat-tail
FW04	0.03 (estimated 0.23)	III	Riverine	PEM/PSS	Reed canary grass, broad-leaf cat-tail, crack willow
FW05	0.20 (estimated 1.67)	IV	Riverine	PEM	Reed canary grass
FW06	0.005 (0.005)	IV	Depressional	PEM	Broad-leaf cat-tail

[a] Wetland rating unit size is the total area of wetland delineated or estimated based on aerial photograph interpretation and field reconnaissance. Area of delineated portions of the wetlands is based on SWCA survey data.

[b] Wetland ratings are based on *Washington State Wetland Rating System for Eastern Washington – Revised* (Hruby 2014).

[c] Cowardin et al. (1979).

3.1.1 Wetland FW01

Palustrine emergent
Category III
0.18 acre within the project site, approximately 5.57 acres in total

Wetland FW01 is a Slope wetland that has a small amount of acreage within the western boundary of the Fumaria Solar Project site, and the majority of the wetland extending offsite to the west and north (see Figures 4 and 5; and wetland rating Figures 1 through 5 in Appendix E). Delineation data were recorded at sample plots FP01 and FP02, provided on datasheets in Appendix C. Wetland FW01 is located on the eastern edge of a Quaternary alluvial plain, where it meets the toe of slope of a terrace consisting of Mesozoic continental sedimentary rock (Schuster 2005). The eastern wetland boundary is formed where the alluvial plain meets the toe of slope of the terrace. An irrigation ditch flows south along the toe of the slope, just outside of the project site. This irrigation ditch forms the southern half of Wetland FW01. The wetland boundary is defined by an obvious rise in topography and a change in the plant community.

Wetland FW01 is a Palustrine Emergent (PEM) wetland (Cowardin et al. 1979). Refer to Table A-1 in Appendix A for definitions of wetland indictor statuses listed in this section (i.e., FACU, FAC, FACW, and OBL). Dominant pant species included reed canary grass (FACW), Fuller's teasel (FAC), and unidentified sedge species (*Carex spp.*, FAC).

Soils in Wetland FW01 are mapped as Metmill very gravelly ashy loam with 0% to 5% slopes, and Reeser-Reelow-Sketter complex with 2% to 5% slopes (NRCS 2017a) (see Figure 3). The typical soil profile observed within 16 inches of the soil surface consists of very dark brown (10YR 2/2) silt loam over black (10YR 2/1) silty clay loam with redoximorphic features below 5 inches (Munsell Color 2009). The soils in Wetland FW01 meet the hydric soil indicator for Redox Dark Surface (F6).

The primary indicator of drift deposits (non-riverine) and the secondary indicator of drainage patterns were observed within Wetland FW01. The presence of these indicators meets the wetland hydrology criteria.

Wetland FW01 is rated as a Category III wetland in the Ecology rating system (see Table 3), with moderately low scores for water quality improvement (5/9 points) and habitat function (5/9 points), and a moderate score for hydrologic function (6/9). Wetland FW01 has low potential to provide water quality improvement because slope wetlands do not retain water or excess nutrients. Wetland FW01 has moderate hydrologic function because the surrounding landscape is dominated by pastoral land use and is situated in the Reecer Creek basin where flooding problems occur.

3.1.2 Wetland FW02

Palustrine emergent
Category II
0.24 acre within the generation tie line, approximately 2.15 acres in total

Wetland FW02 is a Riverine wetland consisting of grazed and ungrazed pasture and a roadside ditch (see Figure 6; and wetland rating Figures 1 through 5 in Appendix E). This wetland is located in the surveyed ROW A alignment of the Fumaria Solar Project generation tie line. Delineation data were recorded at sample plots FP06 and FP07 and is provided on datasheets in Appendix C. This wetland has slopes to the south towards Clarke Road and east towards Reecer Creek. The western portion of this wetland extends

along Clarke Road, as a roadside ditch that flows under a driveway through a culvert into the portion of the wetland adjacent to Reecer Creek. The western portion of the wetland is a Slope wetland. The upland boundary of the wetland is defined by the road to the south and a rise in elevation to the north. The eastern portion of the wetland is located within the 100-year floodplain for Reecer Creek (see Figure 2).

Wetland FW02 is a PEM wetland habitat type (Cowardin et al. 1979). The wetland is dominated by creeping wild rye (*Elymus repens*, FAC), dock-leaf smartweed (*Persicaria lapathifolia*, FACW), yellow nutsedge (*Cyperus esculentus*, FACW), and curly dock (*Rumex crispus*, FAC). The dominance of these species meets the wetland vegetation criteria. Wetland FW02 is mapped adjacent to a NWI-mapped palustrine emergent, persistent, seasonally flooded (PEM1C) wetland (see Figure 2).

Soils in Wetland FW02 are mapped as Modsel complex with 0% to 5% slopes, Metmill very gravelly ashy loam with 0% to 5% slopes, and Reeser-Reelow-Sketter complex with 2% to 5% slopes (NRCS 2017a) (see Figure 3). The soil profile observed within 16 inches of the soil surface consists of dark brown (7.5YR 3/2) silt loam over a very dark gray (10YR 3/1) silty clay loam with redoximorphic features from 2 to 8 inches and a black (2.5Y 2.5/1) silt loam with small amounts of redoximorphic features below 8 inches (Munsell Color 2009). The soils in Wetland FW02 meet the hydric soil indicator for Redox Dark Surface (F6).

Only secondary indicators of hydrology were observed within this wetland, including drift deposits (riverine) and drainage patterns. The presence of these indicators meets the wetland hydrology criteria.

Wetland FW02 is rated as a Category II wetland in the Ecology rating system, with a moderate score for water quality improvement (6/9), a high score for hydrologic function (8/9 points), and a moderately low score for habitat function (5/9 points). Wetland FW02 has a moderately high potential to provide hydrologic functions because it is more than twice the width of the adjacent Reecer Creek channel and it has the potential to slow down water movement to help reduce flooding issues directly downstream in Reecer Creek.

3.1.3 Wetland FW03

Palustrine emergent
Category III
0.03 acre within the generation tie line, approximately 0.58 acre in total

Wetland FW03 is a Depressional wetland on the north side of the KRD Canal, separated by a constructed berm, and starts just east of the Faust Road ROW, extending east out of the study area to Reecer Creek. This wetland is fed by runoff and irrigation from the agricultural fields to the north (see Figure 7; and wetland rating Figures 1 through 5 in Appendix E). Because this wetland was outside of the road ROW and access to the property to the east of the road was prohibited, no sample plots were recorded. The upland boundary of the wetland appeared to be well defined by an obvious rise in elevation to the north and south of the wetland and changes in the vegetation community.

Wetland FW03 is mostly a PEM wetland habitat type with some potential palustrine scrub-shrub (PSS) wetland areas along the southern wetland boundary (Cowardin et al. 1979). The wetland is dominated by reed canary grass and broad-leaf cat-tail (*Typha latifolia*, OBL) with Nootka rose (*Rosa nutkana*, FACU) along the southern wetland boundary. The dominance of these species meets the wetland vegetation criteria.

Soils in Wetland FW03 are mapped as Reeser-Reelow-Sketter complex, with 2% to 5% slopes (NRCS 2017a) (see Figure 3). Soils were not recorded for this wetland because access to the wetland was prohibited by lack of landowner permission. Therefore, hydric soils were assumed to be present within this wetland based on the presence of wetland vegetation and hydrology observed from the road ROW.

Primary indicators of hydrology observed within this wetland from the road ROW include surface water and inundation visible on aerial imagery. The presence of these indicators meets the wetland hydrology criteria.

Wetland FW03 is rated as a Category III wetland in the Ecology rating system, with a moderately high score for water quality improvement (7/9 points) and moderately low scores for hydrologic and habitat functions (5/9 points). Wetland FW03 has a moderately high potential to provide water quality improvements because it is dominated by ungrazed vegetation, has seasonal ponding over half of the wetland area, and is located in a basin where there are total maximum daily loads (TMDLs) defined (KRD Canal).

3.1.4 Wetland FW04

Palustrine emergent/scrub-shrub
Category III
0.03 acre within the generation tie line, approximately 0.23 acre in total

Wetland FW04 is a Riverine wetland on the south side of the KRD Canal, separated by a constructed berm with a culvert, and starts just east of the Faust Road ROW, extending east out of the study area for approximately 360 feet. This wetland is fed by overflow from KRD Canal through the culvert connecting the canal to the wetland through the berm, and by runoff from the field directly south of the wetland (see Figure 7; and wetland rating Figures 1 through 5 in Appendix E). Because this wetland was outside of the road ROW and access to the property to the east of the road was prohibited, no sample plots were recorded. The upland boundary of the wetland appeared to be well defined by an obvious rise in elevation to the north and south of the wetland, and changes in the vegetation community.

Wetland FW04 is predominately a PEM wetland habitat type but also includes an area of PSS wetland just east of the study area boundary (Cowardin et al. 1979). The wetland is dominated by reed canary grass, broad-leaf cat-tail, crack willow (*Salix* X *fragilis*, FAC), and Nootka rose. The dominance of these species meets the wetland vegetation criteria.

Soils in Wetland FW04 are mapped as Reeser-Reelow-Sketter complex, with 2% to 5% slopes (NRCS 2017a) (see Figure 3). Soils were not recorded for this wetland because access to the wetland was prohibited by lack of landowner permission. Therefore, hydric soils were assumed to be present within this wetland, based on the presence of wetland vegetation and the hydrology observed from the road ROW.

Primary indicators of hydrology observed within this wetland from the road ROW include surface water and inundation visible on aerial imagery. The presence of these indicators meets the wetland hydrology criteria.

Wetland FW04 is rated as a Category III wetland in the Ecology rating system, with moderately high scores for water quality improvement and hydrologic function (7/9 points) and a low score for habitat function (4/9 points). Wetland FW04 has moderately high potential to provide water quality improvement and hydrologic function because the majority of it is a depression, all of it is ungrazed,

there are TMDLs defined in the same basin (KRD Canal), the ratio of the wetland width to the adjacent channel width is greater than 1, and there are flooding problems in the basin immediately down gradient (Reecer Creek).

3.1.5 Wetland FW05

Palustrine emergent
Category IV
0.20 acre within the generation tie line, approximately 1.67 acres in total

Wetland FW05 is a Riverine wetland located just north of the Hungry Junction Road ROW and is fed by flooding from the intermittently flowing ditched stream that is a tributary to Town Canal to the south (see Figure 9; and wetland rating Figures 1 through 5 in Appendix E). Because this wetland was outside of the road ROW and access to the property to the north of the road was prohibited, no sample plots were recorded. The upland boundary of the wetland appeared to be well defined by an obvious rise in elevation to the east, and a change in the vegetation community to west.

Wetland FW05 is a PEM wetland habitat type with one crack willow growing within the wetland (Cowardin et al. 1979). The wetland is completely dominated by reed canary grass. The dominance of this species meets the wetland vegetation criteria.

Soils in Wetland FW05 are mapped as Nanum ashy loam, with 0% to 2% slopes (NRCS 2017a) (see Figure 3). Soils were not recorded for this wetland because access to the wetland was prohibited by lack of landowner permission. Therefore, hydric soils were assumed to be present within this wetland based on the presence of wetland vegetation and hydrology observed from the road ROW.

Secondary indicators of hydrology observed within this wetland from the road ROW include drainage patterns, drift deposits (riverine), and saturation visible on aerial imagery. No primary indicators of hydrology could be determined from the road ROW. The presence of these indicators meets the wetland hydrology criteria.

Wetland FW05 is rated as a Category IV wetland in the Ecology rating system, with a moderately high score for hydrologic function (7/9 points) and low scores for water quality improvement and habitat function (4/9 points). Wetland FW05 has a moderately high potential to provide hydrologic functions because it has a width greater than 2 times the width of the stream channel, ungrazed vegetation dominates the wetland, and there are flooding problems down-gradient of the wetland (Yakima River).

3.1.6 Wetland FW06

Palustrine emergent
Category IV
0.005 acre within the generation tie line and in total

Wetland FW06 is a Depressional wetland located northwest of the intersection of McManamy Road and U.S. Highway 97 and is fed by overland flow from the pastures to the north (see Figure 10; and wetland rating Figures 1 through 5 in Appendix E). Delineation data were recorded at sample plots FP09 and FP10 and is provided on datasheets in Appendix C. The uplands directly around this wetland appear to be mowed periodically. The upland boundary of the wetland is defined by a slight change in elevation and vegetation community change in every direction. A culvert is located at the southern end of the

wetland, higher in elevation than the area of seasonal ponding and allows intermittent flow under McManamy Road.

Wetland FW06 is a PEM wetland habitat type (Cowardin et al. 1979). The wetland is dominated by broad-leaf cat-tail and reed canary grass. The dominance of these species meets the wetland vegetation criteria.

Soils in Wetland FW06 are mapped as Weirman-Kayak-Zillah complex, with 0% to 2% slopes (NRCS 2017a) (see Figure 3). The soil profile observed within 16 inches of the soil surface consists of a black (10YR 2/1) coarse silt loam that transitions to a silty clay loam soil deeper with redoximorphic features and faint depletions starting at 8 inches, over a dark grayish brown (10YR 4/2) silty clay loam starting at 12 inches (Munsell Color 2009). The soils in Wetland FW05 meet the hydric soil indicator for Redox Dark Surface (F6).

Primary indicators of hydrology within the wetland include saturation from 0 to 8 inches (surface water driven). Secondary indicators of hydrology within the wetland include drainage patterns and FAC-neutral test. The presence of these indicators meets the wetland hydrology criteria.

Wetland FW06 is rated as a Category IV wetland in the Ecology rating system, with a moderately high score for water quality improvement (7/9 points), low score for hydrologic function (4/9 points), and a very low score for habitat function (3/9 points). Wetland FW06 has a moderately high potential to provide water quality improvements because it is dominated by ungrazed vegetation, has a relatively constrained outlet, and eventually discharges into a stream on the 303(d) list that also has defined TMDLs (Dry Creek).

3.2 Frequently Flooded Areas

FEMA floodplain mapping depicts the 100-year floodplain surrounding Reecer Creek, which crosses the Fumaria Solar Project generation tie line three times (see Figure 2). This area overlaps Wetland FW02, with a total area of 1.90 acres within the study area, but it is located entirely outside of the project site and will likely be avoided during project design. Development within the 100-year floodplain will be avoided; therefore, no net loss of floodplain storage will be achieved.

3.3 Geologically Hazardous Areas

The Fumaria Solar Project site is not within any mapped geologically hazardous areas. No erosion/landslide geologic hazard areas, snow avalanche hazards, or mine hazard areas are mapped on any of the parcels that encompass the project site (Kittitas County 2017). The project will not require specialized engineering to ascertain that the property is suitable for development.

3.4 Habitats

Based on the criteria provided in KCC Chapter 17A.07, the Fumaria Solar Project study area includes riparian habitat and priority species habitat. The project is not located on federal land or land owned or leased by the WDFW, and therefore is not considered big game winter range.

3.4.1 Riparian Habitat

One perennial stream (Reecer Creek), one unnamed intermittent stream (FS04), two canals (KRD and Town Canals), and two ephemeral and numerous roadside ditches are located in the Fumaria Solar Project study area. Based on the field observations, Reecer Creek and FS04 are considered jurisdictional

waters for the USACE, Ecology, and Kittitas County because they satisfy the definition of "waters of the United States" under the Clean Water Rule 40 CFR 230.3. The ephemeral ditches, roadside ditches, and canals ultimately feed into jurisdictional waters could be considered jurisdictional. Table 7 summarizes the size, rating, and classification of the streams found in the study area (see Figures 4 through 10). Photographs of these features are provided in Appendix D.

Table 7. Summary of Streams in the Study Area

Stream Name	Tributary to	Stream Type [a]	USACE Jurisdiction [b]	Average Width in Study Area (feet) [c]	Approximate Length in the Project (feet) [c]
Reecer Creek	Yakima River	F	RPW	14	290
Ephemeral ditch (FS01)	Reecer Creek	N/A	N/A	8	1,760
Ephemeral ditch (FS02)	FS01	N/A	N/A	5	680
KRD Canal (FS03)	Yakima River	N/A	N/A	15	63
Unnamed stream (FS04)	Town Canal	Ns	NRPW	6	57
Town Canal (FS05)	Yakima River	N/A	N/A	16	74
Roadside ditches	Varies	N/A	N/A	3	1,920

[a] F = fish-bearing (WAC 222-16-030), Ns = non-fish-bearing (WAC 222-16-030), N/A = not applicable, due to ditches and canals being excluded from the WAC typing system;

[b] RPW = relatively permanent water; NRPW = non-relatively permanent water, N/A = not applicable, due to exclusion from jurisdiction;

[c] Average widths and approximate lengths were determined based on SWCA survey data and field observations.

3.4.1.1 Reecer Creek

Reecer Creek is a perennial, fish-bearing tributary of the Yakima River in the Currier Creek subwatershed that has a total drainage basin of 46 square miles. Reecer Creek crosses the Fumaria Solar Project generation tie line three times, once along Clarke Road approximately 880 feet east of Faust Road, once along Faust Road approximately 1,220 feet north of Hungry Junction Road, and once along Hungry Junction Road directly west of Faust Road. Within the study area, Reecer Creek averages approximately 14 feet wide and has a FEMA-mapped 100-year floodplain extending from both sides of the creek's OHWM, which encompasses most of the delineated Wetland FW02 north of Clarke Road within the ROW A alignment of the generation tie line. The riparian areas surrounding Reecer Creek are dominated by crack willow and reed canary grass across most the study area. According to WDFW mapping (WDFW 2017a, WDFW 2017b), rainbow trout (*Oncorhynchus mykiss*) is present in Reecer Creek within the study area. Therefore, Reecer Creek is designated as a Type F water, based on the Washington Water Typing Criteria (WAC 222-16-030).

3.4.1.2 Unnamed Stream (FS04)

This unnamed intermittent stream is a tributary of Town Canal, located approximately 0.33 mile south of the Fumaria Solar Project generation tie line, through a 2-foot-wide culvert under Hungry Junction Road. This stream appears to begin 0.63 mile north of the study area, from two channels that drain the agricultural fields to the north. Within the generation tie line, the stream's OHWM is approximately 6

feet wide. Vegetation along the stream is dominated by reed canary grass, with one mature crack willow growing along the east bank approximately 230 feet north of the generation tie line. Current WDFW mapping suggests that fish species do not occur in this stream (WDFW 2017a, 2017b). This stream appears to have been ditched and has a substrate of cobbles and silt. Based on the Washington Water Typing Criteria (WAC 222-16-031) guidance, this stream would be rated as a seasonal non-fish-bearing water, Type Ns.

3.4.1.3 Ephemeral Ditches (FS01 and FS02)

Two ephemeral ditches (FS01 and FS02) were delineated within the Fumaria Solar Project site. FS01 enters the western project site boundary just after Wetland FW01 feeds into it directly offsite. It flows south along the project site boundary and then turns west to flow into Reecer Creek along Clarke Road within the surveyed ROW A alignment. FS02 starts in the southwestern corner of the project site, where it is fed by FS01 through flow control structures. It then flows east across the southern project site boundary before turning northeast to flow to an offsite pond, passing through several culverts along the way. Vegetation was similar around both of these ditches and included Nootka rose, narrow-leaf willow (*Salix exigua*), lamp rush (*Juncus effusus*), curly dock, prickly lettuce, tall false rye grass, Canadian thistle, and devil's pitchfork (*Bidens frondosa*).

The remaining roadside ditches and canals (KRD and Town Canals) that were delineated within the Fumaria Solar Project generation tie line would likely not be considered jurisdictional waters because they are highly managed man-made watercourses.

These ditches and canals are excluded from the WAC typing system, therefore they have not been assigned a stream type.

3.4.2 Priority Habitats and Species

There are a number of PHS-listed salmonid species mapped in Reecer Creek, which passes through the Fumaria Solar Project generation tie line (WDFW 2017a). Rainbow trout is listed as having migrating populations within the study area. Reecer Creek provides adequate fish habitat functions throughout much of its course and could be subject to additional buffer recommendations by WDFW and Kittitas County. PHS mapping is depicted in Figure 3.

PHS mapper also shows an overlay for sharp-tailed snake (*Contia tenuis*) at an accuracy level of quarter (1/4) PLSS section, and overlaps all areas of the study area north of Hungry Junction Road, including the project site (WDFW 2017a). However, there is no suitable habitat for this species in or directly adjacent to the study area.

3.5 Aquifer Recharge Areas

As described in KCC 17A.08.010, no critical aquifer recharge locations have been identified in Kittitas County. Additionally, the Fumaria Solar Project will not involve any hazardous materials or disposal of on-site sewage. No well-heads have been identified within the study area.

4 CONCLUSIONS AND RECOMMENDATIONS

EFSEC will provide permitting requirements for the Fumaria Solar Project, but this report evaluates and shows compliance with County requirements. A review of the Fumaria Solar Project study area determined that the following Kittitas County defined critical areas have the potential to be affected by the project:

- Wetlands
- Frequently Flooded Areas
- Habitats:
    - Riparian Habitat
    - Priority Habitats and Species

A summary of all wetlands, waters, and critical area buffers documented within the study area is provided in Table 8. The wetland and non-wetland waters identified in and adjacent to the study area will likely be determined jurisdictional by Ecology and the USACE, including the delineated ditches. Although EFSEC will provide permitting requirements for the proposed project, to show compliance with County requirements, KCC guidance (Chapter 17A.07.010) defines a minimum 20-foot protection buffer for Type F waters, such as Reecer Creek. However, up to a 100-foot protection buffer could be requested once Kittitas County has had the opportunity to review the results of this study and has had discussions with TUUSSO Energy (see Figures 6 and 8). KCC guidance does not define protection buffers for irrigation canals and ditches, such as the KRD and Town Canals and all delineated ephemeral ditches, because they do not qualify as streams. In addition, KCC guidance specifies that no protection buffer is needed for Type Ns waters, such as the unnamed stream (FS04).

The minimum and maximum wetland protection buffers required by the KCC (Chapter 17A.04.020) are listed in Appendix F, and are provided for these wetlands in Table 8, but only the minimum protection buffers are depicted on Figures 4 through 10. Consultation with the County would be required to determine exact buffer distances.

Table 8. Wetland and Waters Summary

Critical Area	Wetland Rating/ Water Typing [a]	Kittitas County Minimum/Maximum Buffer Distances (feet) [b]	Total Size of Feature Within the Project (acres) [c]
Wetlands			
Wetland FW01	III	20 / 80	0.18
Wetland FW02	II	25 / 100	0.24
Wetland FW03	III	20 / 80	0.03
Wetland FW04	III	0 / 0 [d]	0.03
Wetland FW05	IV	0 / 0 [d]	0.20
Wetland FW06	IV	0 / 0 [d]	0.005
Frequently Flooded Areas			
100-year flood zone (Reecer Creek)	N/A	N/A	1.90
Riparian Habitat			
Reecer Creek	F	20 / 100	0.12
Ephemeral ditch (FS01)	N/A	None	0.32

Table 8. Wetland and Waters Summary

Critical Area	Wetland Rating/ Water Typing [a]	Kittitas County Minimum/Maximum Buffer Distances (feet) [b]	Total Size of Feature Within the Project (acres) [c]
Ephemeral ditch (FS02)	N/A	None	0.08
KRD Canal (FS03)	N/A	None	0.03
Unnamed stream (FS04)	Ns	None	0.01
Town Canal (FS05)	N/A	None	0.04
Roadside ditches	N/A	None	0.18

[a] II = Category II (Hruby 2014); III = Category III (Hruby 2014); IV = Category IV (Hruby 2014); F = fish-bearing (WAC 22-16-030); Ns = seasonal non-fish-bearing (WAC 22-16-030);
[b] Only minimum buffer distances are depicted on maps;
[c] Does not include buffer areas;
[d] No Kittitas County buffer is defined because the wetland area is below the minimum size threshold for protection or is rated as a Category IV; however, building setbacks may be required based on zoning lot line setbacks, but would not exceed 25 feet.

Design plans are incomplete for the proposed Fumaria Solar Project; however, TUUSSO Energy will attempt to design the project to avoid, reduce, or eliminate impacts to wetlands, waters, and their buffers. Following the finalization of the design footprint, all removal-fill activities proposed within jurisdictional features would require a Joint Aquatic Resources Permit Application (JARPA) submitted for USACE and Ecology review.

There is no minimum threshold to implement mitigation sequencing for potential impacts to wetland and waters features. Where possible, the Fumaria Solar Project should demonstrate avoidance of jurisdictional features and then minimization of impacts. Avoidance and minimization could be achieved by making minor design alterations around delineated feature boundaries.

Where impact avoidance is not possible, mitigation measures should be implemented to minimize temporary construction disturbance and other permanent alterations to the features. Mitigation would include the implementation of construction best management practices. Where permanent alterations to wetland and waters features are unavoidable, wetland mitigation measures to achieve “no net loss” would be required. Desktop research shows that there are no approved mitigation banks or in-lieu fee programs in Kittitas County; therefore, any mitigation that would be required must be conducted as an Advance Permittee-Responsible Mitigation. Under KCC guidance (Chapter 17A.04.050), the mitigation ratio for a Category II wetland is 2:1, and the mitigation ratio for a Category III wetland is 1:1.

5 DISCLAIMER

This report documents the investigation, best professional judgment, and conclusions of the investigators. This should be considered a Preliminary Jurisdictional Determination of wetlands and other waters and is not a final determination.

6 LITERATURE CITED AND REVIEWED

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. FWS/OBS-79/31. Washington, D.C.: U.S. Fish and Wildlife Service. Available at: http://www.fws.gov/wetlands/Documents/Classification-of-Wetlands-and-Deepwater-Habitats-of-the-United-States.pdf.

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual*. Technical Report Y-87-1. Online edition. Vicksburg, Mississippi: U.S. Army Engineer Waterways Experiment Station. Available at: http://el.erdc.usace.army.mil/wetlands/pdfs/wlman87.pdf.

Hruby, T. 2014. *Washington State Wetland Rating System for Eastern Washington – Revised.* Washington State Department of Ecology Publication No. 14-06-030. Olympia, Washington: Department of Ecology. Available at: https://fortress.wa.gov/ecy/publications/SummaryPages/1406030.html. Accessed March 10, 2017.

Kittitas County Code (KCC). 2017. Kittitas County, Washington, Ordinances and Resolutions. Available at: http://co.kittitas.wa.us/boc/countycode/. Accessed March 13, 2017.

Kittitas County. 2017. COMPAS Mapping Tool Parcel Report. Available at: https://gis.co.kittitas.wa.us/compas/default.aspx. Accessed May 2, 2017.

Lichvar, R.W., D.L. Banks, W.N. Kirchner, and N.C. Melvin. 2016. *The National Wetland Plant List: 2016 Wetland Ratings.* Phytoneuron 2016-30:1–17. Available at: http://www.phytoneuron.net/ and http://rsgisias.crrel.usace.army.mil/NWPL/. Accessed May 3, 2016.

Munsell Color. 2009. Munsell Soil-Color Charts. Revised Edition. Grand Rapids, Michigan: Munsell Color.

Natural Resources Conservation Service (NRCS). 2008. *Hydrogeomorphic Wetland Classification System: An Overview and Modification to Better Meet the Needs of the Natural Resources Conservation Service*. Technical Note No. 190-8-79. Available at: http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs143_010784.pdf.

———. 2015. List of Hydric Soils. December 2015. Available at: http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/use/hydric/. Accessed March 9, 2016.

———. 2017a. Web soil survey. Available at: http://websoilsurvey.nrcs.usda.gov/app/. Accessed March 10, 2017.

———. 2017b. WETS and precipitation data for Ellensburg, Washington. Available at: http://agacis.rcc-acis.org/. Accessed May 2, 2017.

Olson, P., and E. Stockdale. 2010. *Determining the Ordinary High Water Mark on Streams in Washington State*. Second Review Draft. Ecology Publication No. 08-06-001. Lacey, Washington: Washington State Department of Ecology, Shorelands and Environmental Assistance Program.

Schuster, J. E. 2005. Geologic map of Washington State: Washington Division of Geology and Earth Resources Geologic Map GM-53, 1 sheet, scale 1:500,000, with 44 p. Available at: http://www.dnr.wa. gov/Publications/ger_gm53_geol_map_ washington_500k.zip. Accessed May 22, 2017.

U.S. Army Corps of Engineers (USACE). 2008. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0)*, edited by J.S. Wakeley, R.W. Lichvar, and C.V. Noble. ERDC/EL TR-08-28. Vicksburg, Mississippi: U.S. Army Engineer Research and Development Center.

U. S. Department of Agriculture (USDA). 1954. Kittitas County. Central Washington Historical Aerial Photograph Project. Central Washington University, Department of Geography. Available at: http://www.gis.cwu.edu/geog/historical_airphotos/. Accessed on June 23, 2017.

U. S. Fish and Wildlife Service (USFWS). 2017. National Wetland Inventory. Wetlands Online Mapper. Available at: http://wetlandsfws.er.usgs.gov/wtlnds/launch.html. Accessed March 10, 2017.

Washington State Department of Ecology (Ecology). 1997. Washington State Wetland Identification and Delineation Manual. Publication No. 96-94. Olympia, Washington: Washington State Department of Ecology.

Washington State Department of Fish and Wildlife (WDFW). 2017a. Priority Habitats and Species on the Web. Available at: http://wdfw.wa.gov/mapping/phs/. Accessed March 10, 2017.

———. 2017b. SalmonScape. Available at: http://wdfw.wa.gov/mapping/salmonscape. Accessed March 10, 2017.

APPENDIX A: WETLAND DELINEATION METHODOLOGY

Wetlands are defined as areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and which under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. The methods used to delineate wetlands within the study area conform to guidance in the *Washington State Wetland Identification and Delineation Manual* (Ecology 1997), the *Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987), and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0)* (USACE 2008).

To be considered a wetland by the U.S. Army Corps of Engineers (USACE), an area must express hydrophytic vegetation, hydric soils, and wetland hydrology. SWCA Environmental Consultants (SWCA) staff documented site conditions for these parameters in areas representative of the study area and in areas most likely to exhibit wetland features. Staff collected additional data in associated uplands, as needed, to confirm wetland boundaries. Wetland boundaries, stream boundaries, and wetland data plot locations in the study area were recorded with a Trimble Geo XT global positioning system (GPS) unit. All delineated wetlands and streams were processed and projected onto existing base maps using ArcGIS software.

Vegetation

The dominant and sub-dominant plants were identified and recorded at each sample plot location. These plants were evaluated based on their wetland indicator status to determine if the vegetation was hydrophytic. SWCA biologists utilized the 50/20 rule per USACE recommendations to determine which plants were dominant at each sample plot. Under this guidance, absolute cover estimates were made for each species found rooted within the sample plot radius for each vegetative strata found in the habitat (tree, sapling/shrub, herb, and woody vine). Refer to the USACE regional supplement for exact applications of this method of determining dominance (USACE 2008).

Sample plot radii varied in size depending on site topography and habitat complexity. When documenting vegetation in smaller or oddly-shaped wetlands or habitat features, vegetation strata radii may be adjusted to more accurately depict vegetation rooted within the wetland or habitat feature being delineated.

Hydrophytic vegetation is defined as vegetation adapted to wetland conditions, such as inundation or prolonged saturation. To meet the hydrophytic vegetation criterion, more than 50% of the total dominant plants across all stratums must have a wetland indicator status of Facultative (FAC), Facultative Wetland (FACW), or Obligate (OBL). The wetland indicator status is assigned to plant species that have the potential to occur in wetlands by the USACE (Lichvar et al. 2016). Table A-1 lists the definitions for each wetland indicator status.

Table A-1. Definitions for Each Wetland Plant Indicator Status

Wetland Indicator Status	Symbol	Definition
Obligate Wetland Plants	OBL	Plants that almost always (> 99% of the time) occur in wetlands, but which may rarely (< 1% of the time) occur in non-wetlands.
Facultative Wetland Plants	FACW	Plants that often (67 to 99% of the time) occurs in wetlands, but sometimes (1 to 33% of the time) occur in non-wetlands.
Facultative Plants	FAC	Plants with a similar likelihood (34 to 66% of the time) of occurring in both wetlands and non-wetlands.
Facultative Upland Plants	FACU	Plants that sometimes (1 to 33% of the time) occur in wetlands, but occur more often (67 to 99% of the time) in non-wetlands.
Upland Plants	UPL	Plants that rarely (< 1% of the time) occur in wetlands, and almost always (> 99% of the time) occur in non-wetlands.

Source: Lichvar et al. (2016).

SWCA biologists identified plants found in the field to species whenever possible, when adequate vegetative or flowering characteristics were available. Scientific and common plant names were reported with the currently accepted nomenclature.

Soils

An area typically must contain hydric soils to be considered a wetland, except when problematic site conditions occur. Hydric soils typically form under an area that experiences durations of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper portion of the soil profile. Chemical and biological processes in saturated soil result in reduced oxygen concentrations and promote anaerobic metabolism in microorganisms. These prolonged anaerobic conditions often create mottling and other distinct patterns in the soil, which are used as indicators of hydric soils. The hue, value, and chroma and relative percentage of mottling are recorded in the field at each data plot location. Other important hydric soil indicators include organic matter accumulations in the surface horizon, reduced sulfur odors, and organic matter staining in the soil profile (Natural Resource Conservation Service [NRCS] 2017a).

SWCA staff examined soil profiles at each data plot location by excavating sample pits to a depth of 16 to 20 inches to observe the soil profile, colors, and textures. In some cases, a shallower soil pit was used due to shovel refusal from obstructions in the soil profile, such as gravel, bedrock, thick roots, or clay hardpan. Munsell color charts (Munsell Color 2009) were used to determine soil colors in the field.

Hydrology

SWCA staff investigated the entire project area for evidence of wetland hydrology. Where data plot locations were taken, additional notes were recorded to fully document the presence of primary and secondary wetland hydrology indicators at the sample location. According to the USACE, wetland hydrology criteria were considered to be satisfied if the soil was seasonally inundated or saturated to the surface for a consecutive number of days greater than or equal to 12.5% of the growing season. The growing season for the area was determined based on the period in which temperatures are above 28 degrees Fahrenheit 5 out of 10 years (Ecology 1997) using the long-term climatological data collected by the NRCS (2017). Using the wetlands climate analysis (WETS) table for the nearest station (Ellensburg, Washington), the growing season was approximated as typically between April 20 and October 10, or a total of 173 days (NRCS 17b).

However, often times multiple site visits to determine the duration of seasonal inundation or saturation are not possible. Therefore, field indicators are used in an attempt to determine an area's hydro-period through field observations. Wetland hydrology indicators are divided into two categories: primary and secondary indicators (USACE 2008). Primary indicators of hydrology include, but are not limited to, surface inundation and high water table and saturated soils within 12 inches of the soil surface. The presence of one primary indicator is sufficient to conclude that wetland hydrology is present. Secondary hydrology indicators are also recorded and may substitute in the case of a lack of any primary indicators if multiple secondary indicators are observed. Secondary indicators of hydrology include, but are not limited to, drainage patterns, crayfish burrows, and dry-season water table (USACE 2008). If no primary indicators, and fewer than two secondary indicators, are observed within the sample area, then it is likely that the area is not considered a wetland, unless problematic conditions exist on-site. Aerial and historic imagery are often reviewed before and after site visits to ensure all possible hydrology indicators are taken into account.

References

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual*. Technical Report Y-87-1. Online edition. Vicksburg, MSMississippi: U.S. Army Engineer Waterways Experiment Station. Available at: http://el.erdc.usace.army.mil/wetlands/pdfs/wlman87.pdf.

Lichvar, R.W., D.L. Banks, W.N. Kirchner, and N.C. Melvin. 2016. *The National Wetland Plant List: 2016 Wwetland Rratings.* Phytoneuron 2016-30:1–17. Available at: http://www.phytoneuron.net/ and http://rsgisias.crrel.usace.army.mil/NWPL/. Accessed May 3, 2016.

Munsell Color. 2009. Munsell Soil-Color Charts. Revised Edition. Grand Rapids, MichiganI: Munsell Color.

Natural Resources Conservation Service (NRCS). 2017a. *Field Indicators of Hydric Soils in the United States, a Guide for Identifying and Delineating Hydric Soils, Version 8.1*. Edited by L.M. Vasilas, G.W. Hurt, and J.F. Berkowitz. Available at: https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_053171.pdf. Accessed March 10, 2017.

———. 2017b. WETS and precipitation data for Ellensburg, Washington. Available at: http://agacis.rcc-acis.org/. Accessed May 2, 2017.

U.S. Army Corps of Engineers (USACE). 2008. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0)*, edited by. J.S. Wakeley, R.W. Lichvar, and C.V. Noble. ERDC/EL TR-08-28. Vicksburg, MississippiS: U.S. Army Engineer Research and Development Center.

Washington State Department of Ecology (Ecology). 1997. Washington State Wetland Identification and Delineation Manual. Publication No. #96-94. Olympia, Washington: Washington State Department of Ecology.

APPENDIX B: VEGETATION LIST

Fumaria Solar Site and Transmission Line Project
Vegetation Table
April 5, 6, and 11, 2017

Common Name	Scientific Name	Wetland Indicator Status[1]	Native / Introduced and Invasive / Noxious
fragile onion	*Allium scilloides*	NOL	native
purple threeawn	*Aristida purpurea*	NOL	native
big sagebrush	*Artemisia tridentata*	NOL	native
Garden Yellow-Rocket	*Barbarea vulgaris*	FAC	non-native
Devil's-Pitchfork	*Bidens frondosa*	FACW	native
downy cheat grass	*Bromus tectorum*	NOL	non-native
Shepherd's-Purse	*Capsella bursa-pastoris*	FACU	non-native
sedge	*Carex species*	OBL to FACU	-
spotted knapweed	*Centaurea stoebe*	NOL	noxious
Chicory	*Cichorium intybus*	FACU	non-native
Canadian Thistle	*Cirsium arvense*	FACU	invasive, noxious
Red Osier	*Cornus alba*	FACW	native
common spring-gold	*Crocidium multicaule*	NOL	native
Chufa (yellow nutsedge)	*Cyperus esculentus*	FACW	native, noxious
Fuller's Teasel	*Dipsacus fullonum*	FAC	invasive, noxious
spring draba	*Draba verna*	NOL	native
Creeping Wild Rye	*Elymus repens*	FAC	non-native
tall annual willowherb	*Epilobium brachycarpum*	NOL	native
yellow bell	*Fritillaria pudica*	NOL	native
Hairy Cat's-Ear	*Hypochaeris radicata*	FACU	non-native, noxious
Lamp Rush	*Juncus effusus*	FACW	native
Prickly Lettuce	*Lactuca serriola*	FACU	non-native
Gorman's desert-parsley	*Lomatium gormanii*	NOL	native
nine-leaf lomatium	*Lomatium triternatum*	NOL	native
alfalfa	*Medicago sativa*	UPL	non-native
Dock-Leaf Smartweed	*Persicaria lapathifolia*	FACW	non-native
Reed Canary Grass	*Phalaris arundinacea*	FACW	invasive, noxious
bluegrass	*Poa species*	FAC ?	-
Wright's Rabbit-Tobacco	*Pseudognaphalium canescens*	FACU	native
bitter-brush, antelope-brush	*Purshia tridentata*	NOL	native
Nootka Rose	*Rosa nutkana*	FACU	native
Curly Dock	*Rumex crispus*	FAC	non-native
Narrow-Leaf Willow	*Salix exigua*	FACW	native
crack willow	*Salix X fragilis*	FAC	non-native
Tall False Rye Grass	*Schedonorus arundinaceus*	FACU	non-native
maidenstears	*Silene vulgaris*	NOL	non-native
Field Sow-Thistle	*Sonchus arvensis*	FACU	non-native
Common Dandelion	*Taraxacum officinale*	FACU	non-native
yellow salsify	*Tragopogon dubius*	NOL	non-native
Broad-Leaf Cat-Tail	*Typha latifolia*	OBL	native
Great Mullein	*Verbascum thapsus*	FACU	non-native
Rainier violet	*Viola trinervata*	NOL	native

[1]Wetland Indicator Status (WIS) from the NWPL AW Region - see below.

A question mark (?) preceded by a space indicates our default assumption that the plant is FAC.

Wetland Indicator Status (WIS) and taxonomy for the AW Region per the National Wetland Plant List 2016v3.3:
(common names are capitalized) http://wetland-plants.usace.army.mil/ Accessed January 10, 2017
WIS for non-wetland plants and taxonomy from Reed 1988 and Reed et al. 1993, and the USDA PLANTS database:
(common names are not capitalized) http://plants.usda.gov/ Accessed multiple dates

Native per Hitchcock & Cronquist 1973 and http://plants.usda.gov/
Noxious per Washington State NWCB 2017 http://www.nwcb.wa.gov/

WETLAND INDICATOR STATUS - Arid West Region	
OBL	**Obligate Wetland** – Almost always is a hydrophyte, rarely in uplands. Examples: broad-leaf cat-tail, yellow-skunk-cabbage
FACW	**Facultative Wetland** - Usually is a hydrophyte but occasionally found in uplands. Examples: Oregon ash, red osier
FAC	**Facultative** – Commonly occurs as either a hydrophyte or non-hydrophyte. Examples: red alder, salmon raspberry
FACU	**Facultative Upland** - Occasionally is a hydrophyte but usually occurs in uplands. Examples: big-leaf maple, Himalayan blackberry
UPL	**Upland** - Rarely is a hydrophyte, almost always in uplands. These plants have been removed from the NWPL WMVC Region.
NOL	**Not Listed** - Not on the list; assumed to be UPL.

APPENDIX C: WETLAND DATA SHEETS

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Fumaria Solar Project City/County: - / Kittitas Sampling Date: 4/5/2017

Applicant/Owner: TUUSSO Energy, LLC State: WA Sampling Point: **FP01**

Investigator(s): Evan Dulin, Jamie Young Section, Township, Range: Section 09, T18N, R18E

Landform (hillslope, terrace, etc.): Channel Local relief (concave, convex, none): Concave Slope (%): 2

Subregion (LRR): B, Columbia/Snake River Plateau Lat: 47.064516 Long: -120.583705 Datum: NAD 1983

Soil Map Unit Name: Metmill very gravelly ashy loam, 0 to 5 percent slopes (844) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X* (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____		
Hydric Soil Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?**	**Yes X No ____**
Wetland Hydrology Present?	Yes X	No ____		

Precipitation prior to fieldwork: 0.70" two weeks prior, 2.30" above normal for CYTD, 2.76" above normal for WYTD. *Wetter than normal.

Remarks:

FW01. Wetland extends off-site to the west and north onto heavily grazed areas. Slope wetland that flows down hill in a vegetated channel.

VEGETATION

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30' r)			
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1. *Rosa nutkana*	7%	Yes	FACU
2.			
3.			
4.			
5.			
	7% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Dipsacus fullonum*	25%	Yes	FAC
2. *Phalaris arundinacea*	20%	Yes	FACW
3. *Carex species*	20%	Yes	FAC ?
4. *Lactuca serriola*	10%	No	FACU
5. *Schedonorus arundinaceus*	7%	No	FACU
6. *Barbarea vulgaris*	5%	No	FAC
7. *Epilobium brachycarpum*	5%	No	NOL
8. *Juncus balticus*	3%	No	FACW
9. *Cirsium arvense*	3%	No	FACU
10. *Rumex crispus*	2%	No	FAC
11.			
	100% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 0%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 75% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species 0	x 1 =	0
FACW species 23	x 2 =	46
FAC species 52	x 3 =	156
FACU species 27	x 4 =	108
UPL species 5	x 5 =	25
Column Totals: 107 (A)		335 (B)

Prevalence Index = B/A = 3.13

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ____ 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes X No ____**

Remarks:

Entered by: KL/ED QC by: TJD

SOIL

Sampling Point: **FP01**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 2/2	100					SiL	
5-12	10YR 2/1	97	7.5YR 4/6	3	C	PL	SiCL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distrubed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): N/A

Hydric Soil Present? Yes X No ___

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)
Large rocks present in 5-12" layer. Shoval refusal at 12".

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) (**Nonriverine**)
- X Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- X Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches):	N/A	
Water Table Present?	Yes ___	No X	Depth (inches):	>12	**Wetland Hydrology Present?**
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches):	>12	**Yes X No ___**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Entered by: KL/ED QC by: TJD

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Fumaria Solar Project City/County: - / Kittitas Sampling Date: 4/5/2017

Applicant/Owner: TUUSSO Energy, LLC State: WA Sampling Point: **FP02**

Investigator(s): Evan Dulin, Jamie Young Section, Township, Range: Section 09, T18N, R18E

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): Convex Slope (%): 20

Subregion (LRR): B, Columbia/Snake River Plateau Lat: 47.064508 Long: -120.583637 Datum: NAD 1983

Soil Map Unit Name: Metmill very gravelly ashy loam, 0 to 5 percent slopes (844) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X* (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No **X**	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** **X**
Hydric Soil Present?	Yes ____	No **X**		
Wetland Hydrology Present?	Yes ____	No **X**		

Precipitation prior to fieldwork: 0.70" two weeks prior, 2.30" above normal for CYTD, 2.76" above normal for WYTD. *Wetter than normal.

Remarks:

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1. *Rosa nutkana*	5%	Yes	FACU
2.			
3.			
4.			
5.			
	5% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Barbarea vulgaris*	30%	Yes	FAC
2. *Crocidium multicaule*	20%	Yes	NOL
3. *Lactuca serriola*	15%	No	FACU
4. *Achillea millefolium*	10%	No	FACU
5. *Cichorium intybus*	10%	No	FACU
6. *Schedonorus arundinaceus*	10%	No	FACU
7. *Dipsacus fullonum*	5%	No	FAC
8.			
9.			
10.			
11.			
	100% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 0%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species 0	x 1 =	0
FACW species 0	x 2 =	0
FAC species 35	x 3 =	105
FACU species 50	x 4 =	200
UPL species 20	x 5 =	100
Column Totals: 105 (A)		405 (B)

Prevalence Index = B/A = 3.86

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- ____ 2 - Dominance Test is >50%
- ____ 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Remarks: Entered by: KL/ED QC by: TJD

SOIL

Sampling Point: **FP02**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 2/2	100					SiL	
3	10YR 4/2	100					Sand	
3-12	10YR 2/2	99	7.5YR 4/6	1	C	M	SiL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distrubed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): N/A

Hydric Soil Present? Yes ___ **No X**

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)
Very large rocks throughout. Shovel refusal at 12". Thin soil layer at 3" that has coarse sand mixed in.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches):	N/A
Water Table Present?	Yes ___	No X	Depth (inches):	>12
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches):	>12

Wetland Hydrology Present? Yes ___ **No X**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Entered by: KL/ED QC by: TJD

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Fumaria Solar Project City/County: - / Kittitas Sampling Date: 4/6/2017

Applicant/Owner: TUUSSO Energy, LLC State: WA Sampling Point: **FP03**

Investigator(s): Evan Dulin, Jamie Young Section, Township, Range: Section 09, T18N, R18E

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): None Slope (%): 3

Subregion (LRR): B, Columbia/Snake River Plateau Lat: 47.058695 Long: -120.583140 Datum: NAD 1983

Soil Map Unit Name: Reeser-Reelow-Sketter complex, 2 to 5 percent slopes (822) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X* (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No **X**	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** **X**
Hydric Soil Present?	Yes ____	No **X**		
Wetland Hydrology Present?	Yes ____	No **X**		

Precipitation prior to fieldwork: 0.70" two weeks prior, 2.30" above normal for CYTD, 2.76" above normal for WYTD. *Wetter than normal.

Remarks:

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1.			
2.			
3.			
4.			
5.			
	0% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Poa species*	20%	Yes	FAC ?
2. *Hypochaeris radicata*	20%	Yes	FACU
3. *Draba verna*	20%	Yes	NOL
4. *Lactuca serriola*	10%	No	FACU
5. *Aristida purpurea*	10%	No	NOL
6. *Elymus repens*	5%	No	FAC
7. *Barbarea vulgaris*	5%	No	FAC
8. *Tragopogon dubius*	3%	No	NOL
9. *Fritillaria pudica*	3%	No	NOL
10.			
11.			
	96% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 4%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species 0	x 1 =	0
FACW species 0	x 2 =	0
FAC species 30	x 3 =	90
FACU species 30	x 4 =	120
UPL species 36	x 5 =	180
Column Totals: 96 (A)		390 (B)

Prevalence Index = B/A = 4.06

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- ____ 2 - Dominance Test is >50%
- ____ 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Remarks: Entered by: KL/ED QC by: TJD

SOIL

Sampling Point: **FP03**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-10	10YR 3/2	100					SL	
10-13	10YR 3/3	100					SCL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distrubed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): N/A

Hydric Soil Present? Yes ___ **No X**

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches):	N/A
Water Table Present?	Yes ___	No X	Depth (inches):	>15
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches):	>15

Wetland Hydrology Present?

Yes ___ **No X**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Snow mold.

Entered by: KL/ED QC by: TJD

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Fumaria Solar Project City/County: - / Kittitas Sampling Date: 4/6/2017

Applicant/Owner: TUUSSO Energy, LLC State: WA Sampling Point: **FP04**

Investigator(s): Evan Dulin, Jamie Young Section, Township, Range: Section 09, T18N, R18E

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): None Slope (%): 2

Subregion (LRR): B, Columbia/Snake River Plateau Lat: 47.058185 Long: -120.582609 Datum: NAD 1983

Soil Map Unit Name: Reeser-Reelow-Sketter complex, 2 to 5 percent slopes (822) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X* (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No **X**	**Is the Sampled Area within a Wetland?**	Yes ____ No **X**
Hydric Soil Present?	Yes ____	No **X**		
Wetland Hydrology Present?	Yes ____	No **X**		

Precipitation prior to fieldwork: 0.70" two weeks prior, 2.30" above normal for CYTD, 2.76" above normal for WYTD. *Wetter than normal.

Remarks:
Sample plot taken on slope towards willow thicket and ditch. Overrun by Bromus tectorum.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1.			
2.			
3.			
4.			
5.			
	0% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Bromus tectorum*	50%	Yes	NOL
2. *Poa species*	30%	Yes	FAC ?
3. *Tragopogon dubius*	5%	No	NOL
4. *Fritillaria pudica*	5%	No	NOL
5. *Lactuca serriola*	5%	No	FACU
6.			
7.			
8.			
9.			
10.			
11.			
	95% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 5%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species 0	x 1 =	0
FACW species 0	x 2 =	0
FAC species 30	x 3 =	90
FACU species 5	x 4 =	20
UPL species 60	x 5 =	300
Column Totals: 95 (A)		410 (B)

Prevalence Index = B/A = 4.32

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- ____ 2 - Dominance Test is >50%
- ____ 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ____ No **X**

Remarks: Entered by: KL/ED QC by: TJD

SOIL

Sampling Point: **FP04**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-11	10YR 3/2	100					SL	
11-13	10YR 3/3	100					SCL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distrubed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): N/A

Hydric Soil Present? Yes ___ **No X**

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- X Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches):	N/A	
Water Table Present?	Yes ___	No X	Depth (inches):	>13	**Wetland Hydrology Present?**
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches):	>13	**Yes** ___ **No X**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Entered by: KL/ED QC by: TJD

Snow mold present throughout. Sheet flower patterns observed, knocked over grasses.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Fumaria Solar Project City/County: - / Kittitas Sampling Date: 4/6/2017

Applicant/Owner: TUUSSO Energy, LLC State: WA Sampling Point: **FP05**

Investigator(s): Evan Dulin, Jamie Young Section, Township, Range: Section 09, T18N, R18E

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Concave Slope (%): 1

Subregion (LRR): B, Columbia/Snake River Plateau Lat: 47.057830 Long: -120.582936 Datum: NAD 1983

Soil Map Unit Name: Reeser-Reelow-Sketter complex, 2 to 5 percent slopes (822) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X* (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____		
Hydric Soil Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____	No X		

Precipitation prior to fieldwork: 0.70" two weeks prior, 2.30" above normal for CYTD, 2.76" above normal for WYTD. *Wetter than normal.

Remarks:
Sample plot taken in willow thicket on the north side of FS02 (ditch).

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1. *Salix exigua*	95%	Yes	FACW
2.			
3.			
4.			
5.			
	95% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Bromus tectorum*	20%	Yes	NOL
2. *Elymus repens*	20%	Yes	FAC
3. *Lactuca serriola*	5%	No	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	45% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 55%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 67% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species 0	x 1 =	0
FACW species 95	x 2 =	190
FAC species 20	x 3 =	60
FACU species 5	x 4 =	20
UPL species 20	x 5 =	100
Column Totals: 140 (A)		370 (B)

Prevalence Index = B/A = 2.64

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ____ 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: Entered by: KL/ED QC by: TJD

SOIL

Sampling Point: **FP05**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/2	100					SiL	
4-13	10YR 3/2	100					SL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distrubed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): N/A

Hydric Soil Present? Yes ___ **No X**

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches):	N/A
Water Table Present?	Yes ___	No X	Depth (inches):	>13
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches):	>13

Wetland Hydrology Present? Yes ___ **No X**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Entered by: KL/ED QC by: TJD

Dead willow leaves were present throughout, but did not have signs of water staining. Snow mold present throughout.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Fumaria Solar Project City/County: - / Kittitas Sampling Date: 4/11/2017

Applicant/Owner: TUUSSO Energy, LLC State: WA Sampling Point: **FP06**

Investigator(s): Evan Dulin, Jamie Young Section, Township, Range: Section 09, T18N, R18E

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Concave Slope (%): 0

Subregion (LRR): B, Columbia/Snake River Plateau Lat: 47.057739 Long: -120.589831 Datum: NAD 1983

Soil Map Unit Name: Metmill very gravelly ashy loam, 0 to 5 percent slopes (844) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X* (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?**	**Yes X No ____**
Hydric Soil Present?	Yes X	No ____		
Wetland Hydrology Present?	Yes X	No ____		

Precipitation prior to fieldwork: 0.61" two weeks prior, 2.64" above normal for CYTD, 3.10" above normal for WYTD. *Wetter than normal.

Remarks:

FW02. Riverine wetland adjacent to Reecer Creek.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1.			
2.			
3.			
4.			
5.			
	0% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Elymus repens*	85%	Yes	FAC
2. *Persicaria lapathifolia*	5%	No	FACW
3. *Cyperus esculentus*	5%	No	FACW
4. *Lactuca serriola*	3%	No	FACU
5. *Rumex crispus*	2%	No	FAC
6.			
7.			
8.			
9.			
10.			
11.			
	100% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 0%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species 0	x 1 =	0
FACW species 10	x 2 =	20
FAC species 87	x 3 =	261
FACU species 3	x 4 =	12
UPL species 0	x 5 =	0
Column Totals: 100 (A)		293 (B)

Prevalence Index = B/A = 2.93

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ____ 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: Entered by: KL/ED QC by: TJD

SOIL

Sampling Point: **FP06**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	7.5YR 3/2	100					SiL	Roots
2-8	10YR 3/1	96	5YR 3/4	4	C	M, PL	SiCL	
8-14	2.5Y 2.5/1	99	7.5YR 3/3	1	C	M	SL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distrubed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): N/A

Hydric Soil Present? Yes X No ___

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)
Thick roots in 0-2" layer.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- X Drift Deposits (B3) (**Riverine**)
- X Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches):	N/A
Water Table Present?	Yes ___	No X	Depth (inches):	>14
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches):	14

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Entered by: KL/ED QC by: TJD
Drift deposits on rigid tall forbs closer to Reecer Creek. Saturation occurs at 14", wicking up from water table.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Fumaria Solar Project City/County: - / Kittitas Sampling Date: 4/11/2017

Applicant/Owner: TUUSSO Energy, LLC State: WA Sampling Point: **FP07**

Investigator(s): Evan Dulin, Jamie Young Section, Township, Range: Section 09, T18N, R18E

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): Convex Slope (%): 5

Subregion (LRR): B, Columbia/Snake River Plateau Lat: 47.057698 Long: -120.590118 Datum: NAD 1983

Soil Map Unit Name: Metmill very gravelly ashy loam, 0 to 5 percent slopes (844) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X* (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____		
Hydric Soil Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____	No X		

Precipitation prior to fieldwork: 0.61" two weeks prior, 2.64" above normal for CYTD, 3.10" above normal for WYTD. *Wetter than normal.

Remarks:
Sample plot taken in the disturbed road ROW.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1.			
2.			
3.			
4.			
5.			
	0% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Elymus repens*	65%	Yes	FAC
2. *Lactuca serriola*	15%	No	FACU
3. *Hypochaeris radicata*	15%	No	FACU
4. *Centaurea stoebe*	3%	No	NOL
5. *Tragopogon dubius*	2%	No	NOL
6.			
7.			
8.			
9.			
10.			
11.			
	100% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 0%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species 0	x 1 =	0
FACW species 0	x 2 =	0
FAC species 65	x 3 =	195
FACU species 30	x 4 =	120
UPL species 5	x 5 =	25
Column Totals: 100 (A)		340 (B)

Prevalence Index = B/A = 3.40

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ____ 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: Entered by: KL/ED QC by: TJD

SOIL

Sampling Point: **FP07**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-13	7.5YR 3/3	100					SL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distrubed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): N/A

Hydric Soil Present? Yes ___ **No X**

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)
Rocks throughout from road ROW fill material.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches):	N/A
Water Table Present?	Yes ___	No X	Depth (inches):	>13
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches):	>13

Wetland Hydrology Present?

Yes ___ **No X**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Entered by: KL/ED QC by: TJD

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Fumaria Solar Project City/County: - / Kittitas Sampling Date: 4/11/2017

Applicant/Owner: TUUSSO Energy, LLC State: WA Sampling Point: **FP08**

Investigator(s): Evan Dulin, Jamie Young Section, Township, Range: Section 16, T18N, R18E

Landform (hillslope, terrace, etc.): Channel Local relief (concave, convex, none): Concave Slope (%): 1

Subregion (LRR): B, Columbia/Snake River Plateau Lat: 47.043023 Long: -120.593498 Datum: NAD 1983

Soil Map Unit Name: Nanum ashy loam, 0 to 2 percent slopes (480) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X* (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____		
Hydric Soil Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes X	No ____		

Precipitation prior to fieldwork: 0.61" two weeks prior, 2.64" above normal for CYTD, 3.10" above normal for WYTD. *Wetter than normal.

Remarks:
Sample plot taken in vegetated road side ditch with no flow or saturation.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1.			
2.			
3.			
4.			
5.			
	0% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Phalaris arundinacea*	85%	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	85% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 15%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

	Total % Cover of:	Multiply by:	
OBL species	0	x 1 =	0
FACW species	85	x 2 =	170
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	85 (A)		170 (B)

Prevalence Index = B/A = 2.00

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ____ 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: Entered by: KL/ED QC by: TJD

SOIL

Sampling Point: **FP08**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 3/3	100					SiCL	
2-4	10YR 2/1	98	7.5YR 5/8	2	C	PL	SiL	
4-6	10YR 3/1	97	7.5YR 3/2	3	C	PL	SL	fill; faint redox

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distrubed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): N/A

Hydric Soil Present? Yes ___ No X

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)
Large rock fill below 4". Shovel refusal at 6" due to rock fill.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- X Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- X Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- X Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches):	N/A
Water Table Present?	Yes ___	No X	Depth (inches):	>6
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches):	>6

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Shoval refusal at 6", uncertain how deep to saturation and water table.

Entered by: KL/ED QC by: TJD

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Fumaria Solar Project City/County: - / Kittitas Sampling Date: 4/11/2017

Applicant/Owner: TUUSSO Energy, LLC State: WA Sampling Point: **FP09**

Investigator(s): Evan Dulin, Jamie Young Section, Township, Range: Section 20, T18N, R18E

Landform (hillslope, terrace, etc.): Channel Local relief (concave, convex, none): Concave Slope (%): 0

Subregion (LRR): B, Columbia/Snake River Plateau Lat: 47.038732 Long: -120.608734 Datum: NAD 1983

Soil Map Unit Name: Weirman-Kayak-Zillah complex, 0 to 2 percent slopes (809) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X* (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?**	**Yes X No ____**
Hydric Soil Present?	Yes X	No ____		
Wetland Hydrology Present?	Yes X	No ____		

Precipitation prior to fieldwork: 0.61" two weeks prior, 2.64" above normal for CYTD, 3.10" above normal for WYTD. *Wetter than normal.

Remarks:

FW06. Depressional PEM, fed by runoff from pasture and flows out of wetland through partially blocked culvert higher than the wetland.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1.			
2.			
3.			
4.			
5.			
	0% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Typha latifolia*	90%	Yes	OBL
2. *Phalaris arundinacea*	10%	No	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	100% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 0%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species 90	x 1 =	90
FACW species 10	x 2 =	20
FAC species 0	x 3 =	0
FACU species 0	x 4 =	0
UPL species 0	x 5 =	0
Column Totals: 100 (A)		110 (B)

Prevalence Index = B/A = 1.10

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ____ 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes X No ____**

Remarks:

Entered by: KL/ED QC by: TJD

SOIL

Sampling Point: **FP09**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 2/1	100					coSiL	coarse
5-8	10YR 2/1	100					SiL+	
8-12	10YR 2/1	95	7.5YR 3/3	3	C	M	SiCL	Rocks / Cobbles
			10YR 3/2	2	D	M		
12-13+	10YR 4/2	90	10YR 4/4	10	C	M	SiCL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distrubed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): N/A

Hydric Soil Present? Yes X No ___

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)
Rock and cobbles below 8". Shovel refusal at 13" due to large cobbles.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- X Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes	___	No	X	Depth (inches): N/A
Water Table Present?	Yes	___	No	X	Depth (inches): >13
Saturation Present? (includes capillary fringe)	Yes	X	No	___	Depth (inches): 0-8

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Entered by: KL/ED QC by: TJD
Saturation at surface 0-8". Seep observed at 5". Water appears to perch above the more clayey layer starting at 8".

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Fumaria Solar Project City/County: - / Kittitas Sampling Date: 4/11/2017

Applicant/Owner: TUUSSO Energy, LLC State: WA Sampling Point: **FP10**

Investigator(s): Evan Dulin, Jamie Young Section, Township, Range: Section 20, T18N, R18E

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): Concave Slope (%): 1

Subregion (LRR): B, Columbia/Snake River Plateau Lat: 47.038727 Long: -120.608781 Datum: NAD 1983

Soil Map Unit Name: Weirman-Kayak-Zillah complex, 0 to 2 percent slopes (809) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X* (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Hydric Soil Present?	Yes ____	No X		
Wetland Hydrology Present?	Yes ____	No X		

Precipitation prior to fieldwork: 0.61" two weeks prior, 2.64" above normal for CYTD, 3.10" above normal for WYTD. *Wetter than normal.

Remarks:

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1.			
2.			
3.			
4.			
5.			
	0% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Elymus repens*	75%	Yes	FAC
2. *Phalaris arundinacea*	10%	No	FACW
3. *Carex species*	10%	No	FAC ?
4. *Dipsacus fullonum*	2%	No	FAC
5. *Cirsium arvense*	2%	No	FACU
6. *Hypochaeris radicata*	2%	No	FACU
7.			
8.			
9.			
10.			
11.			
	101% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 0%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species 0	x 1 =	0
FACW species 10	x 2 =	20
FAC species 87	x 3 =	261
FACU species 4	x 4 =	16
UPL species 0	x 5 =	0
Column Totals: 101 (A)		297 (B)

Prevalence Index = B/A = 2.94

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ____ 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: Entered by: KL/ED QC by: TJD

SOIL

Sampling Point: **FP10**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-10	10YR 2/1	100					coSiCL	coarse
10-14	10YR 3/2	99	10YR 4/4	1	C	M	SiC	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distrubed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): N/A

Hydric Soil Present? Yes ___ **No X**

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches):	N/A
Water Table Present?	Yes ___	No X	Depth (inches):	>14
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches):	>14

Wetland Hydrology Present?

Yes ___ **No X**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Entered by: KL/ED QC by: TJD

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Fumaria Solar Project City/County: - / Kittitas Sampling Date: 4/11/2017

Applicant/Owner: TUUSSO Energy, LLC State: WA Sampling Point: **FP11**

Investigator(s): Evan Dulin, Jamie Young Section, Township, Range: Section 20, T18N, R18E

Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope (%): 0

Subregion (LRR): B, Columbia/Snake River Plateau Lat: 47.038429 Long: -120.609158 Datum: NAD 1983

Soil Map Unit Name: Weirman-Kayak-Zillah complex, 0 to 2 percent slopes (809) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X* (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?**	**Yes ____ No X**
Hydric Soil Present?	Yes ____	No X		
Wetland Hydrology Present?	Yes ____	No X		

Precipitation prior to fieldwork: 0.61" two weeks prior, 2.64" above normal for CYTD, 3.10" above normal for WYTD. *Wetter than normal.

Remarks:
Sample plot located in heavily disturbed area leading into the power sub station from burried lines.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1. *Salix exigua*	10%	Yes	FACW
2. *Rosa nutkana*	5%	Yes	FACU
3.			
4.			
5.			
	15% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Phalaris arundinacea*	100%	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	100% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 0%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 67% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species 0	x 1 =	0
FACW species 110	x 2 =	220
FAC species 0	x 3 =	0
FACU species 5	x 4 =	20
UPL species 0	x 5 =	0
Column Totals: 115 (A)		240 (B)

Prevalence Index = B/A = 2.09

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ____ 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes X No ____**

Remarks: Entered by: KL/ED QC by: TJD

SOIL

Sampling Point: **FP11**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 2/1	100					coSiL	coarse
6-10	2.5Y 2.5/1	60					coSiC	coarse
	10YR 3/2	40					coSiL	mixed matrix

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distrubed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): N/A

Hydric Soil Present? Yes ___ **No** X

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)
Shovel refusal at 10" due to rock fill.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches):	N/A
Water Table Present?	Yes ___	No X	Depth (inches):	>10
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches):	>10

Wetland Hydrology Present?

Yes ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Entered by: KL/ED QC by: TJD

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Fumaria Solar Project City/County: - / Kittitas Sampling Date: 4/11/2017

Applicant/Owner: TUUSSO Energy, LLC State: WA Sampling Point: **FP12**

Investigator(s): Evan Dulin, Jamie Young Section, Township, Range: Section 20, T18N, R18E

Landform (hillslope, terrace, etc.): Channel Local relief (concave, convex, none): Concave Slope (%): 1

Subregion (LRR): B, Columbia/Snake River Plateau Lat: 47.038081 Long: -120.608795 Datum: NAD 1983

Soil Map Unit Name: Weirman-Kayak-Zillah complex, 0 to 2 percent slopes (809) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X* (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____		
Hydric Soil Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes X	No ____		

Precipitation prior to fieldwork: 0.61" two weeks prior, 2.64" above normal for CYTD, 3.10" above normal for WYTD. *Wetter than normal.

Remarks:
Sample plot taken in dry vegetated ditch south of the trail entrance.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1. *Salix exigua*	20%	Yes	FACW
2. *Rosa nutkana*	15%	Yes	FACU
3.			
4.			
5.			
	35% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Phalaris arundinacea*	80%	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	80% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 20%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 67% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species 0	x 1 =	0
FACW species 100	x 2 =	200
FAC species 0	x 3 =	0
FACU species 15	x 4 =	60
UPL species 0	x 5 =	0
Column Totals: 115 (A)		260 (B)

Prevalence Index = B/A = 2.26

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ____ 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: Entered by: KL/ED QC by: TJD

SOIL

Sampling Point: **FP12**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-9	10YR 2/1	100					coSiL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distrubed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): N/A

Hydric Soil Present? Yes ___ **No** X

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)
Rocks throughout. Shovel refusal at 9" due to rock layer.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- X Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- X Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches):	N/A	
Water Table Present?	Yes ___	No X	Depth (inches):	>9	**Wetland Hydrology Present?**
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches):	>9	**Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Entered by: KL/ED QC by: TJD

APPENDIX D: WETLAND AND STREAM PHOTOGRAPHS



Photo A. View north of Wetland FW01, extending off-site to the north (FP01).



Photo B. View southwest of Wetland FW01 and property to the west.



Photo C. View north of ditch (FS01) along western site boundary.



Photo D. View south of ditch (FS01) in southwest corner of site.



Photo E. View west of ditch (FS01) extending west along a driveway.



Photo F. View east of off-site pond to the southeast of the site.



Photo G. View west of ditch (FS02) from eastern site boundary..



Photo H. View south of upland area north of ditch (FS02).



Photo I. View northeast of flow control gates connecting FS02 to FS01.



Photo J. View east of ditch (FS01) just before feeding into Reecer Creek.



Photo K. View north of Reecer Creek at Clarke Road crossing.



Photo L. View south of Reecer Creek culverts at Clarke Road crossing.



Photo M. View south of Reecer Creek south of Clarke Road.



Photo N. View east of Wetland FW02.



Photo O. View east of western portion of Wetland FW02.



Photo P. View north of roadside ditch along Faust Road.



Photo Q. View east of Wetland FW03.



Photo R. View east of KRD Canal (FS03).



Photo S. View east of Wetland FW04.



Photo T. View north of Reecer Creek crossing of Faust Road.



Photo U. View north of Reecer Creek crossing of Hungry Junction Road.



Photo V. View west of roadside ditch on Hungry Junction Road, west of Faust Road.



Photo W. View northeast of Wetland FW05 and stream/ditch FS04.



Photo X. View west of roadside ditch on Hungry Junction Road, towards FS04.



Photo Y. View northwest of Town Canal (FS05).



Photo Z. View east of Wetland FW06 (FP010).

APPENDIX E: ECOLOGY RATING FORMS

Wetland name or number FW01

RATING SUMMARY – Eastern Washington

Name of wetland (or ID #): FW01 Date of site visit: 4/5/17

Rated by N. Evan Dunlap Trained by Ecology? ✓ Yes ___ No Date of training 3/24/17

HGM Class used for rating Slope Wetland has multiple HGM classes? ___ Y ✓ N

NOTE: Form is not complete without the figures requested (*figures can be combined*).

Source of base aerial photo/map Google Earth

OVERALL WETLAND CATEGORY III (based on functions ✓ or special characteristics ___)

1. Category of wetland based on FUNCTIONS

___ **Category I** – Total score = 22-27

___ **Category II** – Total score = 19-21

✓ **Category III** – Total score = 16-18

___ **Category IV** – Total score = 9-15

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
	Circle the appropriate ratings			
Site Potential	H M (L)	H M (L)	H M (L)	
Landscape Potential	H (M) L	H (M) L	H (M) L	
Value	H (M) L	(H) M L	H (M) L	TOTAL
Score Based on Ratings	5	6	5	16

Score for each function based on three ratings *(order of ratings is not important)*

9 = H,H,H
8 = H,H,M
7 = H,H,L
7 = H,M,M
6 = H,M,L
6 = M,M,M
5 = H,L,L
5 = M,M,L
4 = M,L,L
3 = L,L,L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	CATEGORY *Circle the appropriate category*
Vernal Pools	II III
Alkali	I
Wetland of High Conservation Value	I
Bog and Calcareous Fens	I
Old Growth or Mature Forest – slow growing	I
Aspen Forest	I
Old Growth or Mature Forest – fast growing	II
Floodplain forest	II
None of the above	✓

Wetland name or number FWO1

Maps and figures required to answer questions correctly for Eastern Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	D 1.3, H 1.1, H 1.5	
Hydroperiods (including area of open water for H 1.3)	D 1.4, H 1.2, H 1.3	
Location of outlet *(can be added to map of hydroperiods)*	D 1.1, D 4.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	
Map of the contributing basin	D 5.3	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	D 3.3	

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	R 2.4	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of wetland vs. width of stream *(can be added to another figure)*	R 4.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	R 3.2, R 3.3	

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	L 1.1, L 4.1, H 1.1, H 1.5	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	1
Hydroperiods	H 1.2, H 1.3	1
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	1
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants *(can be added to figure above)*	S 4.1	1
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	S 2.1, S 5.1	1
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	2
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	3
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	S 3.3	4

Wetland name or number FW01

HGM Classification of Wetland in Eastern Washington

For questions 1-4, the criteria described must apply to the entire unit being rated.

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-4 apply, and go to Question 5.

1. Does the entire unit **meet both** of the following criteria?
   ___The vegetated part of the wetland is on the water side of the Ordinary High Water Mark of a body of permanent open water (without any plants on the surface) that is at least 20 ac (8 ha) in size
   ___At least 30% of the open water area is deeper than 10 ft (3 m)

   NO – go to 2 **YES –** The wetland class is **Lake Fringe** (Lacustrine Fringe)

2. Does the entire wetland unit **meet all** of the following criteria?
   ✓ The wetland is on a slope (*slope can be very gradual*),
   ✓ The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks;
   ✓ The water leaves the wetland **without being impounded**.

   NO - go to 3 YES – The wetland class is **Slope**
   NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 foot deep).

3. Does the entire wetland unit **meet all** of the following criteria?
   ___ The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river;
   ___ The overbank flooding occurs at least once every 10 years.

   NO - go to 4 YES – The wetland class is **Riverine**
   NOTE: The Riverine wetland can contain depressions that are filled with water when the river is not flooding.

4. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year. *This means that any outlet, if present, is higher than the interior of the wetland.*

   NO – go to 5 YES – The wetland class is **Depressional**

5. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-4 APPLY TO DIFFERENT AREAS IN THE WETLAND UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

Wetland name or number FW01

NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the wetland unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM Class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine (the riverine portion is within the boundary of depression)	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine

If you are still unable to determine which of the above criteria apply to your wetland, or if you have ***more than 2 HGM classes*** *within a wetland boundary, classify the wetland as Depressional for the rating.*

Wetland name or number FW01

SLOPE WETLANDS **Water Quality Functions** - Indicators that the site functions to improve water quality	Points (only 1 score per box)
S 1.0. Does the site have the potential to improve water quality?	
S 1.1. Characteristics of average slope of wetland: *(a 1% slope has a 1 ft vertical drop in elevation for every 100 ft of horizontal distance)* __ Slope is 1% or less — points = 3 Slope is > 1% - 2% — points = 2 Slope is > 2% - 5% — points = 1 Slope is greater than 5% — points = 0	3
S 1.2. The soil 2 in below the surface (or duff layer) is true clay or tureorganic *(use NRCS definitions)*: Yes = 3 No = 0	0
S 1.3. Characteristics of the plants in the wetland that trap sediments and pollutants: Choose the points appropriate for the description that best fits the plants in the wetland. *Dense means you have trouble seeing the soil surface (>75% cover), and uncut means not grazed or mowed and plants are higher than 6 in.* Dense, uncut, herbaceous plants > 90% of the wetland area — points = 6 Dense, uncut, herbaceous plants > ½ of area — points = 3 Dense, woody, plants > ½ of area — points = 2 Dense, uncut, herbaceous plants > ¼ of area — points = 1 __ Does not meet any of the criteria above for plants — points = 0 grazed in North + west 0.40 / 5.57 ac = 7%	0
Total for S 1 — Add the points in the boxes above	3

Rating of Site Potential If score is: ___ 12 = H ___ 6-11 = M ✓ 0-5 = L *Record the rating on the first page*

S 2.0. Does the landscape have the potential to support the water quality function at the site?	
S 2.1. Is > 10% of the area within 150 ft on the uphill side of the wetland in land uses that generate pollutants? pasture (cattle) — (Yes = 1) No = 0	1
S 2.2. Are there other sources of pollutants coming into the wetland that are not listed in question S 2.1? Other sources _____ — Yes = 1 (No = 0)	0
Total for S 2 — Add the points in the boxes above	1

Rating of Landscape Potential If score is: ✓ 1-2 = M ___ 0 = L *Record the rating on the first page*

S 3.0. Is the water quality improvement provided by the site valuable to society?	
S 3.1. Does the wetland discharge directly to a stream, river, or lake that is on the 303(d) list (*within 1 mi*)? — Yes = 1 (No = 0)	0
S 3.2. Is the wetland in a basin or sub-basin where water quality is an issue? *At least one aquatic resource in the basin is on the 303(d) list.* — (Yes = 1) No = 0	1
S 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality (*answer YES if there is a TMDL for the drainage or basin in which wetland is found*)? — Yes = 2 (No = 0)	0
Total for S 3 — Add the points in the boxes above	1

Rating of Value If score is: ___ 2-4 = H ✓ 1 = M ___ 0 = L *Record the rating on the first page*

Wetland name or number FW01

SLOPE WETLANDS **Hydrologic Functions** - Indicators that the site functions to reduce flooding and erosion	Points (only 1 score per box)
S 4.0. Does the site have the potential to reduce flooding and erosion?	
S 4.1. Characteristics of plants that reduce the velocity of surface flows during storms: Choose the points appropriate for the description that best fits conditions in the wetland. *Stems of plants should be thick enough (usually > 1/8 in), or dense enough, to remain erect during surface flows.* Dense, uncut, **rigid** plants cover > 90% of the area of the wetland partially grazed points = 1 __ All other conditions points = 0	0

Rating of Site Potential If score is: ___ **1 = M** ✓ **0 = L** *Record the rating on the first page*

S 5.0. Does the landscape have the potential to support the hydrologic functions of the site?	
S 5.1. Is more than 25% of the area within 150 ft upslope of wetland in land uses that generate excess surface runoff? (Yes = 1) No = 0	1

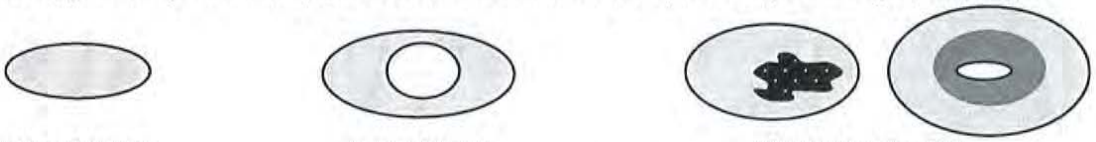
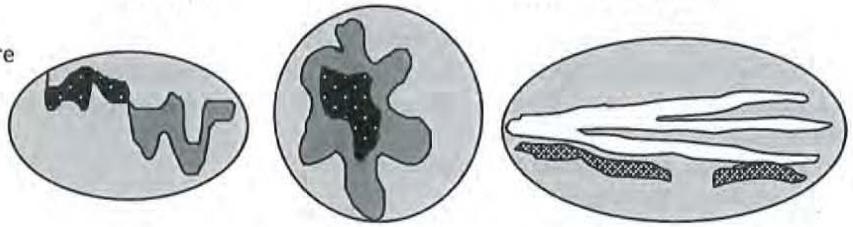
Rating of Landscape Potential If score is: ✓ **1 = M** ___ **0 = L** *Record the rating on the first page*

S 6.0. Are the hydrologic functions provided by the site valuable to society?	
S 6.1. Distance to the nearest areas downstream that have flooding problems: _ The sub-basin immediately down-gradient of site has surface flooding problems that result in damage to human or natural resources (e.g., houses or salmon redds) Beecer creek points = 2 Surface flooding problems are in a sub-basin farther down-gradient points = 1 No flooding problems anywhere downstream points = 0	2
S 6.2. Has the site been identified as important for flood storage and flood conveyance in a regional flood control plan? Yes = 2 (No = 0)	0
Total for S 6 Add the points in the boxes above	2

Rating of Value If score is: ✓ **2-4 = H** ___ **1 = M** ___ **0 = L** *Record the rating on the first page*

NOTES and FIELD OBSERVATIONS:

Wetland name or number FW01

These questions apply to wetlands of all HGM classes. **HABITAT FUNCTIONS** - Indicators that site functions to provide important habitat	(only 1 score per box)
H 1.0. Does the wetland have the potential to provide habitat for many species?	
H 1.1. Structure of the plant community: *Check the Cowardin vegetation classes present and categories of emergent plants. Size threshold for each category is >= ¼ ac or >= 10% of the wetland if wetland is < 2.5 ac.* ____Aquatic bed __✓__Emergent plants 0-12 in (0-30 cm) high are the highest layer and have > 30% cover ____Emergent plants >12-40 in (>30-100 cm) high are the highest layer with >30% cover __✓__Emergent plants > 40 in (> 100 cm) high are the highest layer with >30% cover 0.40 ac ____Scrub-shrub (areas where shrubs have >30% cover) ____Forested (areas where trees have >30% cover) 4 or more checks: points = 3 3 checks: points = 2 2 checks: points = 1 1 check: points = 0	1
H 1.2. Is one of the vegetation types Aquatic Bed? Yes = 1 No = 0	0
H 1.3. Surface water H 1.3.1. Does the wetland have areas of open water (without emergent or shrub plants) over at least ¼ ac **OR** 10% of its area during the March to early June **OR** in August to the end of September? *Answer YES for Lake Fringe wetlands.* Yes = 3 points & go to H 1.4 No = go to H 1.3.2 H 1.3.2. Does the wetland have an intermittent or permanent, and unvegetated stream within its boundaries, or along one side, over at least ¼ ac or 10% of its area? *Answer yes only if H 1.3.1 is No.* Yes = 3 No = 0	0
H 1.4. Richness of plant species Count the number of plant species in the wetland that cover at least 10 ft^2. *Different patches of the same species can be combined to meet the size threshold. You do not have to name the species.* *Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Russian olive, Phragmites, Canadian thistle, yellow-flag iris, and saltcedar (Tamarisk)* # of species ____ Scoring: > 9 species: points = 2 4-9 species: points = 1 < 4 species: points = 0	2
H 1.5. Interspersion of habitats Decide from the diagrams below whether interspersion among types of plant structures (described in H 1.1), and unvegetated areas (open water or mudflats) is high, moderate, low, or none. *Use map of Cowardin and emergent plant classes prepared for questions H 1.1 and map of open water from H 1.3. If you have four or more plant classes or three classes and open water, the rating is always high.*  **None** = 0 points **Low** = 1 point **Moderate** = 2 points All three diagrams in this row are **High** = 3 points  Riparian braided channels with 2 classes	Figure__ 0

Wetland name or number FW01

H 1.6. Special habitat features *Check the habitat features that are present in the wetland. The number of checks is the number of points.* ____Loose rocks larger than 4 in OR large, downed, woody debris (> 4 in diameter) within the area of surface ponding or in stream. ____Cattails or bulrushes are present within the wetland. ____Standing snags (diameter at the bottom > 4 in) in the wetland or within 30 m (100 ft) of the edge. ____Emergent or shrub vegetation in areas that are permanently inundated/ponded. ____Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 45 degree slope) OR signs of recent beaver activity ____ Invasive species cover less than 20% in each stratum of vegetation *(canopy, sub-canopy, shrubs, herbaceous, moss/ground cover)*	0
Total for H 1 — Add the points in the boxes above	3

Rating of Site Potential If score is: ___**15-18 = H** ___**7-14 = M** ✓**0-6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support habitat functions of the site?	
H 2.1. Accessible habitat (only area of habitat abutting wetland). If total accessible habitat is: *Calculate:* % undisturbed habitat 0 + [(% moderate and low intensity land uses)/2] 24.5 = 24.5 % > 1/3 (33.3%) of 1 km Polygon — points = 3 — 20-33% of 1km Polygon — points = 2 10-19% of 1km Polygon — points = 1 <10% of 1km Polygon — points = 0 mid 676 ac / 1150 ac = 59%	2
H 2.2. Undisturbed habitat in 1 km Polygon around wetland. (4 patches) *Calculate:* % undisturbed habitat 1 + [(% moderate and low intensity land uses)/2] 32 = 33 % Undisturbed habitat > 50% of Polygon — points = 3 Undisturbed habitat 10 - 50% and in 1-3 patches — points = 2 — Undisturbed habitat 10 - 50% and > 3 patches — points = 1 Undisturbed habitat < 10% of Polygon — points = 0 undis 3.6 / 1150 = <1%; mid 712 / 1150 = 64%	1
H 2.3. Land use intensity in 1 km Polygon: > 50% of Polygon is high intensity land use 36% — points = (- 2) Does not meet criterion above — points = 0	0
H 2.4. The wetland is in an area where annual rainfall is less than 12 in, and its water regime is not influenced by irrigation practices, dams, or water control structures. *Generally, this means outside boundaries of reclamation areas, irrigation districts, or reservoirs* — Yes = 3 / No = 0	0
Total for H 2 — Add the points in the boxes above	3

Rating of Landscape Potential If score is: ___**4-9 = H** ✓**1-3 = M** ___**< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose the highest score that applies to the wetland being rated* Site meets ANY of the following criteria: — points = 2 — It has 3 or more priority habitats within 100 m (see Appendix B) — It provides habitat for Threatened or Endangered species (any plant or animal on state or federal lists) — It is mapped as a location for an individual WDFW species — It is a Wetland of High Conservation Value as determined by the Department of Natural Resources — It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan — Site has 1 or 2 priority habitats within 100 m (see Appendix B) — points = 1 Site does not meet any of the criteria above — points = 0	1

Rating of Value If score is: ___**2 = H** ✓**1 = M** ___**0 = L** *Record the rating on the first page*

Appendix B: WDFW Priority Habitats in Eastern Washington

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp. http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here: http://wdfw.wa.gov/conservation/phs/list/)

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland: ***NOTE:*** *This question is independent of the land use between the wetland and the priority habitat.*

— **Aspen Stands:** Pure or mixed stands of aspen greater than 1 ac (0.4 ha).

— **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).

— **Old-growth/Mature forests:** Old-growth east of Cascade crest – Stands are highly variable in tree species composition and structural characteristics due to the influence of fire, climate, and soils. In general, stands will be >150 years of age, with 10 trees/ac (25 trees/ha) that are > 21 in (53 cm) dbh, and 1-3 snags/ac (2.5-7.5 snags/ha) that are > 12-14 in (30-35 cm) diameter. Downed logs may vary from abundant to absent. Canopies may be single or multi-layered. Evidence of human-caused alterations to the stand will be absent or so slight as to not affect the ecosystem's essential structures and functions. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west and 80-160 years old east of the Cascade crest.

— **Oregon White Oak:** Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).

✓— **Riparian:** The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

✓— **Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.

— **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

— **Cliffs:** Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.

— **Talus:** Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

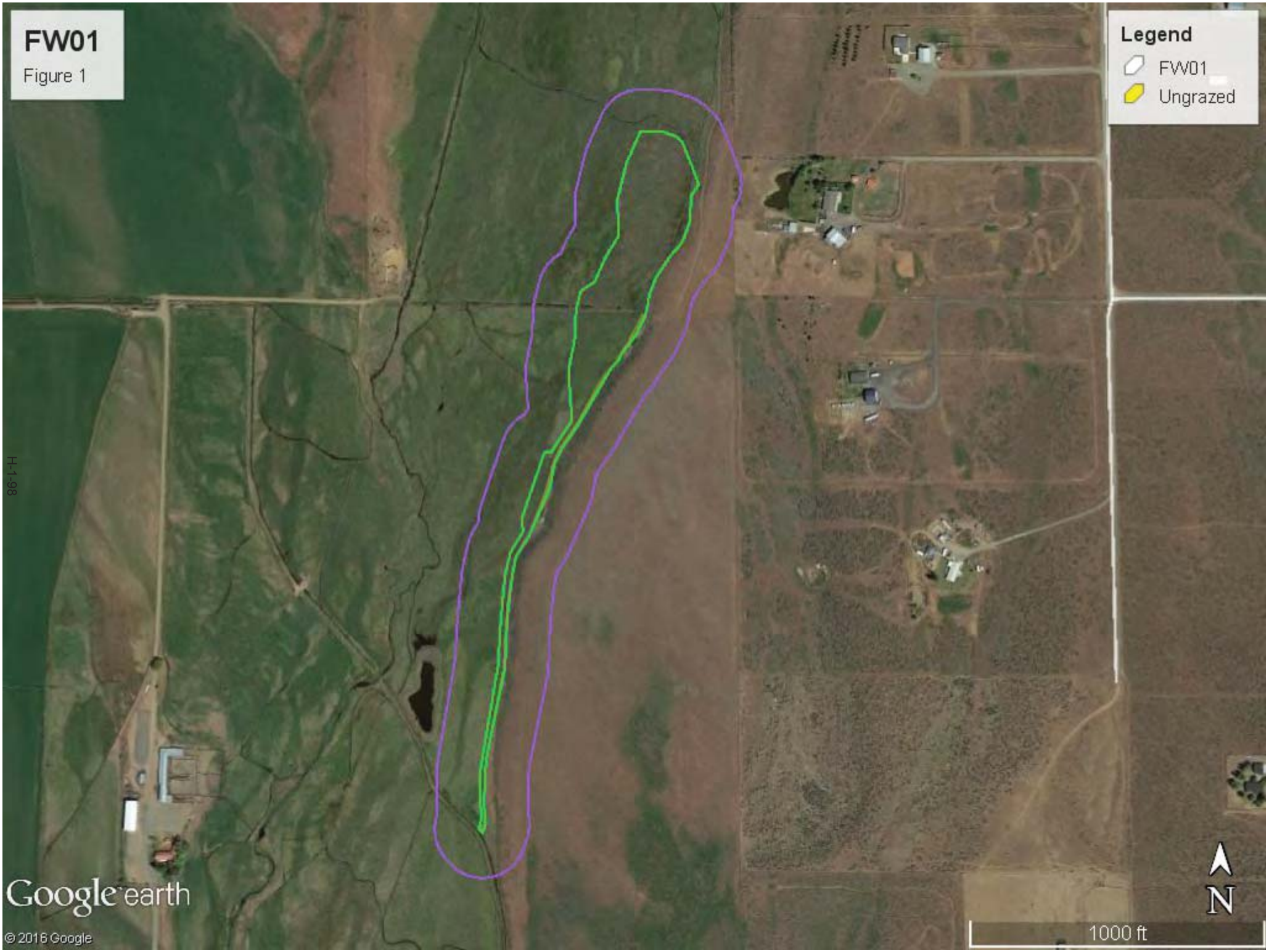
— **Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 12 in (30 cm)in eastern Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

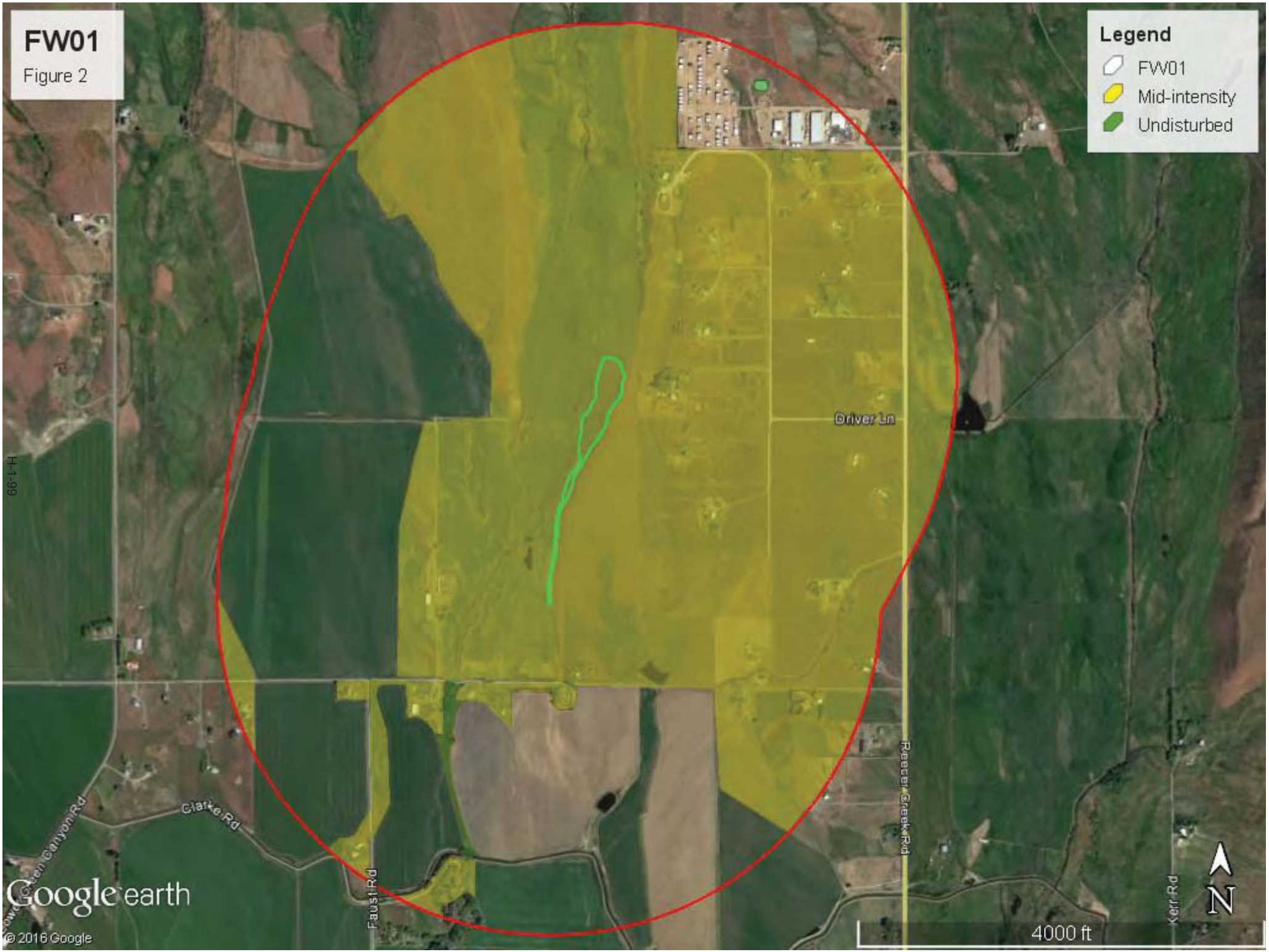
— **Shrub-steppe:** A nonforested vegetation type consisting of one or more layers of perennial bunchgrasses and a conspicuous but discontinuous layer of shrubs (see Eastside Steppe for sites with little or no shrub cover). >100 meters <200 meters

— **Eastside Steppe:** Nonforested vegetation type dominated by broadleaf herbaceous flora (i.e., forbs), perennial bunchgrasses, or a combination of both. Bluebunch wheatgrass (*Pseudoroegneria spicata*) is often the prevailing cover component along with Idaho fescue (*Festuca idahoensis*), Sandberg bluegrass (*Poa secunda*), rough fescue (*F. campestris*), or needlegrasses (*Achnatherum* spp.).

— **Juniper Savannah:** All juniper woodlands.

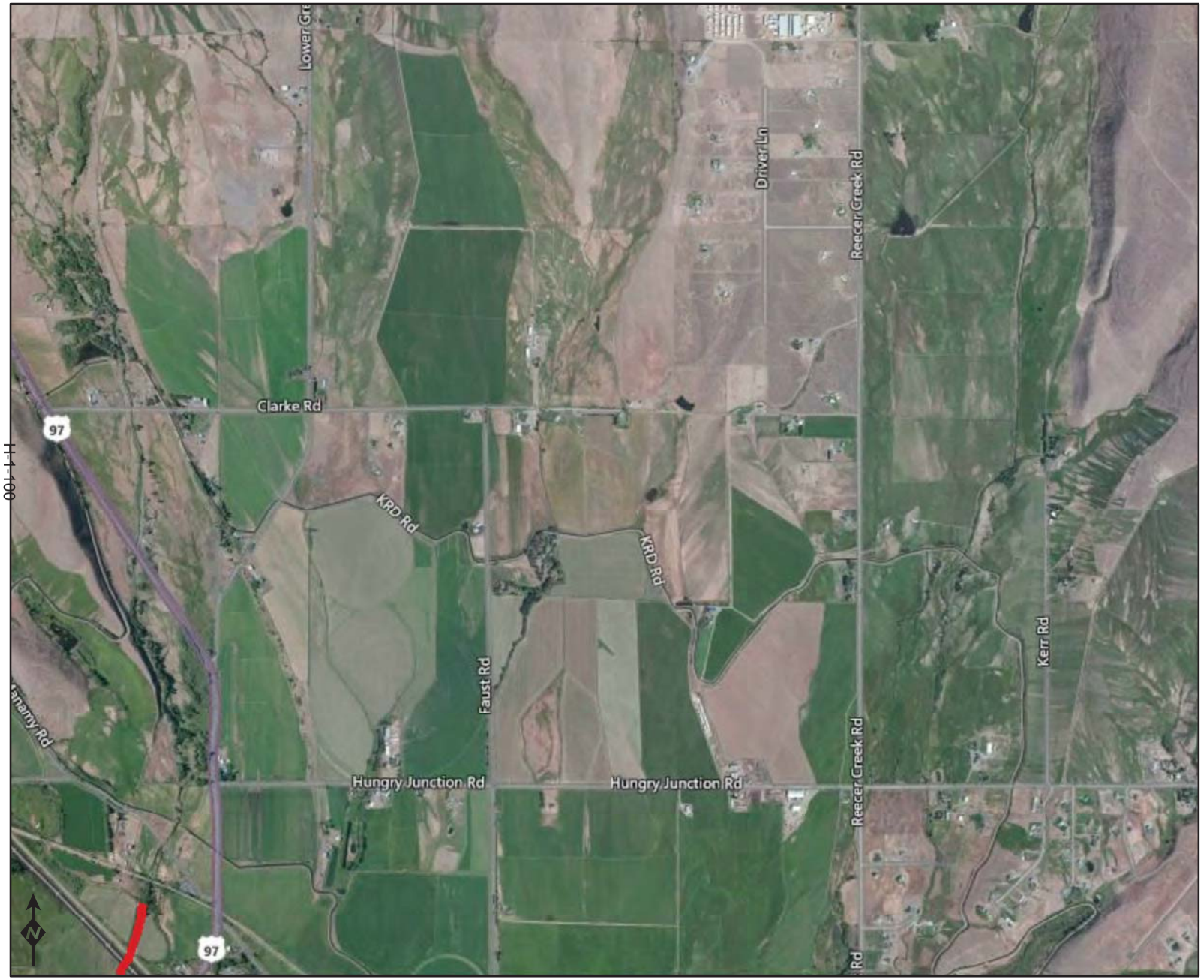
Note: All vegetated wetlands are by definition a priority habitat but are not included in this list because they are addressed elsewhere.


FW01
Figure 1
Legend
FWV01
Ungrazed
H-1-98
Google earth
© 2016 Google
N
1000 ft


FW01
Figure 2
Legend
FW01
Mid-intensity
Undisturbed
Driver Ln
Clarke Rd
Faust Rd
Beecher Creek Rd
Kerr Rd
H-1-99
Google earth
© 2016 Google
4000 ft
N

April 25, 2017

FW01 - Figure 3



H1-100

Assessed Waters/Sediment

Water
- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

Sediment
- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

Image courtesy of USGS Earthstar Geographics SIO © 2017 Microsoft Corporation © 2010 NAVTEQ © AND

Miles
0 0.25 0.5 1

DEPARTMENT OF ECOLOGY
State of Washington

Water Quality Improvement Projects (TMDLs)

WATER QUALITY IMPROVEMENT PROJECTS (TMDLs)

Overview of the process
Project Catalog
- by WRIA
- by County

Funding Opportunities
Project Development Priority Lists
Related Information
TMDL Contacts

RELATED ECOLOGY PROGRAMS

Water Quality

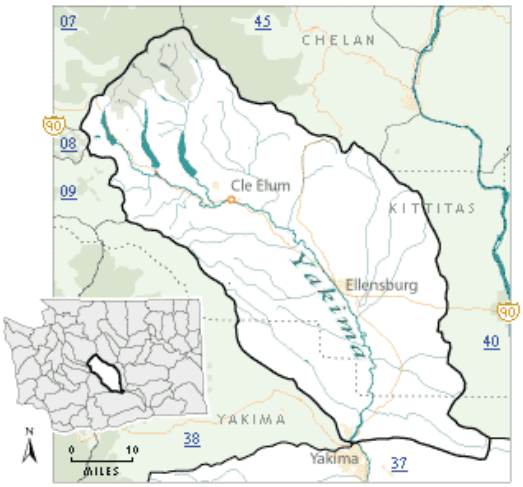
Water Quality Improvement > Water Quality Improvement Projects by WRIA > WRIA 39: Upper Yakima

WRIA 39: Upper Yakima

The following table lists overview information and links to specific water quality improvement projects (including total maximum daily loads, or TMDLs) for this water resource inventory area (WRIA). Please use links (where available) for more information on a project.

Yakima River basin project index:
www.ecy.wa.gov/programs/wq/tmdl/yakima_wq/index.html
Counties

- Kittitas
- Yakima



Project Name	Pollutants	Status**	TMDL Lead
Crystal Creek	Ammonia-N BOD (5-day) Chlorine Fecal Coliform	EPA approved	Jane Creech 509-454-7860
Selah Ditch	Fecal Coliform Temperature	EPA approved	Greg Bohn 509-454-4174
Teanaway River segments: • Upper West Fork Teanaway River • Upper Middle Fork Teanaway River • Upper North Fork Teanaway River • Stafford Creek • Lower West Fork Teanaway River • Lower Middle Fork Teanaway River • Lower North Fork Teanaway River • Mainstem Teanaway River	Temperature	EPA approved	Jane Creech 509-454-7860
Wilson/Cooke Creek Tributaries: • Badger Creek • Bull Ditch • Caribou Creek • Cherry Creek • CID Canal • Coleman Creek • Cook Creek • EWC Canal • Johnson Drain • KRD Canal	Fecal Coliform	EPA approved Has an implementation plan Post-TMDL monitoring report	Jane Creech 509-454-7860 Greg Bohn 509-454-4174

Mercer Creek • Naneum Creek • Parke Creek • Whiskey Creek • Wilson Creek • Wipple Wasteway			
Yakima River, Upper	Dieldrin DDT Suspended Sediments Turbidity	EPA approved	Jane Creech 509-454-7860
	Temperature	EPA approved Has an implementation plan	Jane Creech 509-454-7860
Yakima River	Toxics	Under development	Jane Creech 509-454-7860

**** Status** will be listed as one of the following: Approved by EPA, Under Development or Implementation. No status means project work has not yet started.*

For more information about WRIA 39:

- Waterbodies in WRIA 39 - using the Water Quality Assessment Query Tool
- Watershed Information for WRIA 39

* The Department of Ecology and other state resource agencies frequently use a system of 62 "Water Resource Inventory Areas" or "WRIAs" to refer to the state's major watershed basins.

Back to top of page

Last updated December 2016

Feedback?

About us
Director Maia Bellon
Tracking progress
Newsroom
Jobs
Staff only
Contact us

Publications & forms
Databases
Laws & rules
Public records disclosure
Public input & events
Environmental education
Sustainability information

中文 | Chinese
Tiếng Việt | Vietnamese
한국어 | Korean
Русский | Russian
Español | Spanish
Accessibility

Access Washington®
Welcome to the State of Washington

Copyright © Washington State Department of Ecology
Privacy Notice | Site Info | Accessibility | Contact the web team |

SHARE

Wetland name or number FW02

RATING SUMMARY – Eastern Washington

Name of wetland (or ID #): FW02 Date of site visit: 4/11/17

Rated by N. Evan Dulin Trained by Ecology? ✓ Yes ___ No Date of training 3/24/17

HGM Class used for rating Riverine Wetland has multiple HGM classes? ✓ Y ___ N

NOTE: Form is not complete without the figures requested (*figures can be combined*).

Source of base aerial photo/map Google Earth

OVERALL WETLAND CATEGORY II (based on functions ✓ or special characteristics ___)

1. Category of wetland based on FUNCTIONS

___ **Category I** – Total score = 22-27

✓ **Category II** – Total score = 19-21

___ **Category III** – Total score = 16-18

___ **Category IV** – Total score = 9-15

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
	Circle the appropriate ratings			
Site Potential	H M (L)	(H) M L	H M (L)	
Landscape Potential	H (M) L	H (M) L	H M (L)	
Value	(H) M L	(H) M L	(H) M L	TOTAL
Score Based on Ratings	6	8	5	19

Score for each function based on three ratings *(order of ratings is not important)*

9 = H,H,H
8 = H,H,M
7 = H,H,L
7 = H,M,M
6 = H,M,L
6 = M,M,M
5 = H,L,L
5 = M,M,L
4 = M,L,L
3 = L,L,L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	CATEGORY *Circle the appropriate category*
Vernal Pools	II III
Alkali	I
Wetland of High Conservation Value	I
Bog and Calcareous Fens	I
Old Growth or Mature Forest – slow growing	I
Aspen Forest	I
Old Growth or Mature Forest – fast growing	II
Floodplain forest	II
None of the above	✓

Wetland name or number FW02

Maps and figures required to answer questions correctly for Eastern Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	D 1.3, H 1.1, H 1.5	
Hydroperiods (including area of open water for H 1.3)	D 1.4, H 1.2, H 1.3	
Location of outlet (*can be added to map of hydroperiods)*	D 1.1, D 4.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	
Map of the contributing basin	D 5.3	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	D 3.3	

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	1
Hydroperiods	H 1.2, H 1.3	1
Ponded depressions	R 1.1	1
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	R 2.4	1
Map of the contributing basin	R 2.2, R 2.3, R 5.2	2
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	1
Width of wetland vs. width of stream *(can be added to another figure)*	R 4.1	1
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	3
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	4
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	R 3.2, R 3.3	5

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	L 1.1, L 4.1, H 1.1, H 1.5	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants *(can be added to figure above)*	S 4.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	S 3.3	

Wetland name or number FW02

HGM Classification of Wetland in Eastern Washington

For questions 1-4, the criteria described must apply to the entire unit being rated.

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-4 apply, and go to Question 5.

1. Does the entire unit **meet both** of the following criteria?
   ___The vegetated part of the wetland is on the water side of the Ordinary High Water Mark of a body of permanent open water (without any plants on the surface) that is at least 20 ac (8 ha) in size
   ___At least 30% of the open water area is deeper than 10 ft (3 m)

   NO – go to 2 **YES –** The wetland class is **Lake Fringe** (Lacustrine Fringe)

2. Does the entire wetland unit **meet all** of the following criteria?
   western ✓ ✓ The wetland is on a slope (*slope can be very gradual*),
   ✓ ___The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks;
   ✓ ✓ The water leaves the wetland **without being impounded.** western portion meets

   NO - go to 3 YES – The wetland class is **Slope**

   NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 foot deep).

3. Does the entire wetland unit **meet all** of the following criteria?
   ✓ The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river;
   ✓ The overbank flooding occurs at least once every 10 years.

   NO - go to 4 YES – The wetland class is **Riverine**

   NOTE: The Riverine wetland can contain depressions that are filled with water when the river is not flooding.

4. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year. *This means that any outlet, if present, is higher than the interior of the wetland.*

   NO – go to 5 YES – The wetland class is **Depressional**

5. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-4 APPLY TO DIFFERENT AREAS IN THE WETLAND UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

Wetland name or number FW02

NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the wetland unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM Class to use in rating
→ Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine (the riverine portion is within the boundary of depression)	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine

If you are still unable to determine which of the above criteria apply to your wetland, or if you have ***more than 2 HGM classes*** *within a wetland boundary, classify the wetland as Depressional for the rating.*

Wetland name or number FW02

RIVERINE WETLANDS **Water Quality Functions** - Indicators that the site functions to improve water quality	Points (only 1 score per box)
R 1.0. Does the site have the potential to improve water quality?	
R 1.1. Area of surface depressions within the Riverine wetland that can trap sediments during a flooding event: Depressions cover >1/3 area of wetland — points = 6 Depressions cover > 1/10 area of wetland — points = 3 Depressions present but cover < 1/10 area of wetland — points = 1 No depressions present — points = 0 0.18 / 2.15 ac = 8%	1
R 1.2. Structure of plants in the wetland (areas with >90% cover at person height; **not** Cowardin classes): Forest or shrub > 2/3 the area of the wetland — points = 10 Forest or shrub 1/3 – 2/3 area of the wetland — points = 5 Ungrazed, herbaceous plants > 2/3 area of wetland — points = 5 Ungrazed herbaceous plants 1/3 – 2/3 area of wetland — points = 2 Forest, shrub, and ungrazed herbaceous < 1/3 area of wetland — points = 0 0.39 / 2.15 = 18%	0
Total for R 1 — Add the points in the boxes above	1

Rating of Site Potential If score is: ___ **12-16 = H** ___ **6-11 = M** ✓ **0-5 = L** *Record the rating on the first page*

R 2.0. Does the landscape have the potential to support the water quality function of the site?	
R 2.1. Is the wetland within an incorporated city or within its UGA? Yes = 2 (No = 0)	0
R 2.2. Does the contributing basin include a UGA or incorporated area? Yes = 1 (No = 0)	0
R 2.3. Does at least 10% of the contributing basin contain tilled fields, pastures, or forests that have been clearcut within the last 5 years? (Yes = 1) No = 0	1
R 2.4. Is > 10% of the area within 150 ft of wetland in land uses that generate pollutants (Yes = 1) No = 0	1
R 2.5. Are there other sources of pollutants coming into the wetland that are not listed in questions R 2.1-R 2.4? Source_____ Yes = 1 (No = 0)	0
Total for R 2 — Add the points in the boxes above	2

Rating of Landscape Potential If score is: ___ **3-6 = H** ✓ **1 or 2 = M** ___ **0 = L** *Record the rating on the first page*

R 3.0. Is the water quality improvement provided by the site valuable to society?	
R 3.1. Is the wetland along a stream or river that is on the 303(d) list or on a tributary that drains to one within 1 mi? Yes = 1 (No = 0)	0
R 3.2. Does the river or stream have TMDL limits for nutrients, toxics, or pathogens? Yes = 1 (No = 0)	0
R 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality? *Answer YES if there is a TMDL for the drainage in which wetland is found.* (Yes = 2) No = 0	2
Total for R 3 — Add the points in the boxes above	2

Rating of Value If score is: ✓ **2-4 = H** ___ **1 = M** ___ **0 = L** *Record the rating on the first page*

→ Reecer Creek floodplain Restoration project

Wetland name or number FW02

RIVERINE WETLANDS **Hydrologic Functions** - Indicators that site functions to reduce flooding and stream erosion		Points (only 1 score per box)
R 4.0. Does the site have the potential to reduce flooding and erosion?		
R 4.1. Characteristics of the overbank storage the wetland provides: *Estimate the average width of the wetland perpendicular to the direction of the flow and the width of the stream or river channel (distance between banks). Calculate the ratio: (average width of wetland)/(average width of stream between banks).* — If the ratio is more than 2 (120'/15' = >2X) If the ratio is 1-2 If the ratio is ½-<1 If the ratio is ¼-< ½ If the ratio is < ¼	points = 10 points = 8 points = 4 points = 2 points = 1	10
R 4.2. Characteristics of plants that slow down water velocities during floods: *Treat large woody debris as forest or shrub. Choose the points appropriate for the best description (polygons need to have > 90% cover at person height. These are NOT Cowardin classes).* Forest or shrub for more than $^2/_3$ the area of the wetland — Forest or shrub for $>^1/_3$ area OR emergent plants $> ^2/_3$ area (100% emergent) Forest or shrub for $> ^1/_{10}$ area OR emergent plants $> ^1/_3$ area Plants do not meet above criteria	points = 6 points = 4 points = 2 points = 0	4
Total for R 5	Add the points in the boxes above	14

Rating of Site Potential If score is: ✓ **12-16 = H** ___ **6-11 = M** ___ **0-5 = L** *Record the rating on the first page*

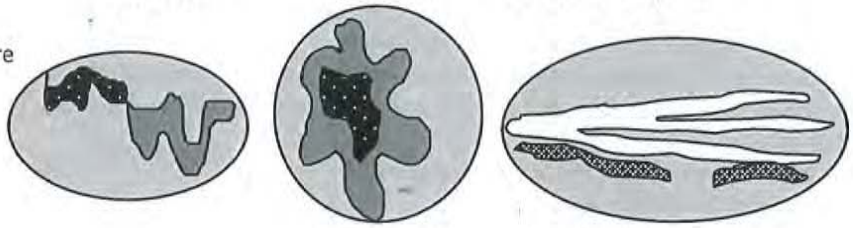
R 5.0. Does the landscape have the potential to support the hydrologic functions of the site?		
R 5.1. Is the stream or river adjacent to the wetland downcut?	Yes = 0 (No = 1)	1
R 5.2. Does the up-gradient watershed include a UGA or incorporated area?	Yes = 1 (No = 0)	0
R 5.3. Is the up-gradient stream or river controlled by dams?	Yes = 0 (No = 1)	1
Total for R 5	Add the points in the boxes above	2

Rating of Landscape Potential If score is: ___ **3 = H** ✓ **1 or 2 = M** ___ **0 = L** *Record the rating on the first page*

R 6.0. Are the hydrologic functions provided by the site valuable to society?		
R 6.1. Distance to the nearest areas downstream that have flooding problems? *Choose the description that best fits the site.* — The sub-basin immediately down-gradient of site has surface flooding problems that result in damage to human or natural resources Surface flooding problems are in a basin farther down-gradient No flooding problems anywhere downstream	points = 2 points = 1 points = 0	2
R 6.2. Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan?	(Yes = 2) No = 0	2
Total for R 6	Add the points in the boxes above	4

Rating of Value If score is: ✓ **2-4 = H** ___ **1 = M** ___ **0 = L** *Record the rating on the first page*

Wetland name or number FW02

These questions apply to wetlands of all HGM classes. **HABITAT FUNCTIONS** - Indicators that site functions to provide important habitat	(only 1 score per box)
H 1.0. Does the wetland have the potential to provide habitat for many species?	
H 1.1. Structure of the plant community: *Check the Cowardin vegetation classes present and categories of emergent plants. Size threshold for each category is >= ¼ ac or >= 10% of the wetland if wetland is < 2.5 ac.* ____Aquatic bed __✓__Emergent plants 0-12 in (0-30 cm) high are the highest layer and have > 30% cover __✓__Emergent plants >12-40 in (>30-100 cm) high are the highest layer with >30% cover ____Emergent plants > 40 in (> 100 cm) high are the highest layer with >30% cover ____Scrub-shrub (areas where shrubs have >30% cover) ____Forested (areas where trees have >30% cover) 4 or more checks: points = 3 3 checks: points = 2 2 checks: points = 1 1 check: points = 0	1
H 1.2. Is one of the vegetation types Aquatic Bed? Yes = 1 No = 0	0
H 1.3. Surface water H 1.3.1. Does the wetland have areas of open water (without emergent or shrub plants) over at least ¼ ac **OR** 10% of its area during the March to early June **OR** in August to the end of September? *Answer YES for Lake Fringe wetlands.* Yes = 3 points & go to H 1.4 No = go to H 1.3.2 H 1.3.2. Does the wetland have an intermittent or permanent, and unvegetated stream within its boundaries, or along one side, over at least ¼ ac or 10% of its area? *Answer yes only if H 1.3.1 is No.* Yes = 3 No = 0	3
H 1.4. Richness of plant species Count the number of plant species in the wetland that cover at least 10 ft^2. *Different patches of the same species can be combined to meet the size threshold. You do not have to name the species.* *Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Russian olive, Phragmites, Canadian thistle, yellow-flag iris, and saltcedar (Tamarisk)* # of species ____ MM 1 Scoring: > 9 species: points = 2 4-9 species: points = 1 < 4 species: points = 0	1
H 1.5. Interspersion of habitats Decide from the diagrams below whether interspersion among types of plant structures (described in H 1.1), and unvegetated areas (open water or mudflats) is high, moderate, low, or none. *Use map of Cowardin and emergent plant classes prepared for questions H 1.1 and map of open water from H 1.3. If you have four or more plant classes or three classes and open water, the rating is always high.*  **None** = 0 points **Low** = 1 point **Moderate** = 2 points All three diagrams in this row are **High** = 3 points  Riparian braided channels with 2 classes	Figure__ 0

Wetland name or number FW02

H 1.6. Special habitat features	
Check the habitat features that are present in the wetland. The number of checks is the number of points. ____Loose rocks larger than 4 in OR large, downed, woody debris (> 4 in diameter) within the area of surface ponding or in stream. ✓ Cattails or bulrushes are present within the wetland. ____Standing snags (diameter at the bottom > 4 in) in the wetland or within 30 m (100 ft) of the edge. ____Emergent or shrub vegetation in areas that are permanently inundated/ponded. ____Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 45 degree slope) OR signs of recent beaver activity ____ Invasive species cover less than 20% in each stratum of vegetation *(canopy, sub-canopy, shrubs, herbaceous, moss/ground cover)*	1
Total for H 1 — Add the points in the boxes above	6

Rating of Site Potential If score is: ___**15-18 = H** ___**7-14 = M** ✓**0-6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support habitat functions of the site?	
H 2.1. Accessible habitat (only area of habitat abutting wetland). If total accessible habitat is: *Calculate:* % undisturbed habitat 0 + [(% moderate and low intensity land uses)/2] 15.5 = 15.5 % > 1/3 (33.3%) of 1 km Polygon — points = 3 20-33% of 1km Polygon — points = 2 ✓ 10-19% of 1km Polygon — points = 1 <10% of 1km Polygon — points = 0 undist: 0/930 ac = 0%; mid: 287/930 = 31%	1
H 2.2. Undisturbed habitat in 1 km Polygon around wetland. (4 patches) *Calculate:* % undisturbed habitat 1 + [(% moderate and low intensity land uses)/2] 23.5 = 24.5 % Undisturbed habitat > 50% of Polygon — points = 3 Undisturbed habitat 10 - 50% and in 1-3 patches — points = 2 ✓ Undisturbed habitat 10 - 50% and > 3 patches — points = 1 Undisturbed habitat < 10% of Polygon — points = 0 undis: 8.5/920 = <1%; mid: 433/930 = 47%	1
H 2.3. Land use intensity in 1 km Polygon: > 50% of Polygon is high intensity land use 52% — points = (- 2) Does not meet criterion above — points = 0	-2
H 2.4. The wetland is in an area where annual rainfall is less than 12 in, and its water regime is not influenced by irrigation practices, dams, or water control structures. *Generally, this means outside boundaries of reclamation areas, irrigation districts, or reservoirs* — Yes = 3 (No = 0)	0
Total for H 2 — Add the points in the boxes above	0

Rating of Landscape Potential If score is: ___**4-9 = H** ___**1-3 = M** ✓**< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose the highest score that applies to the wetland being rated* Site meets ANY of the following criteria: — points = 2 ✓ It has 3 or more priority habitats within 100 m (see Appendix B) — It provides habitat for Threatened or Endangered species (any plant or animal on state or federal lists) — It is mapped as a location for an individual WDFW species — It is a Wetland of High Conservation Value as determined by the Department of Natural Resources — It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan Site has 1 or 2 priority habitats within 100 m (see Appendix B) — points = 1 Site does not meet any of the criteria above — points = 0	2

Rating of Value If score is: ✓**2 = H** ___**1 = M** ___**0 = L** *Record the rating on the first page*

Appendix B: WDFW Priority Habitats in Eastern Washington

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp. http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here: http://wdfw.wa.gov/conservation/phs/list/)

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland: ***NOTE:*** *This question is independent of the land use between the wetland and the priority habitat.*

— **Aspen Stands:** Pure or mixed stands of aspen greater than 1 ac (0.4 ha).

— **Biodiversity Areas and Corridors:** Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).

— **Old-growth/Mature forests:** Old-growth east of Cascade crest – Stands are highly variable in tree species composition and structural characteristics due to the influence of fire, climate, and soils. In general, stands will be >150 years of age, with 10 trees/ac (25 trees/ha) that are > 21 in (53 cm) dbh, and 1-3 snags/ac (2.5-7.5 snags/ha) that are > 12-14 in (30-35 cm) diameter. Downed logs may vary from abundant to absent. Canopies may be single or multi-layered. Evidence of human-caused alterations to the stand will be absent or so slight as to not affect the ecosystem's essential structures and functions. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west and 80-160 years old east of the Cascade crest.

— **Oregon White Oak:** Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).

— **Riparian:** The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

— **Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.

— **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

— **Cliffs:** Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.

— **Talus:** Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

— **Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 12 in (30 cm)in eastern Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

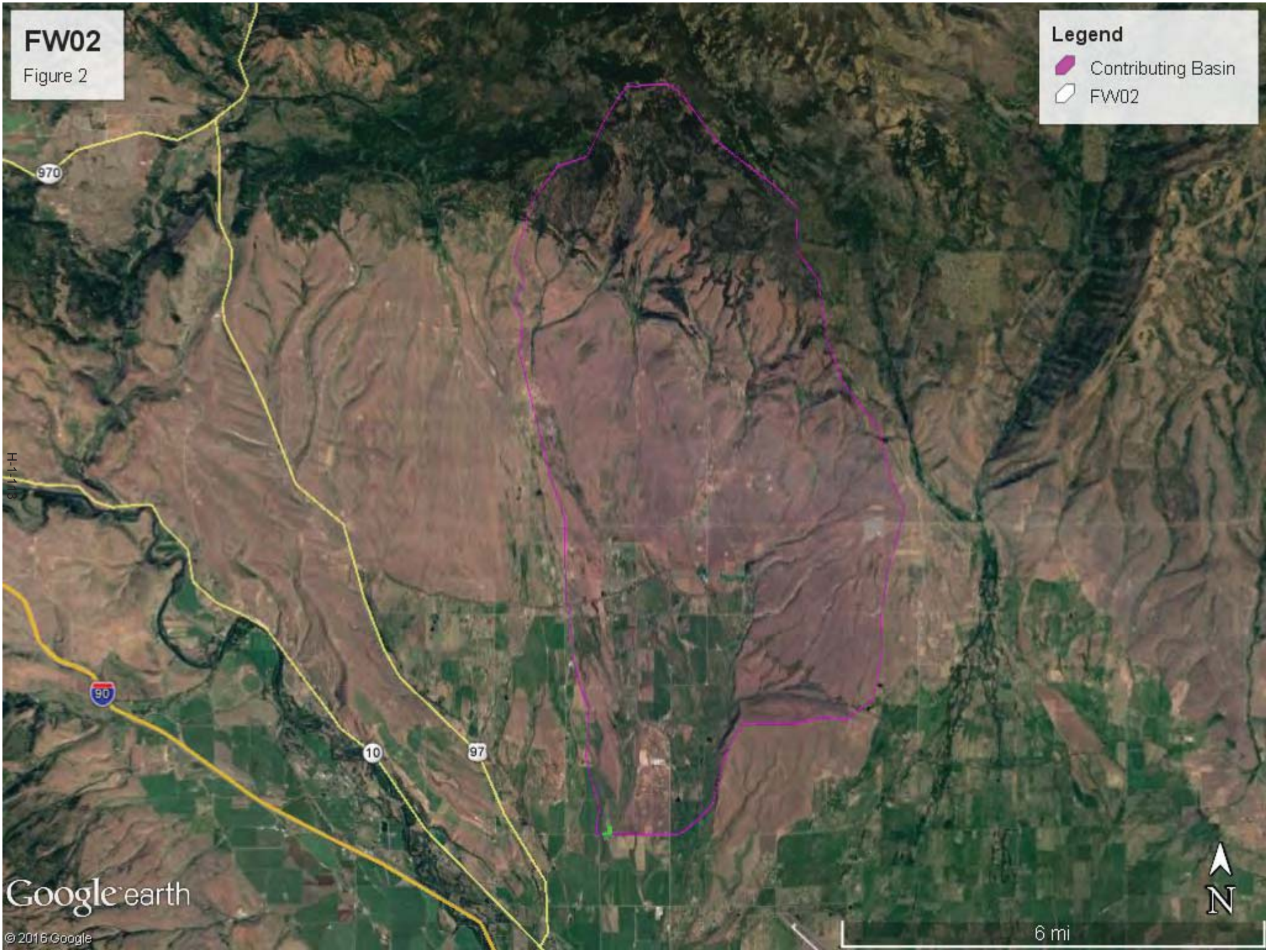
— **Shrub-steppe:** A nonforested vegetation type consisting of one or more layers of perennial bunchgrasses and a conspicuous but discontinuous layer of shrubs (see Eastside Steppe for sites with little or no shrub cover).

— **Eastside Steppe:** Nonforested vegetation type dominated by broadleaf herbaceous flora (i.e., forbs), perennial bunchgrasses, or a combination of both. Bluebunch wheatgrass (*Pseudoroegneria spicata*) is often the prevailing cover component along with Idaho fescue (*Festuca idahoensis*), Sandberg bluegrass (*Poa secunda*), rough fescue (*F. campestris*), or needlegrasses (*Achnatherum* spp.).

— **Juniper Savannah:** All juniper woodlands.

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list because they are addressed elsewhere.


FW02
Figure 1
Legend
Depressions
FW02
Ungrazed (12-40")
Width
H-1-112
Google earth
© 2016 Google
400 ft
N


FW02
Figure 2
Legend
Contributing Basin
FW02
970
H-1118
90
10
97
Google earth
© 2016 Google
6 mi
N


FW02
Figure 3
Legend
FW02
Mid-intensity
Undisturbed
Driver Ln
Clarke Rd
Faust Rd
Green Spur Rd
Lower Green Canyon Rd
Reeser Creek Rd
H-1-14
Google earth
© 2016 Google
N
4000 ft

April 25, 2017

FW02 - Figure 4



Assessed Waters/Sediment

Water
- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

Sediment
- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

Image courtesy of USGS Earthstar Geographics SIO © 2017 Microsoft Corporation © 2010 NAVTEQ © AND

Miles
0 0.25 0.5 1

DEPARTMENT OF ECOLOGY
State of Washington

Water Quality Improvement Projects (TMDLs)

WATER QUALITY IMPROVEMENT PROJECTS (TMDLs)

Overview of the process

Project Catalog

- by WRIA
- by County

Funding Opportunities

Project Development Priority Lists

Related Information

TMDL Contacts

RELATED ECOLOGY PROGRAMS

Water Quality

Water Quality Improvement > Water Quality Improvement Projects by WRIA > WRIA 39: Upper Yakima

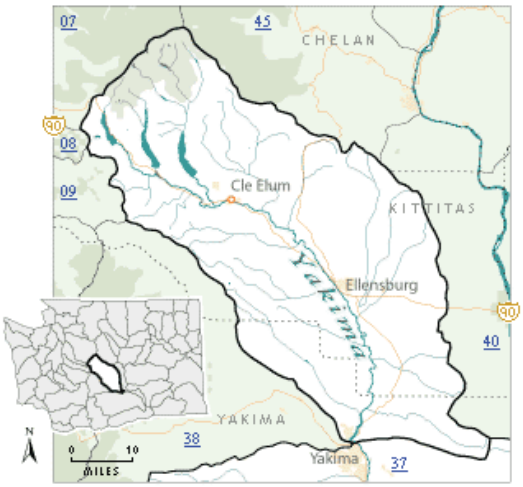
WRIA 39: Upper Yakima

The following table lists overview information and links to specific water quality improvement projects (including total maximum daily loads, or TMDLs) for this water resource inventory area (WRIA). Please use links (where available) for more information on a project.

Yakima River basin project index:
www.ecy.wa.gov/programs/wq/tmdl/yakima_wq/index.html

Counties

- Kittitas
- Yakima



Project Name	Pollutants	Status**	TMDL Lead
Crystal Creek	Ammonia-N BOD (5-day) Chlorine Fecal Coliform	EPA approved	Jane Creech 509-454-7860
Selah Ditch	Fecal Coliform Temperature	EPA approved	Greg Bohn 509-454-4174
Teanaway River segments: • Upper West Fork Teanaway River • Upper Middle Fork Teanaway River • Upper North Fork Teanaway River • Stafford Creek • Lower West Fork Teanaway River • Lower Middle Fork Teanaway River • Lower North Fork Teanaway River • Mainstem Teanaway River	Temperature	EPA approved	Jane Creech 509-454-7860
Wilson/Cooke Creek Tributaries: • Badger Creek • Bull Ditch • Caribou Creek • Cherry Creek • CID Canal • Coleman Creek • Cook Creek • EWC Canal • Johnson Drain • KRD Canal	Fecal Coliform	EPA approved Has an implementation plan Post-TMDL monitoring report	Jane Creech 509-454-7860 Greg Bohn 509-454-4174

• Mercer Creek • Naneum Creek • Parke Creek • Whiskey Creek • Wilson Creek • Wipple Wasteway			
Yakima River, Upper	Dieldrin DDT Suspended Sediments Turbidity	EPA approved	Jane Creech 509-454-7860
	Temperature	EPA approved Has an implementation plan	Jane Creech 509-454-7860
Yakima River	Toxics	Under development	Jane Creech 509-454-7860

**** Status** will be listed as one of the following: Approved by EPA, Under Development or Implementation. No status means project work has not yet started.*

For more information about WRIA 39:

- Waterbodies in WRIA 39 - using the Water Quality Assessment Query Tool
- Watershed Information for WRIA 39

* The Department of Ecology and other state resource agencies frequently use a system of 62 "Water Resource Inventory Areas" or "WRIAs" to refer to the state's major watershed basins.

Back to top of page

Last updated December 2016

Feedback?

About us
Director Maia Bellon
Tracking progress
Newsroom
Jobs
Staff only
Contact us

Publications & forms
Databases
Laws & rules
Public records disclosure
Public input & events
Environmental education
Sustainability information

中文 | Chinese
Tiếng Việt | Vietnamese
한국어 | Korean
Русский | Russian
Español | Spanish
Accessibility

Access Washington®
Welcome to the State of Washington

Copyright © Washington State Department of Ecology
Privacy Notice | Site Info | Accessibility | Contact the web team |

SHARE

Wetland name or number FW03

RATING SUMMARY – Eastern Washington

Name of wetland (or ID #): FW03 Date of site visit: 4/11/17

Rated by N. Evan Dulin Trained by Ecology? ✓Yes ___ No Date of training 3/24/17

HGM Class used for rating Depressional Wetland has multiple HGM classes? ___Y ✓N

NOTE: Form is not complete without the figures requested (*figures can be combined*).
Source of base aerial photo/map Google Earth

OVERALL WETLAND CATEGORY III (based on functions ✓ or special characteristics ___)

1. Category of wetland based on FUNCTIONS

___**Category I** – Total score = 22-27

___**Category II** – Total score = 19-21

✓ **Category III** – Total score = 16-18

___**Category IV** – Total score = 9-15

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
	Circle the appropriate ratings			
Site Potential	H (M) L	H (M) L	H M (L)	
Landscape Potential	H (M) L	H (M) L	H M (L)	
Value	(H) M L	H M (L)	(H) M L	TOTAL
Score Based on Ratings	7	5	5	17

Score for each function based on three ratings *(order of ratings is not important)*

9 = H,H,H
8 = H,H,M
7 = H,H,L
7 = H,M,M
6 = H,M,L
6 = M,M,M
5 = H,L,L
5 = M,M,L
4 = M,L,L
3 = L,L,L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	CATEGORY *Circle the appropriate category*
Vernal Pools	II III
Alkali	I
Wetland of High Conservation Value	I
Bog and Calcareous Fens	I
Old Growth or Mature Forest – slow growing	I
Aspen Forest	I
Old Growth or Mature Forest – fast growing	II
Floodplain forest	II
None of the above	✓

Wetland name or number FW03

Maps and figures required to answer questions correctly for Eastern Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	D 1.3, H 1.1, H 1.5	1
Hydroperiods (including area of open water for H 1.3)	D 1.4, H 1.2, H 1.3	1
Location of outlet (*can be added to map of hydroperiods)*	D 1.1, D 4.1	1
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	1
Map of the contributing basin	D 5.3	2
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	3
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	4
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	D 3.3	5

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	R 2.4	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of wetland vs. width of stream *(can be added to another figure)*	R 4.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	R 3.2, R 3.3	

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	L 1.1, L 4.1, H 1.1, H 1.5	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants *(can be added to figure above)*	S 4.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	S 3.3	

Wetland name or number FW03

HGM Classification of Wetland in Eastern Washington

For questions 1-4, the criteria described must apply to the entire unit being rated.

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-4 apply, and go to Question 5.

1. Does the entire unit **meet both** of the following criteria?
   ___The vegetated part of the wetland is on the water side of the Ordinary High Water Mark of a body of permanent open water (without any plants on the surface) that is at least 20 ac (8 ha) in size
   ___At least 30% of the open water area is deeper than 10 ft (3 m)

   NO – go to 2 **YES –** The wetland class is **Lake Fringe** (Lacustrine Fringe)

2. Does the entire wetland unit **meet all** of the following criteria?
   ___The wetland is on a slope (*slope can be very gradual*),
   ___The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks;
   ___The water leaves the wetland **without being impounded**.

   NO - go to 3 YES – The wetland class is **Slope**
   NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 foot deep).

3. Does the entire wetland unit **meet all** of the following criteria?
   ___ The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river;
   ___ The overbank flooding occurs at least once every 10 years.

   NO - go to 4 YES – The wetland class is **Riverine**
   NOTE: The Riverine wetland can contain depressions that are filled with water when the river is not flooding.

4. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year. *This means that any outlet, if present, is higher than the interior of the wetland.*

   NO – go to 5 YES – The wetland class is **Depressional**

5. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-4 APPLY TO DIFFERENT AREAS IN THE WETLAND UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

Wetland name or number Flu03

NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the wetland unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM Class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine (the riverine portion is within the boundary of depression)	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine

*If you are still unable to determine which of the above criteria apply to your wetland, or if you have **more than 2 HGM classes** within a wetland boundary, classify the wetland as Depressional for the rating.*

Wetland name or number Hw03

DEPRESSIONAL WETLANDS **Water Quality Functions** - Indicators that the site functions to improve water quality	Points (only 1 score per box)
D 1.0. Does the site have the potential to improve water quality?	
D 1.1. Characteristics of surface water outflows from the wetland: Wetland has no surface water outlet — points = 5 Wetland has an intermittently flowing outlet — points = 3 Wetland has a highly constricted permanently flowing outlet — points = 3 Wetland has a permanently flowing, unconstricted, surface outlet — points = 1	3
D 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic *(use NRCS definitions of soils)* Soil within wetland could not be observed — YES = 3 NO = 0	0
D 1.3. Characteristics of persistent vegetation (Emergent, Scrub-shrub, and/or Forested Cowardin classes) Wetland has persistent, ungrazed, vegetation for > 2/3 of area 100% — points = 5 Wetland has persistent, ungrazed, vegetation from 1/3 to 2/3 of area — points = 3 Wetland has persistent, ungrazed vegetation from 1/10 to < 1/3 of area — points = 1 Wetland has persistent, ungrazed vegetation < 1/10 of area — points = 0	5
D 1.4. Characteristics of seasonal ponding or inundation: *This is the area of ponding that fluctuates every year. Do not count the area that is permanently ponded.* Area seasonally ponded is > ½ total area of wetland — points = 3 Area seasonally ponded is ¼ - ½ total area of wetland — points = 1 Area seasonally ponded is < ¼ total area of wetland — points = 0 0.31 / 0.58 ac = 53%	3
Total for D 1 — Add the points in the boxes above	11

Rating of Site Potential If score is: ___ **12- 16 = H** ✓ **6- 11 = M** ___ **0- 5 = L** *Record the rating on the first page*

D 2.0. Does the landscape have the potential to support the water quality function of the site?	
D 2.1. Does the wetland receive stormwater discharges? Yes = 1 (No = 0)	0
D 2.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate pollutants? (Yes = 1) No = 0	1
D 2.3. Are there septic systems within 250 ft of the wetland? Highly likely (Yes = 1) No = 0	1
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1- D 2.3? Source_____ Yes = 1 (No = 0)	0
Total for D 2 — Add the points in the boxes above	2

Rating of Landscape Potential If score is: ___ **3 or 4 = H** ✓ **1 or 2 = M** ___ **0 = L** *Record the rating on the first page*

D 3.0. Is the water quality improvement provided by the site valuable to society?	
D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, or lake that is on the 303(d) list? Yes = 1 (No = 0)	0
D 3.2. Is the wetland in a basin or sub-basin where water quality is an issue in some aquatic resource [303(d) list, eutrophic lakes, problems with nuisance and toxic algae]? Yes = 1 (No = 0)	0
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality (*answer YES if there is a TMDL for the drainage or basin in which the wetland is found*)? (Yes = 2) No = 0	2
Total for D 3 — Add the points in the boxes above	2

Rating of Value If score is: ✓ **2-4 = H** ___ **1 = M** ___ **0 = L** *Record the rating on the first page*

No Access
↓
No Sample Plots taken

Wetland name or number FW03

DEPRESSIONAL WETLANDS **Hydrologic Functions** - Indicators that the site functions to reduce flooding and erosion.	Points (only 1 score per box)
D 4.0. Does the site have the potential to reduce flooding and erosion?	
D 4.1. Characteristics of surface water outflows from the wetland: Wetland has no surface water outlet — points = 8 Wetland has an intermittently flowing outlet — points = 4 Wetland has a highly constricted permanently flowing outlet — points = 4 Wetland has a permanently flowing unconstricted surface outlet — points = 0 *(If outlet is a ditch and not permanently flowing treat wetland as "intermittently flowing")*	4
D 4.2. Depth of storage during wet periods: *Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or deepest part (if dry).* Seasonal ponding: > 3 ft above the lowest point in wetland or the surface of permanent ponding — points = 8 Seasonal ponding: 2 ft - < 3 ft above the lowest point in wetland or the surface of permanent ponding — points = 6 The wetland is a headwater wetland — points = 4 Seasonal ponding: 1 ft - < 2 ft — points = 4 Seasonal ponding: 6 in - < 1 ft — points = 2 Seasonal ponding: < 6 in or wetland has only saturated soils — points = 0	NO ACCESS to outflow 2 or 4
Total for D 4 — Add the points in the boxes above	6-8

Rating of Site Potential If score is: ___ **12-16 = H** ✓ **6-11 = M** ___ **0-5 = L** *Record the rating on the first page*

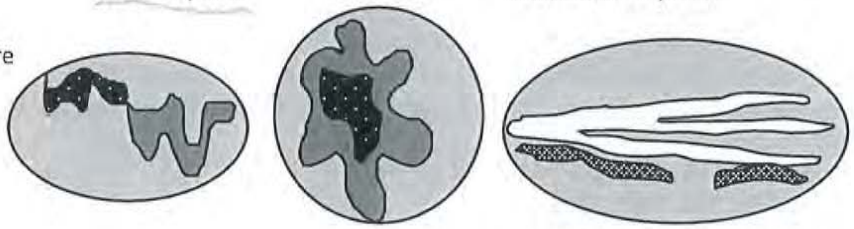
D 5.0. Does the landscape have the potential to support the hydrologic functions of the site?	
D 5.1. Does the wetland receive stormwater discharges? Yes = 1 (No = 0)	0
D 5.2. Is > 10% of the area within 150 ft of the wetland in a land use that generates runoff? Yes = 1 (No = 0)	0
D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land uses? (Yes = 1) No = 0	1
Total for D 5 — Add the points in the boxes above	1

Rating of Landscape Potential If score is: ___ **3 = H** ✓ **1 or 2 = M** ___ **0 = L** *Record the rating on the first page*

D 6.0. Are the hydrologic functions provided by the site valuable to society?	
D 6.1. The wetland is in a landscape that has flooding problems. Choose the description that best matches conditions around the wetland being rated. *Do not add points. Choose the highest score if more than one condition is met.* The wetland captures surface water that would otherwise flow down-gradient into areas where flooding has damaged human or natural resources (e.g., houses or salmon redds), AND Flooding occurs in sub-basin that is immediately down-gradient of wetland (Peecer creek) — points = 2 Surface flooding problems are in a sub-basin farther down-gradient — points = 1 — The existing or potential outflow from the wetland is so constrained by human or natural conditions that the water stored by the wetland cannot reach areas that flood. *Explain why* Water is sourced from controlled irrigation — points = 0 There are no problems with flooding downstream of the wetland — points = 0	0
D 6.2. Has the site has been identified as important for flood storage or flood conveyance in a regional flood control plan? Yes = 2 (No = 0)	0
Total for D 6 — Add the points in the boxes above	0

Rating of Value If score is: ___ **2-4 = H** ___ **1 = M** ✓ **0 = L** *Record the rating on the first page*

Wetland name or number Fwd3

These questions apply to wetlands of all HGM classes. **HABITAT FUNCTIONS** - Indicators that site functions to provide important habitat	(only 1 score per box)
H 1.0. Does the wetland have the potential to provide habitat for many species?	
H 1.1. Structure of the plant community: *Check the Cowardin vegetation classes present and categories of emergent plants. Size threshold for each category is >= ¼ ac or >= 10% of the wetland if wetland is < 2.5 ac.* ____Aquatic bed ____Emergent plants 0-12 in (0-30 cm) high are the highest layer and have > 30% cover ✓ Emergent plants >12-40 in (>30-100 cm) high are the highest layer with >30% cover 31% ✓ Emergent plants > 40 in (> 100 cm) high are the highest layer with >30% cover 64% ____Scrub-shrub (areas where shrubs have >30% cover) ____Forested (areas where trees have >30% cover) ~6% 4 or more checks: points = 3 3 checks: points = 2 2 checks: points = 1 1 check: points = 0	1
H 1.2. Is one of the vegetation types Aquatic Bed? Yes = 1 No = 0	0
H 1.3. Surface water H 1.3.1. Does the wetland have areas of open water (without emergent or shrub plants) over at least ¼ ac **OR** 10% of its area during the March to early June **OR** in August to the end of September? *Answer YES for Lake Fringe wetlands.* Yes = 3 points & go to H 1.4 (No = go to H 1.3.2) H 1.3.2. Does the wetland have an intermittent or permanent, and unvegetated stream within its boundaries, or along one side, over at least ¼ ac or 10% of its area? *Answer yes only if H 1.3.1 is No.* Seperated by berm from canal (only 40' along Paxton Creek) Yes = 3 (No = 0)	0
H 1.4. Richness of plant species Count the number of plant species in the wetland that cover at least 10 ft^2. *Different patches of the same species can be combined to meet the size threshold. You do not have to name the species.* *Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Russian olive, Phragmites, Canadian thistle, yellow-flag iris, and saltcedar (Tamarisk)* # of species ____ Scoring: > 9 species: points = 2 4-9 species: points = 1 (< 4 species: points = 0	0
H 1.5. Interspersion of habitats Decide from the diagrams below whether interspersion among types of plant structures (described in H 1.1), and unvegetated areas (open water or mudflats) is high, moderate, low, or none. *Use map of Cowardin and emergent plant classes prepared for questions H 1.1 and map of open water from H 1.3. If you have four or more plant classes or three classes and open water, the rating is always high.*  **None** = 0 points **Low** = 1 point **Moderate** = 2 points All three diagrams in this row are **High** = 3 points  Riparian braided channels with 2 classes	Figure__ 1

Wetland name or number FWO3

H 1.6. Special habitat features	
Check the habitat features that are present in the wetland. The number of checks is the number of points. ___ Loose rocks larger than 4 in OR large, downed, woody debris (> 4 in diameter) within the area of surface ponding or in stream. ✓ Cattails or bulrushes are present within the wetland. ___ Standing snags (diameter at the bottom > 4 in) in the wetland or within 30 m (100 ft) of the edge. ___ Emergent or shrub vegetation in areas that are permanently inundated/ponded. ___ Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 45 degree slope) OR signs of recent beaver activity ✓ Invasive species cover less than 20% in each stratum of vegetation *(canopy, sub-canopy, shrubs, herbaceous, moss/ground cover)*	2
Total for H 1 — Add the points in the boxes above	4

Rating of Site Potential If score is: ___ **15-18 = H** ___ **7-14 = M** ✓ **0-6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support habitat functions of the site?	
H 2.1. Accessible habitat (only area of habitat abutting wetland). If total accessible habitat is: *Calculate:* % undisturbed habitat 1 + [(% moderate and low intensity land uses)/2] 1.5 = 2.5 % > 1/3 (33.3%) of 1 km Polygon — points = 3 20-33% of 1km Polygon — points = 2 10-19% of 1km Polygon — points = 1 — <10% of 1km Polygon — points = 0 undis 10 / 940 ac = 1%; mid 25 / 940 ac = 3%	0
H 2.2. Undisturbed habitat in 1 km Polygon around wetland. *Calculate:* % undisturbed habitat 1 + [(% moderate and low intensity land uses)/2] 12 = 13 % Undisturbed habitat > 50% of Polygon — points = 3 Undisturbed habitat 10 - 50% and in 1-3 patches — points = 2 — Undisturbed habitat 10 - 50% and > 3 patches — points = 1 Undisturbed habitat < 10% of Polygon — points = 0 undis 11 / 940 = 1% (6 patches); mid 227 / 940 = 24%	1
H 2.3. Land use intensity in 1 km Polygon: > 50% of Polygon is high intensity land use 75% — points = (- 2) Does not meet criterion above — points = 0	-2
H 2.4. The wetland is in an area where annual rainfall is less than 12 in, and its water regime is not influenced by irrigation practices, dams, or water control structures. *Generally, this means outside boundaries of reclamation areas, irrigation districts, or reservoirs* — Yes = 3 (No = 0)	0
Total for H 2 — Add the points in the boxes above	-1

Rating of Landscape Potential If score is: ___ **4-9 = H** ___ **1-3 = M** ✓ **< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose the highest score that applies to the wetland being rated* Site meets ANY of the following criteria: — points = 2 ✓ It has 3 or more priority habitats within 100 m (see Appendix B) — It provides habitat for Threatened or Endangered species (any plant or animal on state or federal lists) — It is mapped as a location for an individual WDFW species — It is a Wetland of High Conservation Value as determined by the Department of Natural Resources — It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan Site has 1 or 2 priority habitats within 100 m (see Appendix B) — points = 1 Site does not meet any of the criteria above — points = 0	2

Rating of Value If score is: ✓ **2 = H** ___ **1 = M** ___ **0 = L** *Record the rating on the first page*

Appendix B: WDFW Priority Habitats in Eastern Washington

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp. http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here: http://wdfw.wa.gov/conservation/phs/list/)

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland: ***NOTE:*** *This question is independent of the land use between the wetland and the priority habitat.*

— **Aspen Stands:** Pure or mixed stands of aspen greater than 1 ac (0.4 ha).

— **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).

— **Old-growth/Mature forests:** Old-growth east of Cascade crest – Stands are highly variable in tree species composition and structural characteristics due to the influence of fire, climate, and soils. In general, stands will be >150 years of age, with 10 trees/ac (25 trees/ha) that are > 21 in (53 cm) dbh, and 1-3 snags/ac (2.5-7.5 snags/ha) that are > 12-14 in (30-35 cm) diameter. Downed logs may vary from abundant to absent. Canopies may be single or multi-layered. Evidence of human-caused alterations to the stand will be absent or so slight as to not affect the ecosystem's essential structures and functions. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west and 80-160 years old east of the Cascade crest.

— **Oregon White Oak:** Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).

— **Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

— **Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.

— **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

— **Cliffs:** Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.

— **Talus:** Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

— **Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 12 in (30 cm)in eastern Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

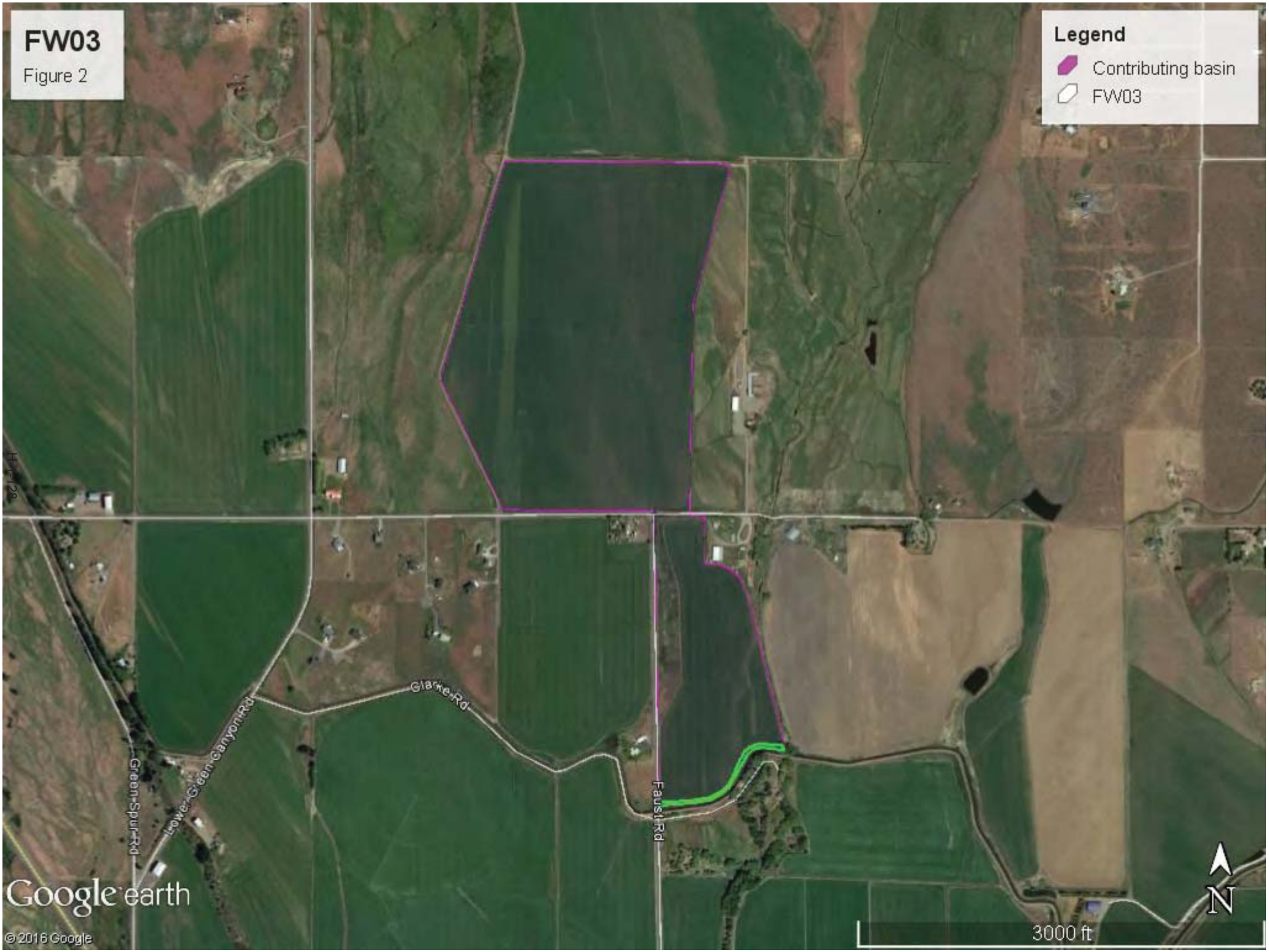
— **Shrub-steppe:** A nonforested vegetation type consisting of one or more layers of perennial bunchgrasses and a conspicuous but discontinuous layer of shrubs (see Eastside Steppe for sites with little or no shrub cover).

— **Eastside Steppe:** Nonforested vegetation type dominated by broadleaf herbaceous flora (i.e., forbs), perennial bunchgrasses, or a combination of both. Bluebunch wheatgrass (*Pseudoroegneria spicata*) is often the prevailing cover component along with Idaho fescue (*Festuca idahoensis*), Sandberg bluegrass (*Poa secunda*), rough fescue (*F. campestris*), or needlegrasses (*Achnatherum* spp.).

— **Juniper Savannah:** All juniper woodlands.

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list because they are addressed elsewhere.


FW03
Figure 1
Legend
Emergent (12-40")
Emergent (>40")
FW03
Forested
Seasonal ponding
H-1-127
Clarke Rd
Farm Rd
Google earth
© 2016 Google
N
400 ft


FW03
Figure 2
Legend
Contributing basin
FW03
Glarke Rd
Faust Rd
Lower Green Canyon Rd
Green Spur Rd
Google earth
© 2016 Google
N
3000 ft


FW03
Figure 3
Legend
FW03
Mid-intensity
Undisturbed
Clarke Rd
Lower Green Canyon Rd
Green Spur Rd
H-1-129
Faust Rd
Reece Creek Rd
Google earth
© 2016 Google
97
N
3000 ft

April 26, 2017

FW03 - Figure 4



Assessed Waters/Sediment

Water
- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

Sediment
- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

FW-1-30

Image courtesy of USGS Earthstar Geographics SIO © 2017 Microsoft Corporation © 2017 HERE © AND

Miles
0 0.25 0.5 1

DEPARTMENT OF ECOLOGY
State of Washington

Water Quality Improvement Projects (TMDLs)

WATER QUALITY IMPROVEMENT PROJECTS (TMDLs)

Overview of the process
Project Catalog
- by WRIA
- by County

Funding Opportunities
Project Development Priority Lists
Related Information
TMDL Contacts

RELATED ECOLOGY PROGRAMS

Water Quality

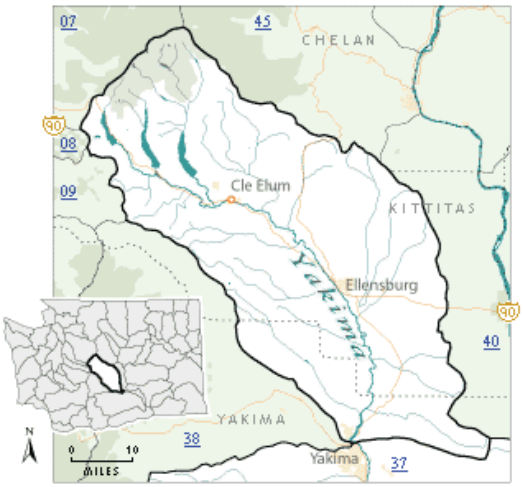
Water Quality Improvement > Water Quality Improvement Projects by WRIA > WRIA 39: Upper Yakima

WRIA 39: Upper Yakima

The following table lists overview information and links to specific water quality improvement projects (including total maximum daily loads, or TMDLs) for this water resource inventory area (WRIA). Please use links (where available) for more information on a project.

Yakima River basin project index:
www.ecy.wa.gov/programs/wq/tmdl/yakima_wq/index.html
Counties

- Kittitas
- Yakima



Project Name	Pollutants	Status**	TMDL Lead
Crystal Creek	Ammonia-N BOD (5-day) Chlorine Fecal Coliform	EPA approved	Jane Creech 509-454-7860
Selah Ditch	Fecal Coliform Temperature	EPA approved	Greg Bohn 509-454-4174
Teanaway River segments: • Upper West Fork Teanaway River • Upper Middle Fork Teanaway River • Upper North Fork Teanaway River • Stafford Creek • Lower West Fork Teanaway River • Lower Middle Fork Teanaway River • Lower North Fork Teanaway River • Mainstem Teanaway River	Temperature	EPA approved	Jane Creech 509-454-7860
Wilson/Cooke Creek Tributaries: • Badger Creek • Bull Ditch • Caribou Creek • Cherry Creek • CID Canal • Coleman Creek • Cook Creek • EWC Canal • Johnson Drain • KRD Canal	Fecal Coliform	EPA approved Has an implementation plan Post-TMDL monitoring report	Jane Creech 509-454-7860 Greg Bohn 509-454-4174

• Mercer Creek • Naneum Creek • Parke Creek • Whiskey Creek • Wilson Creek • Wipple Wasteway			
Yakima River, Upper	Dieldrin DDT Suspended Sediments Turbidity	EPA approved	Jane Creech 509-454-7860
	Temperature	EPA approved Has an implementation plan	Jane Creech 509-454-7860
Yakima River	Toxics	Under development	Jane Creech 509-454-7860

**** Status** will be listed as one of the following: Approved by EPA, Under Development or Implementation. No status means project work has not yet started.*

For more information about WRIA 39:

- Waterbodies in WRIA 39 - using the Water Quality Assessment Query Tool
- Watershed Information for WRIA 39

* The Department of Ecology and other state resource agencies frequently use a system of 62 "Water Resource Inventory Areas" or "WRIAs" to refer to the state's major watershed basins.

Back to top of page

Last updated December 2016

Feedback?

About us
Director Maia Bellon
Tracking progress
Newsroom
Jobs
Staff only
Contact us

Publications & forms
Databases
Laws & rules
Public records disclosure
Public input & events
Environmental education
Sustainability information

中文 | Chinese
Tiếng Việt | Vietnamese
한국어 | Korean
Русский | Russian
Español | Spanish
Accessibility

Access Washington®
Welcome to the State of Washington

Copyright © Washington State Department of Ecology
Privacy Notice | Site Info | Accessibility | Contact the web team |

SHARE

Wetland name or number FW04

RATING SUMMARY – Eastern Washington

Name of wetland (or ID #): FW04 Date of site visit: 4/11/17

Rated by N. Evan Dulik Trained by Ecology? ✓ Yes ___ No Date of training 3/24/17

HGM Class used for rating Riverine Wetland has multiple HGM classes? ___Y ✓N

NOTE: Form is not complete without the figures requested (*figures can be combined*).
Source of base aerial photo/map Google Earth

OVERALL WETLAND CATEGORY III (based on functions ✓ or special characteristics ___)

1. Category of wetland based on FUNCTIONS

___**Category I** – Total score = 22-27

___**Category II** – Total score = 19-21

✓**Category III** – Total score = 16-18

___**Category IV** – Total score = 9-15

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
	Circle the appropriate ratings			
Site Potential	H (M) L	(H) M L	H M (L)	
Landscape Potential	H (M) L	H M (L)	H M (L)	
Value	(H) M L	(H) M L	H (M) L	TOTAL
Score Based on Ratings	7	7	4	18

Score for each function based on three ratings *(order of ratings is not important)*

9 = H,H,H
8 = H,H,M
7 = H,H,L
7 = H,M,M
6 = H,M,L
6 = M,M,M
5 = H,L,L
5 = M,M,L
4 = M,L,L
3 = L,L,L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	CATEGORY *Circle the appropriate category*
Vernal Pools	II III
Alkali	I
Wetland of High Conservation Value	I
Bog and Calcareous Fens	I
Old Growth or Mature Forest – slow growing	I
Aspen Forest	I
Old Growth or Mature Forest – fast growing	II
Floodplain forest	II
None of the above	✓

Wetland name or number FW04

Maps and figures required to answer questions correctly for Eastern Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	D 1.3, H 1.1, H 1.5	
Hydroperiods (including area of open water for H 1.3)	D 1.4, H 1.2, H 1.3	
Location of outlet (*can be added to map of hydroperiods)*	D 1.1, D 4.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	
Map of the contributing basin	D 5.3	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	D 3.3	

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	1
Hydroperiods	H 1.2, H 1.3	1
Ponded depressions	R 1.1	1
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	R 2.4	1
Map of the contributing basin	R 2.2, R 2.3, R 5.2	N/A*
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	1
Width of wetland vs. width of stream *(can be added to another figure)*	R 4.1	1
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	2
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	4
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	R 3.2, R 3.3	3

Lake Fringe Wetlands

*KRD canal is unnaturally fed by irrigation, spanning several drainage basins in the Wilson/Cooke Creek System.

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	L 1.1, L 4.1, H 1.1, H 1.5	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants *(can be added to figure above)*	S 4.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	S 3.3	

Wetland name or number FW04

HGM Classification of Wetland in Eastern Washington

For questions 1-4, the criteria described must apply to the entire unit being rated.

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-4 apply, and go to Question 5.

1. Does the entire unit **meet both** of the following criteria?
   ___The vegetated part of the wetland is on the water side of the Ordinary High Water Mark of a body of permanent open water (without any plants on the surface) that is at least 20 ac (8 ha) in size
   ___At least 30% of the open water area is deeper than 10 ft (3 m)

   NO – go to 2 **YES –** The wetland class is **Lake Fringe** (Lacustrine Fringe)

2. Does the entire wetland unit **meet all** of the following criteria?
   ___The wetland is on a slope (*slope can be very gradual*),
   ___The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks;
   ___The water leaves the wetland **without being impounded**.

   NO - go to 3 YES – The wetland class is **Slope**
   NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 foot deep).

3. Does the entire wetland unit **meet all** of the following criteria?
   ___✓The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river;
   ___✓The overbank flooding occurs at least once every 10 years.

   NO - go to 4 YES – The wetland class is **Riverine**
   NOTE: The Riverine wetland can contain depressions that are filled with water when the river is not flooding.

4. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year. *This means that any outlet, if present, is higher than the interior of the wetland.*

   NO – go to 5 YES – The wetland class is **Depressional**

5. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-4 APPLY TO DIFFERENT AREAS IN THE WETLAND UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

Wetland name or number FW04

NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the wetland unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM Class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine (the riverine portion is within the boundary of depression)	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine

*If you are still unable to determine which of the above criteria apply to your wetland, or if you have **more than 2 HGM classes** within a wetland boundary, classify the wetland as Depressional for the rating.*

Wetland name or number Flw04

RIVERINE WETLANDS **Water Quality Functions** - Indicators that the site functions to improve water quality	Points (only 1 score per box)
R 1.0. Does the site have the potential to improve water quality?	
R 1.1. Area of surface depressions within the Riverine wetland that can trap sediments during a flooding event: — Depressions cover > 1/3 area of wetland 52% — points = 6 Depressions cover > 1/10 area of wetland — points = 3 Depressions present but cover < 1/10 area of wetland — points = 1 No depressions present — points = 0	6
R 1.2. Structure of plants in the wetland (areas with >90% cover at person height; **not** Cowardin classes): Forest or shrub > 2/3 the area of the wetland — points = 10 Forest or shrub 1/3 – 2/3 area of the wetland — points = 5 —Ungrazed, herbaceous plants > 2/3 area of wetland 100% ungrazed — points = 5 Ungrazed herbaceous plants 1/3 – 2/3 area of wetland — points = 2 Forest, shrub, and ungrazed herbaceous < 1/3 area of wetland — points = 0	5
Total for R 1 — Add the points in the boxes above	11

Rating of Site Potential If score is: ___ **12-16 = H** ✓ **6-11 = M** ___ **0-5 = L** *Record the rating on the first page*

R 2.0. Does the landscape have the potential to support the water quality function of the site?	
R 2.1. Is the wetland within an incorporated city or within its UGA? Yes = 2 (No = 0)	0
R 2.2. Does the contributing basin include a UGA or incorporated area? Yes = 1 (No = 0)	0
R 2.3. Does at least 10% of the contributing basin contain tilled fields, pastures, or forests that have been clearcut within the last 5 years? (Yes = 1) No = 0	1
R 2.4. Is > 10% of the area within 150 ft of wetland in land uses that generate pollutants (Yes = 1) No = 0	1
R 2.5. Are there other sources of pollutants coming into the wetland that are not listed in questions R 2.1-R 2.4? Source_____ Yes = 1 (No = 0)	0
Total for R 2 — Add the points in the boxes above	2

Rating of Landscape Potential If score is: ___ **3-6 = H** ✓ **1 or 2 = M** ___ **0 = L** *Record the rating on the first page*

R 3.0. Is the water quality improvement provided by the site valuable to society?	
R 3.1. Is the wetland along a stream or river that is on the 303(d) list or on a tributary that drains to one within 1 mi? Yes = 1 (No = 0)	0
R 3.2. Does the river or stream have TMDL limits for nutrients, toxics, or pathogens? (Yes = 1) No = 0	1
R 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality? *Answer YES if there is a TMDL for the drainage in which wetland is found.* (Yes = 2) No = 0	2
Total for R 3 — Add the points in the boxes above	3

Rating of Value If score is: ✓ **2-4 = H** ___ **1 = M** ___ **0 = L** *Record the rating on the first page*

Wetland name or number FW04

RIVERINE WETLANDS **Hydrologic Functions** - Indicators that site functions to reduce flooding and stream erosion	Points (only 1 score per box)
R 4.0. Does the site have the potential to reduce flooding and erosion?	
R 4.1. Characteristics of the overbank storage the wetland provides: *Estimate the average width of the wetland perpendicular to the direction of the flow and the width of the stream or river channel (distance between banks). Calculate the ratio: (average width of wetland)/(average width of stream between banks).* If the ratio is more than 2 — points = 10 ✓ If the ratio is 1-2 — points = 8 If the ratio is ½-<1 — points = 4 If the ratio is ¼-< ½ — points = 2 If the ratio is < ¼ — points = 1 28' / 25' = 1.12 X	8
R 4.2. Characteristics of plants that slow down water velocities during floods: *Treat large woody debris as forest or shrub. Choose the points appropriate for the best description (polygons need to have > 90% cover at person height. These are NOT Cowardin classes).* Forest or shrub for more than $^2/_3$ the area of the wetland — points = 6 — Forest or shrub for $>^1/_3$ area OR emergent plants $> ^2/_3$ area — points = 4 Forest or shrub for $> ^1/_{10}$ area OR emergent plants $> ^1/_3$ area — points = 2 Plants do not meet above criteria — points = 0 24% shrub 76% emergent	4
Total for R 5 — Add the points in the boxes above	12

Rating of Site Potential If score is: ✓ **12-16 = H** ___ **6-11 = M** ___ **0-5 = L** *Record the rating on the first page*

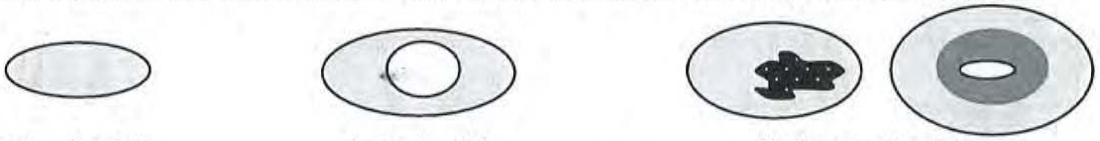
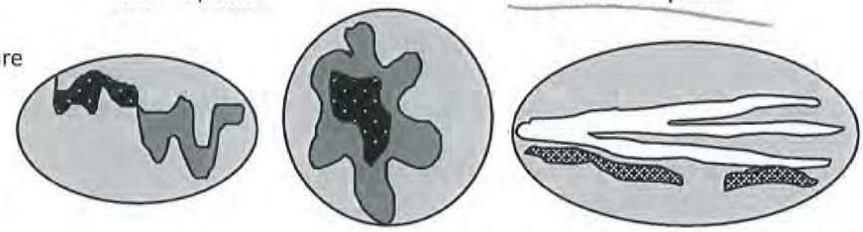
R 5.0. Does the landscape have the potential to support the hydrologic functions of the site?		
R 5.1. Is the stream or river adjacent to the wetland downcut? man-made canal	Yes = 0 No = 1	0
R 5.2. Does the up-gradient watershed include a UGA or incorporated area?	Yes = 1 (No = 0)	0
R 5.3. Is the up-gradient stream or river controlled by dams?	(Yes = 0) No = 1	0
Total for R 5 — Add the points in the boxes above		0

Rating of Landscape Potential If score is: ___ **3 = H** ___ **1 or 2 = M** ✓ **0 = L** *Record the rating on the first page*

R 6.0. Are the hydrologic functions provided by the site valuable to society?	
R 6.1. Distance to the nearest areas downstream that have flooding problems? *Choose the description that best fits the site.* — The sub-basin immediately down-gradient of site has surface flooding problems that result in damage to human or natural resources — points = 2 Surface flooding problems are in a basin farther down-gradient — points = 1 No flooding problems anywhere downstream — points = 0	2
R 6.2. Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan? — Yes = 2 (No = 0)	0
Total for R 6 — Add the points in the boxes above	2

Rating of Value If score is: ✓ **2-4 = H** ___ **1 = M** ___ **0 = L** *Record the rating on the first page*

Wetland name or number FW04

These questions apply to wetlands of all HGM classes. **HABITAT FUNCTIONS** - Indicators that site functions to provide important habitat	(only 1 score per box)
H 1.0. Does the wetland have the potential to provide habitat for many species?	
H 1.1. Structure of the plant community: *Check the Cowardin vegetation classes present and categories of emergent plants. Size threshold for each category is >= ¼ ac or >= 10% of the wetland if wetland is < 2.5 ac.* ____Aquatic bed ____Emergent plants 0-12 in (0-30 cm) high are the highest layer and have > 30% cover __✓__Emergent plants >12-40 in (>30-100 cm) high are the highest layer with >30% cover 41% (also reed) __✓__Emergent plants > 40 in (> 100 cm) high are the highest layer with >30% cover 35% __✓__Scrub-shrub (areas where shrubs have >30% cover) 24% ____Forested (areas where trees have >30% cover) 4 or more checks: points = 3 __3__ checks: points = 2 2 checks: points = 1 1 check: points = 0	2
H 1.2. Is one of the vegetation types Aquatic Bed? Yes = 1 No = 0	0
H 1.3. Surface water H 1.3.1. Does the wetland have areas of open water (without emergent or shrub plants) over at least ¼ ac **OR** 10% of its area during the March to early June **OR** in August to the end of September? *Answer YES for Lake Fringe wetlands.* Yes = 3 points & go to H 1.4 No = go to H 1.3.2 H 1.3.2. Does the wetland have an intermittent or permanent, and unvegetated stream within its boundaries, or along one side, over at least ¼ ac or 10% of its area? *Answer yes only if H 1.3.1 is No.* Separated by berm from Canal, fed via culvert Yes = 3 No = 0	0
H 1.4. Richness of plant species Count the number of plant species in the wetland that cover at least 10 ft^2. *Different patches of the same species can be combined to meet the size threshold. You do not have to name the species.* *Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Russian olive, Phragmites, Canadian thistle, yellow-flag iris, and saltcedar (Tamarisk)* # of species ____ Scoring: > 9 species: points = 2 4-9 species: points = 1 __<__ 4 species: points = 0	0
H 1.5. Interspersion of habitats Decide from the diagrams below whether interspersion among types of plant structures (described in H 1.1), and unvegetated areas (open water or mudflats) is high, moderate, low, or none. *Use map of Cowardin and emergent plant classes prepared for questions H 1.1 and map of open water from H 1.3. If you have four or more plant classes or three classes and open water, the rating is always high.*  **None** = 0 points **Low** = 1 point **Moderate** = 2 points All three diagrams in this row are **High** = 3 points  Riparian braided channels with 2 classes	Figure__ 2

Wetland name or number FW04

H 1.6. Special habitat features *Check the habitat features that are present in the wetland. The number of checks is the number of points.* ____Loose rocks larger than 4 in OR large, downed, woody debris (> 4 in diameter) within the area of surface ponding or in stream. __✓__Cattails or bulrushes are present within the wetland. ____Standing snags (diameter at the bottom > 4 in) in the wetland or within 30 m (100 ft) of the edge. ____Emergent or shrub vegetation in areas that are permanently inundated/ponded. ____Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 45 degree slope) OR signs of recent beaver activity __✓__Invasive species cover less than 20% in each stratum of vegetation *(canopy, sub-canopy, shrubs, herbaceous, moss/ground cover)*	2
Total for H 1 Add the points in the boxes above	6

Rating of Site Potential If score is:___**15-18 = H** ___**7-14 = M** __✓__**0-6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support habitat functions of the site?	
H 2.1. Accessible habitat (only area of habitat abutting wetland). If total accessible habitat is: *Calculate:* % undisturbed habitat 1 + [(% moderate and low intensity land uses)/2] 1.5 = 2.5 % > 1/3 (33.3%) of 1 km Polygon points = 3 20-33% of 1km Polygon points = 2 10-19% of 1km Polygon points = 1 __✓__<10% of 1km Polygon points = 0 undis 10/830 ac = 1% mid 25/830 ac = 3%	0
H 2.2. Undisturbed habitat in 1 km Polygon around wetland. *Calculate:* % undisturbed habitat 1 + [(% moderate and low intensity land uses)/2] 10 = 11 % Undisturbed habitat > 50% of Polygon points = 3 Undisturbed habitat 10 - 50% and in 1-3 patches points = 2 __✓__Undisturbed habitat 10 - 50% and > 3 patches points = 1 Undisturbed habitat < 10% of Polygon points = 0 undis 11/830 = 1% mid 167/830 = 20% 7 patches	1
H 2.3. Land use intensity in 1 km Polygon: > 50% of Polygon is high intensity land use 79% points = (- 2) Does not meet criterion above points = 0	-2
H 2.4. The wetland is in an area where annual rainfall is less than 12 in, and its water regime is not influenced by irrigation practices, dams, or water control structures. *Generally, this means outside boundaries of reclamation areas, irrigation districts, or reservoirs* Yes = 3 (No = 0)	0
Total for H 2 Add the points in the boxes above	-1

Rating of Landscape Potential If score is:___**4-9 = H** ___**1-3 = M** __✓__**< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose the highest score that applies to the wetland being rated* Site meets ANY of the following criteria: points = 2 — It has 3 or more priority habitats within 100 m (see Appendix B) — It provides habitat for Threatened or Endangered species (any plant or animal on state or federal lists) — It is mapped as a location for an individual WDFW species — It is a Wetland of High Conservation Value as determined by the Department of Natural Resources — It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan __✓__Site has 1 or 2 priority habitats within 100 m (see Appendix B) points = 1 Site does not meet any of the criteria above points = 0	1

Rating of Value If score is:___**2 = H** __✓__**1 = M** ___**0 = L** *Record the rating on the first page*

Appendix B: WDFW Priority Habitats in Eastern Washington

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp. http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here: http://wdfw.wa.gov/conservation/phs/list/)

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland: ***NOTE:*** *This question is independent of the land use between the wetland and the priority habitat.*

— **Aspen Stands:** Pure or mixed stands of aspen greater than 1 ac (0.4 ha).

— **Biodiversity Areas and Corridors:** Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).

— **Old-growth/Mature forests:** Old-growth east of Cascade crest – Stands are highly variable in tree species composition and structural characteristics due to the influence of fire, climate, and soils. In general, stands will be >150 years of age, with 10 trees/ac (25 trees/ha) that are > 21 in (53 cm) dbh, and 1-3 snags/ac (2.5-7.5 snags/ha) that are > 12-14 in (30-35 cm) diameter. Downed logs may vary from abundant to absent. Canopies may be single or multi-layered. Evidence of human-caused alterations to the stand will be absent or so slight as to not affect the ecosystem's essential structures and functions. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west and 80-160 years old east of the Cascade crest.

— **Oregon White Oak:** Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).

— **Riparian:** The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

— **Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.

— **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

— **Cliffs:** Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.

— **Talus:** Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

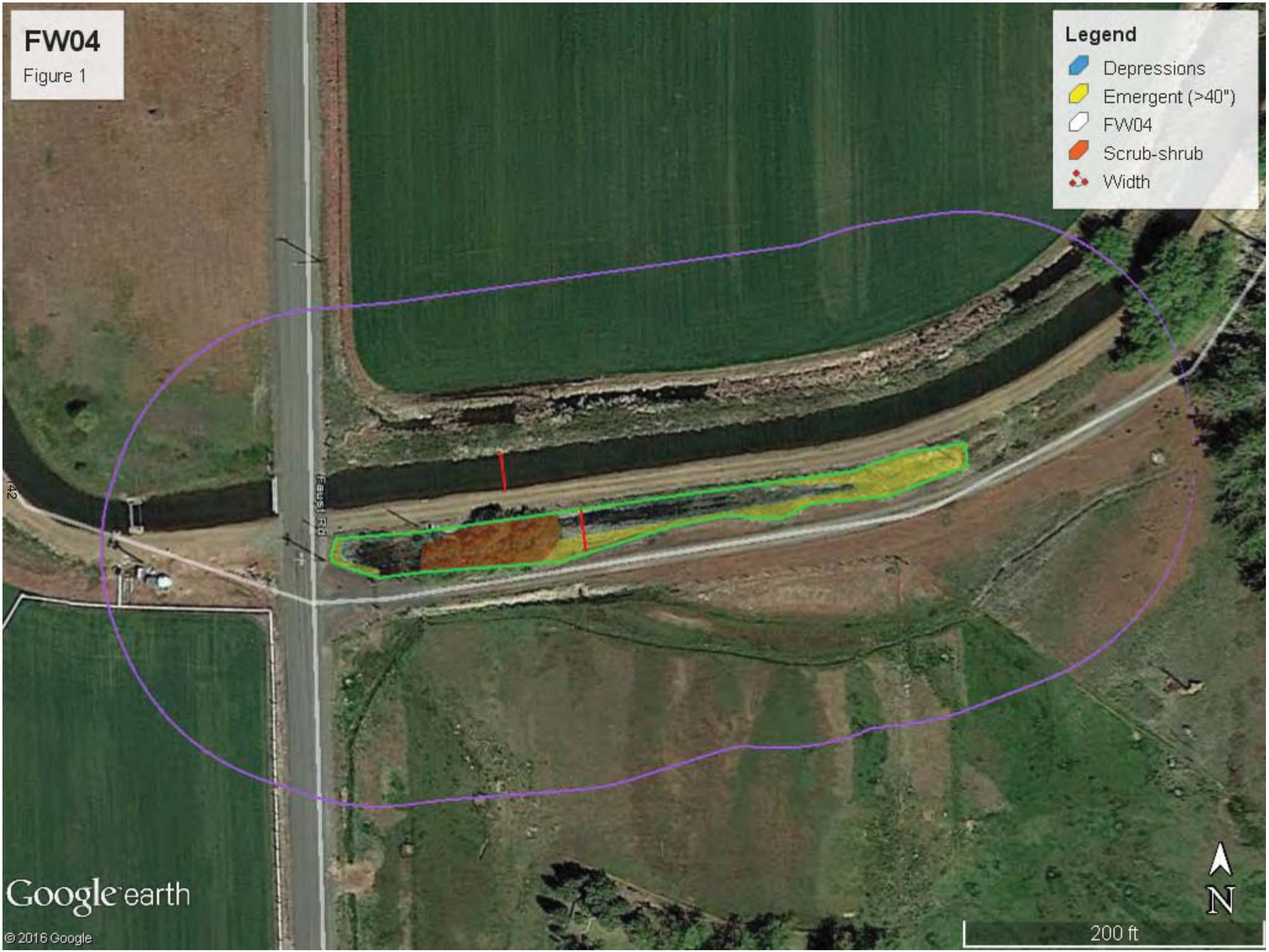
— **Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 12 in (30 cm)in eastern Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

— **Shrub-steppe:** A nonforested vegetation type consisting of one or more layers of perennial bunchgrasses and a conspicuous but discontinuous layer of shrubs (see Eastside Steppe for sites with little or no shrub cover).

— **Eastside Steppe:** Nonforested vegetation type dominated by broadleaf herbaceous flora (i.e., forbs), perennial bunchgrasses, or a combination of both. Bluebunch wheatgrass (*Pseudoroegneria spicata*) is often the prevailing cover component along with Idaho fescue (*Festuca idahoensis*), Sandberg bluegrass (*Poa secunda*), rough fescue (*F. campestris*), or needlegrasses (*Achnatherum* spp.).

— **Juniper Savannah:** All juniper woodlands.

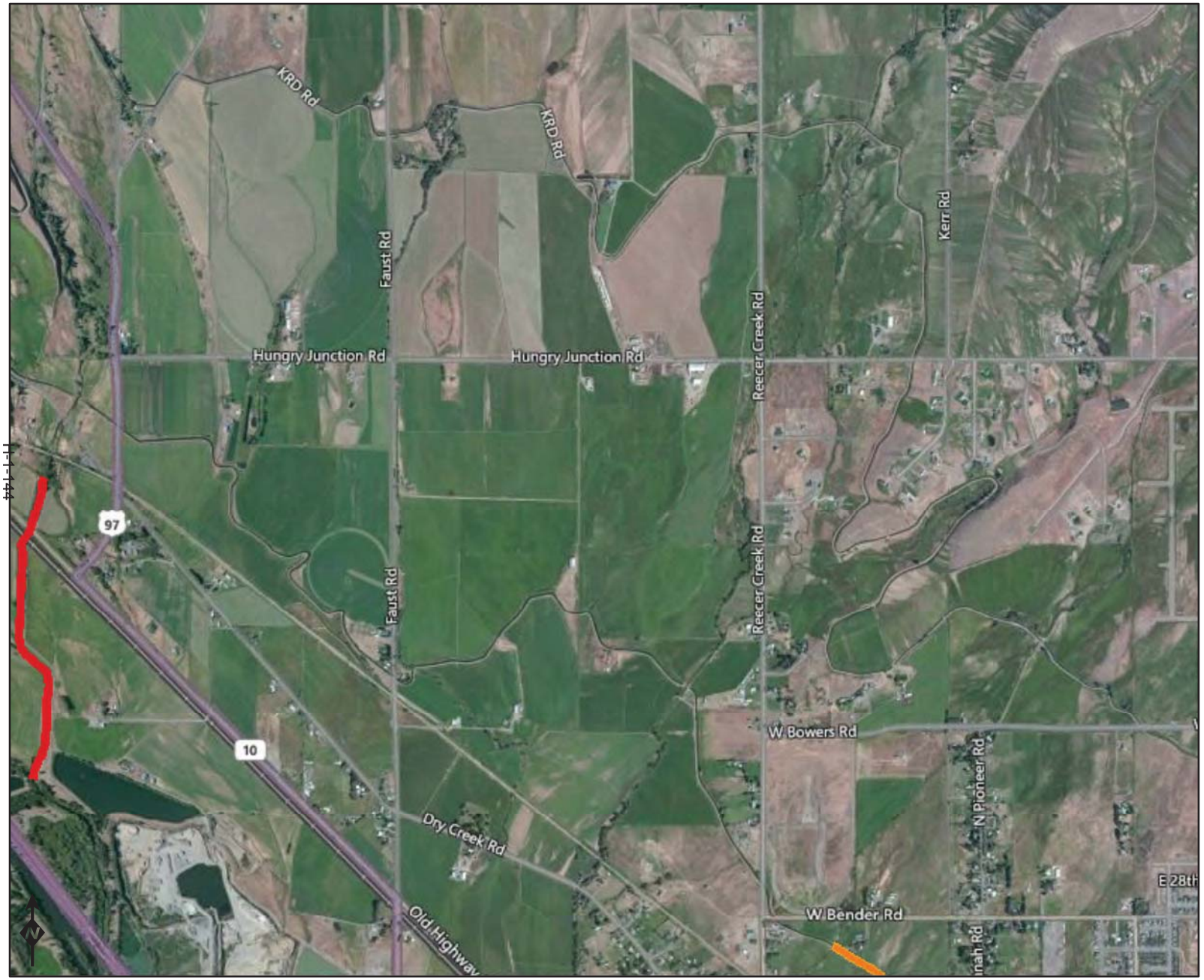
Note: All vegetated wetlands are by definition a priority habitat but are not included in this list because they are addressed elsewhere.


FW04
Figure 1
Legend
Depressions
Emergent (>40")
FW04
Scrub-shrub
Width
Faust Rd
Google earth
© 2016 Google
N
200 ft


FW04
Figure 3
Legend
FW04
Mid-intensity
Undisturbed
Clarke Rd
Lower Green Canyon Rd
Green Spur Rd
Faust Rd
H-1-143
97
Google earth
© 2016 Google
3000 ft
N

April 26, 2017

FW04 - Figure 4



Assessed Waters/Sediment

Water
- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

Sediment
- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

Image courtesy of USGS Earthstar Geographics SIO © 2017 Microsoft Corporation © 2010 NAVTEQ © AND

DEPARTMENT OF ECOLOGY
State of Washington

Water Quality Improvement Projects (TMDLs)

WATER QUALITY IMPROVEMENT PROJECTS (TMDLs)

Overview of the process

Project Catalog

- by WRIA
- by County

Funding Opportunities

Project Development Priority Lists

Related Information

TMDL Contacts

RELATED ECOLOGY PROGRAMS

Water Quality

Water Quality Improvement > Water Quality Improvement Projects by WRIA > WRIA 39: Upper Yakima

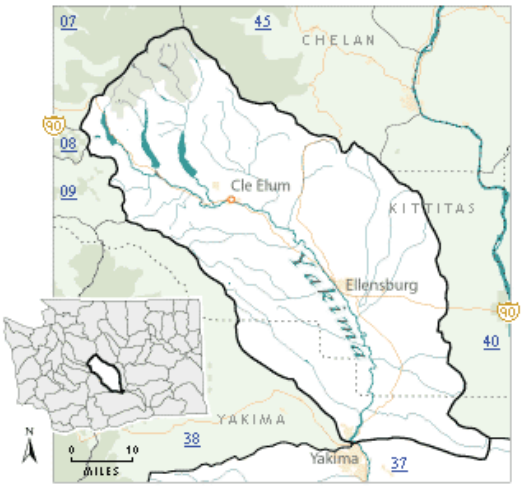
WRIA 39: Upper Yakima

The following table lists overview information and links to specific water quality improvement projects (including total maximum daily loads, or TMDLs) for this water resource inventory area (WRIA). Please use links (where available) for more information on a project.

Yakima River basin project index:
www.ecy.wa.gov/programs/wq/tmdl/yakima_wq/index.html

Counties

- Kittitas
- Yakima



Project Name	Pollutants	Status**	TMDL Lead
Crystal Creek	Ammonia-N BOD (5-day) Chlorine Fecal Coliform	EPA approved	Jane Creech 509-454-7860
Selah Ditch	Fecal Coliform Temperature	EPA approved	Greg Bohn 509-454-4174
Teanaway River segments: • Upper West Fork Teanaway River • Upper Middle Fork Teanaway River • Upper North Fork Teanaway River • Stafford Creek • Lower West Fork Teanaway River • Lower Middle Fork Teanaway River • Lower North Fork Teanaway River • Mainstem Teanaway River	Temperature	EPA approved	Jane Creech 509-454-7860
Wilson/Cooke Creek Tributaries: • Badger Creek • Bull Ditch • Caribou Creek • Cherry Creek • CID Canal • Coleman Creek • Cook Creek • EWC Canal • Johnson Drain • KRD Canal	Fecal Coliform	EPA approved Has an implementation plan Post-TMDL monitoring report	Jane Creech 509-454-7860 Greg Bohn 509-454-4174

• Mercer Creek • Naneum Creek • Parke Creek • Whiskey Creek • Wilson Creek • Wipple Wasteway			
Yakima River, Upper	Dieldrin DDT Suspended Sediments Turbidity	EPA approved	Jane Creech 509-454-7860
	Temperature	EPA approved Has an implementation plan	Jane Creech 509-454-7860
Yakima River	Toxics	Under development	Jane Creech 509-454-7860

**** Status** will be listed as one of the following: Approved by EPA, Under Development or Implementation. No status means project work has not yet started.*

For more information about WRIA 39:

- Waterbodies in WRIA 39 - using the Water Quality Assessment Query Tool
- Watershed Information for WRIA 39

* The Department of Ecology and other state resource agencies frequently use a system of 62 "Water Resource Inventory Areas" or "WRIAs" to refer to the state's major watershed basins.

Back to top of page

Last updated December 2016

Feedback?

About us
Director Maia Bellon
Tracking progress
Newsroom
Jobs
Staff only
Contact us

Publications & forms
Databases
Laws & rules
Public records disclosure
Public input & events
Environmental education
Sustainability information

中文 | Chinese
Tiếng Việt | Vietnamese
한국어 | Korean
Русский | Russian
Español | Spanish
Accessibility

Access Washington®
Welcome to the State of Washington

Copyright © Washington State Department of Ecology
Privacy Notice | Site Info | Accessibility | Contact the web team |

SHARE

Wetland name or number FW05

RATING SUMMARY – Eastern Washington

Name of wetland (or ID #): FW05 Date of site visit: 4/11/17

Rated by N. Evan Dulin Trained by Ecology? ✓ Yes ___ No Date of training 3/24/17

HGM Class used for rating Riverine Wetland has multiple HGM classes? ___Y ✓N

NOTE: Form is not complete without the figures requested (*figures can be combined*).
Source of base aerial photo/map Google Earth

OVERALL WETLAND CATEGORY IV (based on functions ✓ or special characteristics ___)

1. Category of wetland based on FUNCTIONS

___**Category I** – Total score = 22-27
___**Category II** – Total score = 19-21
___**Category III** – Total score = 16-18
✓ **Category IV** – Total score = 9-15

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
	Circle the appropriate ratings			
Site Potential	H M (L)	(H) M L	H M (L)	
Landscape Potential	H (M) L	H (M) L	H M (L)	
Value	H M (L)	H (M) L	H (M) L	TOTAL
Score Based on Ratings	4	7	4	15

Score for each function based on three ratings *(order of ratings is not important)*

9 = H,H,H
8 = H,H,M
7 = H,H,L
7 = H,M,M
6 = H,M,L
6 = M,M,M
5 = H,L,L
5 = M,M,L
4 = M,L,L
3 = L,L,L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	CATEGORY *Circle the appropriate category*
Vernal Pools	II III
Alkali	I
Wetland of High Conservation Value	I
Bog and Calcareous Fens	I
Old Growth or Mature Forest – slow growing	I
Aspen Forest	I
Old Growth or Mature Forest – fast growing	II
Floodplain forest	II
None of the above	✓

Wetland name or number FW05

Maps and figures required to answer questions correctly for Eastern Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	D 1.3, H 1.1, H 1.5	
Hydroperiods (including area of open water for H 1.3)	D 1.4, H 1.2, H 1.3	
Location of outlet (*can be added to map of hydroperiods)*	D 1.1, D 4.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	
Map of the contributing basin	D 5.3	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	D 3.3	

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	1
Hydroperiods	H 1.2, H 1.3	1
Ponded depressions	R 1.1	1
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	R 2.4	1
Map of the contributing basin	R 2.2, R 2.3, R 5.2	2
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	1
Width of wetland vs. width of stream *(can be added to another figure)*	R 4.1	1
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	3
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	4
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	R 3.2, R 3.3	5

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	L 1.1, L 4.1, H 1.1, H 1.5	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants *(can be added to figure above)*	S 4.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	S 3.3	

Wetland name or number Pw05

HGM Classification of Wetland in Eastern Washington

For questions 1-4, the criteria described must apply to the entire unit being rated.

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-4 apply, and go to Question 5.

1. Does the entire unit **meet both** of the following criteria?
   ___The vegetated part of the wetland is on the water side of the Ordinary High Water Mark of a body of permanent open water (without any plants on the surface) that is at least 20 ac (8 ha) in size
   ___At least 30% of the open water area is deeper than 10 ft (3 m)

   NO – go to 2 **YES –** The wetland class is **Lake Fringe** (Lacustrine Fringe)

2. Does the entire wetland unit **meet all** of the following criteria?
   ✓ The wetland is on a slope (*slope can be very gradual*),
   ___The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks;
   ✓ The water leaves the wetland **without being impounded.**

   NO - go to 3 YES – The wetland class is **Slope**
   NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 foot deep).

3. Does the entire wetland unit **meet all** of the following criteria?
   ✓ The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river;
   ✓ The overbank flooding occurs at least once every 10 years.

   NO - go to 4 YES – The wetland class is **Riverine**
   NOTE: The Riverine wetland can contain depressions that are filled with water when the river is not flooding.

4. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year. *This means that any outlet, if present, is higher than the interior of the wetland.*

   NO – go to 5 YES – The wetland class is **Depressional**

5. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-4 APPLY TO DIFFERENT AREAS IN THE WETLAND UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

Wetland name or number FW05

NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the wetland unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM Class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine (the riverine portion is within the boundary of depression)	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine

If you are still unable to determine which of the above criteria apply to your wetland, or if you have ***more than 2 HGM classes*** *within a wetland boundary, classify the wetland as Depressional for the rating.*

Wetland name or number FW05

RIVERINE WETLANDS **Water Quality Functions** - Indicators that the site functions to improve water quality	Points (only 1 score per box)
R 1.0. Does the site have the potential to improve water quality?	
R 1.1. Area of surface depressions within the Riverine wetland that can trap sediments during a flooding event: Depressions cover > 1/3 area of wetland — points = 6 Depressions cover > 1/10 area of wetland — points = 3 Depressions present but cover < 1/10 area of wetland — points = 1 No depressions present — points = 0	0
R 1.2. Structure of plants in the wetland (areas with >90% cover at person height; **not** Cowardin classes): Forest or shrub > 2/3 the area of the wetland — points = 10 Forest or shrub 1/3 – 2/3 area of the wetland 11% — points = 5 Ungrazed, herbaceous plants > 2/3 area of wetland 100% ungrazed → 89% herbaceous — points = 5 Ungrazed herbaceous plants 1/3 – 2/3 area of wetland — points = 2 Forest, shrub, and ungrazed herbaceous < 1/3 area of wetland — points = 0	5
Total for R 1 — Add the points in the boxes above	5

Rating of Site Potential If score is: ___ **12-16 = H** ___ **6-11 = M** ✓ **0-5 = L** *Record the rating on the first page*

R 2.0. Does the landscape have the potential to support the water quality function of the site?	
R 2.1. Is the wetland within an incorporated city or within its UGA? Yes = 2 (No = 0)	0
R 2.2. Does the contributing basin include a UGA or incorporated area? Yes = 1 (No = 0)	0
R 2.3. Does at least 10% of the contributing basin contain tilled fields, pastures, or forests that have been clearcut within the last 5 years? (Yes = 1) No = 0	1
R 2.4. Is > 10% of the area within 150 ft of wetland in land uses that generate pollutants (Yes = 1) No = 0	1
R 2.5. Are there other sources of pollutants coming into the wetland that are not listed in questions R 2.1-R 2.4? Source_____ Yes = 1 (No = 0)	0
Total for R 2 — Add the points in the boxes above	2

Rating of Landscape Potential If score is: ___ **3-6 = H** ✓ **1 or 2 = M** ___ **0 = L** *Record the rating on the first page*

R 3.0. Is the water quality improvement provided by the site valuable to society?	
R 3.1. Is the wetland along a stream or river that is on the 303(d) list or on a tributary that drains to one within 1 mi? EWC Canal within 1 mile is not on 303(d) list Yes = 1 (No = 0)	0
R 3.2. Does the river or stream have TMDL limits for nutrients, toxics, or pathogens? Yes = 1 (No = 0)	0
R 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality? *Answer YES if there is a TMDL for the drainage in which wetland is found.* Yes = 2 (No = 0)	0
Total for R 3 — Add the points in the boxes above	0

Rating of Value If score is: ___ **2-4 = H** ___ **1 = M** ✓ **0 = L** *Record the rating on the first page*

Wetland name or number FW05

RIVERINE WETLANDS **Hydrologic Functions** - Indicators that site functions to reduce flooding and stream erosion	Points (only 1 score per box)
R 4.0. Does the site have the potential to reduce flooding and erosion?	
R 4.1. Characteristics of the overbank storage the wetland provides: *Estimate the average width of the wetland perpendicular to the direction of the flow and the width of the stream or river channel (distance between banks). Calculate the ratio: (average width of wetland)/(average width of stream between banks).* — If the ratio is more than 2 points = 10 If the ratio is 1-2 points = 8 If the ratio is ½-<1 points = 4 If the ratio is ¼-< ½ points = 2 If the ratio is < ¼ points = 1 wet ~32' / stm 3' = 10+	10
R 4.2. Characteristics of plants that slow down water velocities during floods: *Treat large woody debris as forest or shrub. Choose the points appropriate for the best description (polygons need to have > 90% cover at person height. These are NOT Cowardin classes).* Forest or shrub for more than $^2/_3$ the area of the wetland points = 6 — Forest or shrub for $>^1/_3$ area OR emergent plants $> ^2/_3$ area points = 4 Forest or shrub for $> ^1/_{10}$ area OR emergent plants $> ^1/_3$ area points = 2 Plants do not meet above criteria points = 0	4
Total for R 5 Add the points in the boxes above	14

Rating of Site Potential If score is: ✓ **12-16 = H** ___ **6-11 = M** ___ **0-5 = L** *Record the rating on the first page*

R 5.0. Does the landscape have the potential to support the hydrologic functions of the site?		
R 5.1. Is the stream or river adjacent to the wetland downcut?	Yes = 0 (No = 1)	1
R 5.2. Does the up-gradient watershed include a UGA or incorporated area?	Yes = 1 (No = 0)	0
R 5.3. Is the up-gradient stream or river controlled by dams?	Yes = 0 (No = 1)	1
Total for R 5	Add the points in the boxes above	2

Rating of Landscape Potential If score is: ___ **3 = H** ✓ **1 or 2 = M** ___ **0 = L** *Record the rating on the first page*

R 6.0. Are the hydrologic functions provided by the site valuable to society?		
R 6.1. Distance to the nearest areas downstream that have flooding problems? *Choose the description that best fits the site.* The sub-basin immediately down-gradient of site has surface flooding problems that result in damage to human or natural resources points = 2 — Surface flooding problems are in a basin farther down-gradient points = 1 No flooding problems anywhere downstream points = 0		1
R 6.2. Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan?	Yes = 2 (No = 0)	0
Total for R 6	Add the points in the boxes above	1

Rating of Value If score is: ___ **2-4 = H** ✓ **1 = M** ___ **0 = L** *Record the rating on the first page*

Wetland name or number FW05

These questions apply to wetlands of all HGM classes. **HABITAT FUNCTIONS** - Indicators that site functions to provide important habitat	(only 1 score per box)
H 1.0. Does the wetland have the potential to provide habitat for many species?	
H 1.1. Structure of the plant community: *Check the Cowardin vegetation classes present and categories of emergent plants. Size threshold for each category is >= ¼ ac or >= 10% of the wetland if wetland is < 2.5 ac.* ___Aquatic bed ___Emergent plants 0-12 in (0-30 cm) high are the highest layer and have > 30% cover ___Emergent plants >12-40 in (>30-100 cm) high are the highest layer with >30% cover ✓ Emergent plants > 40 in (> 100 cm) high are the highest layer with >30% cover (the rest Reed canary Grass >90%) ___Scrub-shrub (areas where shrubs have >30% cover) ✓ Forested (areas where trees have >30% cover) 11% 4 or more checks: points = 3 3 checks: points = 2 2 checks: points = 1 1 check: points = 0	1
H 1.2. Is one of the vegetation types Aquatic Bed? Yes = 1 No = 0	0
H 1.3. Surface water H 1.3.1. Does the wetland have areas of open water (without emergent or shrub plants) over at least ¼ ac **OR** 10% of its area during the March to early June **OR** in August to the end of September? *Answer YES for Lake Fringe wetlands.* Yes = 3 points & go to H 1.4 No = go to H 1.3.2 H 1.3.2. Does the wetland have an intermittent or permanent, and unvegetated stream within its boundaries, or along one side, over at least ¼ ac or 10% of its area? *Answer yes only if H 1.3.1 is No.* 8%, <0.25 ac Yes = 3 (No = 0)	0
H 1.4. Richness of plant species Count the number of plant species in the wetland that cover at least 10 ft². *Different patches of the same species can be combined to meet the size threshold. You do not have to name the species.* *Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Russian olive, Phragmites, Canadian thistle, yellow-flag iris, and saltcedar (Tamarisk)* # of species ____ Scoring: > 9 species: points = 2 4-9 species: points = 1 < 4 species: points = 0	0
H 1.5. Interspersion of habitats Decide from the diagrams below whether interspersion among types of plant structures (described in H 1.1), and unvegetated areas (open water or mudflats) is high, moderate, low, or none. *Use map of Cowardin and emergent plant classes prepared for questions H 1.1 and map of open water from H 1.3. If you have four or more plant classes or three classes and open water, the rating is always high.* **None** = 0 points **Low** = 1 point **Moderate** = 2 points All three diagrams in this row are **High** = 3 points Riparian braided channels with 2 classes	Figure 2

Wetland name or number FW05

H 1.6. Special habitat features *Check the habitat features that are present in the wetland. The number of checks is the number of points.* ____Loose rocks larger than 4 in OR large, downed, woody debris (> 4 in diameter) within the area of surface ponding or in stream. ____Cattails or bulrushes are present within the wetland. ____Standing snags (diameter at the bottom > 4 in) in the wetland or within 30 m (100 ft) of the edge. ____Emergent or shrub vegetation in areas that are permanently inundated/ponded. ____Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 45 degree slope) OR signs of recent beaver activity ____ Invasive species cover less than 20% in each stratum of vegetation *(canopy, sub-canopy, shrubs, herbaceous, moss/ground cover)*	0
Total for H 1 Add the points in the boxes above	3

Rating of Site Potential If score is: ___**15-18 = H** ___**7-14 = M** ✓**0-6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support habitat functions of the site?	
H 2.1. Accessible habitat (only area of habitat abutting wetland). If total accessible habitat is: *Calculate:* % undisturbed habitat 0 + [(% moderate and low intensity land uses)/2] 0.5 = 0.5 % > 1/3 (33.3%) of 1 km Polygon points = 3 20-33% of 1km Polygon points = 2 10-19% of 1km Polygon points = 1 —<10% of 1km Polygon points = 0 mid 9.5 / 900 ac = 1%	0
H 2.2. Undisturbed habitat in 1 km Polygon around wetland. (10+ patches) *Calculate:* % undisturbed habitat 7 + [(% moderate and low intensity land uses)/2] 9 = 16 % Undisturbed habitat > 50% of Polygon points = 3 Undisturbed habitat 10 - 50% and in 1-3 patches points = 2 — Undisturbed habitat 10 - 50% and > 3 patches points = 1 Undisturbed habitat < 10% of Polygon points = 0 undis 67/900 ac = 7% mid 158/900 ac = 18%	1
H 2.3. Land use intensity in 1 km Polygon: > 50% of Polygon is high intensity land use 75% points = (- 2) Does not meet criterion above points = 0	-2
H 2.4. The wetland is in an area where annual rainfall is less than 12 in, and its water regime is not influenced by irrigation practices, dams, or water control structures. *Generally, this means outside boundaries of reclamation areas, irrigation districts, or reservoirs* Yes = 3 (No = 0)	0
Total for H 2 Add the points in the boxes above	-1

Rating of Landscape Potential If score is: ___**4-9 = H** ___**1-3 = M** ✓**< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose the highest score that applies to the wetland being rated* Site meets ANY of the following criteria: points = 2 — It has 3 or more priority habitats within 100 m (see Appendix B) — It provides habitat for Threatened or Endangered species (any plant or animal on state or federal lists) — It is mapped as a location for an individual WDFW species — It is a Wetland of High Conservation Value as determined by the Department of Natural Resources — It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan — Site has 1 or 2 priority habitats within 100 m (see Appendix B) points = 1 Site does not meet any of the criteria above points = 0	1

Rating of Value If score is: ___**2 = H** ✓**1 = M** ___**0 = L** *Record the rating on the first page*

Appendix B: WDFW Priority Habitats in Eastern Washington

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp. http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here: http://wdfw.wa.gov/conservation/phs/list/)

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland: ***NOTE:*** *This question is independent of the land use between the wetland and the priority habitat.*

— **Aspen Stands:** Pure or mixed stands of aspen greater than 1 ac (0.4 ha).

— **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).

— **Old-growth/Mature forests:** Old-growth east of Cascade crest – Stands are highly variable in tree species composition and structural characteristics due to the influence of fire, climate, and soils. In general, stands will be >150 years of age, with 10 trees/ac (25 trees/ha) that are > 21 in (53 cm) dbh, and 1-3 snags/ac (2.5-7.5 snags/ha) that are > 12-14 in (30-35 cm) diameter. Downed logs may vary from abundant to absent. Canopies may be single or multi-layered. Evidence of human-caused alterations to the stand will be absent or so slight as to not affect the ecosystem's essential structures and functions. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west and 80-160 years old east of the Cascade crest.

— **Oregon White Oak:** Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).

✓— **Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

— **Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.

— **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

— **Cliffs:** Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.

— **Talus:** Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

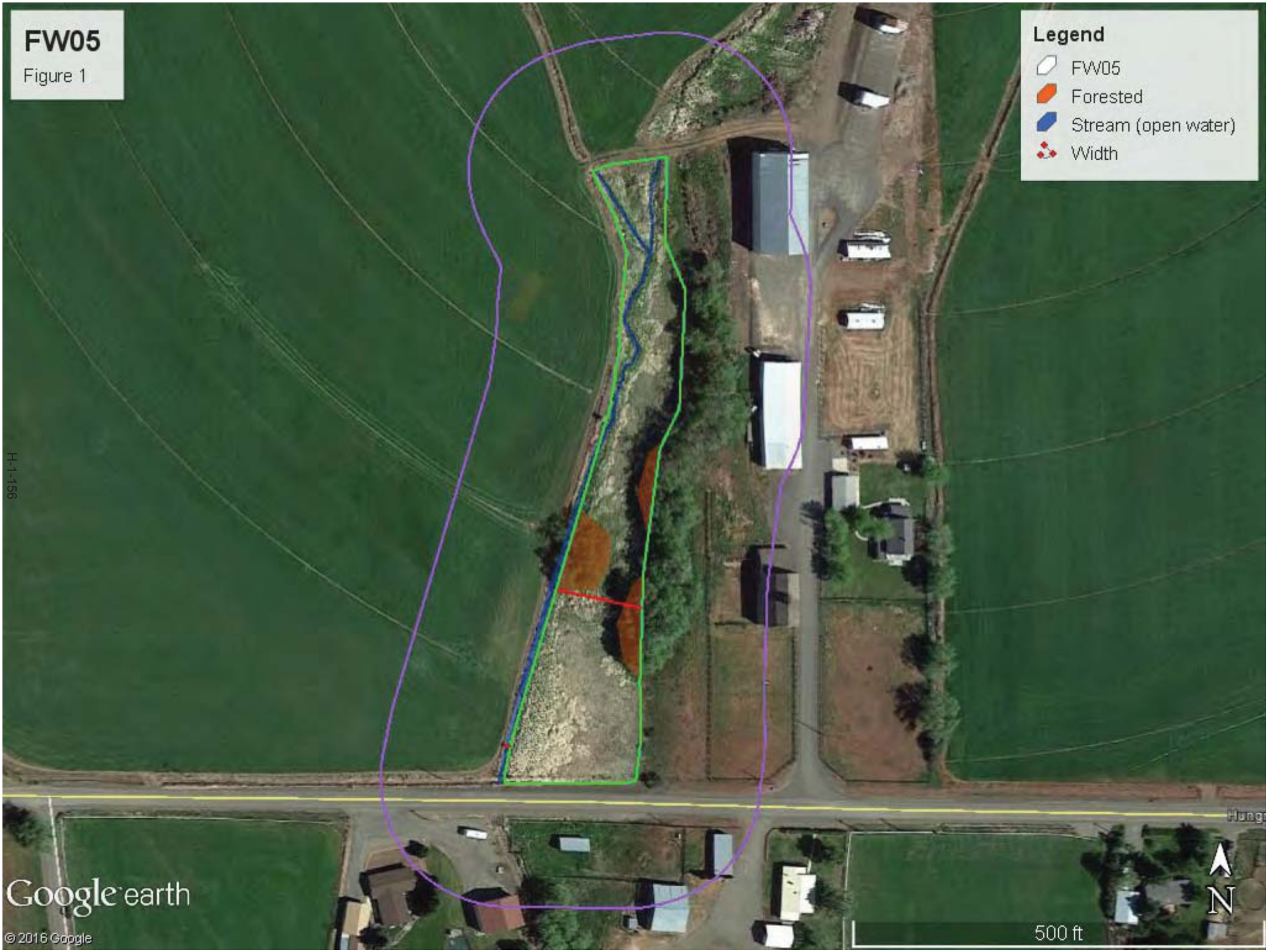
— **Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 12 in (30 cm)in eastern Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

— **Shrub-steppe:** A nonforested vegetation type consisting of one or more layers of perennial bunchgrasses and a conspicuous but discontinuous layer of shrubs (see Eastside Steppe for sites with little or no shrub cover).

— **Eastside Steppe:** Nonforested vegetation type dominated by broadleaf herbaceous flora (i.e., forbs), perennial bunchgrasses, or a combination of both. Bluebunch wheatgrass (*Pseudoroegneria spicata*) is often the prevailing cover component along with Idaho fescue (*Festuca idahoensis*), Sandberg bluegrass (*Poa secunda*), rough fescue (*F. campestris*), or needlegrasses (*Achnatherum* spp.).

— **Juniper Savannah:** All juniper woodlands.

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list because they are addressed elsewhere.

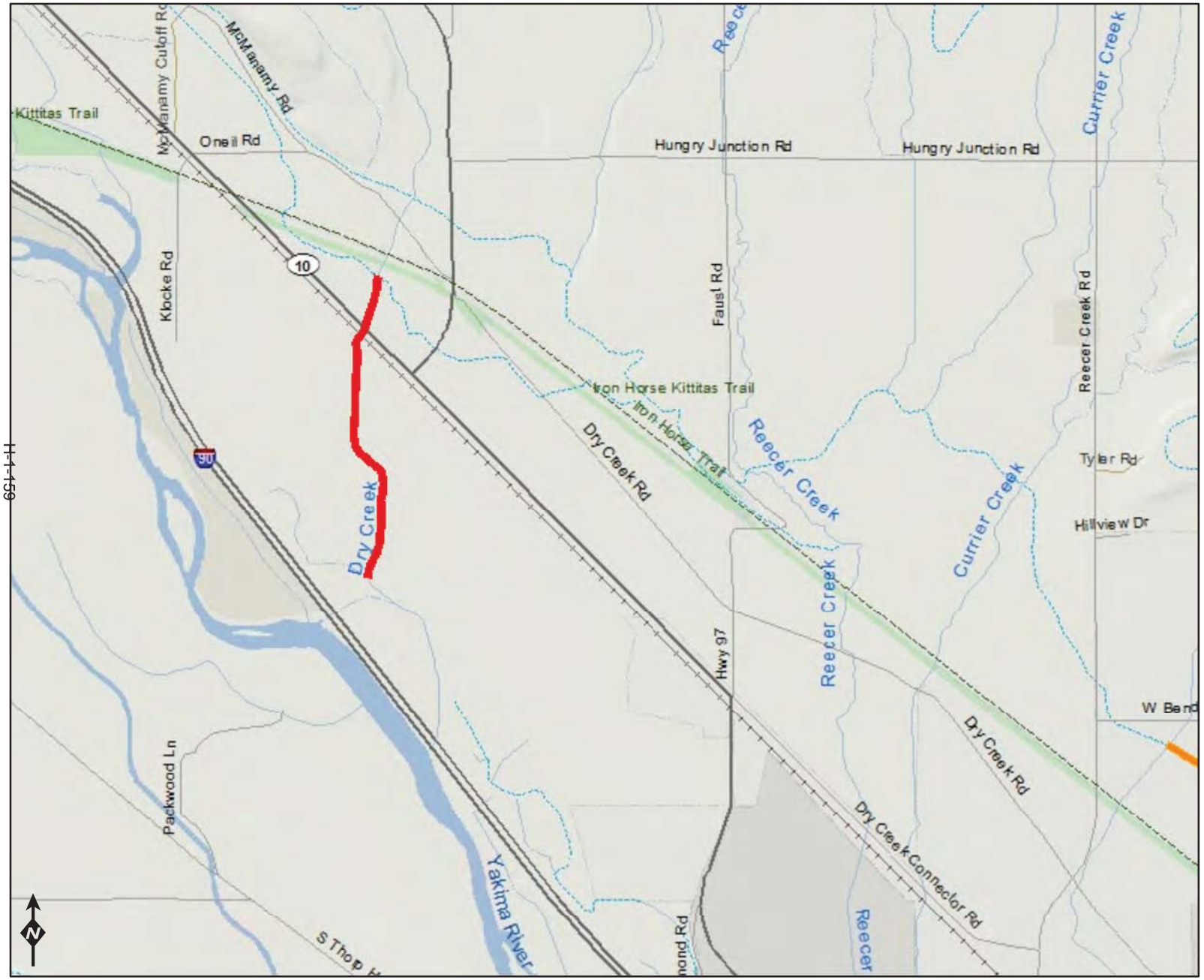

FW05
Figure 1
Legend
FW05
Forested
Stream (open water)
Width
H-1-156
Google earth
© 2016 Google
N
500 ft


FW05
Figure 2
Legend
Contributing Basin
FW05
Clarke Rd
Lower Green Canyon Rd
H-1-157
97
Manamy Rd
Hungry
Faust Rd
Google earth
© 2016 Google
N
2000 ft


FW05
Figure 3
Legend
FW05
Mid-intensity
Undisturbed
Clarke Rd
Green Spur Rd
Lower Green Canyon Rd
H-1-158
Oneill Rd
McMannamy Rd
10
97
Dry Creek Rd
Faust Rd
Google earth
© 2016 Google
N
4000 ft

April 27, 2017

FW05 - Figure 4



H1-159

Assessed Waters/Sediment

Water
- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

Sediment
- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

DEPARTMENT OF ECOLOGY
State of Washington

Water Quality Improvement Projects (TMDLs)

WATER QUALITY IMPROVEMENT PROJECTS (TMDLs)

Overview of the process

Project Catalog

- by WRIA
- by County

Funding Opportunities

Project Development Priority Lists

Related Information

TMDL Contacts

RELATED ECOLOGY PROGRAMS

Water Quality

Water Quality Improvement > Water Quality Improvement Projects by WRIA > WRIA 39: Upper Yakima

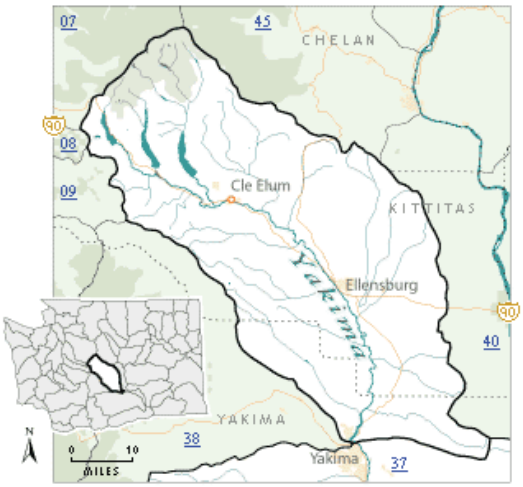
WRIA 39: Upper Yakima

The following table lists overview information and links to specific water quality improvement projects (including total maximum daily loads, or TMDLs) for this water resource inventory area (WRIA). Please use links (where available) for more information on a project.

Yakima River basin project index:
www.ecy.wa.gov/programs/wq/tmdl/yakima_wq/index.html

Counties

- Kittitas
- Yakima



Project Name	Pollutants	Status**	TMDL Lead
Crystal Creek	Ammonia-N BOD (5-day) Chlorine Fecal Coliform	EPA approved	Jane Creech 509-454-7860
Selah Ditch	Fecal Coliform Temperature	EPA approved	Greg Bohn 509-454-4174
Teanaway River segments: • Upper West Fork Teanaway River • Upper Middle Fork Teanaway River • Upper North Fork Teanaway River • Stafford Creek • Lower West Fork Teanaway River • Lower Middle Fork Teanaway River • Lower North Fork Teanaway River • Mainstem Teanaway River	Temperature	EPA approved	Jane Creech 509-454-7860
Wilson/Cooke Creek Tributaries: • Badger Creek • Bull Ditch • Caribou Creek • Cherry Creek • CID Canal • Coleman Creek • Cook Creek • EWC Canal • Johnson Drain • KRD Canal	Fecal Coliform	EPA approved Has an implementation plan Post-TMDL monitoring report	Jane Creech 509-454-7860 Greg Bohn 509-454-4174

Mercer Creek • Naneum Creek • Parke Creek • Whiskey Creek • Wilson Creek • Wipple Wasteway			
Yakima River, Upper	Dieldrin DDT Suspended Sediments Turbidity	EPA approved	Jane Creech 509-454-7860
	Temperature	EPA approved Has an implementation plan	Jane Creech 509-454-7860
Yakima River	Toxics	Under development	Jane Creech 509-454-7860

**** Status** will be listed as one of the following: Approved by EPA, Under Development or Implementation. No status means project work has not yet started.*

For more information about WRIA 39:

- Waterbodies in WRIA 39 - using the Water Quality Assessment Query Tool
- Watershed Information for WRIA 39

* The Department of Ecology and other state resource agencies frequently use a system of 62 "Water Resource Inventory Areas" or "WRIAs" to refer to the state's major watershed basins.

Back to top of page

Last updated December 2016

Feedback?

About us
Director Maia Bellon
Tracking progress
Newsroom
Jobs
Staff only
Contact us

Publications & forms
Databases
Laws & rules
Public records disclosure
Public input & events
Environmental education
Sustainability information

中文 | Chinese
Tiếng Việt | Vietnamese
한국어 | Korean
Русский | Russian
Español | Spanish
Accessibility

Access Washington®
Welcome to the State of Washington

Copyright © Washington State Department of Ecology
Privacy Notice | Site Info | Accessibility | Contact the web team |

SHARE

Wetland name or number FW06

RATING SUMMARY – Eastern Washington

Name of wetland (or ID #): FW06 Date of site visit: 4/11/17

Rated by N. Evan Dulin Trained by Ecology? ✓ Yes ___ No Date of training 3/24/17

HGM Class used for rating Depressional Wetland has multiple HGM classes? ___Y ✓N

NOTE: Form is not complete without the figures requested (*figures can be combined*).
Source of base aerial photo/map Google Earth

OVERALL WETLAND CATEGORY IV (based on functions ✓ or special characteristics ___)

1. Category of wetland based on FUNCTIONS

___**Category I** – Total score = 22-27

___**Category II** – Total score = 19-21

___**Category III** – Total score = 16-18

✓ **Category IV** – Total score = 9-15

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
	Circle the appropriate ratings			
Site Potential	H (M) L	H M (L)	H M (L)	
Landscape Potential	H (M) L	H (M) L	H M (L)	
Value	(H) M L	H M (L)	H M (L)	TOTAL
Score Based on Ratings	7	4	3	14

Score for each function based on three ratings *(order of ratings is not important)*

9 = H,H,H
8 = H,H,M
7 = H,H,L
7 = H,M,M
6 = H,M,L
6 = M,M,M
5 = H,L,L
5 = M,M,L
4 = M,L,L
3 = L,L,L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	CATEGORY *Circle the appropriate category*
Vernal Pools	II III
Alkali	I
Wetland of High Conservation Value	I
Bog and Calcareous Fens	I
Old Growth or Mature Forest – slow growing	I
Aspen Forest	I
Old Growth or Mature Forest – fast growing	II
Floodplain forest	II
None of the above	✓

Wetland name or number FW06

Maps and figures required to answer questions correctly for Eastern Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	D 1.3, H 1.1, H 1.5	1
Hydroperiods (including area of open water for H 1.3)	D 1.4, H 1.2, H 1.3	1
Location of outlet (*can be added to map of hydroperiods)*	D 1.1, D 4.1	1
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	1
Map of the contributing basin	D 5.3	2
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	3
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	4
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	D 3.3	5

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	R 2.4	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of wetland vs. width of stream *(can be added to another figure)*	R 4.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	R 3.2, R 3.3	

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	L 1.1, L 4.1, H 1.1, H 1.5	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants *(can be added to figure above)*	S 4.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	S 3.3	

Wetland name or number FW06

HGM Classification of Wetland in Eastern Washington

For questions 1-4, the criteria described must apply to the entire unit being rated.

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-4 apply, and go to Question 5.

1. Does the entire unit **meet both** of the following criteria?
   ___The vegetated part of the wetland is on the water side of the Ordinary High Water Mark of a body of permanent open water (without any plants on the surface) that is at least 20 ac (8 ha) in size
   ___At least 30% of the open water area is deeper than 10 ft (3 m)

   NO – go to 2 **YES –** The wetland class is **Lake Fringe** (Lacustrine Fringe)

2. Does the entire wetland unit **meet all** of the following criteria?
   ___The wetland is on a slope (*slope can be very gradual*),
   ___The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks;
   ___The water leaves the wetland **without being impounded**.

   NO - go to 3 YES – The wetland class is **Slope**
   NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 foot deep).

3. Does the entire wetland unit **meet all** of the following criteria?
   ___ The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river;
   ___ The overbank flooding occurs at least once every 10 years.

   NO - go to 4 YES – The wetland class is **Riverine**
   NOTE: The Riverine wetland can contain depressions that are filled with water when the river is not flooding.

4. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year. *This means that any outlet, if present, is higher than the interior of the wetland.*

   NO – go to 5 YES – The wetland class is **Depressional**

5. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-4 APPLY TO DIFFERENT AREAS IN THE WETLAND UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

Wetland name or number FW06

NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the wetland unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM Class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine (the riverine portion is within the boundary of depression)	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine

If you are still unable to determine which of the above criteria apply to your wetland, or if you have ***more than 2 HGM classes*** *within a wetland boundary, classify the wetland as Depressional for the rating.*

Wetland name or number FW06

DEPRESSIONAL WETLANDS **Water Quality Functions** - Indicators that the site functions to improve water quality	Points (only 1 score per box)
D 1.0. Does the site have the potential to improve water quality?	
D 1.1. Characteristics of surface water outflows from the wetland: Wetland has no surface water outlet — points = 5 _ Wetland has an intermittently flowing outlet — points = 3 Wetland has a highly constricted permanently flowing outlet — points = 3 Wetland has a permanently flowing, unconstricted, surface outlet — points = 1	3
D 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic *(use NRCS definitions of soils)* YES = 3 (NO = 0)	0
D 1.3. Characteristics of persistent vegetation (Emergent, Scrub-shrub, and/or Forested Cowardin classes) _ Wetland has persistent, ungrazed, vegetation for > $^2/_3$ of area 100% ungrazed — points = 5 Wetland has persistent, ungrazed, vegetation from $^1/_3$ to $^2/_3$ of area — points = 3 Wetland has persistent, ungrazed vegetation from $^1/_{10}$ to < $^1/_3$ of area — points = 1 Wetland has persistent, ungrazed vegetation < $^1/_{10}$ of area — points = 0	5
D 1.4. Characteristics of seasonal ponding or inundation: *This is the area of ponding that fluctuates every year. Do not count the area that is permanently ponded.* Area seasonally ponded is > ½ total area of wetland — points = 3 Area seasonally ponded is ¼ - ½ total area of wetland — points = 1 _ Area seasonally ponded is < ¼ total area of wetland 1% — points = 0	0
Total for D 1 — Add the points in the boxes above	8

Rating of Site Potential If score is: ___ **12- 16 = H** ✓ **6- 11 = M** ___ **0- 5 = L** *Record the rating on the first page*

D 2.0. Does the landscape have the potential to support the water quality function of the site?	
D 2.1. Does the wetland receive stormwater discharges? Yes = 1 (No = 0)	0
D 2.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate pollutants? (Yes = 1) No = 0	1
D 2.3. Are there septic systems within 250 ft of the wetland? Yes = 1 (No = 0)	0
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1- D 2.3? Source_____ Yes = 1 (No = 0)	0
Total for D 2 — Add the points in the boxes above	1

Rating of Landscape Potential If score is: ___ **3 or 4 = H** ✓ **1 or 2 = M** ___ **0 = L** *Record the rating on the first page*

D 3.0. Is the water quality improvement provided by the site valuable to society?	
D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, or lake that is on the 303(d) list? Dry Creek in < 0.25 mile (Yes = 1) No = 0	1
D 3.2. Is the wetland in a basin or sub-basin where water quality is an issue in some aquatic resource [303(d) list, eutrophic lakes, problems with nuisance and toxic algae]? (Yes = 1) No = 0	1
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality (*answer YES if there is a TMDL for the drainage or basin in which the wetland is found*)? (Yes = 2) No = 0	2
Total for D 3 — Add the points in the boxes above	4

Rating of Value If score is: ✓ **2-4 = H** ___ **1 = M** ___ **0 = L** *Record the rating on the first page*

Wetland name or number FW06

DEPRESSIONAL WETLANDS **Hydrologic Functions** - Indicators that the site functions to reduce flooding and erosion.	Points (only 1 score per box)
D 4.0. Does the site have the potential to reduce flooding and erosion?	
D 4.1. Characteristics of surface water outflows from the wetland: Wetland has no surface water outlet — points = 8 — Wetland has an intermittently flowing outlet — points = 4 Wetland has a highly constricted permanently flowing outlet — points = 4 Wetland has a permanently flowing unconstricted surface outlet — points = 0 *(If outlet is a ditch and not permanently flowing treat wetland as "intermittently flowing")*	4
D 4.2. Depth of storage during wet periods: *Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or deepest part (if dry).* Seasonal ponding: > 3 ft above the lowest point in wetland or the surface of permanent ponding — points = 8 Seasonal ponding: 2 ft - < 3 ft above the lowest point in wetland or the surface of permanent ponding — points = 6 The wetland is a headwater wetland — points = 4 Seasonal ponding: 1 ft - < 2 ft — points = 4 Seasonal ponding: 6 in - < 1 ft — points = 2 — Seasonal ponding: < 6 in or wetland has only saturated soils — points = 0	0
Total for D 4 — Add the points in the boxes above	4

Rating of Site Potential If score is: ___ 12-16 = H ___ 6-11 = M ✓ 0-5 = L *Record the rating on the first page*

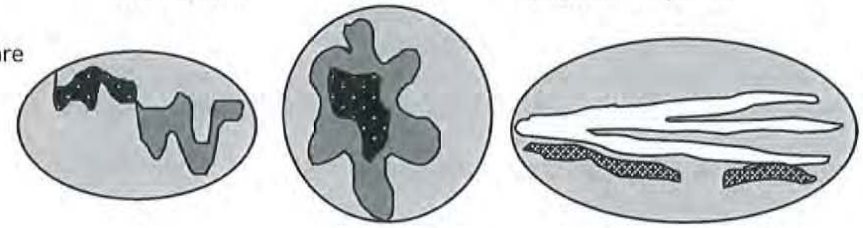
D 5.0. Does the landscape have the potential to support the hydrologic functions of the site?	
D 5.1. Does the wetland receive stormwater discharges? Yes = 1 (No = 0)	0
D 5.2. Is > 10% of the area within 150 ft of the wetland in a land use that generates runoff? (Yes = 1) No = 0	1
D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land uses? (Yes = 1) No = 0 Cow pasture	1
Total for D 5 — Add the points in the boxes above	2

Rating of Landscape Potential If score is: ___ 3 = H ✓ 1 or 2 = M ___ 0 = L *Record the rating on the first page*

D 6.0. Are the hydrologic functions provided by the site valuable to society?	
D 6.1. The wetland is in a landscape that has flooding problems. Choose the description that best matches conditions around the wetland being rated. *Do not add points. Choose the highest score if more than one condition is met.* The wetland captures surface water that would otherwise flow down-gradient into areas where flooding has damaged human or natural resources (e.g., houses or salmon redds), AND Flooding occurs in sub-basin that is immediately down-gradient of wetland — points = 2 Surface flooding problems are in a sub-basin farther down-gradient — points = 1 — The existing or potential outflow from the wetland is so constrained by human or natural conditions that the water stored by the wetland cannot reach areas that flood. *Explain why* water source is from controlled irrigation — points = 0 There are no problems with flooding downstream of the wetland — points = 0	0
D 6.2. Has the site has been identified as important for flood storage or flood conveyance in a regional flood control plan? Yes = 2 (No = 0)	0
Total for D 6 — Add the points in the boxes above	0

Rating of Value If score is: ___ 2-4 = H ___ 1 = M ✓ 0 = L *Record the rating on the first page*

Wetland name or number FW06

These questions apply to wetlands of all HGM classes. **HABITAT FUNCTIONS** - Indicators that site functions to provide important habitat	(only 1 score per box)
H 1.0. Does the wetland have the potential to provide habitat for many species?	
H 1.1. Structure of the plant community: *Check the Cowardin vegetation classes present and categories of emergent plants. Size threshold for each category is >= ¼ ac or >= 10% of the wetland if wetland is < 2.5 ac.* ____Aquatic bed ____Emergent plants 0-12 in (0-30 cm) high are the highest layer and have > 30% cover ____Emergent plants >12-40 in (>30-100 cm) high are the highest layer with >30% cover ✓ Emergent plants > 40 in (> 100 cm) high are the highest layer with >30% cover 100% ____Scrub-shrub (areas where shrubs have >30% cover) 4 or more checks: points = 3 ____Forested (areas where trees have >30% cover) 3 checks: points = 2 2 checks: points = 1 1 check: points = 0	0
H 1.2. Is one of the vegetation types Aquatic Bed? Yes = 1 (No = 0)	0
H 1.3. Surface water H 1.3.1. Does the wetland have areas of open water (without emergent or shrub plants) over at least ¼ ac **OR** 10% of its area during the March to early June **OR** in August to the end of September? *Answer YES for Lake Fringe wetlands.* Yes = 3 points & go to H 1.4 (No = go to H 1.3.2) H 1.3.2. Does the wetland have an intermittent or permanent, and unvegetated stream within its boundaries, or along one side, over at least ¼ ac or 10% of its area? *Answer yes only if H 1.3.1 is No.* Yes = 3 (No = 0)	0
H 1.4. Richness of plant species Count the number of plant species in the wetland that cover at least 10 ft^2. *Different patches of the same species can be combined to meet the size threshold. You do not have to name the species.* *Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Russian olive, Phragmites, Canadian thistle, yellow-flag iris, and saltcedar (Tamarisk)* # of species ____ Scoring: > 9 species: points = 2 4-9 species: points = 1 < 4 species: points = 0	0
H 1.5. Interspersion of habitats Decide from the diagrams below whether interspersion among types of plant structures (described in H 1.1), and unvegetated areas (open water or mudflats) is high, moderate, low, or none. *Use map of Cowardin and emergent plant classes prepared for questions H 1.1 and map of open water from H 1.3. If you have four or more plant classes or three classes and open water, the rating is always high.*  **None** = 0 points **Low** = 1 point **Moderate** = 2 points All three diagrams in this row are **High** = 3 points  Riparian braided channels with 2 classes	Figure__ 0

Wetland name or number FW06

H 1.6. Special habitat features *Check the habitat features that are present in the wetland. The number of checks is the number of points.* ___Loose rocks larger than 4 in OR large, downed, woody debris (> 4 in diameter) within the area of surface ponding or in stream. ✓ Cattails or bulrushes are present within the wetland. ___Standing snags (diameter at the bottom > 4 in) in the wetland or within 30 m (100 ft) of the edge. ___Emergent or shrub vegetation in areas that are permanently inundated/ponded. ___Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 45 degree slope) OR signs of recent beaver activity ✓ Invasive species cover less than 20% in each stratum of vegetation *(canopy, sub-canopy, shrubs, herbaceous, moss/ground cover)*	2
Total for H 1 Add the points in the boxes above	2

Rating of Site Potential If score is: ___**15-18 = H** ___**7-14 = M** ✓**0-6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support habitat functions of the site?	
H 2.1. Accessible habitat (only area of habitat abutting wetland). If total accessible habitat is: *Calculate:* % undisturbed habitat 11 + [(% moderate and low intensity land uses)/2] 1 = 12 % > 1/3 (33.3%) of 1 km Polygon points = 3 20-33% of 1km Polygon points = 2 — 10-19% of 1km Polygon points = 1 <10% of 1km Polygon points = 0 undis 83 / 780 ac = 11%; mid 17 / 780 ac = 2%	1
H 2.2. Undisturbed habitat in 1 km Polygon around wetland. (7+ patches) *Calculate:* % undisturbed habitat 14 + [(% moderate and low intensity land uses)/2] 15.5 = 29.5 % Undisturbed habitat > 50% of Polygon points = 3 Undisturbed habitat 10 - 50% and in 1-3 patches points = 2 — Undisturbed habitat 10 - 50% and > 3 patches points = 1 Undisturbed habitat < 10% of Polygon points = 0 undis 107 / 780 ac = 14%; mid 245 / 780 ac = 31%	1
H 2.3. Land use intensity in 1 km Polygon: > 50% of Polygon is high intensity land use 55% points = (- 2) Does not meet criterion above points = 0	-2
H 2.4. The wetland is in an area where annual rainfall is less than 12 in, and its water regime is not influenced by irrigation practices, dams, or water control structures. *Generally, this means outside boundaries of reclamation areas, irrigation districts, or reservoirs* Yes = 3 (No = 0)	0
Total for H 2 Add the points in the boxes above	0

Rating of Landscape Potential If score is: ___**4-9 = H** ___**1-3 = M** ✓**< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose the highest score that applies to the wetland being rated* Site meets ANY of the following criteria: points = 2 — It has 3 or more priority habitats within 100 m (see Appendix B) — It provides habitat for Threatened or Endangered species (any plant or animal on state or federal lists) — It is mapped as a location for an individual WDFW species — It is a Wetland of High Conservation Value as determined by the Department of Natural Resources — It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan Site has 1 or 2 priority habitats within 100 m (see Appendix B) points = 1 — Site does not meet any of the criteria above points = 0	0

Rating of Value If score is: ___**2 = H** ___**1 = M** ✓**0 = L** *Record the rating on the first page*

Appendix B: WDFW Priority Habitats in Eastern Washington

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp. http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here: http://wdfw.wa.gov/conservation/phs/list/)

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland: ***NOTE:*** *This question is independent of the land use between the wetland and the priority habitat.*

— **Aspen Stands:** Pure or mixed stands of aspen greater than 1 ac (0.4 ha). Aspen Stand within 100 meters (<1 ac)

— **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).

— **Old-growth/Mature forests:** Old-growth east of Cascade crest – Stands are highly variable in tree species composition and structural characteristics due to the influence of fire, climate, and soils. In general, stands will be >150 years of age, with 10 trees/ac (25 trees/ha) that are > 21 in (53 cm) dbh, and 1-3 snags/ac (2.5-7.5 snags/ha) that are > 12-14 in (30-35 cm) diameter. Downed logs may vary from abundant to absent. Canopies may be single or multi-layered. Evidence of human-caused alterations to the stand will be absent or so slight as to not affect the ecosystem's essential structures and functions. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west and 80-160 years old east of the Cascade crest.

— **Oregon White Oak:** Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).

— **Riparian:** The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

— **Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.

— **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

— **Cliffs:** Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.

— **Talus:** Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

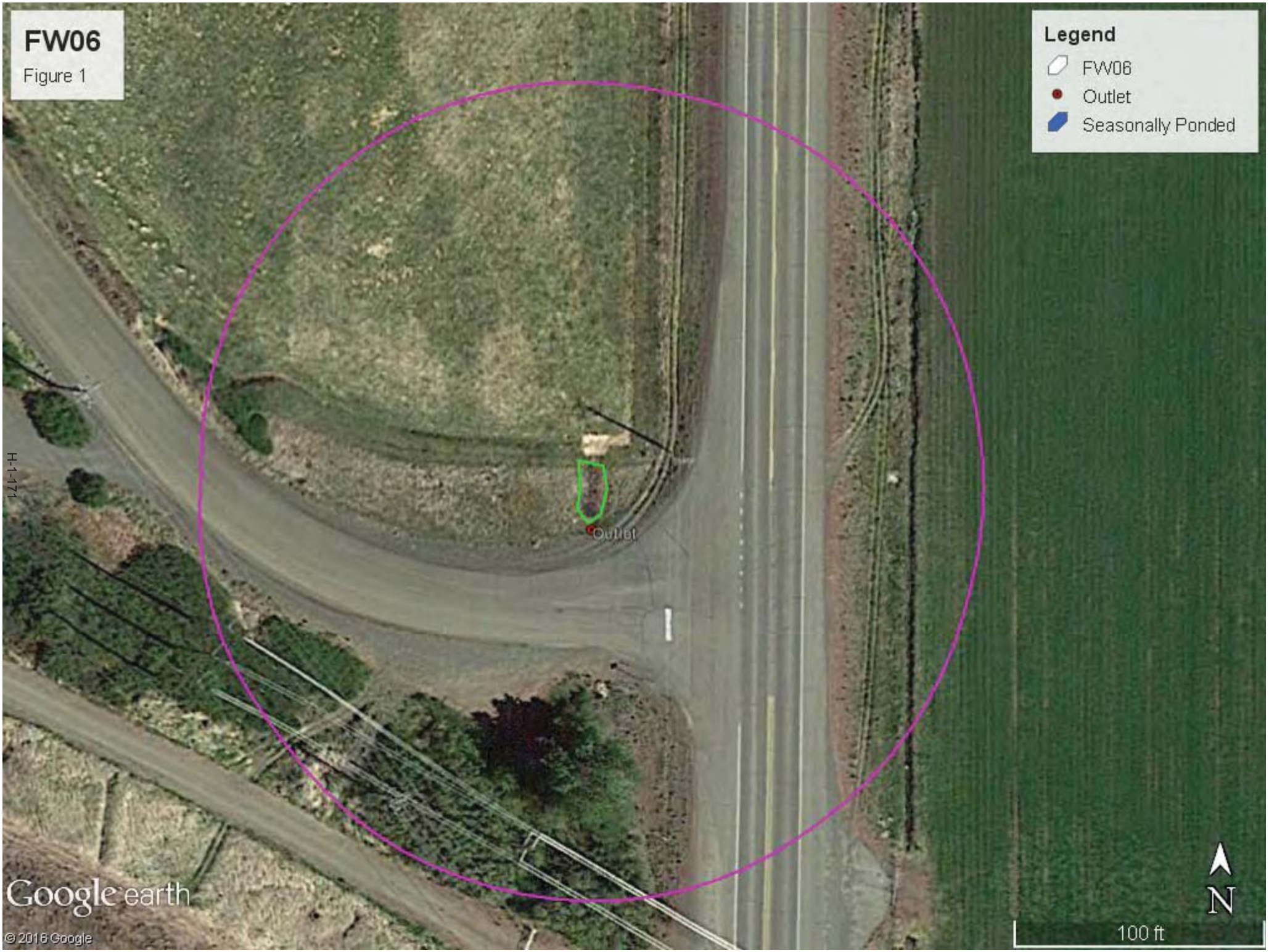
— **Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 12 in (30 cm)in eastern Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

— **Shrub-steppe:** A nonforested vegetation type consisting of one or more layers of perennial bunchgrasses and a conspicuous but discontinuous layer of shrubs (see Eastside Steppe for sites with little or no shrub cover).

— **Eastside Steppe:** Nonforested vegetation type dominated by broadleaf herbaceous flora (i.e., forbs), perennial bunchgrasses, or a combination of both. Bluebunch wheatgrass (*Pseudoroegneria spicata*) is often the prevailing cover component along with Idaho fescue (*Festuca idahoensis*), Sandberg bluegrass (*Poa secunda*), rough fescue (*F. campestris*), or needlegrasses (*Achnatherum* spp.).

— **Juniper Savannah:** All juniper woodlands.

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list because they are addressed elsewhere.


FW06
Figure 1
Legend
FW06
Outlet
Seasonally Ponded
H-1-171
Outlet
Google earth
© 2016 Google
N
100 ft


FW06
Figure 2
Legend
Contributing Basin
FW06
McMahanny Rd
97
H-1-172
Google earth
© 2018 Google
N
600 ft


FW06
Figure 3
Legend
FW06
Mid-intensity
Undisturbed
Oneil Rd
McManamy Rd
97
10
H-1-73
Klocke Rd
90
Dry Creek Rd
Hungry
N
3000 ft
Google earth
© 2016 Google

April 27, 2017

FW06 - Figure 4



Assessed Waters/Sediment

Water
- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

Sediment
- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

Miles
0 0.125 0.25 0.5

Image courtesy of USGS Earthstar Geographics SIO © 2017 Microsoft Corporation © 2017 HERE © AND

DEPARTMENT OF ECOLOGY
State of Washington

Water Quality Improvement Projects (TMDLs)

WATER QUALITY IMPROVEMENT PROJECTS (TMDLs)

Overview of the process
Project Catalog
- by WRIA
- by County

Funding Opportunities
Project Development Priority Lists
Related Information
TMDL Contacts

RELATED ECOLOGY PROGRAMS

Water Quality

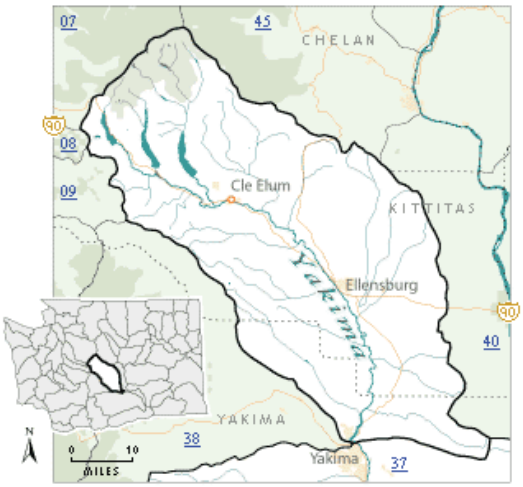
Water Quality Improvement > Water Quality Improvement Projects by WRIA > WRIA 39: Upper Yakima

WRIA 39: Upper Yakima

The following table lists overview information and links to specific water quality improvement projects (including total maximum daily loads, or TMDLs) for this water resource inventory area (WRIA). Please use links (where available) for more information on a project.

Yakima River basin project index:
www.ecy.wa.gov/programs/wq/tmdl/yakima_wq/index.html
Counties

- Kittitas
- Yakima



Project Name	Pollutants	Status**	TMDL Lead
Crystal Creek	Ammonia-N BOD (5-day) Chlorine Fecal Coliform	EPA approved	Jane Creech 509-454-7860
Selah Ditch	Fecal Coliform Temperature	EPA approved	Greg Bohn 509-454-4174
Teanaway River segments: • Upper West Fork Teanaway River • Upper Middle Fork Teanaway River • Upper North Fork Teanaway River • Stafford Creek • Lower West Fork Teanaway River • Lower Middle Fork Teanaway River • Lower North Fork Teanaway River • Mainstem Teanaway River	Temperature	EPA approved	Jane Creech 509-454-7860
Wilson/Cooke Creek Tributaries: • Badger Creek • Bull Ditch • Caribou Creek • Cherry Creek • CID Canal • Coleman Creek • Cook Creek • EWC Canal • Johnson Drain • KRD Canal	Fecal Coliform	EPA approved Has an implementation plan Post-TMDL monitoring report	Jane Creech 509-454-7860 Greg Bohn 509-454-4174

• Mercer Creek • Naneum Creek • Parke Creek • Whiskey Creek • Wilson Creek • Wipple Wasteway			
Yakima River, Upper	Dieldrin DDT Suspended Sediments Turbidity	EPA approved	Jane Creech 509-454-7860
	Temperature	EPA approved Has an implementation plan	Jane Creech 509-454-7860
Yakima River	Toxics	Under development	Jane Creech 509-454-7860

**** Status** will be listed as one of the following: Approved by EPA, Under Development or Implementation. No status means project work has not yet started.*

For more information about WRIA 39:

- Waterbodies in WRIA 39 - using the Water Quality Assessment Query Tool
- Watershed Information for WRIA 39

* The Department of Ecology and other state resource agencies frequently use a system of 62 "Water Resource Inventory Areas" or "WRIAs" to refer to the state's major watershed basins.

Back to top of page

Last updated December 2016

Feedback?

About us
Director Maia Bellon
Tracking progress
Newsroom
Jobs
Staff only
Contact us

Publications & forms
Databases
Laws & rules
Public records disclosure
Public input & events
Environmental education
Sustainability information

中文 | Chinese
Tiếng Việt | Vietnamese
한국어 | Korean
Русский | Russian
Español | Spanish
Accessibility

Access Washington®
Welcome to the State of Washington

Copyright © Washington State Department of Ecology
Privacy Notice | Site Info | Accessibility | Contact the web team |

SHARE

APPENDIX F: KITTITAS COUNTY WETLAND BUFFER GUIDANCE

Chapter 17A.04
CRITICAL AREAS DESIGNATION AND DEVELOPMENT STANDARDS

Sections

17A.04.010 Wetlands.
17A.04.015 No net loss of wetland areas.
17A.04.020 Buffer width requirements.
17A.04.025 Wetland buffer ranges.
17A.04.030 Wetland buffer averaging.
17A.04.035 Natural condition of wetland buffer.
17A.04.040 Allowed uses.
17A.04.045 Building setback lines from wetland buffers.
17A.04.050 Wetland replacement ratios.

17A.04.010 Wetlands.
Wetlands in Kittitas County are defined in Section 17A.02.310 and classified in four categories: Category I (extreme high value), Category II (high value), Category III (average value), Category IV (less than average value). Critical area wetlands in Kittitas County are defined as Category I, Category II, Category III and Category IV wetlands as determined by the planning manager.

Category IV wetlands may be determined by the director to constitute a critical area based upon application of the criteria in this chapter. (Ord. 95-15 (part), 1995; Ord. 94-22 (part), 1994).

17A.04.015 No net loss of wetland areas.
Kittitas County shall require, to the extent practical, and except for Category IV wetlands, a zero net loss of natural wetlands functions and values together with, if reasonably possible through voluntary agreements or government incentives, a gain of wetlands in the long term. (Ord. 94-22 (part), 1994).

17A.04.020 Buffer width requirements.
Wetland buffer requirements apply to all nonexempt activities on regulated wetlands. All wetland buffers shall be measured from the wetland boundary.

Category	Size of Wetland	Required Buffer
I	any size	50 - 200 feet
II	over 2,000 sq. ft.	25 - 100 feet
III	over 10,000 sq. ft.	20 - 80 feet
IV*	43,560 sq. ft. (1 acre)	Building setbacks will be determined by the zoning lot line setbacks, but shall not exceed 25 feet.

*Includes only nonirrigation induced or enhanced Category IV wetlands. Irrigation water does influence ground water table elevations in Kittitas County.

(Ord. 96-14 (part), 1996; Ord. 95-15 (part), 1995; Ord. 94-22 (part), 1994).

17A.04.025 Wetland buffer ranges.
The wetland buffer ranges have been established to reflect the impact of certain intense land uses on wetland function and values. The director shall base the buffer size on the following criteria and shall establish the least restrictive width of buffer necessary to account for all of the following considerations:

1. The overall intensity of the proposed use;
2. The presence of threatened, endangered, or sensitive species;
3. The site's susceptibility to severe erosion;
4. The use of a buffer enhancement plan by the applicant which uses native vegetation or other measures which will enhance the functions and values of the wetland or buffer. (Ord. 94-22 (part), 1994).

17A.04.030 Wetland buffer averaging.
Wetland buffers may be modified by averaging buffer widths. Wetland buffer width averaging shall be allowed only where the applicant demonstrates that the following exists:

1. That averaging is necessary to avoid an extraordinary hardship to the applicant caused by circumstances peculiar to the property;
2. That the wetland contains variations in sensitivity due to existing physical characteristics;
3. That the proposed use would be located adjacent to areas where buffer width is reduced, and that such land uses are low in impact;
4. That width averaging will not adversely impact wetland function and values. (Ord. 9422 (part), 1994).

17A.04.035 Natural condition of wetland buffer.
Natural condition of wetland buffer. Wetland buffer areas shall be retained in their natural condition or may be improved to enhance buffer functions and values. Where buffer disturbance has occurred during construction, revegetation with native vegetation may be required. The Kittitas County noxious weed ordinance shall be adhered to. (Ord. 94-22 (part), 1994).

17A.04.040 Allowed uses.
In addition to exempt activities otherwise identified herein, the following activities are allowed to occur on wetland and wetland buffer areas: nonmotorized outdoor recreational activities including hunting and fishing; educational activities; existing and ongoing agricultural activities, silviculture and mining; and maintenance of existing facilities, structures, ditches, roads, bridges and other utility systems. Up to two acres of Class IV wetlands may be filled, drained or modified with no approval required from the planning manager. If more than two acres of Class IV wetlands are filled, drained or modified, approval of the planning manager is required. Such development activity shall provide mitigation in accordance with Section 17A.04.050 for that portion of the wetland fill or modification that exceeds two acres. Category IV wetlands may be used for secondary stormwater management facilities having no reasonable alternative on-site location, provided there is no significant adverse impact to the functions and values of those wetlands. (Ord. 95-15 (part), 1995; Ord. 94-22 (part), 1994).

17A.04.045 Building setback lines from wetland buffers.
A building setback line equal to the side yard setback requirement of the applicable zoning district is required from the edge of any wetland buffer. Minor intrusions into the area of the building setback may be allowed if the director determines that such intrusions will not negatively impact the wetland. The setbacks shall be shown on all site plans submitted with the application. (Ord. 94-22 (part), 1994).

17A.04.050 Wetland replacement ratios.
Wetland replacement ratios are expressed in gross area required for replacement. The actual replacement, enhancement or rehabilitation of wetlands shall be determined by the director and meet all applicable standards for such. Replacement areas shall be determined according to function, acreage, type, location, time factors, ability to be self sustaining and projected success. Wetland functions and values shall be calculated using the Kittitas County critical areas policy document and the professional judgment of the director.

Category of Wetland	**Replacement Ratio**
I	3:1
II	2:1
III	1.5:1
IV	1:1 for the portion of a wetland fill or modification

(Ord. 96-14 (part), 1996; Ord. 95-15 (part), 1995; Ord. 94-22 (part), 1994).

Appendix H-2: Fumaria Solar Project Cultural Resources Report



CULTURAL RESOURCES ASSESSMENT
FUMARIA SOLAR PROJECT
KITTITAS COUNTY, WASHINGTON

June 8, 2017

SWCA ENVIRONMENTAL CONSULTANTS
SEATTLE, WASHINGTON

This report has been redacted due to archaeological site confidentiality

Appendix H-3: Fumaria Solar Project Permit Applications

KITTITAS COUNTY
DEPARTMENT OF PUBLIC WORKS

ACCESS AND ADDRESS APPLICATION

Application for: ☐ **Address $100.00** ☐ **Access $270.00** **Payment Method:** ☐ **Check** _____ ☐ **Cash**
☒ **Access and Address $330.00**

Owner Name Reecer Creek Solar LLC **Permit #**_____
Mailing Address 6616 223rd Ave NE
Redmond, WA 98053
Phone Number 425-681-1205
Email Address jaypitt@microsoft.com

Applicant Name TUUSSO Energy, LLC
Mailing Address 500 Yale Ave North
Seattle, WA 98109
Phone Number 206-303-0198
Email Address jason.evans@tuusso.com

DATE STAMP

Request Access and/or Address for:

☐ Approved Subdivision ☐ Pending Subdivision ☐ Agricultural Access
☐ Single Family Dwelling ☐ Commercial Access ☐ Temporary Access
☒ Other Photovoltaic solar project

Number of Lots to be served by the Access: 1

Assessor's Map No.: 18-18-09000-0011

Plat Name N/A Lot N/A

Road Name of Access Location: Clarke Road

Distance and Direction to Nearest Intersection or Adjacent Address:
0.38 miles east of the Faust Rd Intersection

Desired Width of Driveway: 12 FT (Minimum Width Requirement is based on length of driveway)

CALL BEFORE YOU DIG 1-800-424-5555 OR 811

Applicant is responsible for calling for underground utility locates 48 hours prior to construction.

☒ **I have attached a site map with details on the access, driveway and any buildings (existing or proposed).**
☒ **Applicant will stake along right-of-way to mark desired location of access.**
☒ **Applicant agrees to perform the work in compliance with the Kittitas County Road Standards and the requirements on the Access Permit.**
☒ **Applicant certifies that the access applied for is only for the purpose indicated.**

Applicant declares he/she is the owner or owner's agent of the real property whose access is under construction.
Applicant Signature _____ Date _____

Reviewers Notes:

NEW ADDRESS: _____

CITY: _____ ZIP: _____

☐ PRIVATE ROAD CERTIFICATION REQUIRED PRIOR TO_____

ACCESS REQUIREMENTS PRIOR TO BUILDING PERMIT:

☐ PAVED APRON REQUIRED – WSDOT DESIGN STANDARDS
☐ CULVERT REQUIRED-MUST BE BEDDED ON A MINIMUM OF 4" OF 5/8 GRAVEL OR EQUIVALENT
-Minimum Culvert Diameter: _____ Inches
-Minimum Beveled End Length: _____ Feet
-Total Culvert Length: _____ Feet
-Minimum Cover of: _____ Inches
☐ 4:1 BEVELS REQUIRED ON CULVERT ENDS
☐ CONSTRUCT APRON(FIRST 20 FEET) WITH NO MORE THAN 6% GRADE
☐ COMPACTED GRAVEL SURFACE LAYER REQUIRED
☐ 10 FOOT TURNING RADIUS ON APRON
☐ SIDE SLOPES OFF OF APRON NOT TO EXCEED A 4:1 SLOPE

☐ PERMIT EXPIRES ON: _____

DRIVEWAY REQUIREMENTS PRIOR TO OCCUPANCY PERMIT:

☐ DRIVEWAY NOT TO EXCEED 15% GRADE
☐ DRIVEWAYS LESS THAN 150 FEET IN LENGTH TO BE A MINIMUM OF 12 FEET WIDE WITH COMPACTED GRAVEL SURFACE LAYER
☐ DRIVEWAYS LONGER THAN 150 FEET IN LENGTH TO BE A MINIMUM OF 16 FEET WIDE WITH COMPACTED GRAVEL SURFACE LAYER
☐ DRIVEWAY SET BACK OF 5 FEET FROM SIDE PROPERTY BOUNDARIES
☐ SIDE SLOPE OFF DRIVEWAY SURFACE LAYER NOT TO EXCEED A 2:1 SLOPE

NOTES: _____

_____

_____

_____

_____

_____

_____

_____

_____

Reviewers Signature Title Date

_____

411 N. Ruby St. Suite 1
Ellensburg, WA 98926
TEL (509) 962-7523
FAX (509) 962-7663

TUUSSO ENERGY - FUMARIA SITE

A PORTION OF THE SE ¼ OF SECTION 9, T. 18 N., R. 18 E., W.M.

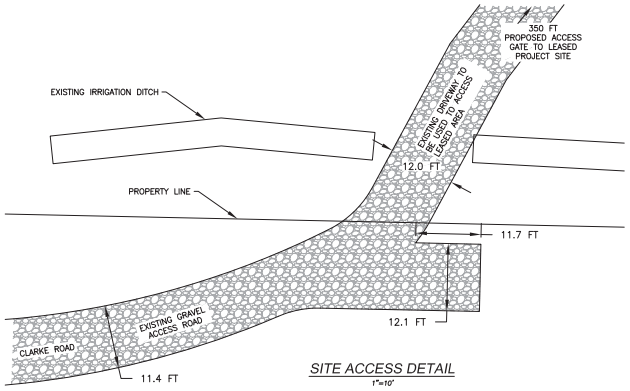
KITTITAS COUNTY, STATE OF WASHINGTON

NORTH

0S 25 50 100

SCALE 1" = 100'





SITE ACCESS DETAIL

1"=10'

PROPERTY INFORMATION:

APPLICANT:	TUUSSO ENERGY, LLC 500 YALE AVE SEATTLE, WA 98109
PARCEL NUMBER:	14033
PARCEL SIZE:	38.99 ACRES
TRACT 1A SIZE:	35.24 ACRES (SITE)
TRACT 2A SIZE:	3.75 ACRES
PROPERTY ADDRESS:	TBD ELLENSBURG, WA 98926
ZONE:	AGRICULTURAL
IRRIGATION DISTRICT:	KITTITAS RECLAMATION DISTRICT

REVISIONS		
DESCRIPTION	BY	DATE

© THE PLANS SET FORTH ON THIS SHEET ARE AND SHALL REMAIN THE PROPERTY OF ENCOMPASS ENGINEERING & SURVEYING, INC.

NOT FOR CONSTRUCTION

TUUSSO ENERGY, LLC

FUMARIA SITE

ACCESS SITE PLAN

Encompass
ENGINEERING & SURVEYING
Western Washington Division
165 NE Juniper Street, Suite 201 ■ Issaquah, WA 98027 ■ Phone (425) 392-0250 ■ Fax (425) 391-3055
Eastern Washington Division
407 Swiftwater Blvd. ■ Cle Elum, WA 98922 ■ Phone (509) 674-7433 ■ Fax (509) 674-7419

JOB NO.	17016
DATE	July 2017
SCALE	AS SHOWN
DESIGNED	SF
DRAWN	SF
CHECKED	TML
APPROVED	TML
SHEET	EX-1

H-3-3

KITTITAS COUNTY
COMMUNITY DEVELOPMENT SERVICES
411 NORTH RUBY STREET SUITE #2 ■ ELLENSBURG, WA 98926
PHONE (509) 962-7506 ■ FAX (509) 962-7682

General Application for Construction

Assessor Map Number:	Official Use Only:
(Use http://www.co.kittitas.wa.us/assessor/property.asp if needed) Example 21-12-35000-0021 1 7 - 1 9 - 1 8 0 4 0 - ___ ___ ___ ___	**Permit #:**
Short Plat/ Subdivision: / Lot #:	**Date Applied:**
	Intake:

Site Address: 4561 No. 6 Road and 2100 Tjossem Road, Ellensburg, WA 98926			
Project Description/ Nature of Work: Camas 5-MW Solar Project		~~Square Foot~~ Total:	
Specific Use of Structure: To generate renewable electricity		No. of Bedrooms: 0	
Heating System Type & Location: N/A	Heating System Fuel Type: N/A	Fireplace Fuel Type: N/A	Hot Water Location & Fuel: N/A
☐ New Residential ☐ Residential Alteration ☐ Residential Addition ☐ Foundation	☐ New Commercial ☐ Commercial Alteration ☐ Commercial Addition ☐ Tenant Improvement	☐ Multi-Family ☐ Demolition ☐ Mobile Home ☐ Accessory Building	☐ Accessory Building Alteration ☐ Agricultural Building ■ Other New Industrial

PROPERTY OWNER:	Valley Land Company, LLC	Day Phone: 509-962-2840
Mailing Address:	1585 Tjossem Road	
City, State, ZIP:	Ellensburg, WA 98926	
E-mail:	jbrunson@fairpoint.net	Cell Phone: 509-899-2840
CONTRACTOR:		Day Phone:
Contact:		
Address, City, State, ZIP:		
E-mail:		Cell Phone:
Contractor License #:		Expiration Date:
ARCHITECT/ ENGINEER/ DESIGNER:		Day Phone:
Contact:		
Address, City, State, ZIP:		
E-mail:		Cell Phone:
Professional License No.:		Expiration Date:

APPLICANT/ AGENT:	Jason Evans	Day Phone: 206-708-6055
Company (if any):	TUUSSO Energy LLC	
Address, City, State, ZIP:	500 Yale Avenue North, Seattle, WA 98109	
E-mail:	Jason.evans@tuusso.com	Cell Phone: 206-303-0198

This Section To Be Completed For Construction Permits Only

Pursuant to RCW 19.27.095 (2)(i-ii) The requirements for a fully completed construction application shall include:

i. The name, address, and phone number of the office of the lender administering the interim construction financing, if any: OR

ii. The name and address of the firm that has issued a payment bond, if any, on behalf of the prime contractor for the protection of the owner, if the bond is for an amount not less than 50% of the total amount of the construction project.

If for any reason the information requested below is not available at the time of application, the applicant shall provide the information as soon as it can be reasonably be obtained.

☐ Lending Agency Name: Phone:

Mailing Address: City: State: ZIP:

☐ I acknowledge by checking this box that this project has no lending agency for construction financing.

☐ Bonding Agency Name: Phone:

Mailing Address: City: State: ZIP

☐ I acknowledge by checking this box that this project has no bonding agency.

If you are the Owner and Acting As Your Own Contractor, please complete the following declaration:

I acknowledge that I am applying for a construction permit through the Kittitas County Community Development Services. I also acknowledge that I *am* not a licensed contractor, specialty or general, or that I am not acting as a contractor and wish to be exempt from the requirements of the Washington State Contractor's Act, per RCW 18.27.090, and will abide by all provisions and conditions of the exemption as stated. I agree that if I use the assistance of any person(s) to provide labor and/or assistance, I will retain only contractors registered and currently licensed as required under the laws of the State of Washington.

I (print name) _____ certify under penalty of perjury under the laws of the State of Washington that the foregoing is true and correct.

Owner Signature: _____ Date: _____

1. All permits shall expire by limitation and be declared void if any one of the following apply:
   a. Work is not started within 365 days of obtaining a permit.
   b. Work is abandoned for 365 days or more after beginning work.
   c. An inspection and approval of work completed has not been performed by Kittitas County Community Development Services for 365 days.
2. The building permit card and approved construction plans shall be kept on the site of work until completion of the project.
3. It shall be the duty of the permit holder or their agent to notify the building official that such work is ready for inspection. It shall by the duty of the person requesting any inspections required by code to provide access to and means for inspection of such work. Work shall not be done beyond the point indicated in each successive inspection without first obtaining the approval of the building official. Any portion that does not comply shall be corrected and such portion shall not be covered or concealed until authorized by the building official.
4. No building or structure shall be used or occupied, and no change in the existing occupancy classification of a building or structure or portion thereof shall be made until the building official has issued a Certificate of Occupancy.
5. Work shall be installed in accordance with the approved construction documents, and any changes made during construction that are not in compliance with the approved construction documents shall be resubmitted for approval as an amended set of construction documents.

I hereby acknowledge that I have read this application and certify under penalty of perjury under the laws of the State of Washington that the above answers are true and complete to the best of my knowledge. I agree to comply with all current codes, laws, regulations and permit requirements related to this project. I hereby certify that I will pay all fees as required by law, including any applicable review fees if I do not purchase the permit. I further agree to, and hereby grant to Kittitas County Community Development Services and Department of Public Works a right to enter onto the premises as described for this permit application, for the purpose of making such inspections and tests as may be required. By signing this application, the Owner certifies that they are the legal owner of the property. All permit fees are non-refundable.

Owners Signature: (Required)		Authorized Agent Signature:	
Print Name:		Print Name:	
Date:		Date:	

Tuusso Energy: Fumaria Solar Project

NOI Application

September 5, 2017

SECTION 1. CONTACT INFO

Contact Information Section Help

This Notice of Intent application requires the following contact types: **Permittee, Site Owner, and Site Contact**. Please use the table below to fill in your required contacts. You may add additional contact types that are not pre-listed.

Note: Please remember you are responsible for notifying the Department of Ecology when your contact information changes.

Contact Type	First Name	Last Name	Organization Name	Action
Permittee	Jason	Evans	Tuusso Energy, LLC	Edit - Remove
Site Contact	Jason	Evans	Tuusso Energy, LLC	Edit - Remove
Site Owner	Jay	Pittenger	Reecer Creek Solar LLC	Edit - Remove

Your mailing address will be standardized against the postal service (USPS) mailing database when you click on the "Update" button. Verfication may be necessary.

Honorific: ▼ **Contact Type:** Permittee

First Name: Jason **Last Name:** Evans

Organization Name: Tuusso Energy, LLC Title:

Mailing Address: 500 Yale Ave N

Country: UNITED STATES ▼

City: Seattle **State:** WA ▼ **Zip:** 98109 - 5680

Email Address: jason.evans@tuusso.com

Business Phone: 206 - 708 - 6055 Ext. Fax Number: - -

Cell Phone: 206 - 303 - 0198 UBI Number:

Copy From... My Profile ▼ Save Contact Cancel

Your mailing address will be standardized against the postal service (USPS) mailing database when you click on the "Update" button. Verfication may be necessary.

Honorific: ▼ **Contact Type:** Site Owner

First Name: Jay **Last Name:** Pittenger

Organization Name: Reecer Creek Solar LLC Title:

Mailing Address: 6616 223rd Ave NE

Country: UNITED STATES ▼

City: Redmond **State:** WA ▼ **Zip:** 98053 - 2396

Email Address: jaypitt@microsoft.com

Business Phone: 425 - 681 - 1205 Ext. Fax Number: - -

Cell Phone: - - UBI Number:

Copy From... My Profile ▼ Save Contact Cancel

SECTION 2. FACILITY/SITE INFO

Facility/Site Information

Section Help

Your facility address will be standardized against the postal service (USPS) mailing database when you click on the "Select facility from map" link. Verfication may be necessary.

This Facility/Site's Ownership Type is: Private

Facility/Site Name: Fumaria Solar Project

Street Address:

City: Zip: 98926

Or

If the site lacks a street address, list its specific location. Example: Intersection of Highway 61 and 34.

Location Description: TBD (near 2130 Clarke Rd), Ellensburg, WA 98926

Find my facility/site on a map

Please use the pop up map to complete the latitude, longitude and county information below. Use the pencil tool on the map to locate your facility at the front door or site entrance. *(The map may take a second to pop up.)*

Select facility/site from map

Latitude: 47.058166 **Longitude:** -120.583634 **County:** Kittitas

SECTION 3. SITE/PROJECT INFO

Project Information

Section Help

Type of Construction Activity: *(check all that apply)*

☐ Highway or Road (city, county, state) ☐ Residential ☐ Commercial ☐ Industrial

☐ Utilities ☑ Other *(specify):* photovoltaic solar panel s

Project/Site Size: 35.24 acres

The total size of the project site in acres. This is all land that is owned or controlled by the permittee.

Soil Disturbance Size: 35 acres

Total area of soil disturbance for your site/project over the life of the project. Include grading, equipment staging, excavation, borrow pit, material storage areas, dump areas, haul roads, side-cast areas, off-site construction support areas, and all other soil disturbance acreage associated with the project. (Note: 1 acre = 43,500 ft²).

Estimated Project Start Date: 4/1/2018

Estimated Project End Date: 10/31/2018

Will 1,000 cubic yards or more of poured concrete or recycled concrete be used over the life of the project? ○ Yes ◉ No

Site Conditions

Are you aware of contaminated soils present on the site? ○ Yes ◉ No

Are you aware of groundwater contamination located within the site boundary? ○ Yes ◉ No

Other Permits

Please enter other permits issued by Water Quality for this site.

Permit Number	Action
	Add

SECTION 4. DISCHARGE LOCATION

Discharge Location/Outfall Information

Section Help

Will water discharge directly or indirectly (through a storm drain system or roadside ditch) into one or more surface waterbodies (wetlands, creeks, lakes, and all other surface waters and water courses)?

No, no discharge to surface waters (100% infiltration) ▼

If your project includes dewatering, you must include dewatering plans and discharge locations in your site Stormwater Pollution Prevention Plan.

Location of Discharge into Surface Waterbody (Outfall Location)

Select the waterbody location (outfall) on the pop up map where the site has the potential to discharge into a waterbody (enter all locations). If you have 100% infiltration, you must select where the infiltration point is as your outfall. *(The map may take a second to pop up.)*

Outfall Number	Outfall Name	Lat/Long	Action
1	Infiltration	47.05817/-120.583629	Edit - Remove

SECTION 5. NOI INFORMATION

Stormwater Pollution Prevention Plan (SWPPP)

You must develop a SWPPP prior to starting construction. Do **not** submit your SWPPP with your application. The exception is that Ecology may request a copy of all or part of your SWPPP if you answered yes to the questions under the Site Conditions heading on the Site/Project Info tab.

☑ I have read and agree to the information above

Best Management Practices (BMPs)

You must use the BMPs listed in the Stormwater Management Manual for Western Washington or the Stormwater Management Manual for Eastern Washington or other manuals approved by Ecology. Alternatively, you may use demonstrably equivalent BMPs on the basis of permit condition S9.C.4. If you intend to use a BMP at your site that is not included in these manuals, but that you believe meets the definition of a demostrably equivalent BMP, you must notify the appropriate regional office. (See Definitions in the Construction Stormwater General Permit).

Note that if you receive permit coverage without indicating the preference for a demostrably equivalent BMP and later decide to use one, you must provide Ecology with notice of the selection of an equivalent BMP no less than 60 days before the intended use of the equivalent BMP.

http://www.ecy.wa.gov/programs/wq/stormwater/construction/contacts.html

☑ I have read and agree to the information above

SECTION 6. DMR

Discharge Monitoring Reports (DMRs)

Permittees must submit monitoring data using Ecology's WQWebDMR program.

To sign up for WQWebDMR, or to register a new site, go to http://www.ecy.wa.gov/programs/wq/permits/paris/webdmr.html. If you are unable to submit your DMRs electronically, you may contact Ecology to request a waiver. Ecology will generally only grant waiver requests to those permittees without internet access. Only a permittee or representative, designated in writing, may request access to or a waiver from WQWebDMR. If you have questions on this process, contact Ecology's WQWebDMR staff at WQWebPortal@ecy.wa.gov or 1-800-633-6193, Option 3 (toll free).

☑ I have read and agree to the information above

SECTION 7. SEPA

State Environmental Policy Act (SEPA)

Section Help

This Notice of Intent (NOI) is incomplete and cannot be approved until the applicable SEPA requirements under Chapter 197-11 WAC are met.

Who is the SEPA lead agency on your site? Energy Facility Site Evaluation Council

Has the SEPA lead agency issued a final decision on your checklist? ○ No ○ Yes ○ Exempt

More SEPA information is available at: http://www.ecy.wa.gov/programs/sea/sepa/e-review.html

SECTION 8. PUBLIC NOTICE

Public Notice

Section Help

You must publish a public notice at least **once** a week for **two** consecutive weeks with **seven days** between publications, in at least a **single** newspaper of general circulation in the county in which the construction is to take place. Ecology cannot grant permit coverage sooner than the end of the 30-day public comment period, which begins on the date of the **second** public notice.

You may choose to use a system generated public notice and download it below. If not, you need to upload the public notice used.

- (•) I will use the system generated public notice document
- ( ) I will upload my own public notice

```
Tuusso Energy, LLC, Jason Evans, 500 Yale Ave N Seattle, WA 98109, is seeking coverage under
the Washington State Department of Ecology's Construction Stormwater NPDES and State Waste
Discharge General Permit.
The proposed project, Fumaria Solar Project, is located at  TBD (near 2130 Clarke Rd),
Ellensburg, WA 98926 in  in Kittitas county.
This project involves 35 acres of soil disturbance for Other (photovoltaic solar panel site)
construction activities.
All discharges and runoff goes to ground water.
Any persons desiring to present their views to the Washington State Department of Ecology
regarding this Application, or interested in Ecology's action on this Application, may notify
Ecology in writing no later than 30 days of the last date of publication of this notice.
Ecology reviews public comments and considers whether discharges from this project would
cause a measurable change in receiving water quality, and, if so, whether the project is
necessary and in the overriding public interest according to Tier II antidegradation
requirements under WAC 173-201A-320.

Comments can be submitted to:
Department of Ecology
Attn: Water Quality Program, Construction Stormwater
P.O. Box 47696, Olympia, WA 98504-7696
```

Clicking the text will copy it to your clipboard, if allowed. Open notice in a new window for printing.

To add a public notice to your application, select the newspaper name and enter your public notice dates, then click on the "Add" link. If you do not click the "Add" link, the public notice entry will be lost.

Note: This system does not publish your public notice in the newspaper for you. You must submit your public notice text to your selected newspaper.

Newspaper Name	First Notice	Second Notice	Action
Ellensburg - Daily Record ▼	*	*	Add

* First notice date is required.
* Second notice date is required.

SECTION 9. QUESTIONS

For Questions...

Please contact the following staff per your construction site's location.

If your construction site is located in:	Contact the following staff:
City of Seattle, Kitsap, Pierce, or Thurston County	Josh Klimek 360-407-7451 josh.klimek@ecy.wa.gov
Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Skagit, Snohomish, Spokane, Stevens, Walla Walla, Whatcom, or Whitman County	Shawn Hopkins 360-407-6442 shawn.hopkins@ecy.wa.gov
Benton, Chelan, Clallam, Clark, Cowlitz, Douglas, Grays Harbor, Jefferson, Kittitas, Klickitat, Lewis, Mason, Okanogan, Pacific, Skamania, Wahkiakum, or Yakima County	Joyce Smith 360-407-6858 joyce.smith@ecy.wa.gov
Island, King, or San Juan County	RaChelle Stane 360-407-6556 rachelle.stane@ecy.wa.gov

Tuusso Energy, LLC, Jason Evans, 500 Yale Ave N Seattle, WA 98109, is seeking coverage under the Washington State Department of Ecology's Construction Stormwater NPDES and State Waste Discharge General Permit.

The proposed project, Fumaria Solar Project, is located at TBD (near 2130 Clarke Rd), Ellensburg, WA 98926 in Kittitas county.

This project involves 35 acres of soil disturbance for Other (Solar Panel Farm) construction activities.

All discharges and runoff goes to ground water.

Any persons desiring to present their views to the Washington State Department of Ecology regarding this application, or interested in Ecology's action on this application, may notify Ecology in writing no later than 30 days of the last date of publication of this notice. Ecology reviews public comments and considers whether discharges from this project would cause a measurable change in receiving water quality, and, if so, whether the project is necessary and in the overriding public interest according to Tier II antidegradation requirements under WAC 173-201A-320.

Comments can be submitted to:

Department of Ecology

Attn: Water Quality Program, Construction Stormwater

P.O. Box 47696, Olympia, WA 98504-7696

Construction Stormwater General Permit

Stormwater Pollution Prevention Plan (SWPPP)

for

Tuusso Energy: Fumaria Solar Project

Prepared for:

The Washington State Department of Ecology

Central Regional Office

Permittee / Owner	Developer	Operator / Contractor
Tuusso Energy LLC	Jason Evans	TBD

TBD (Near 2130 Clarke Rd), Ellensburg, WA 98926

Certified Erosion and Sediment Control Lead (CESCL)

Name	Organization	Contact Phone Number
TBD	TBD	TBD

SWPPP Prepared By

Name	Organization	Contact Phone Number
Sarah Foster, EI	Encompass Engineering & Surveying	(509)-674-7433

SWPPP Preparation Date

July 28, 2017

Project Construction Dates

Activity / Phase	Start Date	End Date
Phase 1	4/1/2018	10/31/2018

Table of Contents

1 Project Information 5
1.1 Existing Conditions 5
1.2 Proposed Construction Activities 5
2 Construction Stormwater Best Management Practices (BMPs) 7
2.1 The 13 Elements 7
2.1.1 Element 1: Preserve Vegetation / Mark Clearing Limits 7
2.1.2 Element 2: Establish Construction Access 7
2.1.3 Element 3: Control Flow Rates 8
2.1.4 Element 4: Install Sediment Controls 9
2.1.5 Element 5: Stabilize Soils 9
2.1.6 Element 6: Protect Slopes 9
2.1.7 Element 7: Protect Drain Inlets 10
2.1.8 Element 8: Stabilize Channels and Outlets 10
2.1.9 Element 9: Control Pollutants 11
2.1.10 Element 10: Control Dewatering 12
2.1.11 Element 11: Maintain BMPs 13
2.1.12 Element 12: Manage the Project 13
2.1.13 Element 13: Protect Low Impact Development (LID) BMPs 14
3 Pollution Prevention Team 15
4 Monitoring and Sampling Requirements 16
4.1 Site Inspection 16
4.2 Stormwater Quality Sampling 16
4.2.1 Turbidity Sampling 16
4.2.2 pH Sampling 18
5 Discharges to 303(d) or Total Maximum Daily Load (TMDL) Waterbodies 19
5.1 303(d) Listed Waterbodies 19
5.2 TMDL Waterbodies 19
6 Reporting and Record Keeping 20
6.1 Record Keeping 20
6.1.1 Site Log Book 20
6.1.2 Records Retention 20
6.1.3 Updating the SWPPP 20
6.2 Reporting 21
6.2.1 Discharge Monitoring Reports 21
6.2.2 Notification of Noncompliance 21

List of Tables

Table 1 – Summary of Site Pollutant Constituents **5**
Table 2 – Pollutants **11**
Table 3 – pH-Modifying Sources **11**
Table 4 – Dewatering BMPs **12**
Table 5 – Management **14**
Table 7 – Team Information **15**
Table 8 – Turbidity Sampling Method **16**
Table 9 – pH Sampling Method **18**

List of Appendices

Appendix/Glossary

A. Site Map
B. BMP Details
C. Correspondance

CorrespondenceD. Site Inspection Form

Site Inspection Form E. Construction Stormwater General Permit

F. 303(d) List Waterbodies / TMDL Waterbodies Information

G. Contaminated Site Information

Contaminated Site Information H. Engineering Calculations

List of Acronyms and Abbreviations

Acronym / Abbreviation	Explanation
303(d)	Section of the Clean Water Act pertaining to Impaired Waterbodies
BFO	Bellingham Field Office of the Department of Ecology
BMP(s)	Best Management Practice(s)
CESCL	Certified Erosion and Sediment Control Lead
CO_2	Carbon Dioxide
CRO	Central Regional Office of the Department of Ecology
CSWGP	Construction Stormwater General Permit
CWA	Clean Water Act
DMR	Discharge Monitoring Report
DO	Dissolved Oxygen
Ecology	Washington State Department of Ecology
EPA	United States Environmental Protection Agency
ERO	Eastern Regional Office of the Department of Ecology
ERTS	Environmental Report Tracking System
ESC	Erosion and Sediment Control
GULD	General Use Level Designation
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Units
NWRO	Northwest Regional Office of the Department of Ecology
pH	Power of Hydrogen
RCW	Revised Code of Washington
SPCC	Spill Prevention, Control, and Countermeasure
su	Standard Units
SWMMEW	Stormwater Management Manual for Eastern Washington
SWMMWW	Stormwater Management Manual for Western Washington
SWPPP	Stormwater Pollution Prevention Plan
TESC	Temporary Erosion and Sediment Control
SWRO	Southwest Regional Office of the Department of Ecology
TMDL	Total Maximum Daily Load
VFO	Vancouver Field Office of the Department of Ecology
WAC	Washington Administrative Code
WSDOT	Washington Department of Transportation
WWHM	Western Washington Hydrology Model

1 Project Information

Project/Site Name: Fumaria Solar Project
Street/Location: TBD (Near 2130 Clarke Rd)
City: Ellensburg State: WA Zip code: 98926
Subdivision: NA
Receiving waterbody: Privately owned, existing irrigation pond

1.1 Existing Conditions

Total acreage (including support activities such as off-site equipment staging yards, material storage areas, borrow areas).

Total acreage: 35.24
Disturbed acreage: 35.00
Existing structures: 0
Landscape topography: Gently sloped grassland, generally to the southeast. A small portion of the western edge is steep and slopes to the west.
Drainage patterns: Flows generally south/southeast
Existing Vegetation: Range/grassland
Critical Areas (wetlands, streams, high erosion risk, steep or difficult to stabilize slopes): Irrigation ditch along southern boundary

List of known impairments for 303(d) listed or Total Maximum Daily Load (TMDL) for the receiving waterbody: None

Table 1 includes a list of suspected and/or known contaminants associated with the construction activity.

No known contaminants on site or associated with construction activity.

Table 1 – Summary of Site Pollutant Constituents

Constituent (Pollutant)	Location	Depth	Concentration
NA	NA	NA	NA

1.2 Proposed Construction Activities

Description of site development (example: subdivision):
Photovoltaic solar facility project site with all weather-access roads, inverter stations, and modular trackers with solar panels.

Description of construction activities (example: site preparation, demolition, excavation):

1. Pre-construction meeting
2. Grade and install construction entrance
3. Install perimeter protection

4. Grade and stabilize construction roads
5. Install vibratory driven H piles for wide flange steel beams
6. Install electrical underground and mechanical trackers
7. Install panels
8. Perform any required site restoration.

Description of site drainage including flow from and onto adjacent properties. Must be consistent with Site Map in Appendix A:
Flows from stormwater are principally infiltrated on-site. Any excess runoff from the site during large storm events will follow the existing natural ground slope towards the south of the site. The flow will exit the site via the southeast corner in an existing irrigation ditch and enter an existing irrigation pond.

Description of final stabilization (example: extent of revegetation, paving, landscaping):
Existing vegetation will be preserved as much as possible during construction. For any disturbed areas, they will be revegetated with native vegetation.

Contaminated Site Information:
Proposed activities regarding contaminated soils or groundwater (example: on-site treatment system, authorized sanitary sewer discharge):
No contamination is known to be on site.

2 Construction Stormwater Best Management Practices (BMPs)

The SWPPP is a living document reflecting current conditions and changes throughout the life of the project. These changes may be informal (i.e., hand-written notes and deletions). Update the SWPPP when the CESCL has noted a deficiency in BMPs or deviation from original design.

2.1 The 13 Elements

2.1.1 Element 1: Preserve Vegetation / Mark Clearing Limits

List and describe BMPs:

BMP C101: Preserving Natural Vegetation

Natural vegetation will be preserved throughout the site except for those areas requiring grading or incidentally disturbed during construction. Natural vegetation will also be preserved on the small steep slope on the western edge of the site.

Installation Schedules: TBD

Inspection and Maintenance plan: TBD

Responsible Staff: TBD

BMP C102: Buffer Zones

Buffer zones will be established at the limits of the proposed facility to protect existing wetlands and relieve downstream impacts. Existing vegetation will be maintained within the buffer zones throughout construction.

Installation Schedules: TBD

Inspection and Maintenance plan: TBD

Responsible Staff: TBD

2.1.2 Element 2: Establish Construction Access

List and describe BMPs:

BMP C105 – Stabilized Construction Enterance

A single, stabilized construction entrance will be provided at the entrance to the leased land. It will be off of the private driveway that comes off the end of Clarke Rd where vehicles will be entering/exiting, in order to prevent tracking out from the site.

Installation Schedules: TBD

Inspection and Maintenance plan: TBD

Responsible Staff: TBD

2.1.3 Element 3: Control Flow Rates

Will you construct stormwater retention and/or detention facilities?
☐ Yes ☒ No

Will you use permanent infiltration ponds or other low impact development (example: rain gardens, bio-retention, porous pavement) to control flow during construction?
☐ Yes ☒ No

Project will not impair or alter downstream conveyance systems. Full dispersion on site will be used to account for increased flows due to proposed impervious areas. Per Chapter 2.2.6 of the SWMMEW there are exemptions for new development when flow control is not required as long as certain conditions are met. Per exemption 1, “Any project able to disperse, without discharging to surface waters, the total 25-year runoff volume for the proposed development condition” is exempt from meeting the flow control requirements. The Fumaria project will use full dispersion as the main way to handle increased flows due to impervious areas. As outlined in SWMMEW Chapter 6.5, BMP F6.42, full dispersion allows up to 10% of the site that is impervious to be characterized as non-effective impervious area by dispersing runoff into the native vegetation area. On the Fumaria site, the impervious areas may conservatively make up to 4.9% of the site while the rest of the site will maintain the existing vegetation or plantings similar to existing vegetation. This is under the 10% threshold, making full dispersion a viable option.

List and describe BMPs:

BMP F6.42- Full dispersion: Runoff from impervious areas with in the site will be dispersed within the site utilizing the native vegetation.

BMP C102 – Buffer Zones (See Element 1)

BMP C233 – Silt Fence will also control flow rates from the site during construction (See Element 4).

Installation Schedules: TBD

Inspection and Maintenance plan: TBD

Responsible Staff: TBD

2.1.4 Element 4: Install Sediment Controls

List and describe BMPs:

BMP C233- Silt Fence: Silt Fence will surround the site at all areas downslope of all disturbed areas and will be placed upslope of any existing water bodies.The silt fence will also serve to mark the clearing limits per Element 1 above.

Installation Schedules: TBD

Inspection and Maintenance plan: TBD

Responsible Staff: TBD

2.1.5 Element 5: Stabilize Soils

The Central Basin*, East of the Cascade Mountain Crest

Season	Dates	Number of Days Soils Can be Left Exposed
During the Dry Season	July 1 – September 30	30 days
During the Wet Season	October 1 – June 30	15 days

*Note: The Central Basin is defined as the portions of Eastern Washington with mean annual precipitation of less than 12 inches.

Soils must be stabilized at the end of the shift before a holiday or weekend if needed based on the weather forecast.

Anticipated project dates: Start date: 04/01/2018 End date: 10/31/2018

Will you construct during the wet season?
☒ Yes ☐ No

List and describe BMPs:

BMP C123- Plastic Covering: Plastic covering will be used as necessary to protect any soil stockpiles that are produced from construction activity.

Installation Schedules: TBD

Inspection and Maintenance plan: TBD

Responsible Staff: TBD

2.1.6 Element 6: Protect Slopes

Will steep slopes be present at the site during construction?
☐ Yes ☒ No

The majority of the site is relatively flat and is not expected to require protection for slopes. There is one small portion of land on the western edge of the site with a steep slope, which will remain undisturbed for the duration of the project.

List and describe BMPs: None

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

2.1.7 Element 7: Protect Drain Inlets

There are no storm drain inlets on the site.

List and describe BMPs: None

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

2.1.8 Element 8: Stabilize Channels and Outlets

Provide stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent stream banks, slopes, and downstream reaches, will be installed at the outlets of all conveyance systems.

As mentioned previously in Element 3, full dispersion will be in effect at the project site and off-site runoff will be minimal. Due to this there will be no on-site conveyance channels or outlets to account for.

List and describe BMPs: None

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

2.1.9 Element 9: Control Pollutants

The following pollutants are anticipated to be present on-site: No known pollutants are present on-site.

Table 2 – Pollutants

Pollutant (List pollutants and source, if applicable)
NA

List and describe BMPs: None

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

Will maintenance, fueling, and/or repair of heavy equipment and vehicles occur on-site?
☒ Yes ☐ No

Contractor is required to keep a spill kit on site and use spill prevention measures throughout the construction process, in order to address any potential fuel spills or equipment breakdowns.

List and describe BMPs: None

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

Will wheel wash or tire bath system BMPs be used during construction?
☐ Yes ☒ No

List and describe BMPs: Wheel wash is not proposed at this time; however, if construction activities are such that sediment may be tracked with tires off-site a wheel wash will be used and any wastewater generated would be disposed at a local permitted facility.

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

Will pH-modifying sources be present on-site?
☐ Yes ☒ No If yes, check the source(s).

Table 3 – pH-Modifying Sources

☒	None

☐	Bulk cement
☐	Cement kiln dust
☐	Fly ash
☐	Other cementitious materials
☐	New concrete washing or curing waters
☐	Waste streams generated from concrete grinding and sawing
☐	Exposed aggregate processes
☐	Dewatering concrete vaults
☐	Concrete pumping and mixer washout waters
☐	Recycled concrete
☐	Recycled concrete stockpiles
☐	Other (i.e., calcium lignosulfate) [please describe:]

List and describe BMPs: None

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

Concrete trucks must not be washed out onto the ground, or into storm drains, open ditches, streets, or streams. Excess concrete must not be dumped on-site, except in designated concrete washout areas with appropriate BMPs installed.

Will uncontaminated water from water-only based shaft drilling for construction of building, road, and bridge foundations be infiltrated provided the wastewater is managed in a way that prohibits discharge to surface waters?
☐ Yes ☒ No

List and describe BMPs: None

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

2.1.10 Element 10: Control Dewatering

No dewatering is proposed or expected to occur as part of the project.

Table 4 – Dewatering BMPs

☐	Infiltration
☐	Transport off-site in a vehicle (vacuum truck for legal disposal)
☐	Ecology-approved on-site chemical treatment or other suitable treatment technologies
☐	Sanitary or combined sewer discharge with local sewer district approval (last resort)

☐	Use of sedimentation bag with discharge to ditch or swale (small volumes of localized dewatering)

List and describe BMPs: None

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

2.1.11 Element 11: Maintain BMPs

All temporary and permanent Erosion and Sediment Control (ESC) BMPs shall be maintained and repaired as needed to ensure continued performance of their intended function.

Maintenance and repair shall be conducted in accordance with each particular BMP specification (see *Volume II of the SWMMWW or Chapter 7 of the SWMMEW*).

Visual monitoring of all BMPs installed at the site will be conducted at least once every calendar week and within 24 hours of any stormwater or non-stormwater discharge from the site. If the site becomes inactive and is temporarily stabilized, the inspection frequency may be reduced to once every calendar month.

All temporary ESC BMPs shall be removed within 30 days after final site stabilization is achieved or after the temporary BMPs are no longer needed.

Trapped sediment shall be stabilized on-site or removed. Disturbed soil resulting from removal of either BMPs or vegetation shall be permanently stabilized.

Additionally, protection must be provided for all BMPs installed for the permanent control of stormwater from sediment and compaction. BMPs that are to remain in place following completion of construction shall be examined and restored to full operating condition. If sediment enters these BMPs during construction, the sediment shall be removed and the facility shall be returned to conditions specified in the construction documents.

2.1.12 Element 12: Manage the Project

The project will be managed based on the following principles:

- Projects will be phased to the maximum extent practicable and seasonal work limitations will be taken into account.
- Inspection and monitoring:
    - Inspection, maintenance and repair of all BMPs will occur as needed to ensure performance of their intended function.
    - Site inspections and monitoring will be conducted in accordance with Special Condition S4 of the CSWGP. Sampling locations are indicated on the Site Map.

Sampling station(s) are located in accordance with applicable requirements of the CSWGP.

- Maintain an updated SWPPP.
    - The SWPPP will be updated, maintained, and implemented in accordance with Special Conditions S3, S4, and S9 of the CSWGP.

As site work progresses the SWPPP will be modified routinely to reflect changing site conditions. The SWPPP will be reviewed monthly to ensure the content is current.

Table 5 – Management

☒	Design the project to fit the existing topography, soils, and drainage patterns
☒	Emphasize erosion control rather than sediment control
☒	Minimize the extent and duration of the area exposed
☒	Keep runoff velocities low
☒	Retain sediment on-site
☒	Thoroughly monitor site and maintain all ESC measures
☐	Schedule major earthwork during the dry season
☐	Other (please describe)

2.1.13 Element 13: Protect Low Impact Development (LID) BMPs

There are no existing or proposed LID facilities associated with the project site. Buffer zones will be established during construction to protect off-site wetlands and drainage ditches.

3 Pollution Prevention Team

Table 7 – Team Information

Title	Name(s)	Phone Number
Certified Erosion and Sediment Control Lead (CESCL)	TBD	TBD
Resident Engineer	TBD	TBD
Emergency Ecology Contact	TBD	TBD
Emergency Permittee/ Owner Contact	TBD	TBD
Non-Emergency Owner Contact	TBD	TBD
Monitoring Personnel	TBD	TBD
Ecology Regional Office	Central Regional Office	(509)-575-2490

4 Monitoring and Sampling Requirements

Monitoring includes visual inspection, sampling for water quality parameters of concern, and documentation of the inspection and sampling findings in a site log book. A site log book will be maintained for all on-site construction activities and will include:

- A record of the implementation of the SWPPP and other permit requirements
- Site inspections
- Stormwater sampling data

File a blank form under Appendix D.

The site log book must be maintained on-site within reasonable access to the site and be made available upon request to Ecology or the local jurisdiction.

Numeric effluent limits may be required for certain discharges to 303(d) listed waterbodies. See CSWGP Special Condition S8 and Section 5 of this template.

4.1 Site Inspection

Site inspections will be conducted at least once every calendar week and within 24 hours following any discharge from the site. For sites that are temporarily stabilized and inactive, the required frequency is reduced to once per calendar month.

The discharge point(s) are indicated on the Site Map (see Appendix A) and in accordance with the applicable requirements of the CSWGP.

4.2 Stormwater Quality Sampling

4.2.1 Turbidity Sampling

Requirements include calibrated turbidity meter or transparency tube to sample site discharges for compliance with the CSWGP. Sampling will be conducted at all discharge points at least once per calendar week.

Method for sampling turbidity:

Table 8 – Turbidity Sampling Method

☒	Turbidity Meter/Turbidimeter (required for disturbances 5 acres or greater in size)
☐	Transparency Tube (option for disturbances less than 1 acre and up to 5 acres in size)

The benchmark for turbidity value is 25 nephelometric turbidity units (NTU) and a transparency less than 33 centimeters.

If the discharge's turbidity is 26 to 249 NTU **or** the transparency is less than 33 cm but equal to or greater than 6 cm, the following steps will be conducted:

1. Review the SWPPP for compliance with Special Condition S9. Make appropriate revisions within 7 days of the date the discharge exceeded the benchmark.

2. Immediately begin the process to fully implement and maintain appropriate source control and/or treatment BMPs as soon as possible. Address the problems within 10 days of the date the discharge exceeded the benchmark. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when the Permittee requests an extension within the initial 10-day response period.
3. Document BMP implementation and maintenance in the site log book.

If the turbidity exceeds 250 NTU **or** the transparency is 6 cm or less at any time, the following steps will be conducted:

1. Telephone or submit an electronic report to the applicable Ecology Region's Environmental Report Tracking System (ERTS) within 24 hours.
    - **Central Region** (Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, Yakima): (509) 575-2490 or http://www.ecy.wa.gov/programs/spills/forms/nerts_online/CRO_nerts_online.html
    - **Eastern Region** (Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman): (509) 329-3400 or http://www.ecy.wa.gov/programs/spills/forms/nerts_online/ERO_nerts_online.html
    - **Northwest Region** (King, Kitsap, Island, San Juan, Skagit, Snohomish, Whatcom): (425) 649-7000 or http://www.ecy.wa.gov/programs/spills/forms/nerts_online/NWRO_nerts_online.html
    - **Southwest Region** (Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Lewis, Mason, Pacific, Pierce, Skamania, Thurston, Wahkiakum,): (360) 407-6300 or http://www.ecy.wa.gov/programs/spills/forms/nerts_online/SWRO_nerts_online.html
2. Immediately begin the process to fully implement and maintain appropriate source control and/or treatment BMPs as soon as possible. Address the problems within 10 days of the date the discharge exceeded the benchmark. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when the Permittee requests an extension within the initial 10-day response period
3. Document BMP implementation and maintenance in the site log book.
4. Continue to sample discharges daily until one of the following is true:
    - Turbidity is 25 NTU (or lower).
    - Transparency is 33 cm (or greater).
    - Compliance with the water quality limit for turbidity is achieved.
        - 1 - 5 NTU over background turbidity, if background is less than 50 NTU
        - 1% - 10% over background turbidity, if background is 50 NTU or greater
    - The discharge stops or is eliminated.

4.2.2 pH Sampling

pH monitoring is required for “Significant concrete work” (i.e., greater than 1000 cubic yards poured concrete over the life of the project). The use of recycled concrete or engineered soils (soil amendments including but not limited to Portland cement-treated base [CTB], cement kiln dust [CKD] or fly ash) also requires pH monitoring.

For significant concrete work, pH sampling will start the first day concrete is poured and continue until it is cured, typically three (3) weeks after the last pour.

For engineered soils and recycled concrete, pH sampling begins when engineered soils or recycled concrete are first exposed to precipitation and continues until the area is fully stabilized.

If the measured pH is 8.5 or greater, the following measures will be taken:

1. Prevent high pH water from entering storm sewer systems or surface water.
2. Adjust or neutralize the high pH water to the range of 6.5 to 8.5 su using appropriate technology such as carbon dioxide (CO_2) sparging (liquid or dry ice).
3. Written approval will be obtained from Ecology prior to the use of chemical treatment other than CO_2 sparging or dry ice.

Method for sampling pH: None required

Table 9 – pH Sampling Method

☐	pH meter
☐	pH test kit
☐	Wide range pH indicator paper

5 Discharges to 303(d) or Total Maximum Daily Load (TMDL) Waterbodies

5.1 303(d) Listed Waterbodies

Is the receiving water 303(d) (Category 5) listed for turbidity, fine sediment, phosphorus, or pH?

☐ Yes ☒ No

List the impairment(s):

NA

5.2 TMDL Waterbodies

Waste Load Allocation for CWSGP discharges:

NA

List and describe BMPs:

NA

Discharges to TMDL receiving waterbodies will meet in-stream water quality criteria at the point of discharge.

The Construction Stormwater General Permit Proposed New Discharge to an Impaired Water Body form is included in Appendix F.

6 Reporting and Record Keeping

6.1 Record Keeping

6.1.1 Site Log Book

A site log book will be maintained for all on-site construction activities and will include:

- A record of the implementation of the SWPPP and other permit requirements
- Site inspections
- Sample logs

6.1.2 Records Retention

Records will be retained during the life of the project and for a minimum of three (3) years following the termination of permit coverage in accordance with Special Condition S5.C of the CSWGP.

Permit documentation to be retained on-site:

- CSWGP
- Permit Coverage Letter
- SWPPP
- Site Log Book

Permit documentation will be provided within 14 days of receipt of a written request from Ecology. A copy of the SWPPP or access to the SWPPP will be provided to the public when requested in writing in accordance with Special Condition S5.G.2.b of the CSWGP.

6.1.3 Updating the SWPPP

The SWPPP will be modified if:

- Found ineffective in eliminating or significantly minimizing pollutants in stormwater discharges from the site.
- There is a change in design, construction, operation, or maintenance at the construction site that has, or could have, a significant effect on the discharge of pollutants to waters of the State.

The SWPPP will be modified within seven (7) days if inspection(s) or investigation(s) determine additional or modified BMPs are necessary for compliance. An updated timeline for BMP implementation will be prepared.

6.2 Reporting

6.2.1 Discharge Monitoring Reports

Cumulative soil disturbance is one (1) acre or larger; therefore, Discharge Monitoring Reports (DMRs) will be submitted to Ecology monthly. If there was no discharge during a given monitoring period the DMR will be submitted as required, reporting "No Discharge". The DMR due date is fifteen (15) days following the end of each calendar month.

DMRs will be reported online through Ecology's WQWebDMR System.

6.2.2 Notification of Noncompliance

If any of the terms and conditions of the permit is not met, and the resulting noncompliance may cause a threat to human health or the environment, the following actions will be taken:

1. Ecology will be notified within 24-hours of the failure to comply by calling the applicable Regional office ERTS phone number (Regional office numbers listed below).
2. Immediate action will be taken to prevent the discharge/pollution or otherwise stop or correct the noncompliance. If applicable, sampling and analysis of any noncompliance will be repeated immediately and the results submitted to Ecology within five (5) days of becoming aware of the violation.
3. A detailed written report describing the noncompliance will be submitted to Ecology within five (5) days, unless requested earlier by Ecology.

Anytime turbidity sampling indicates turbidity is 250 NTUs or greater, or water transparency is 6 cm or less, the Ecology Regional office will be notified by phone within 24 hours of analysis as required by Special Condition S5.A of the CSWGP.

- **Central Region** at (509) 575-2490 for Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, or Yakima County
- **Eastern Region** at (509) 329-3400 for Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, or Whitman County
- **Northwest Region** at (425) 649-7000 for Island, King, Kitsap, San Juan, Skagit, Snohomish, or Whatcom County
- **Southwest Region** at (360) 407-6300 for Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Lewis, Mason, Pacific, Pierce, Skamania, Thurston, or Wahkiakum

Include the following information:

1. Your name and / Phone number
2. Permit number
3. City / County of project
4. Sample results
5. Date / Time of call
6. Date / Time of sample

7. Project name

In accordance with Special Condition S4.D.5.b of the CSWGP, the Ecology Regional office will be notified if chemical treatment other than CO_2 sparging is planned for adjustment of high pH water.

Please see Page G-3-35 for shared SWPPP Appendices

Appendix H-4: Fumaria Solar Project Geotechnical Engineering Study

Geotechnical Engineering Study, Phase 1
Fumaria Solar Array Site
2130 Clarke Road
Ellensburg, Washington
Project No. 170020:GES

Site Description

The subject site is a single tax lot, Kittitas County Tax Parcel No. 14033, and is located at 2130 Clarke Road in Ellensburg, Washington. The site is roughly elongate in shape and comprises 35.24 acres that is currently being used to grow hay. The site is currently undeveloped with the exception of some storage buildings and a barn that may or may not lie on the property itself. The site is sloped gently north to south with an overall inclination of about 15 percent. Access to the lot is from the southeast corner on a provide road. The road crosses a likely seasonal creek that passes through corrugated steel culverts that are relatively thin walled and are partially structurally compromised.

Proposed Site Development

It is our understanding that a series of linear solar panel racks will be constructed on the property along with access/maintenance roads and power infrastructure for distribution to the power grid. We have not been provided with detailed plans and specifications for installation of the solar panels nor have we been provided with a grading plan. However, based on review of similar projects, we believe that very little grading will be required to construct the solar panel racks. We understand that the solar panels are then attached to horizontal steel rods that are supported on driven H-beams. The solar panels are attached to the horizontal supports which are oriented north-south. The panels rotate so that they are always exposed to the sun as it moves from east to west. We assume that the maintenance roads will run between the racks, provide access to the electrical infrastructure elements, and will probably run around the perimeter of the array.

If development plans should change or if our assumptions regarding development are incorrect, Swiftwater Environmental and Geotechnical (SEG) should be contacted as soon as possible to review

and/or revise the recommendations contained herein. SEG should be provided an opportunity to review final plans and specifications to confirm that these recommendations have been incorporated into the plans.

Subsurface Conditions

On April 28, 2017, SEG personnel observed the installation of two test borings using a track-mounted vibratory drilling rig – a GeoProbe 8140 LC – also known as a sonic rig. A four-inch steel hollow-stem drill string is driven into the soil under high-frequency vibratory loading. Standard Penetration Testing (SPT) is then carried out at standard depths for this type of report. For this project, we directed the drillers to complete at least one SPT at the surface before drilling commenced to collect N-values for the surficial soils. SPTs were then variously carried out at standard depths of 2.5', 5.0', 7.5', 10.0', 12.5' and 15.0'. Based on hardness of drilling during advancement of the core barrel, we decided to forego some of the intermediate samples given that we would be reviewing a complete sample after drilling was completed. Samples were collected from the SPT split-spoons at the appropriate depths.

One of the advantages of using the sonic drill rig is that a continuous four-inch diameter sample is collected in the hollow stem drill string as it is advanced. The continuous soil sample is then extruded into polyethylene bags and removed from the immediate area of the drill rig. The continuous sample can then be examined by cutting the bag open to expose the entire 2.4 to 4-foot sample. We were thus able to closely examine the soil profile and to identify bearing soils with unusual precision. The borings were advanced to a maximum depth of 16.5 feet below existing grade. We understand that standard H-beam penetration for this type of installation is six to eight feet below grade. Boring locations are shown on the attached Boring Location Plan (Figure 2) along with the Boring Logs on subsequent pages. Please refer to the Boring Logs for detailed descriptions of the site soils. A general description of soils and groundwater conditions is provided below.

The boring locations were selected to attempt to be representative of the entire site. Boring F-1 was completed in the north-northwestern quadrant of the site and Boring F-2 was located in the southeastern quadrant of the site. The soil profiles in both borings were very consistent and we believe that based on the likely depositional environment and also on the locally flat topography that the soil profile across the site will be similar to the profiles found in the borings.

In Boring F-1, we observed less than six inches of about one and one-half feet of dark brown topsoil-like material comprising a moist, very loose to loose silty SAND to sandy SILT with varying amounts of gravel. Immediately underlying the very thin topsoil unit with a SPT (N-value) of 88 (sum of two 6" n-values of less than 50 total). We observed a dark gray to light gray, slightly moist to moist, very dense and partially cemented sandy GRAVEL with varying amounts of silt. We observed no seepage in either boring on this site. This boring was terminated 16.5 feet below ground level with N-values below 13 feet of about 28. This is still on the high end of dense and should not cause any problems, both because of the depth and the depth of the material.

In Boring F-2, we observed a soil profile that was nearly identical to that found in F-1. The only difference is that in F-2, we observed a thin (2-3 inch) unit of poorly developed topsoil and a slight reduction density below 13 feet. Given that the depth lies well beyond the proposed piling depth, we do not anticipate any problem with pile installation of strength. Boring F-2 was terminated in this unit at 16.5 feet.

In both borings, we observed that drilling was difficult with depth right from the surface indicating that embedment soils are present from the start of installation of the piles.

Groundwater

As noted above, we did not observe groundwater in either of these borings. It should be expected that groundwater may be present during wetter parts of the year and plans should be implemented accordingly.

If grading and/or construction is carried out during the winter or spring months, the contractor should anticipate that possible significant groundwater seepage might be present and should plan accordingly. The entire profile of the site soils is moisture sensitive and those soils will be difficult to use as structural fill during the rainy winter and spring months. The underlying partially cemented sandy gravel soils will be less moisture-sensitive, but natural variability of the fine-grained fraction (e.g. silts and clay minerals) might cause these soils to be moisture-sensitive as well. In any case, if excavated site soils are to be used as structural fill, they should be protected from moisture while stock-piled.

Geologic Setting

According to the USGS Open File Report 1127, *Late Cenozoic Deposits, Landforms, Stratigraphy, and Tectonism in Kittitas Valley, Washington*, Richard B. Waitt, Jr., 1979, the subject site and surrounding area are underlain by Qs (Quaternary Alluvium, Sidestream Facies) which is characterized as downstream aggradation deposits with their source being upstream glacial moraines located to the west and northwest areas of the Kittitas Valley. These deposits consist primarily of basaltic gravels and sands with varying amounts of silt and clay minerals. The gravel varies from fine to coarse with occasional specimens in excess of one and a half meters. These undifferentiated sandy GRAVEL deposits are overlain by varying thicknesses of topsoil, weathered sandy gravel horizons, and loessal (wind) deposits that comprise the silty SAND and sandy SILT units that we observed from the surface down to the relatively un-weathered, partially cemented gravels. The gravel deposits consistently displayed some level of cementation that is most likely caused by breakdown of the basaltic rock to silt and clay minerals and then subsequent re-lithification under normal loading. The soils we observed in our borings at the subject site are consistent with this mapping.

In Boring F-2, we encountered a fine-grained, reddish brown to tan silty clay to clayey silt unit underlying the sandy gravel deposits. We contacted Dr. Nick Zentner, Professor of Geological Sciences at Central Washington University about this unit. Dr. Zentner indicated that it is probably an alluvial deposit that develops in slow-water areas and ox-bows proximate to streams and to the Yakima River. Dr. Zentner stated that these deposits are horizontally discontinuous and are found throughout the valley. The deposit on the subject site is thus likely limited in lateral extent, especially given that we did not encounter it in Boring F-1.

General Discussion and Recommendations

Based on the results of our site investigation, construction of the proposed solar panel array is absolutely feasible from a geotechnical standpoint provided that strong enough vertical H-beam supports are provided. The density of the soil matrix combined with the weight of the hammer might possibly damage the pile leading to less than satisfactory bearing capacity values. In this case, it would be prudent to complete a couple of test borings to determine if the piles can be placed with damage.

We understand that the site will be developed by constructing linear racks of structural members to which the solar panels will be attached. The racks will be oriented north to south, which support the solar panels on east to west oscillating horizontal members. Those horizontal members are in turn supported on a series of driven steel H-beams. We have reviewed plans for similar installations and it appears that there is variation in the length of the horizontal supports meaning there will be variation on the total loading for each individual H-beam. For example, some H-beams will support eight solar panels along with their mounting and support equipment while others will support six panels, etc. This means that for a design bearing capacity, pile embedment depths will vary or possibly, the H-beam sizing will need to be increased. *In either case, it is critical that final plans be reviewed by SEG to ensure that appropriate bearing capacities and embedment lengths have been incorporated into the plans and specifications.* Further, SEG should be retained to provide construction monitoring to ensure that the H-beams are installed in accordance with the plans and specifications and to document that adequate bearing capacity is developed.

Final bearing capacities and embedment lengths can be computed once the loading for the piles has been provided to us. Alternatively, we can estimate the loading for each pile if we are provided with information about the weight of the panels, supporting members and ancillary equipment. In either case, we have been informed that this information will be forthcoming and we can then complete the pile designs. We have attached a figure that shows the appropriate embedment zone for the H-beams.

We strongly recommend that once the bearing capacities and embedment lengths have been determined, a series of test piles should be driven using the same equipment that will be used during construction. The purpose of this testing is two-fold: 1) it is necessary to determine that the piles can be driven into the bearing soils to the required embedment depth without damaging the pile and, 2) it is required in order to load test the resulting piles to determine that adequate bearing capacity is being developed.

Wind Loading

The Kittitas Valley, particularly the Ellensburg area, is known for year-around windy conditions. We understand that the solar panels that will be used for this project are 32-square-foot panels mounted immediately adjacent to one another in linear "bays" of seven or eight panels. Therefore, for purposes of computing wind-loading, each bay will effectively be a single panel of 224 or 256 square feet.

We computed the maximum wind load for a 32-square-foot panel using the Uniform Building Code (UBC, 1997) formula with the preferred alternate methodology for computing wind pressure. We also used the Engineering News Record (ENR) methodology in order to check consistency across methodology. The following are wind loads for a four-foot by eight-foot panel erected vertically that is exposed to wind that is moving over a flat surface with few obstructions. Wind speeds were obtained from the Applied Technology Council (ATC) website wherein maximum wind speeds are obtained by location. The ASCE site-specific wind speed values are obtained from the ASCE manuals noted, but were retrieved from the ATC Windspeed by Location website. The wind speed values were then used in the UBC formula to calculate the following values for wind pressure in pounds for a single four-foot by eight-foot solar panel.

• ASCE 7-93 Wind speed (fastest mile in mph	70 mph	593 lbs
• ASCE 7-05 Wind speed (3 second peak gust)	85 mph	878 lbs
• ASCE 7-10 100-year Mean Recurrence Interval	91 mph	1006 lbs
• ASCE 7-10 Risk Category II	110 mph	1470 lbs

The wind pressure values are the functional equivalent of lateral pressure on the H-beams. These values are maximum values. Wind pressure and equivalent lateral pressure will be less than the values shown because the solar panels are rarely, or never, in a vertical position and presumably can be rotated to a horizontal position before or during high-wind events to "spill" wind over time. Further, we believe that end to end placement of the panels will lead to an overall increase in per-panel value due to the failure of the wind to "spill" over the panel edges. Once we have received the H-beam size information, we can compute actual lateral loads based on the wind pressure values above.

Site Preparation and Earthwork

We anticipate that site preparation for the subject site will consist of installation of Temporary Erosion and Sedimentation Control (TESC) measures, installation of grade staking, establishing clearing and grading limits, site clearing and stripping, and possible stockpiling of strippings and organic material in non-structural areas. Once these activities have been completed, installation of underground utilities and final grading can occur and construction of the solar panel array can commence.

Infiltration and Temporary Erosion and Sedimentation Control (TESC)

It is important to understand and utilize Low Impact Development (LID) practices and LID Best Management Practices (BMP) in Eastern Washington to reduce or eliminate concentrated storm water runoff and erosion. BMP also help limit the introduction of pollutants/contamination into Eastern Washington's arid land soils and rangeland soils. BMP that address these issues can be found in the Washington State Department of Ecology (DOE) publication 13-10-036, *Eastern Washington Low Impact Development Guidance Manual*, June 13, 2013.

Construction of the solar array will tend to create a *variable* increase in the total *and effective* impervious area of the site that is equivalent to the area of the solar panels and associated infrastructure. The increase is variable because the panels move in accordance with the position of the sun and are tilted most of the time. There will also be an increase in less pervious area because of the proposed gravel access roads.

Based on the results of our subsurface investigation, we believe that infiltration into the upper, topsoil-like silty sand/sandy silt soils is not only feasible, but is ongoing. This site, like many others in the vicinity of Ellensburg, have been cultivated using flood irrigation methods. This consists of running a perforated PVC pipe along the upslope side of a site and simply flooding the entire area. Irrigation water percolates into the soil and is stored above the underlying relatively impervious layer found throughout the area. Based on our observations at several of these sites and on publications and anecdotal testimonies, it is clear that these soils are quite capable of infiltrating storm water during an average year. According to the referenced DOE publication, Ellensburg is located in Climate Region 2 – Central Basin – and receives an average of about 8 inches of precipitation per year, some of it in the form of snow. Given the variable nature of the solar panel position, and relatively low precipitation in the area, combined with the natural permeability of the upper soil horizon, it is our opinion that infiltration of normal storm water amounts will occur and that normal levels of storm water will not be concentrated to a significant extent.

Based on the texture and class of the soil types that we encountered, and on a review of various documents related to storm water control in Eastern Washington, it is our opinion that it is reasonable to assume an infiltration rate of 1.02 inches/hour for the upper, silty sand unit and 0.27 inches/hour for the

underlying sandy gravel. The rate for the sandy gravel unit is assumed to be low because of the presence of fine-grained silt and clay minerals in the interstitial spaces and fractures of this partially cemented unit.

Temporary construction ingress and egress should be completed prior to the start of on-going construction traffic. A temporary construction entrance should be constructed of 8-12 inches of quarry spalls. If the soils in the entrance location are soft, a layer of geotextile fabric can be laid down as a barrier prior to placement of quarry spalls. The quarry spalls will provide a stable entrance/exit to the site and will limit tracking of mud onto the private road that extends east to the southwest property corner. TESC measures consist of installation of silt fencing *as needed* around the site entrance, around the perimeter of the low side of the site, and at discharge points where sediment-laden surface water may enter off-site drainage features. Because the subject site is flat and slopes very gently to the south, silt fencing will probably not be required at the south perimeter unless desired by Kittitas County.

Stripping

No well-developed sod or heavily organic topsoil layer was observed at this site because of ongoing cultivation, thus stripping should not be required. If a topsoil horizon is observed in areas where maintenance roads are proposed, the topsoil should be removed down to mineral soil and replaced with crushed rock or structural fill. It is important that all deleterious material is removed prior to placement of structural fill. Topsoil strippings can be stockpiled for use in non-structural areas, as desired, but should not be allowed to mix with soils that will be used for structural fill.

Native Soils and Imported Soils

Native site soils encountered below the surface contain significant fines and are very moisture sensitive. However, if moisture content is near optimum, the soil can be used as compacted structural fill. Excavated site soils should be stockpiled and covered immediately if they are to be saved and used as structural fill. If the soils are above optimum moisture content, it may be possible to aerate them to reduce moisture content. This is possible during the warmer summer months, but it is difficult to achieve uniform moisture content. It may also be possible to use Portland cement as an admixture to reduce moisture content. If the site soils cannot be adequately compacted, it may be necessary to use imported soil for structural fill. Imported soil should be a well-graded granular mineral soil with fines content below five percent (i.e. less than five percent passing the No. 200 sieve) and should be at or slightly above the optimum moisture content. If construction is scheduled to occur during periods where precipitation is expected, a contingency should be built into the project budget for imported soil/crushed rock base (CRB) and other costs associated with placement of imported structural fill.

Subgrade Preparation

Once the site has been prepared for construction of the maintenance roads and placement of the H-beams, a SEG representative should observe subgrade conditions to confirm that they are as expected and to provide additional recommendations, if necessary. If disturbed native soil is encountered in structural areas (e.g. maintenance road prism or foundations for solar panel infrastructure) the fill should re-compacted in accordance with the specifications for structural fill or should be removed and replaced with structural fill as required to reach design grade. As an alternative, CRB can be placed and compacted. SEG should observe and confirm subgrade conditions as construction progresses. The contractor should

be prepared to retain a local materials testing firm to sample soils to be used as structural fill, collect samples for Proctor testing, and to provide compaction testing as structural fill is placed, as needed.

Structural Fill

Structural fill is fill that is deliberately placed in thin lifts and compacted to a design specification. Structural fill is intended to support overlying structures in a manner that produces little or no post-construction movement. It is typically used under foundations, slabs, in utility trenches, roads, behind retaining walls, and in constructed slopes. Structural fill should be placed in loose lifts that do not exceed 12 inches and compacted to a relative compaction of 95 percent of maximum dry density as determined by Modified Proctor (ASTM D1557). Compaction specifications may vary, especially in utility trenches in public or private roads as specified by the local jurisdiction. Moisture content is critical to achieving adequate densification (compaction) and the upper unit of the site soils is very moisture sensitive, e.g. a small change in moisture content can make them unusable as structural fill. *If the soils are stockpiled and not covered, precipitation will make them difficult or impossible to use as structural fill.*

Foundations

We believe that foundations for the electrical infrastructure elements of the project can be supported on undisturbed, competent, native sandy gravel soils found below the upper topsoil-like horizon, on re-compacted native soils, on structural fill, or on CRB. Where loose or unsuitable soils are encountered at design subgrade, it will be necessary to re-compact the native soils to structural fill specifications or to over-excavate down to competent native soils then place structural fill or CRB up to design subgrade.

If the subgrade is prepared as described above, the following parameters may be used for design:

- Allowable soil bearing capacity — 1,500 psf
- Passive earth pressure — 300 pcf (equivalent fluid)
- Coefficient of friction — 0.35

A one-third increase in the allowable soil bearing capacity may be assumed for short-term wind and seismic loading conditions. The passive pressure and friction values above include a factor-of-safety of at least 1.5. With anticipated structural loads, total settlement of one inch and differential settlement of one-half inch is anticipated. Most settlement should occur during construction, as dead loads are applied.

Seismic Design

The 2015 International Building Code recognizes the American Society of Civil Engineers (ASCE) for seismic site class definitions. In accordance with Table 20.3-1 of the ASCE Minimum Design Loads for Buildings and Other Structures manual, Site Class D should be used for design.

Based on our observations of the upper native silty sand soils and the underlying partially cemented sandy gravels, it is our opinion that the subject site has very low susceptibility to liquefaction. Liquefaction is a phenomenon wherein loose, saturated soils suddenly lose shear strength and begin to behave as a fluid. Liquefaction typically occurs under seismic loading conditions and if structures are supported on soils that liquefy, structural damage can occur. The site groundwater and native soil conditions we observed in the test borings have allowed us to reach this conclusion.

Drainage

We did observe occasional mottling/rust-staining in the weathered till units indicating presence of water at some time in the past. During the rainy winter months, it is prudent to anticipate seepage in excavations and groundwater control measures should be on-site or readily available, including trash pumps, sumps and discharge ditches. Seepage may create instability in the walls of excavations – SEG should be notified if seepage is observed in excavations so that control measures may be discussed with the contractor and properly implemented. The site should be graded such that surface water is directed away from structures and slopes. Surface water must never be allowed to pond near the tops or toes of slopes. Based on the soil types observed in our test pits, it is our opinion that infiltration is not feasible at this site. Storm water discharge BMPs should be implemented to control runoff from the site. Sediment-laden surface water must be treated such that water discharged from the site meet all water quality requirements. Storm water should not be discharged over the slope to the north of the site.

Excavations/Slopes

Soils observed in the upper one and a half to two feet of the test borings would be classified as OSHA/WISHA Type C. Temporary excavations like utility excavations and foundation excavations with heights in excess of four feet must be sloped no steeper than 1.5H:1V. If seepage is observed in these excavations, they may need to be sloped at 2H:1V to prevent sloughing due to seepage pressure. The dense native sandy gravel soil observed below about two feet would be considered OSHA/WISHA Type B soils and can be laid back at 1H:1V.

SEG should be contacted to observe temporary slopes and utility excavations as they are constructed or excavated to assess slope stability and recommend additional measures, if necessary.

Utility Support, Trenches, and Trench Backfill

Site soils should be suitable for support of solar panel infrastructure and utilities. In shallower trenches, particularly shallower than about two feet, it may be necessary to over-excavate loose or wet soil down to suitable, stable soils, and then replace them with compacted structural fill or CRB. Groundwater seepage may be encountered in trench walls, particularly if deeper than two to three feet. Seepage may cause caving of the trench walls and temporary shoring may be required. Dewatering measures may also be needed to control seepage and SEG should be contacted to assess the need for such measures.

Site soils may be suitable for use as backfill provided the moisture content is optimal as determined in the laboratory. Trench backfill should be placed and compacted in accordance with the specifications for structural fill as described above or in accordance with specifications provided by the local jurisdiction. CRB should be placed in six to eight inch lifts and compacted with a plate compactor or other compaction device.

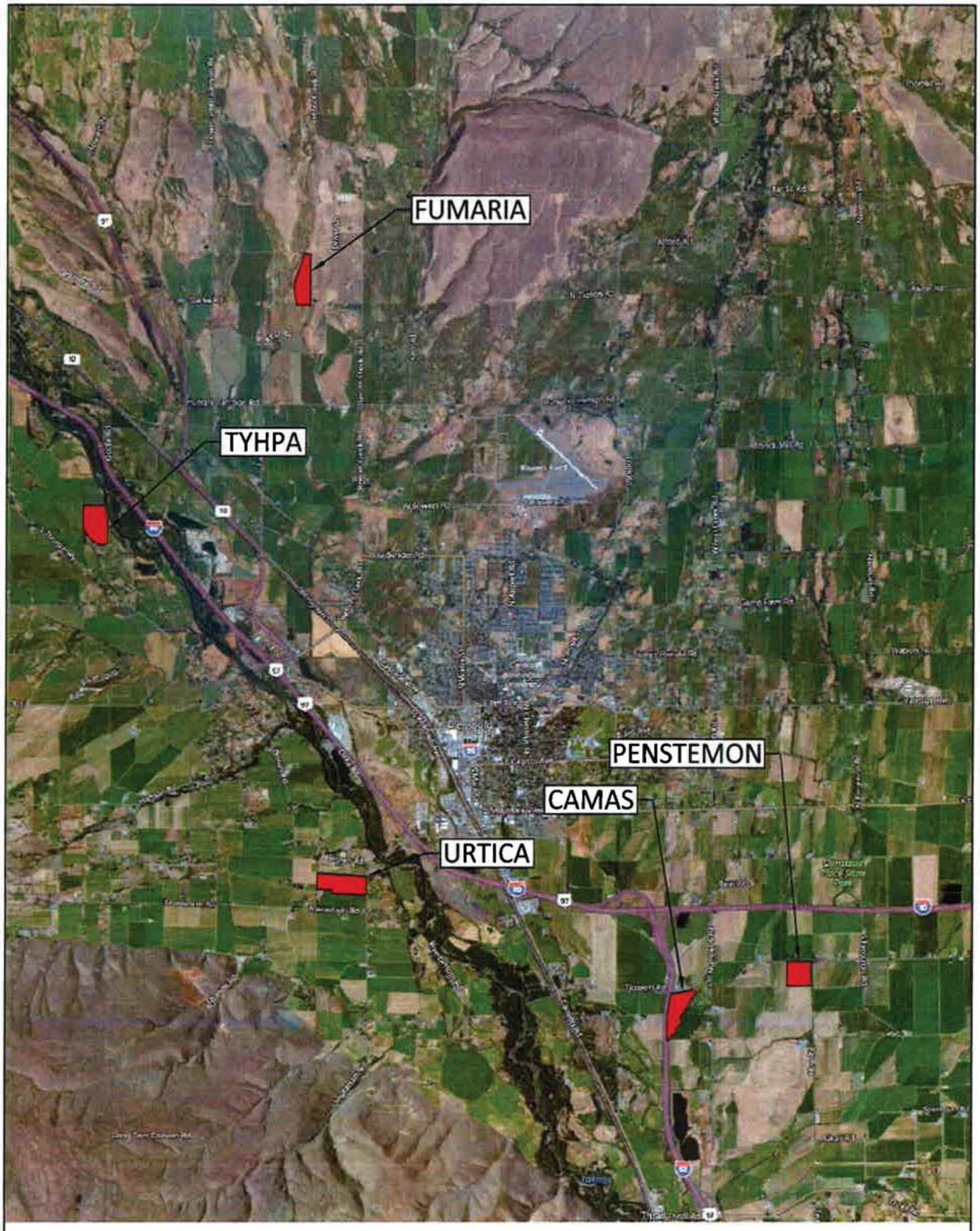
Limitations

This report is an instrument of service and has been prepared for the exclusive use of Tuusso Energy, LLC and their representatives and agents. The recommendations and conclusions provided in this study are professional opinions consistent with the level of care and skill that is typical of other members of the profession currently practicing in this area. A warranty is neither expressed nor implied. Variations in the soil and groundwater conditions observed in the test boring locations may exist and may not become

apparent until construction commences. SEG should reevaluate the conclusions contained in this study if such variations are encountered.



James L. Hatch



TUUSO ENERGY, LLC
ELLENSBURG SOLAR PROJECTS
LOCATION MAP

Swiftwater
Environmental & Geotechnical
Western Washington Division
165 NE Juniper Street, Suite 201A • Issaquah, WA 98027 • Phone: (425) 321-0787
Eastern Washington Division
407 Swiftwater Blvd., Suite A • Cle Elum, WA 98922 • Phone: (425) 321-0787

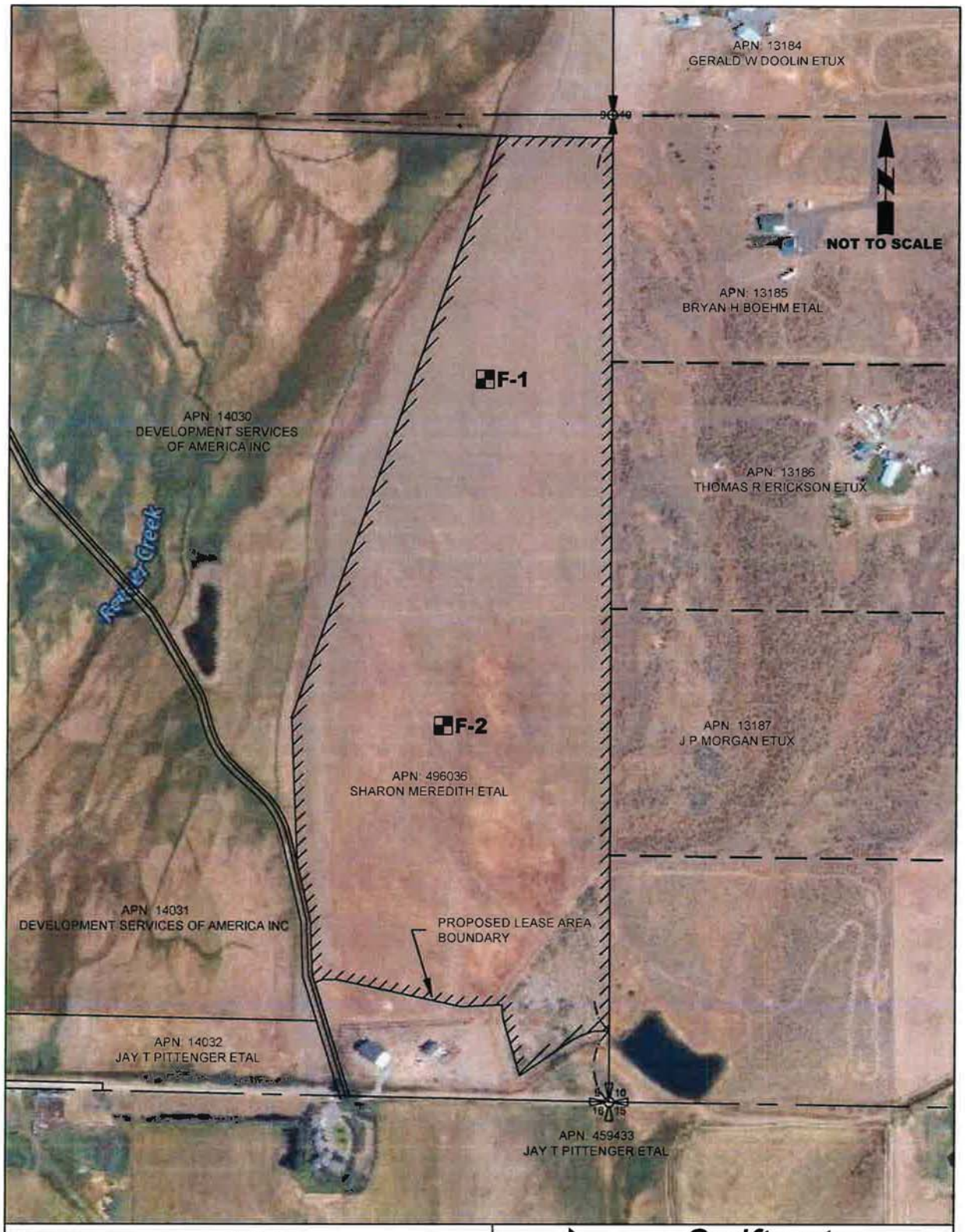


FIG. 2
FUMARIA SITE
TEST BORING LOCATIONS

Swiftwater
Environmental & Geotechnical
Western Washington Division
165 NE Juniper Street, Suite 201A • Issaquah, WA 98027 • Phone: (425) 321-0787
Eastern Washington Division
407 Swiftwater Blvd., Suite A • Cle Elum, WA 98922 • Phone: (425) 321-0787

Swiftwater
Environmental & Geotechnical

Project:	Tuusso Energy - Fumaria Site	Project No. 170020	Date: 4/28/2017
Location	2130 Clarke Road	Surface Elevation	Groundwater NA
Earthwork Contractor	Excavation Equip.	Logged By	
Holocene Drilling	GeoProbe 8104 LC	JH	

Depth (feet) From	Depth (feet) To	Tests	USCS Soil Class.	Generalized Soil Description
0.0	1.5	N - 50	SM	Tan to Brown Silty fine SAND to sandy SILT, trace to some gravel, very dense.
5.0	6.5	N - 50	SM	Same
10.0	11.5	N - 50	SM	Same, some cementation
15.0	16.5	N - 50	SM	Same, Boring terminated at 16.5 feet below grade

Notes: 3-6" Topsoil / Sod @ Surface

BORING LOG NO.	F - 1
Page	1 OF 1

Swiftwater
Environmental & Geotechnical

Project:	Tuusso Energy - Fumaria Site	Project No. 170020	Date: 4/28/2017
Location	2130 Clarke Road	Surface Elevation	Groundwater NA
Earthwork Contractor	Excavation Equip.	Logged By	
Holocene Drilling	GeoProbe 8104 LC	JH	

Depth (feet) From	To	Tests	USCS Soil Class.	Generalized Soil Description
0.0	1.5	N - 50	SM	Tan to Brown Silty fine SAND to sandy SILT, trace to some gravel, very dense.
5.0	6.5	N - 50	SM	Same Reddish brown fine sand seam at 6.5-7.0, wet.
10.0	11.5	N - 50	SM	Same, minor cementation
15.0	16.5	N - 28	SM	Reddish brown silty CLAY to clayey SILT, moist, very stiff. Boring terminated at 16.5 feet below grade.

Notes: 3-6" Topsoil / Sod @ Surface

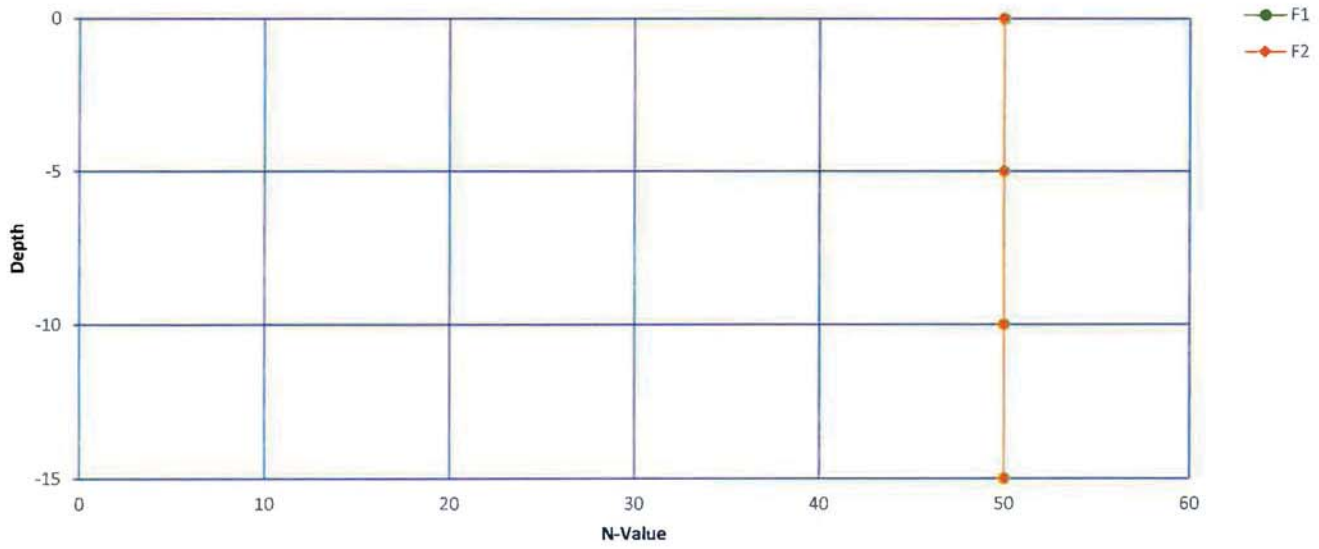
BORING LOG NO.	F - 2
Page	1 OF 1

Swiftwater
Environmental & Geotechnical

Project:	Tuusso - Fumaria Site	Project No. 170020:GES	Date: 6/6/2017
Location	2130 Clarke Road	Surface Elevation	Groundwater N/A
Earthwork Contractor	Excavation Equip.	Logged By	
Holocene Driling	Geoprobe 8104	JH	

	F-1			F-2			
	Depth (ft)	N		Depth (ft)	N		
	0.0	50.0		0.0	50.0		
	-5.0	50.0		-5.0	50.0		
	-10.0	50.0		-10.0	50.0		
	-15.0	50.0		-15.0	50.0		

Approximate Embedment Depth



Note: Tests conducted per ASTM D1586-11 (Standard test method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils)

Appendix H-5: Fumaria Solar Project Drainage Report

Tuusso Energy
Fumaria Solar Project:
DRAINAGE REPORT

Date: July 2017

Prepared by:
Encompass Engineering & Surveying
407 Swiftwater Blvd
Cle Elum, WA 98922

Table of Contents

I. INTRODUCTION 2
II. EXISTING CONDITIONS 2
a. Drainage Basins 3
b. Downstream Analysis 3
c. Soil Report 3
III. PROPOSED CONDITIONS 3
a. Solar Panel Array 4
b. Drainage Basin 4
IV. HYDROLOGIC MODELING- SANTA BARBARA URBAN HYDROGRAPH METHOD 4
a. Precipitation 4
b. Curve Number 4
c. Time of Concentration 5
d. Flow Calculations 5
V. HYDROLOGIC ANALYSIS 5
VI. COMPLIANCE WITH SWMMEW CORE ELEMENTS 6
VII. CONCLUSION 7

List of Figures

Figure 1- Existing Conditions Exhibit
Figure 2- Proposed Conditions Exhibit

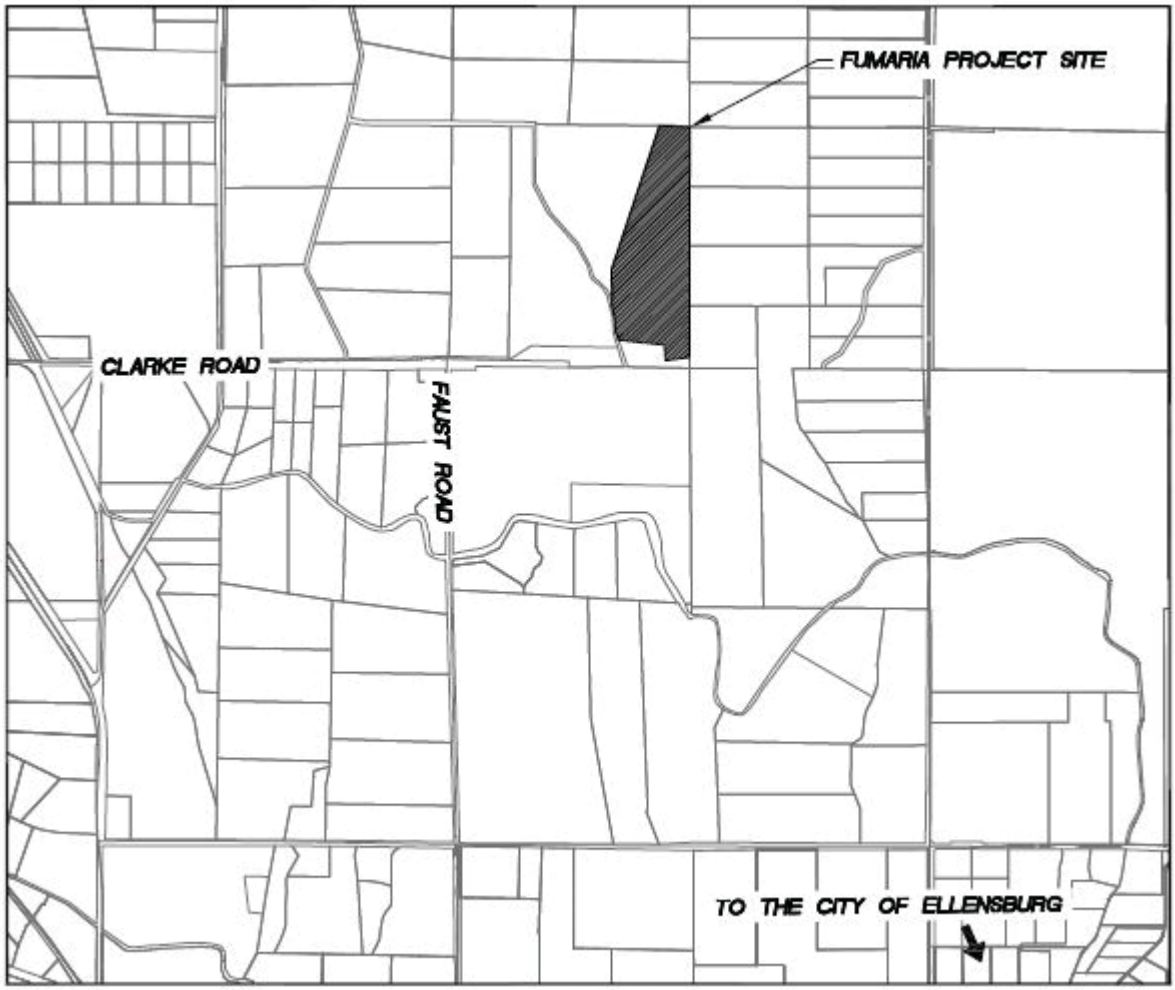
Appendix

Appendix A- NRCS Web Soil Survey
Appendix B- *SWMMEW* Isopluvial Maps
Appendix C- Curve Number Calculations
Appendix D- HydroCAD Report: Existing Basin
Appendix E- HydroCAD Report: Proposed Basin

I. INTRODUCTION

Per Kittitas County assessor records the Tuusso Energy: Fumaria Solar Project site is located within Tax Parcel No. 14033, at 2130 Clarke Road in Ellensburg, WA, in the SE ¼ of Section 9, Township 18 North, Range 18 East W.M. The project site is 35.24 acres and currently used as agricultural land to produce hay. See Vicinity Map below.

The purpose of this project is to convert the site to a photovoltaic solar project with minimal change to the existing topography and site features. The proposed site will consist of rows of modular trackers with solar panels, an all-weather access road, and inverter stations to convert power from the solar panels. The solar panels are attached to horizontal supports that run north-south, and the panels themselves rotate east to west, in order to maximize sun exposure. Access to the site is from the southwest corner of the site via a private road.



VICINITY MAP

II. EXISTING CONDITIONS

The site is currently an open field used to make hay using flood irrigation methods. The overall topography of the site gently slopes to the south. The majority of surface water that does not infiltrate, flows to the south, with a small portion of the site on the western side, sheet flowing off

the site to the west. Runoff to the west is captured by an existing irrigation ditch that flows south along the western border of the site, before turning east and flowing along the southern portion of the site. Runoff to the south is captured in the southern portion of the ditch where it discharges to an existing detention pond just off the southeast corner of the property. Existing conditions can be seen in Figure 1.

a. Drainage Basins

For the purpose of this report, the site is considered to be a single drainage basin since all runoff is either infiltrated on-site or captured in the existing irrigation pond. This basin is represented by 2 sub-basins: Basin 1A and Basin 1B, which can be seen in Figure 1. Basin 1A makes up the majority of the site and flows generally to the south. Basin 1B makes up a small portion of the site that sheet flows off the site to the west and will remain undisturbed throughout the project with no appreciable impervious surface added. Runoff from Basins 1A and 1B meet in an existing irrigation ditch. The existing drainage basin contains no impervious surfaces, meaning the entire 35.24 acres is pervious.

b. Downstream Analysis

As noted above, all runoff from the site flows into the existing irrigation ditch at the southern end of the site. The ditch discharges into an existing irrigation pond immediately to the southeast of the project site. The ditch and pond are currently maintained by the landowner. The irrigation ditch is part of a larger irrigation network that serves the rural areas north of Ellensburg. The pond outlets via a culvert to the south, where it then splits into two ditches, one to south and one to the east. As these are irrigation facilities, the flow rates are currently controlled as needed. The irrigation ditches downstream of the project site are part of a larger irrigation system serving rural areas, north of Ellensburg. No issues have been brought up in relation to the existing irrigation infrastructure downstream of the project site.

c. Soil Report

An NRCS Web Soil Survey was performed for the site in order to obtain onsite soil types. The results of the report give descriptions of the soils found in the project area and the corresponding hydrologic soil groups. The results can be seen in APPENDIX A. The site is composed of Reeser-Reelow-Sketter complex with 2-5% slopes and Reelow-Reeser-Sketter complex with 2-10% slopes, both soils belonging to hydrologic soil group D.

III. PROPOSED CONDITIONS

The proposed development on this site consists of adding solar trackers, an access road, fencing, and associated electrical infrastructure. The new impervious surface will be a portion of the solar trackers (described below), the proposed all-weather access road (which may be compacted soil or gravel) that will run north/south through the center of the site, and the electrical infrastructure that is made up of five inverters and one utility disconnect with a project metering location. Each inverter as well as the utility disconnect, resides on its own concrete pad. The access roads were conservatively modeled as gravel roads.

a. Solar Panel Array

A series of modular trackers will be installed throughout the site. Each tracker is essentially a long horizontal support (of various lengths), held in place by evenly spaced, driven H-beams. The trackers are oriented north-south, with solar panels attached to the entire length of the tracker. The solar panels rotate and tilt east to west to maximize sun exposure. The panels will generate runoff within the site, however, due to the way the panels tilt and that they are not continuous structures, they are not considered impervious in the proposed conditions calculations. The panels do not reduce available ground surface for infiltration. The ground below the solar panels will have native plantings, and therefore it will continue to intercept and infiltrate runoff water from the panels. The only impervious area due to the solar panels is from the posts in the ground upon which the solar panels are attached. For impervious calculations, the posts are conservatively estimated to make up 5% of the total area of the solar tracker configuration.

b. Drainage Basin

Minimal grading and ground disturbance will take place as part of this project. The access road, concrete pads for the electrical infrastructure, and solar tracker posts are the only impervious surfaces proposed for the site. The portion of the solar panel array installation that actually disturbs the ground is very minimal as well. Because of this, existing topography and drainage patterns will remain relatively undisturbed, and the proposed drainage basin encompasses the same area as the existing drainage basin. Proposed conditions can be seen in Figure 2.

IV. HYDROLOGIC MODELING- SANTA BARBARA URBAN HYDROGRAPH METHOD

Hydrologic analysis for the proposed project is consistent with Title 12 of the Kittitas County Code and the 2004 *SWMMEW*. In order to properly analyze the impacts of the proposed development on the watershed, runoff modeling was done using the Santa Barbara Urban Hydrograph method (SBUH), SCS Type 1A 24-hour storm event for Region 2 per the 2004 *SWMMEW*. This was done to determine peak runoff during the 2-year, 10-year, 25-year and 100-year storm events. Calculations were performed utilizing HydroCAD version 10.00-18, which is accepted by the Department of Ecology as a proper simulation modeling program.

a. Precipitation

The precipitation information used for the pre-development and post-development run-off calculations is based on the isopluvial maps provided in the 2004 *SWMMEW* and can be seen in APPENDIX B. The inputs for this project site north of Ellensburg are seen below:

P_{2yr} = 1.0”
P_{10yr} = 1.2”
P_{25yr} = 1.6”
P_{100yr} = 2.0”

b. Curve Number

The SCS Curve Number (CN) is a function of the soil type and ground cover. It is used to determine the portion of the precipitation depth that will be conveyed as runoff. The curve numbers are pulled from *Technical Release 55 Urban Hydrology for Small Watersheds*, and the curve numbers used can be seen in Table 1.

Table 1: Curve Numbers Used

DESCRIPTION	HYDROLOGIC SOIL GROUP			
	A	B	C	D
Meadow	30	58	71	78
Impervious areas	98	98	98	98
Gravel Roads	76	85	89	91

Using the soils report and the curve number table, a composite curve number was determined for the proposed and existing basins. A detailed curve number breakdown can be seen in APPENDIX C. Calculations can also be seen in APPENDIX D and E as part of the HydroCAD report.

c. Time of Concentration

Time of concentration is the time it takes for the runoff to get from the most hydrologically distant location to the point of collection for the basin. The flow path is broken up into three segments, with the hydrologic travel time calculated separate for each segment.

- Sheet flow- flow over plane surfaces which usually occurs at the headwaters of a catchment area. The maximum allowable length for sheet flow is 300-ft
- Shallow concentrated flow-flow in headwater areas where flow begins to concentrate in small rills or rough channels
- Channel flow- flow that is concentrated in defined channels

The time of concentration is the total of the travel times for each flow segment. Time of concentration calculations can be seen in APPENDIX D and E as part of the HydroCAD report.

d. Flow Calculations

HydroCAD uses all of the inputs described above in order to determine the peak flows for various storm events. All the inputs are combined to create an instantaneous hydrograph which is then routed through a modeled reservoir with a time delay equal to the time of concentration in order to generate the runoff hydrograph. The runoff hydrograph can be found in APPENDIX D and E as part of the HydroCAD report. The peak runoff values for the 2, 10, 25, and 100-year storms can be seen below in Table 2.

Table 2: Flow Computations

Q (cfs)				
Time Span	**2-yr**	10-yr	**25-yr**	100-yr
Existing Basin	**0.17**	0.38	**0.96**	1.73
Proposed Basin	**0.21**	0.44	**1.07**	1.88

V. HYDROLOGIC ANALYSIS

As seen in the calculated peak flow rates, the increased runoff due to proposed site development is minimal. The 2-yr peak flow is increased by 0.04 cfs and the 25-yr peak flow is increased by 0.11 cfs. Typically, *SWMMEW* requires developments to release runoff at or below one half of the existing 2-yr peak flow and at or below the existing 25-yr peak flow, as well as for that runoff to be treated.

Per Chapter 2.2.6 of the *SWMMEW* there are exemptions for new development when flow control is not required as long as certain conditions are met. Per chapter 2.6.6 exemption 1, "Any project able to disperse, without discharging to surface waters, the total 25-year runoff volume for the proposed development condition" is exempt from meeting the flow control requirements. The Fumaria project will use full dispersion as the main way to handle increased flows due to impervious areas. As outlined in *SWMMEW* Chapter 6.5, BMP F6.42, full dispersion allows up to 10% of the site that is impervious to be characterized as non-effective impervious area by dispersing runoff into the native vegetation area. On the Fumaria site, the impervious areas may conservatively make up to 4.9% of the site while the rest of the site maintains existing vegetation or plantings similar to existing vegetation. This is under the 10% threshold, making full dispersion a viable option.

Chapter 2.2.5 of the *SWMMEW* summarizes the requirements for treating storm water runoff to reduce pollutant loads and concentrations. Runoff treatment is required for all projects creating 5,000 square feet or more of pollutant-generating impervious surfaces (PGIS). The Fumaria site is not classified as a high use site and all of the proposed impervious surfaces are considered Non-Pollutant Generating Impervious Surfaces (NPGIS). Infrequently used maintenance access roads are classified as NPGIS, and thus are exempt from basic treatment requirements. The solar panels are detached impervious surfaces which the water flows off of and into natural vegetation below. The inverter pads are concrete pads, which the inverters and transformers sit on. The inverters contain no fluids. The transformers may be "dry", meaning they contain no fluids, or they may contain fluids, that has not been finalized yet. If they do contain fluid, it would be Envirotemp or a similar biodegradable vegetable based coolant. Therefore, the inverter pads will be considered NPGIS as well, however if that classification is challenged, they make up no more than 3,600 square feet, which is below the 5,000 square feet threshold. The Fumaria site meets the exemption requirement, therefore no treatment measures will be necessary or put in place.

While analyzing the effects of increased storm water runoff, it is also important to note any other changes that will occur on the site due to the development. One thing of note on the Fumaria site is that it is currently cultivated using flood irrigation methods. In this method, an excess amount of water is applied to the site for irrigation, and the general assumption is that half of the applied water actually goes to the crop while the other half is lost to evaporation, runoff, infiltration or transpiration (*Alliance for Water Efficiency: Flood Irrigation Introduction*). With the construction of this project, the flood irrigation will be minimized, if not stopped completely. The net loss of surface water due to reducing flood irrigation will be greater than the minimal increases in stormwater runoff due to the construction associated with the solar panel farm. Therefore, the additional runoff of the peak 2-yr and 25-yr storms of 0.04 and 0.11 cfs respectively, is considered negligible when analyzing the site as a whole.

VI. COMPLIANCE WITH *SWMMEW* CORE ELEMENTS

All new development projects must comply with the 8 Core Elements outlined in Chapter 2 in the *SWMMEW* when applicable. Exemptions exist for each Core Element and vary depending on requirements that must be met. The Core Elements are listed below in relation to the proposed development of the Tuusso Energy: Fumaria Solar Project, and exemptions are noted when applicable.

1. Preparation of a Stormwater Site Plan:
    - This can be seen in Figure 2- Proposed Drainage Basin Map, and will be included in the civil plans.
2. Construction Stormwater Pollution Prevention:
    - This will be included as part of the SWPPP submittal.
3. Source Control Pollution
    - The only potential fluid on the site is a biodegradable vegetable based coolant, which is not classified as a pollutant. Therefore, no point source pollutants are on the site.
4. Preservation of Natural Drainage Systems
    - Minimal grading will occur on site and natural drainage patterns will be maintained.
5. Runoff Treatment
    - The site is not a high use site and has less than 5,000 square feet of PGIS, making it exempt from runoff treatment.
6. Flow Control
    - Per Exemption 1 in chapter 2.6.6 of *SWMMEW*, the site will use full dispersion to control the 2 and 25-yr flows.
7. Operation and Maintenance
    - No on-site maintenance is required for full dispersion. Maintenance of the existing off-site drainage ditches will be performed by the current land owner.
8. Local Requirements
    - There are no local ordinances above and beyond what is outlined in *SWMMEW.*

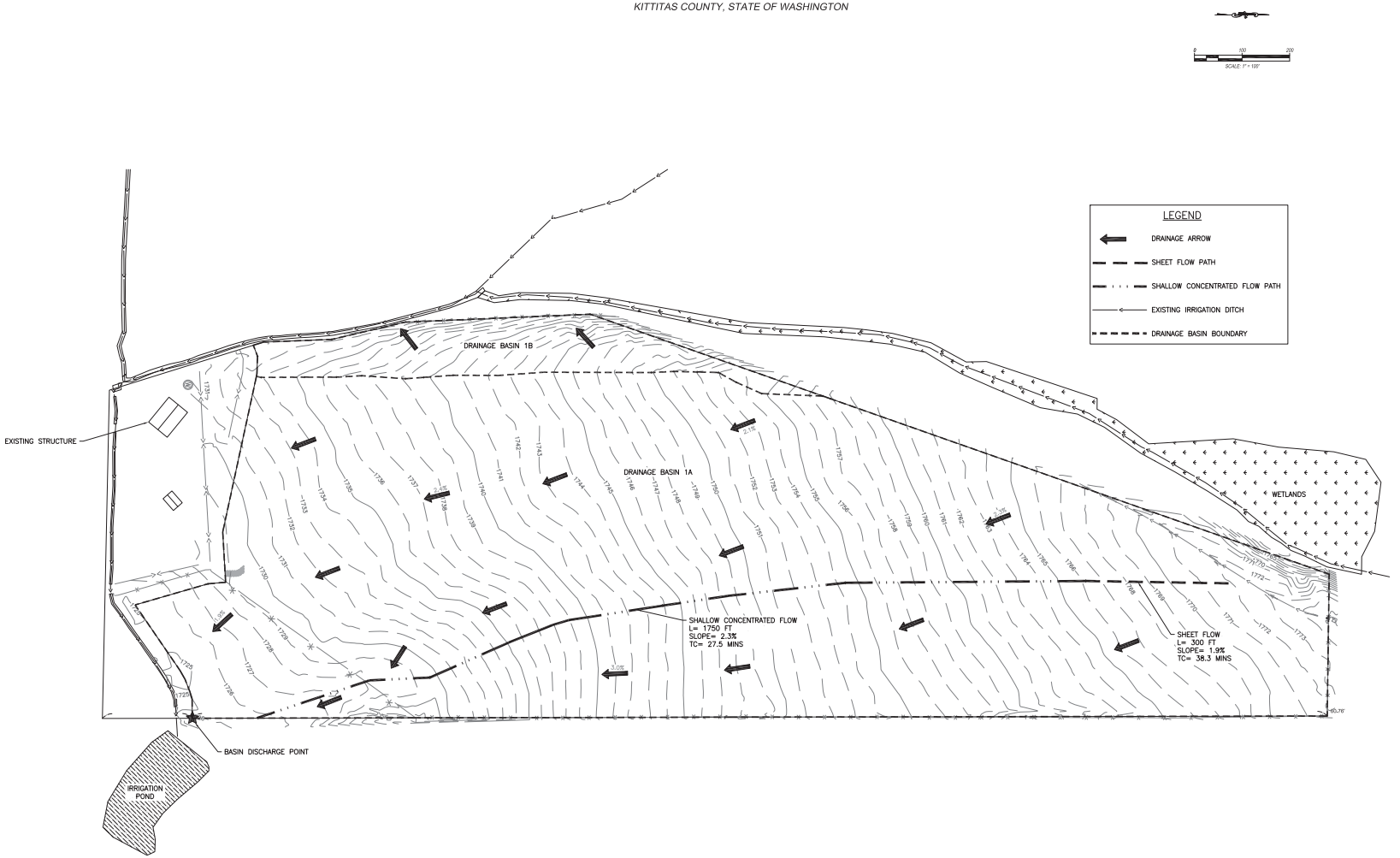
VII. CONCLUSION

The Tuusso Energy: Fumaria Solar Project involves transforming 35.24 acres of an existing hay field, into a solar project. The project consists of adding an array of solar panels, an access road, and the associated electrical infrastructure. Existing topography and vegetation will be preserved to the maximum extent possible and native plantings will be made throughout the site where needed. From a stormwater and drainage standpoint, the biggest impacts of the project will be from converting 1.71 acres into impervious surfaces in the form of an all-weather access road, electrical infrastructure, and posts for the solar trackers. 1.71 acres is an overestimate of impervious area, as it maxes out the percentage of impervious to pervious surfaces based on the design of the solar tracker modules. All site and location factors were taken into account in order to perform the SBUH hydrologic modelling method. The calculations from the modelling showed that the runoff generated from the 2-yr storm increased from 0.17 cfs to 0.21 cfs, while the runoff generated from the 25-yr storm increased from 0.96 cfs to 1.07 cfs. This increased runoff can be handled by full dispersion throughout the site, due to maintaining a majority of the existing pervious area with minimal grading. The increased runoff is also considered negligible, due to the reduction of flood irrigation to the site which will accompany the project.

TUUSSO ENERGY - FUMARIA SITE

A PORTION OF THE SE ¼ OF SECTION 9, T. 18 N., R. 18 E., W.M.

KITTITAS COUNTY, STATE OF WASHINGTON



TUUSSO ENERGY, LLC

FUMARIA SITE

EXISTING DRAINAGE CONDITIONS

Encompass ENGINEERING & SURVEYING

165 NE Juniper Street, Suite 201 ▪ Issaquah, WA 98027 ▪ Phone: (425) 392-0250 ▪ Fax: (425) 391-3055
Western Washington Division

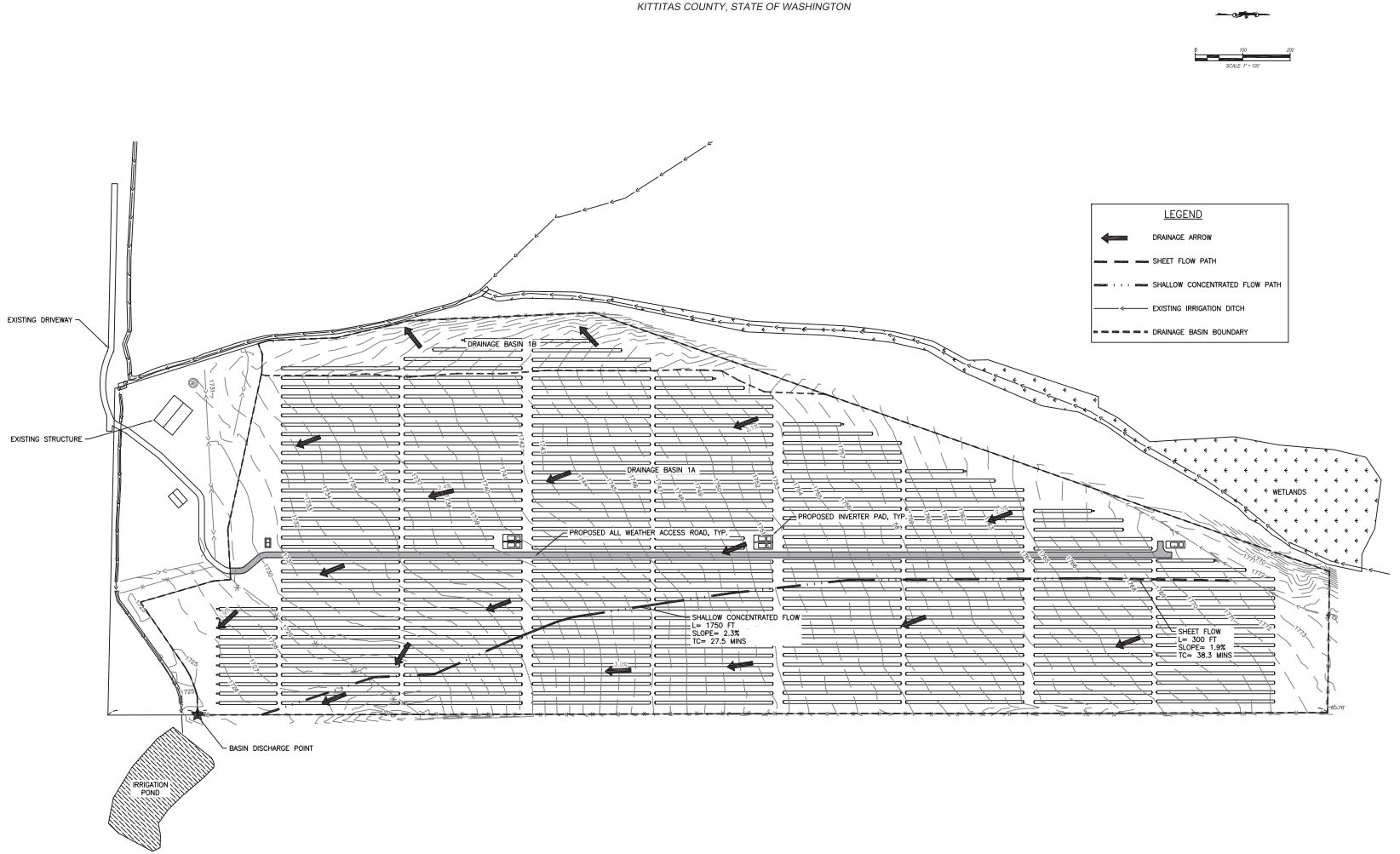
407 Southwest Blvd. ▪ Kennewick, WA 99336 ▪ Phone: (509) 474-9933 ▪ Fax: (509) 474-9419
Eastern Washington Division

JOB NO.	17016
DATE	July 2017
SCALE	AS SHOWN
DESIGNED	TML
DRAWN	TML
CHECKED	GG/MKK
APPROVED	TML
SHEET	FIG-1

TUUSSO ENERGY - FUMARIA SITE

A PORTION OF THE SE ¼ OF SECTION 9, T. 18 N., R. 18 E., W.M.

KITTITAS COUNTY, STATE OF WASHINGTON



TUUSSO ENERGY, LLC

FUMARIA SITE

PROPOSED DRAINAGE CONDITIONS

Encompass ENGINEERING & SURVEYING

165 NE Juniper Street, Suite 201 ▪ Issaquah, WA 98027 ▪ Phone: (425) 392-0250 ▪ Fax: (425) 391-3055

Western Washington Division

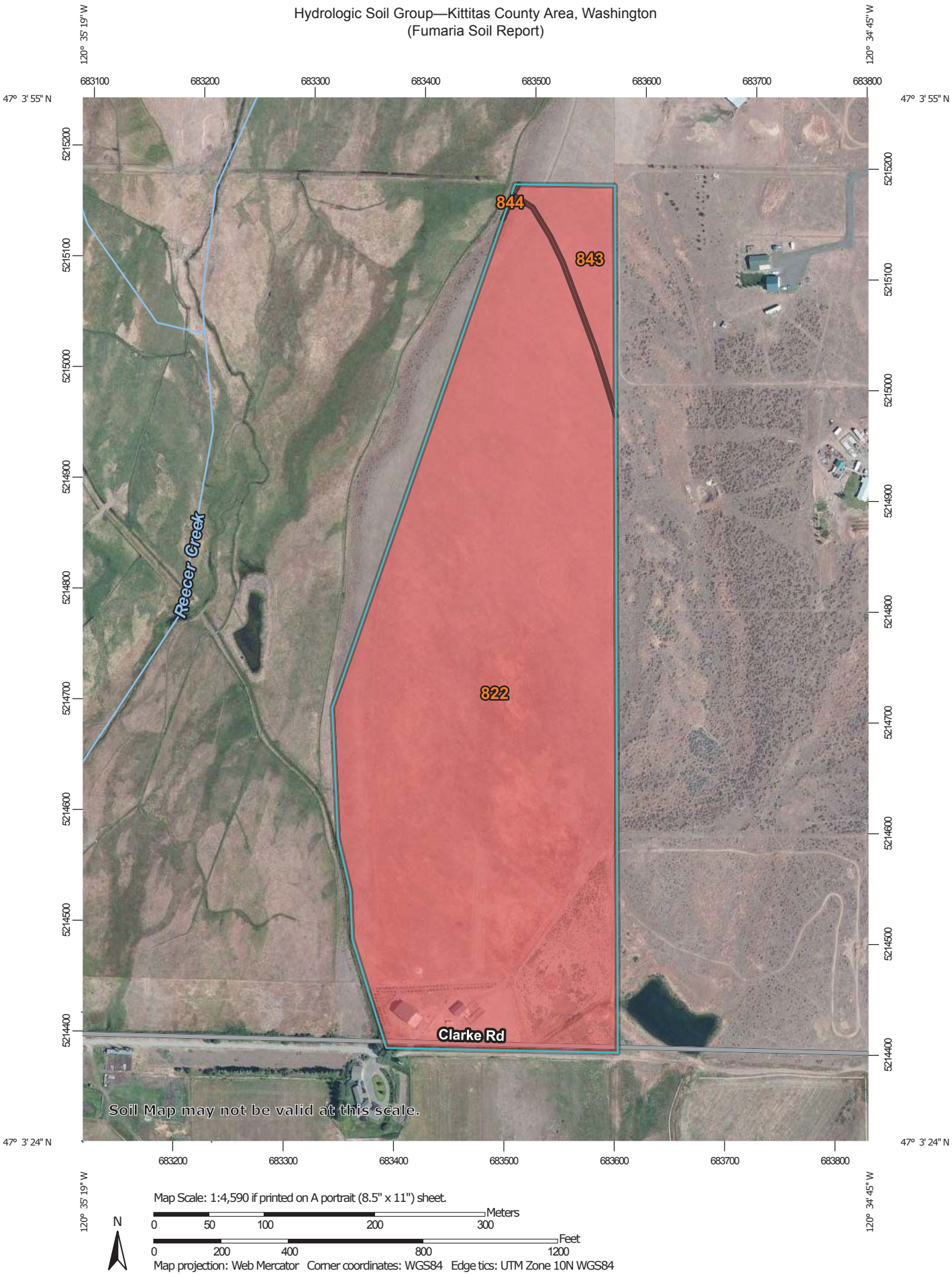
407 Southwest Blvd. ▪ Kennewick, WA 99336 ▪ Phone: (509) 474-9113 ▪ Fax: (509) 474-9419

Eastern Washington Division

JOB NO.	17016
DATE	July 2017
SCALE	AS SHOWN
DESIGNED	TML
DRAWN	TML
CHECKED	GG/MKK
APPROVED	TML
SHEET	FIG-2

Appendix A:

NRCS WEB SOIL SURVEY



Map Scale: 1:4,590 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1200

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Kittitas County Area, Washington
Survey Area Data: Version 9, Sep 9, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 25, 2010—Oct 17, 2010

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

H-5-13

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Kittitas County Area, Washington (WA637)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
822	Reeser-Reelow-Sketter complex, 2 to 5 percent slopes	D	37.0	95.0%
843	Reelow-Reeser-Sketter complex, 2 to 10 percent slopes	D	2.0	5.0%
844	Metmill very gravelly ashy loam, 0 to 5 percent slopes	C/D	0.0	0.0%
Totals for Area of Interest			**39.0**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

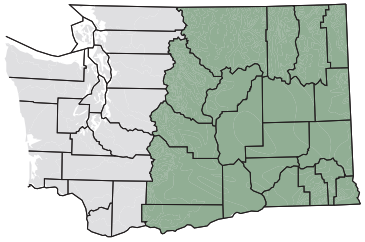
Tie-break Rule: Higher

Appendix B:

SWMMEW ISOPLUVIAL MAPS



Eastern Washington Stormwater Manual



2-Year 24-Hour Isopluvials

Source: NOAA Atlas 2, Volume IX, 1973
Precipitation in inches

County(2003, 1:24,000)
City(2003, 1:24,000)
Latitude/Longitude(1/10 degree)
Isopluvial(1973, 1:2,000,000)
NOAA/NWS Station(1931-1998)

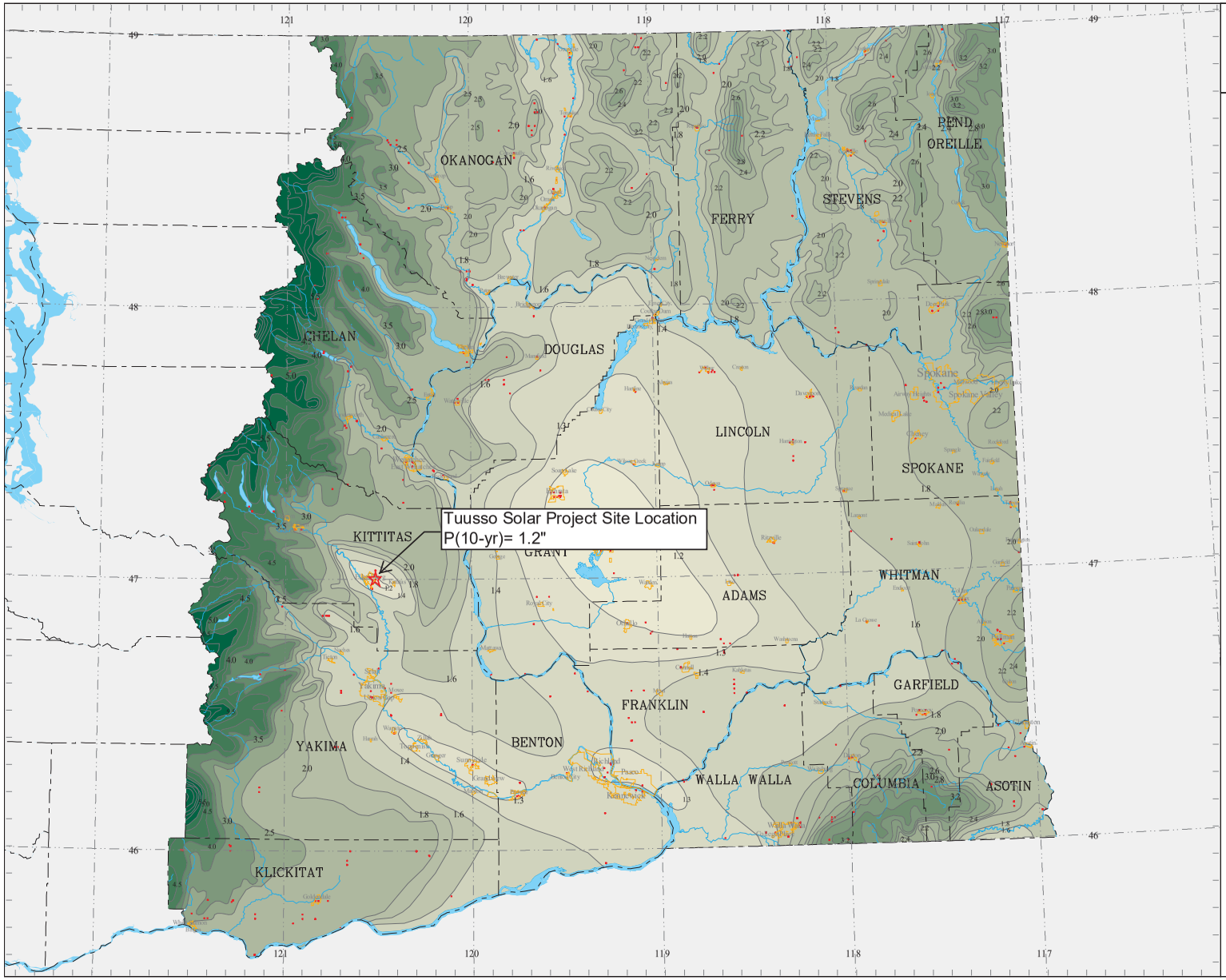
N

Scale 1:1,600,000
Miles
0 16.5 33

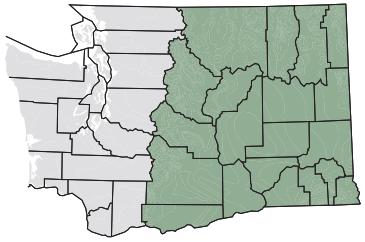
Water Quality Program

WASHINGTON STATE DEPARTMENT OF ECOLOGY

GIS Technical Services
02/25/04
Figure_4.3.3



Eastern Washington Stormwater Manual



10-Year 24-Hour Isopluvials

Source: NOAA Atlas 2, Volume IX, 1973
Precipitation in inches

- County(2003, 1:24,000)
- City(2003, 1:24,000)
- Latitude/Longitude(1/10 degree)
- Isopluvial(1973, 1:2,000,000)
- NOAA/NWS Station(1931-1998)

Scale 1:1,600,000
Miles
0 16.5 33

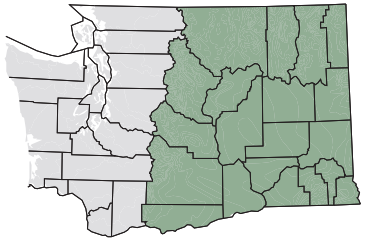
Water Quality Program

WASHINGTON STATE DEPARTMENT OF ECOLOGY

GIS Technical Services
02/25/04
Figure_4.3.4



Eastern Washington Stormwater Manual



25-Year 24-Hour Isopluvials

Source: NOAA Atlas 2, Volume IX, 1973
Precipitation in inches

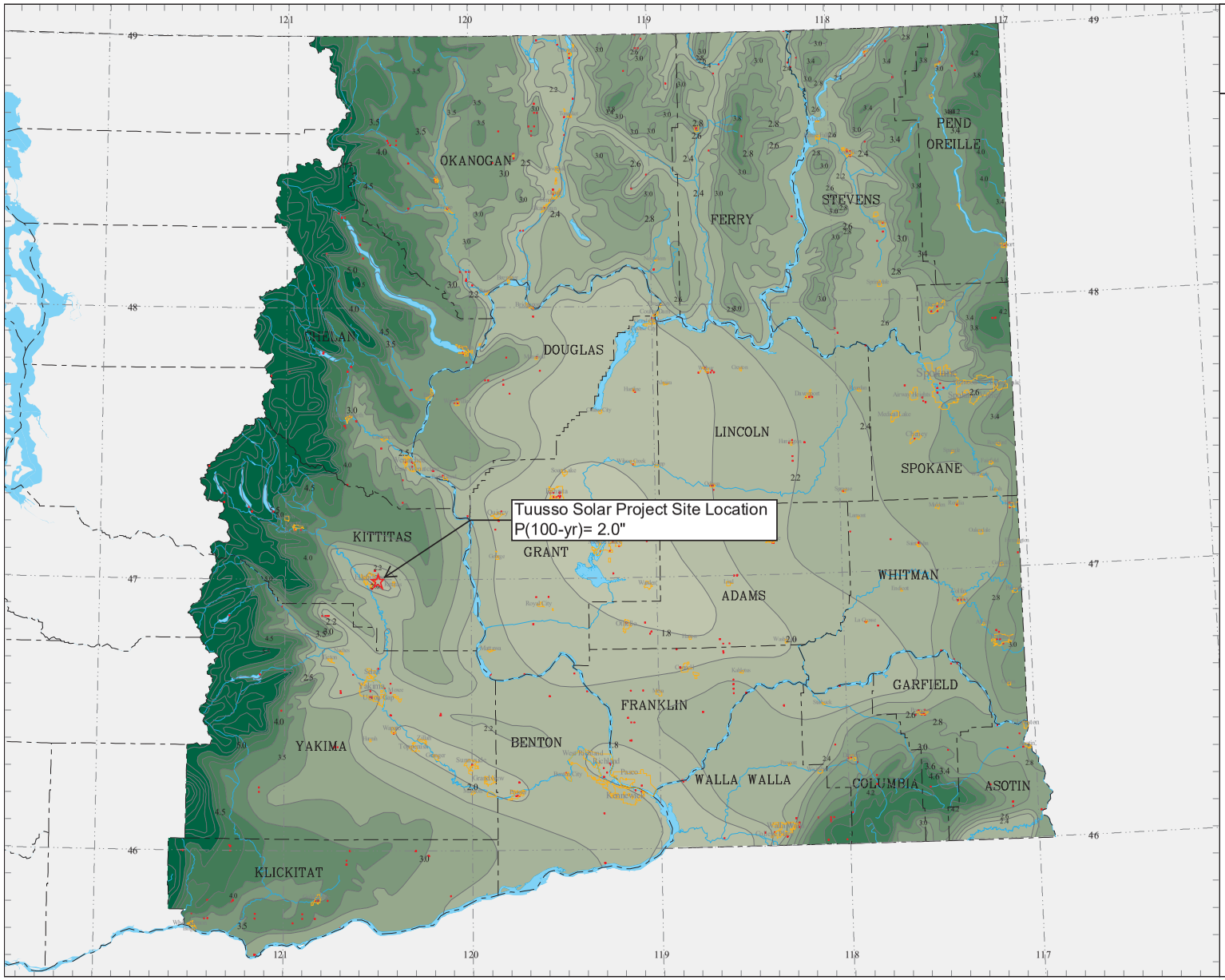
- County(2003, 1:24,000)
- City(2003, 1:24,000)
- Latitude/Longitude(1/10 degree)
- Isopluvial(1973, 1:2,000,000)
- NOAA/NWS Station(1931-1998)

Scale 1:1,600,000
Miles
0 16.5 33

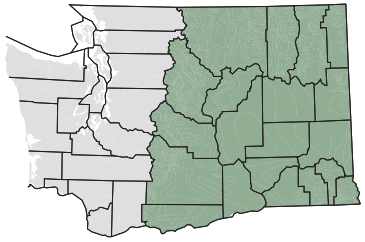
Water Quality Program

WASHINGTON STATE DEPARTMENT OF ECOLOGY

GIS Technical Services
02/25/04
Figure_4.3.5



Eastern Washington Stormwater Manual



100-Year 24-Hour Isopluvials

Source: NOAA Atlas 2, Volume IX, 1973
Precipitation in inches

County(2003, 1:24,000)
City(2003, 1:24,000)
Latitude/Longitude(1/10 degree)
Isopluvial(1973, 1:2,000,000)
NOAA/NWS Station(1931-1998)

Scale 1:1,600,000
Miles
0 16.5 33

Water Quality Program

WASHINGTON STATE DEPARTMENT OF ECOLOGY

GIS Technical Services
02/25/04
Figure_4.3.7

Appendix C:

CURVE NUMBER CALCULATIONS

Predeveloped Conditions											
Basin Name	Total Area (sf)	Total Area (ac)	Impervious Area (sf)	Impervious Area (ac)	HSG	CN	Meadow (sf)	Meadow (ac)	HSG	CN	**Composite Curve Number**
Exisiting Basin	1535081.8	35.24	0	0.00	-	-	1535081.81	35.24	D	78	**78**

Postdeveloped Conditions											
Basin Name	Total Area (sf)	Total Area (ac)	Impervious Area (sf)	Impervious Area (ac)	HSG	CN	Meadow (sf)	Meadow (ac)	HSG	CN	**Composite Curve Number**
Proposed Basin	1535081.8	35.24	74414.25	1.71	D	93	1460667.56	33.53	D	78	**79**

Impervious Area Break Down			
Lot or Tract	Area (sf)	CN classification	CN
Road	51480	Gravel	91
Inverters	3600	Impervious	98
Post	19334	Impervious	98
		Composite CN	93

Post Area

Solar Trackers	Length	Width	#	area (sf)
72 ft trackers	248	6.5	222	357864
52 ft trackers	188	6.5	12	14664
36 ft traclers	121	6.5	18	14157
			Total	386685
			assumed % impervious (posts)	5%
			impervious area	19334.25

Appendix D:

HydroCAD REPORT:
EXISTING BASIN

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
35.240	78	Meadow: HSG D (1S)

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	35.240	0.000	35.240	Meadow:	1S

Time span=5.00-72.00 hrs, dt=0.05 hrs, 1341 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Existing Fumaria Basin Runoff Area=35.240 ac 0.00% Impervious Runoff Depth=0.06"
Flow Length=2,050' Tc=65.8 min CN=78/0 Runoff=0.17 cfs 0.171 af

Summary for Subcatchment 1S: Existing Fumaria Basin

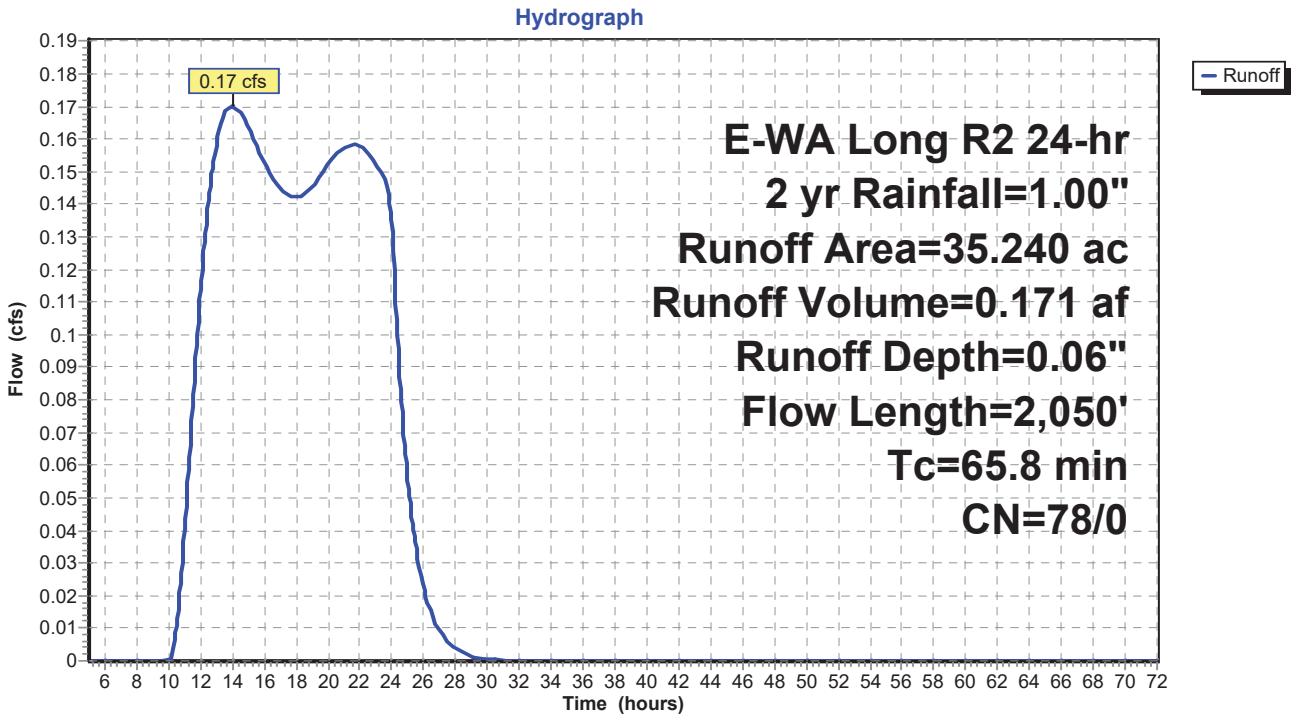
Runoff = 0.17 cfs @ 13.97 hrs, Volume= 0.171 af, Depth= 0.06"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 2 yr Rainfall=1.00"

	Area (ac)	CN	Description
*	35.240	78	Meadow: HSG D
	35.240	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
38.3	300	0.0192	0.13		**Sheet Flow,** Range n= 0.130 P2= 1.00"
27.5	1,750	0.0229	1.06		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
65.8	2,050	Total			

Subcatchment 1S: Existing Fumaria Basin



Time span=5.00-72.00 hrs, dt=0.05 hrs, 1341 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Existing Fumaria Basin Runoff Area=35.240 ac 0.00% Impervious Runoff Depth=0.12"
Flow Length=2,050' Tc=65.8 min CN=78/0 Runoff=0.38 cfs 0.344 af

Summary for Subcatchment 1S: Existing Fumaria Basin

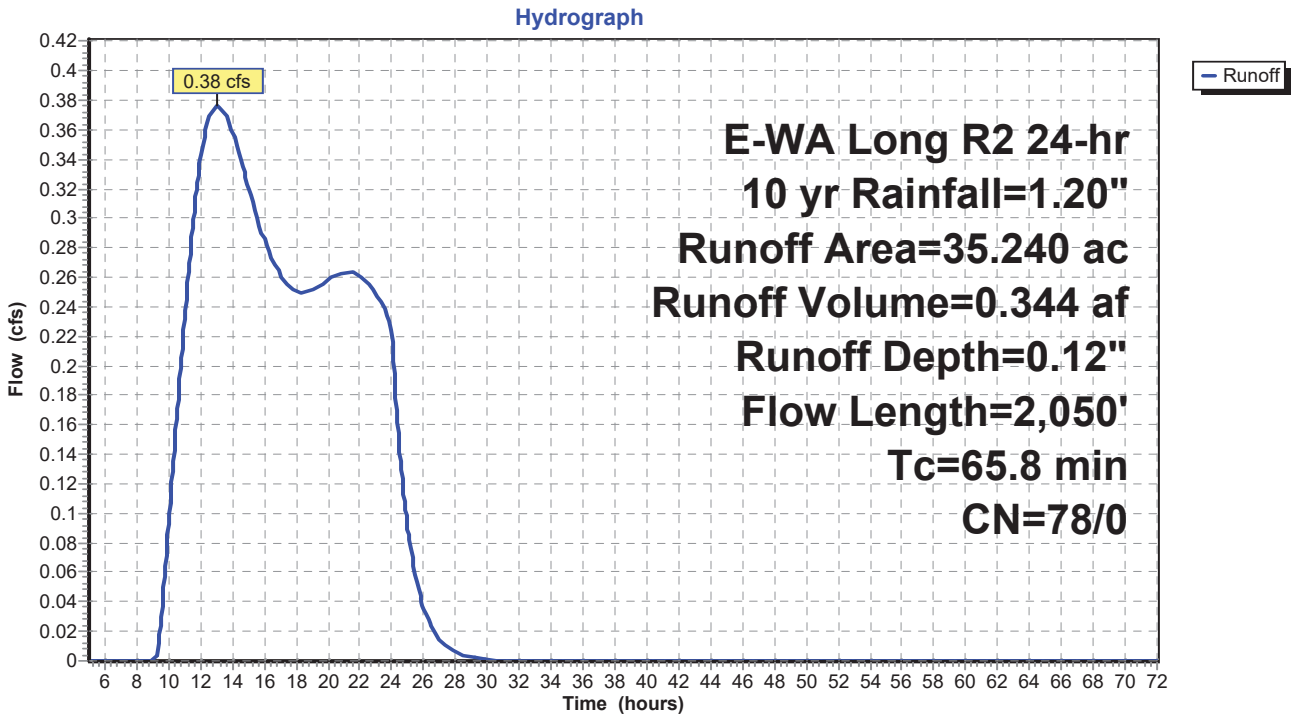
Runoff = 0.38 cfs @ 13.05 hrs, Volume= 0.344 af, Depth= 0.12"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 10 yr Rainfall=1.20"

	Area (ac)	CN	Description
*	35.240	78	Meadow: HSG D
	35.240	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
38.3	300	0.0192	0.13		**Sheet Flow,** Range n= 0.130 P2= 1.00"
27.5	1,750	0.0229	1.06		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
65.8	2,050	Total			

Subcatchment 1S: Existing Fumaria Basin



Time span=5.00-72.00 hrs, dt=0.05 hrs, 1341 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Existing Fumaria Basin Runoff Area=35.240 ac 0.00% Impervious Runoff Depth=0.28"
Flow Length=2,050' Tc=65.8 min CN=78/0 Runoff=0.96 cfs 0.817 af

Summary for Subcatchment 1S: Existing Fumaria Basin

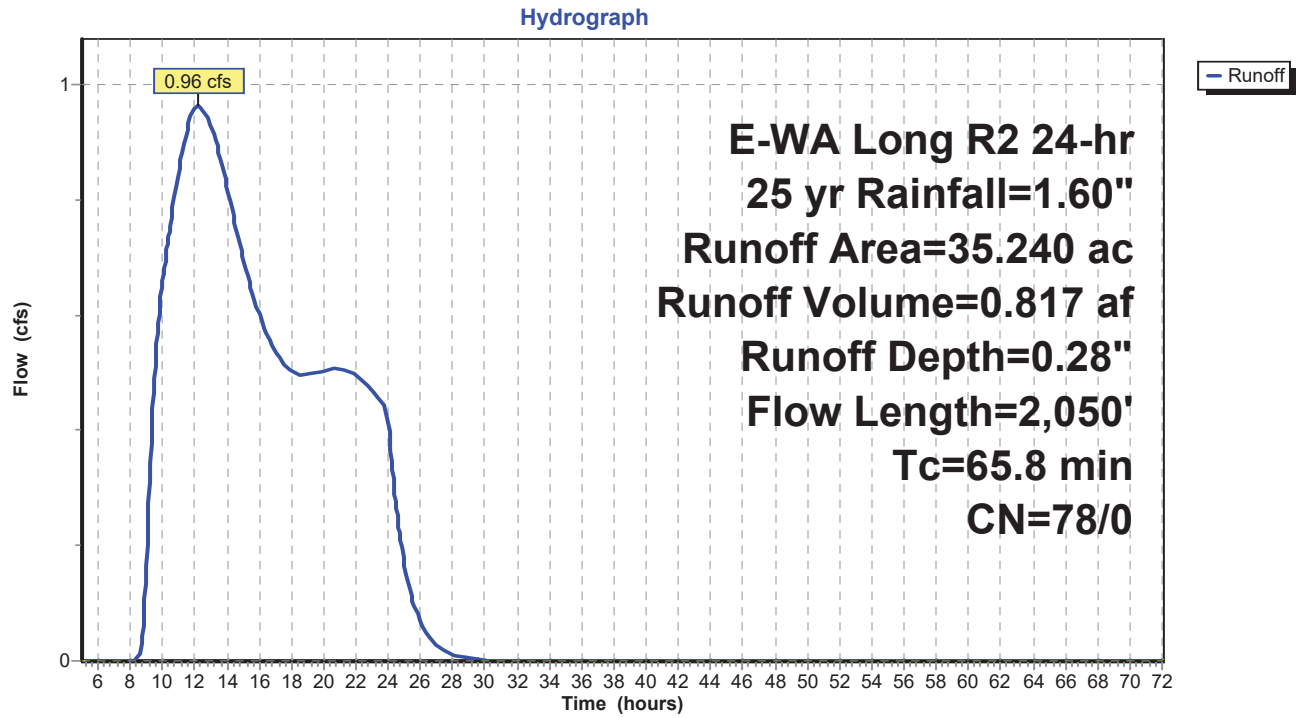
Runoff = 0.96 cfs @ 12.24 hrs, Volume= 0.817 af, Depth= 0.28"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 25 yr Rainfall=1.60"

	Area (ac)	CN	Description
*	35.240	78	Meadow: HSG D
	35.240	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
38.3	300	0.0192	0.13		**Sheet Flow,** Range n= 0.130 P2= 1.00"
27.5	1,750	0.0229	1.06		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
65.8	2,050	Total			

Subcatchment 1S: Existing Fumaria Basin



Time span=5.00-72.00 hrs, dt=0.05 hrs, 1341 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Existing Fumaria Basin Runoff Area=35.240 ac 0.00% Impervious Runoff Depth=0.48"
Flow Length=2,050' Tc=65.8 min CN=78/0 Runoff=1.73 cfs 1.423 af

Summary for Subcatchment 1S: Existing Fumaria Basin

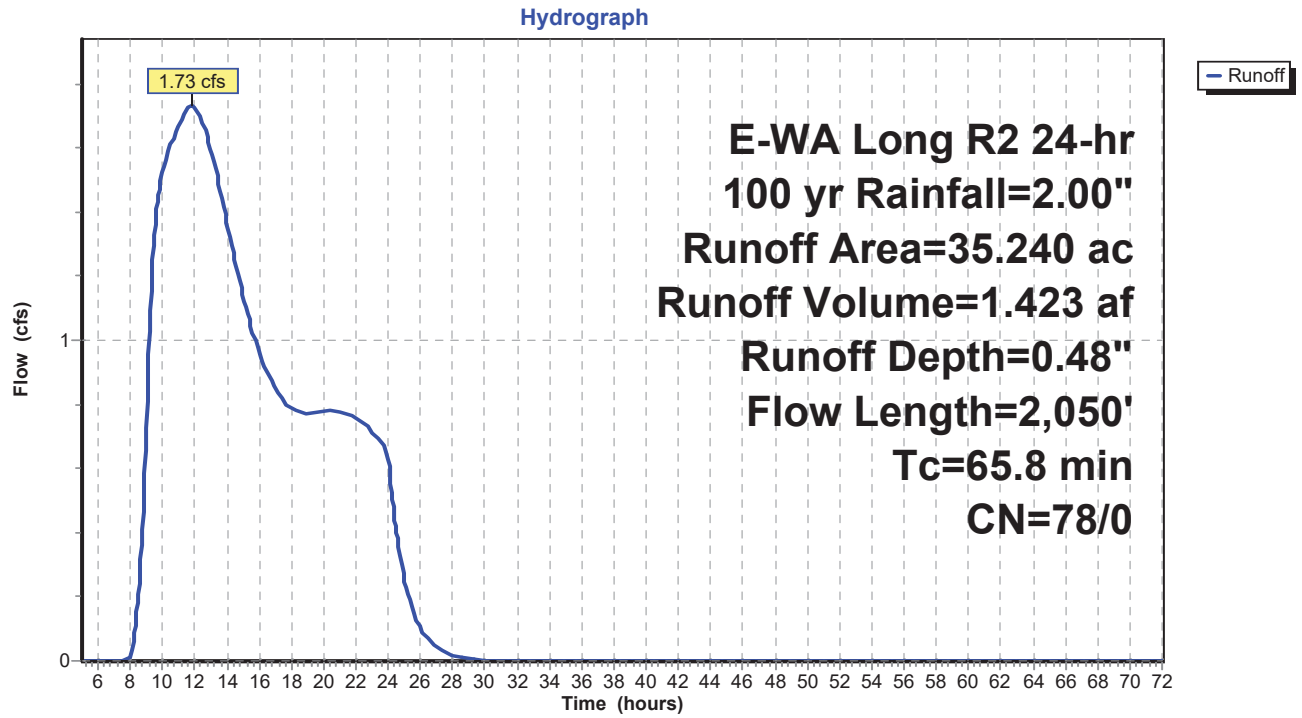
Runoff = 1.73 cfs @ 11.82 hrs, Volume= 1.423 af, Depth= 0.48"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 100 yr Rainfall=2.00"

	Area (ac)	CN	Description
*	35.240	78	Meadow: HSG D
	35.240	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
38.3	300	0.0192	0.13		**Sheet Flow,** Range n= 0.130 P2= 1.00"
27.5	1,750	0.0229	1.06		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
65.8	2,050	Total			

Subcatchment 1S: Existing Fumaria Basin



Appendix E:

HydroCAD REPORT:
PROPOSED BASIN

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.710	93	Impervious Areas (2S)
33.530	78	Meadow: HSG D (2S)

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.000	1.710	1.710	Impervious Areas	2S
0.000	0.000	0.000	33.530	0.000	33.530	Meadow:	2S

Time span=5.00-72.00 hrs, dt=0.05 hrs, 1341 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 2S: Proposed Fumaria Basin Runoff Area=35.240 ac 0.00% Impervious Runoff Depth=0.07"
Flow Length=2,050' Tc=65.8 min CN=79/0 Runoff=0.21 cfs 0.206 af

Summary for Subcatchment 2S: Proposed Fumaria Basin

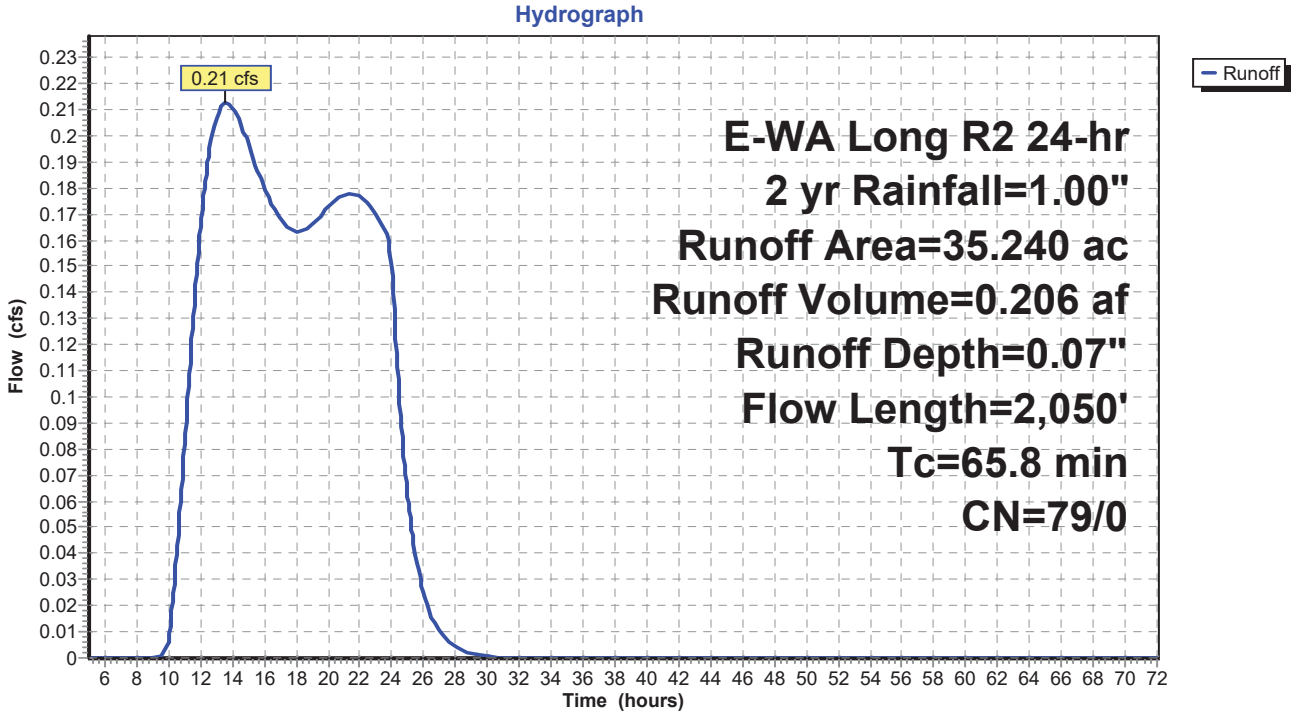
Runoff = 0.21 cfs @ 13.59 hrs, Volume= 0.206 af, Depth= 0.07"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 2 yr Rainfall=1.00"

	Area (ac)	CN	Description
*	1.710	93	Impervious Areas
*	33.530	78	Meadow: HSG D
	35.240	79	Weighted Average
	35.240	79	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
38.3	300	0.0192	0.13		**Sheet Flow,** Range n= 0.130 P2= 1.00"
27.5	1,750	0.0229	1.06		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
65.8	2,050	Total			

Subcatchment 2S: Proposed Fumaria Basin



Time span=5.00-72.00 hrs, dt=0.05 hrs, 1341 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 2S: Proposed Fumaria Basin Runoff Area=35.240 ac 0.00% Impervious Runoff Depth=0.13"
Flow Length=2,050' Tc=65.8 min CN=79/0 Runoff=0.44 cfs 0.394 af

Summary for Subcatchment 2S: Proposed Fumaria Basin

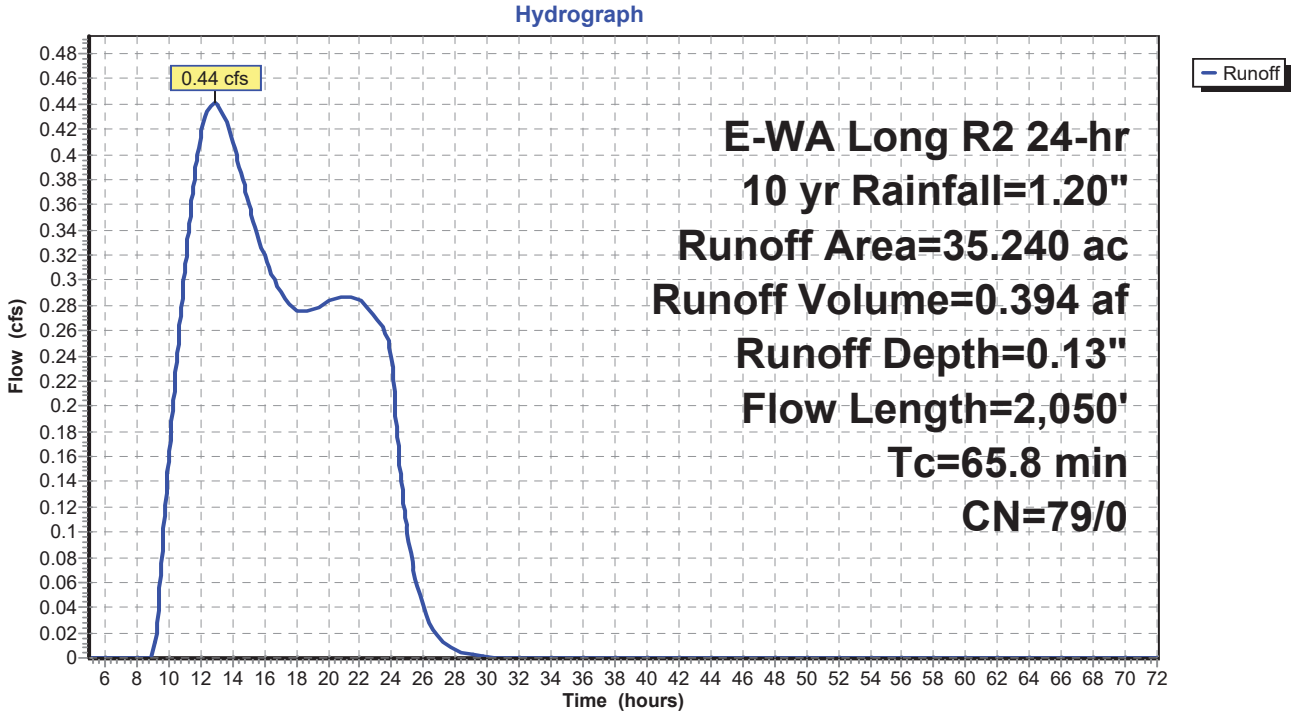
Runoff = 0.44 cfs @ 12.85 hrs, Volume= 0.394 af, Depth= 0.13"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 10 yr Rainfall=1.20"

	Area (ac)	CN	Description
*	1.710	93	Impervious Areas
*	33.530	78	Meadow: HSG D
	35.240	79	Weighted Average
	35.240	79	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
38.3	300	0.0192	0.13		**Sheet Flow,** Range n= 0.130 P2= 1.00"
27.5	1,750	0.0229	1.06		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
65.8	2,050	Total			

Subcatchment 2S: Proposed Fumaria Basin



Time span=5.00-72.00 hrs, dt=0.05 hrs, 1341 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 2S: Proposed Fumaria Basin Runoff Area=35.240 ac 0.00% Impervious Runoff Depth=0.31"
Flow Length=2,050' Tc=65.8 min CN=79/0 Runoff=1.07 cfs 0.899 af

Summary for Subcatchment 2S: Proposed Fumaria Basin

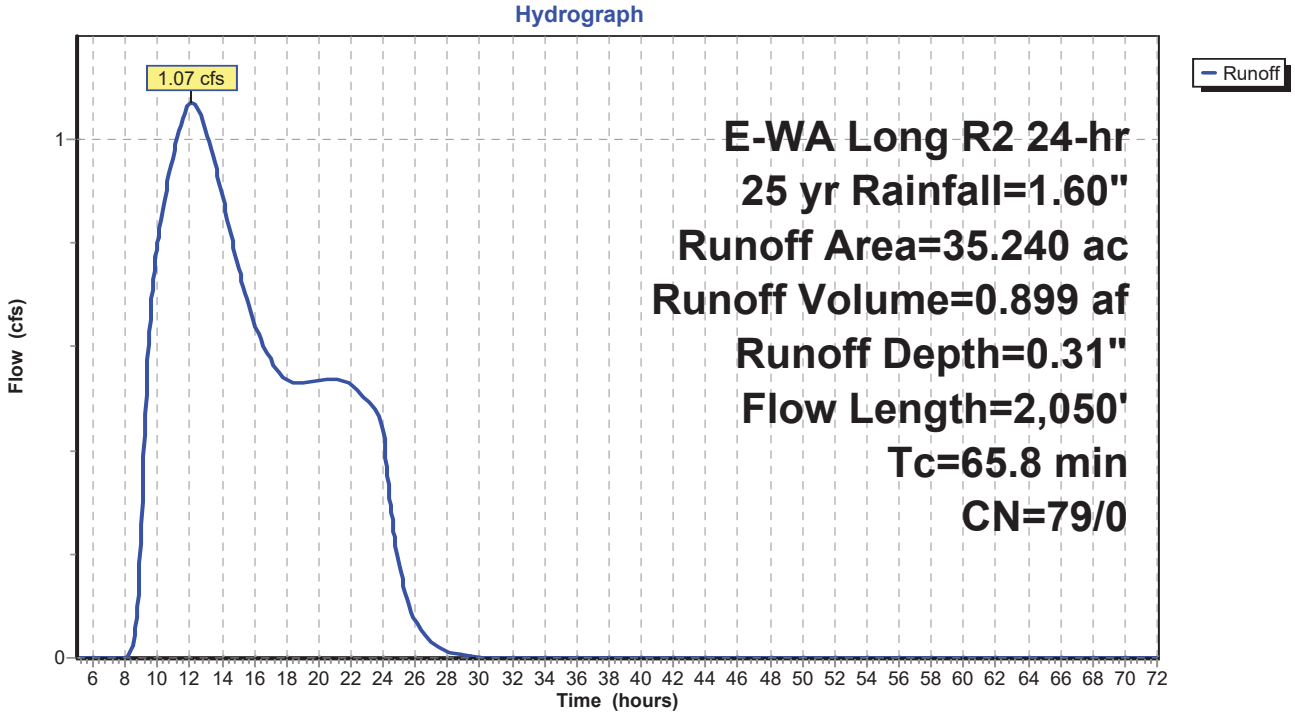
Runoff = 1.07 cfs @ 12.11 hrs, Volume= 0.899 af, Depth= 0.31"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 25 yr Rainfall=1.60"

	Area (ac)	CN	Description
*	1.710	93	Impervious Areas
*	33.530	78	Meadow: HSG D
	35.240	79	Weighted Average
	35.240	79	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
38.3	300	0.0192	0.13		**Sheet Flow,** Range n= 0.130 P2= 1.00"
27.5	1,750	0.0229	1.06		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
65.8	2,050	Total			

Subcatchment 2S: Proposed Fumaria Basin



Time span=5.00-72.00 hrs, dt=0.05 hrs, 1341 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 2S: Proposed Fumaria Basin Runoff Area=35.240 ac 0.00% Impervious Runoff Depth=0.52"
Flow Length=2,050' Tc=65.8 min CN=79/0 Runoff=1.88 cfs 1.534 af

Summary for Subcatchment 2S: Proposed Fumaria Basin

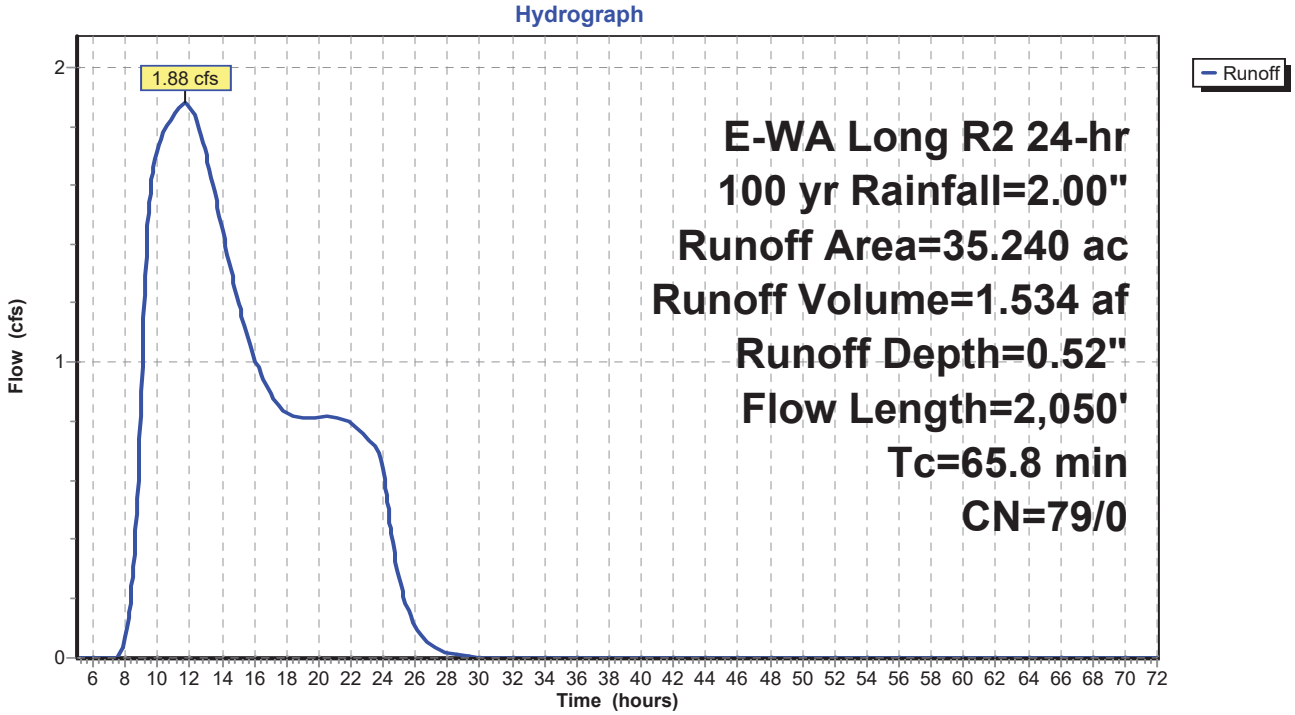
Runoff = 1.88 cfs @ 11.72 hrs, Volume= 1.534 af, Depth= 0.52"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 100 yr Rainfall=2.00"

	Area (ac)	CN	Description
*	1.710	93	Impervious Areas
*	33.530	78	Meadow: HSG D
	35.240	79	Weighted Average
	35.240	79	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
38.3	300	0.0192	0.13		**Sheet Flow,** Range n= 0.130 P2= 1.00"
27.5	1,750	0.0229	1.06		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
65.8	2,050	Total			

Subcatchment 2S: Proposed Fumaria Basin



Appendix I: Penstemon Solar Project Site Reports and Permit Applications

I-1: Penstemon Solar Project Critical Areas Report

I-2: Penstemon Solar Project Cultural Resources Report

I-3: Penstemon Solar Project Permit Applications

I-4: Penstemon Solar Project Geotechnical Engineering Study

I-5: Penstemon Solar Project Drainage Report

Appendix I-1: Penstemon Solar Project Critical Areas Report



CRITICAL AREAS WETLAND AND WATERS DELINEATION REPORT FOR THE PENSTEMON SOLAR PROJECT



July 10, 2017

SWCA ENVIRONMENTAL CONSULTANTS
SEATTLE, WASHINGTON

CRITICAL AREAS WETLAND AND WATERS DELINEATION REPORT FOR THE PENSTEMON SOLAR PROJECT KITTITAS COUNTY, WASHINGTON

Section 17, Township 17 North, Range 19 East
Parcel Number 840233

Report Prepared for

TUUSSO Energy, LLC

By
Evan Dulin

July 10, 2017

Project Number 38727.05

SWCA Environmental Consultants
221 1st Ave W, Suite 205
Seattle, Washington 98119

TABLE OF CONTENTS

1 INTRODUCTION 1
1.1 Background 1
1.2 Project Setting 1
2 METHODS 1
2.1 Study Area 1
2.2 Review of Existing Information 1
2.3 Field Investigation 3
2.3.1 Wetlands 6
2.3.2 Riparian Habitats 9
3 RESULTS AND DISCUSSION 9
3.1 Wetlands 10
3.1.1 Wetland PW01 11
3.2 Frequently Flooded Areas 12
3.3 Geologically Hazardous Areas 12
3.4 Habitats 12
3.4.1 Riparian Habitat 12
3.4.2 Priority Habitats and Species 13
3.5 Aquifer Recharge Areas 13
4 CONCLUSIONS AND RECOMMENDATIONS 14
5 DISCLAIMER 15
6 LITERATURE CITED AND REVIEWED 16
APPENDIX A: WETLAND DELINEATION METHODOLOGY A-1
APPENDIX B: VEGETATION LIST B-1
APPENDIX C: WETLAND DATA SHEETS C-1
APPENDIX D: WETLAND AND STREAM PHOTOGRAPHS D-1
APPENDIX E: ECOLOGY RATING FORMS E-1
APPENDIX F: KITTITAS COUNTY WETLAND BUFFER GUIDANCE F-1

LIST OF TABLES

Table 1. Precipitation for 3 Months Prior to Site Visits (in inches) 6
Table 2. Precipitation 2 Weeks Prior to Site Visits (in inches) 6
Table 3. Washington State Department of Ecology Wetland Rating System 7
Table 4. Summary of the Water Typing System 9
Table 5. Soil Mapping within the Study Area 10
Table 6. Wetland Size, Rating, and Classification for Wetlands within the Study Area 11
Table 7. Summary of Streams in the Study Area 12
Table 8. Wetland and Waters Summary 14

LIST OF FIGURES

Figure 1. Project vicinity map. 2
Figure 2. NWI, NHD, and floodplain mapping. 4
Figure 3. Soils and PHS mapping. 5
Figure 4. Wetland and waters delineation map 8

1 INTRODUCTION

This report describes the methods and findings of wetland, stream, and other critical areas delineation for the proposed Penstemon Solar Project. The report was prepared by SWCA Environmental Consultants (SWCA), and is intended to address permitting requirements under Energy Facility Site Evaluation Council (EFSEC) Washington Administrative Code (WAC) 463-60-322, -332, and -333, and to show compliance of the proposed project with Kittitas County's Code for Critical Areas Ordinance (KCC Chapter 17A).

1.1 Background

TUUSSO Energy, LLC (TUUSSO) is proposing to construct a new photovoltaic solar facility installation on approximately 37.0 acres of private agricultural land, which would connect into the existing Puget Sound Energy (PSE) distribution transmission line along Tjossem Road, located southeast of Ellensburg, Kittitas County, Washington. The Penstemon Solar Project is intended to provide up to 5 MW of solar energy to PSE for use within their service area.

1.2 Project Setting

The Penstemon Solar Project site is active agricultural land located immediately southwest of the intersection of Tjossem Road and Moe Road in unincorporated Kittitas County, Washington. The project would be located approximately 4 miles southeast of the Ellensburg city center, in Section 17 of Township 17 North, Range 19 East, Willamette Meridian (Figure 1). The project site totals approximately 37.0 acres. Topography of the site slopes to the south, with surface elevations ranging from 1,498 to 1,509 feet above mean sea level.

2 METHODS

2.1 Study Area

The Penstemon Solar Project study area is approximately 37.0 acres in size (Figure 1). Wetlands and streams outside of the project site but that occur within 200 feet of the project site boundary and had the potential to have buffers extend into the project site were included in the study area. Wetlands and streams outside of the project site and within the study area were visually inspected but not formally delineated.

2.2 Review of Existing Information

Prior to conducting fieldwork, background materials were reviewed to determine the potential for wetlands, floodplains, habitats, and other critical areas and their buffers to occur within the study area. Materials referenced during the desktop study are listed below. The list below follows the KCC Critical Areas required checklist outlined in KCC Chapter 17A.03.035.

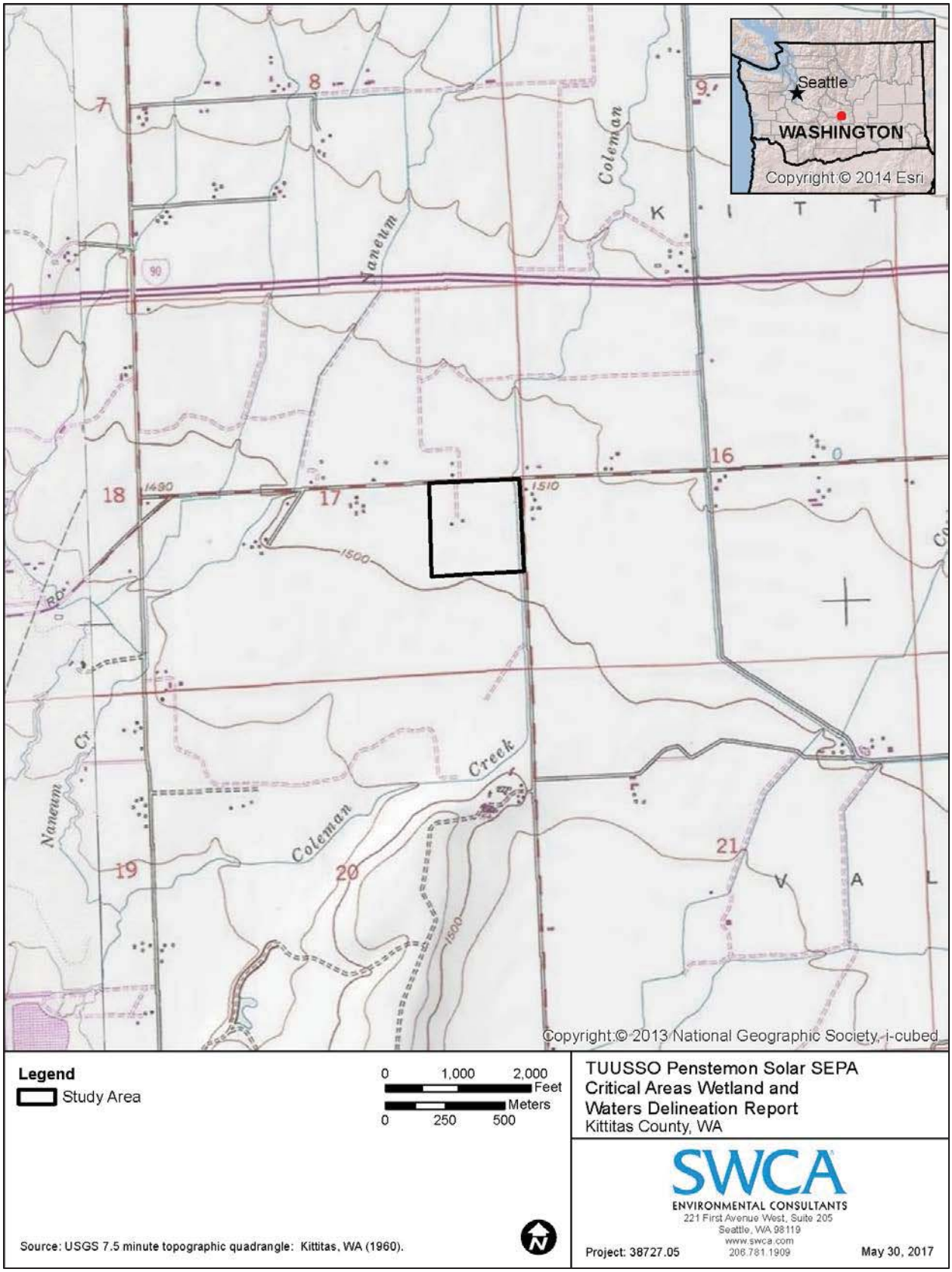


Figure 1. Project vicinity map.

Wetlands (KCC Chapter 17A.04)

- Historical Google Earth aerial photography (2000–2016).
- U.S. Department of Agriculture (USDA) historical imagery (USDA 1954).
- U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle map for Kittitas, Washington, included in Figure 1.
- USFWS National Wetlands Inventory (NWI) data and USGS National Hydrography Dataset (NHD), included in Figure 2.
- Natural Resources Conservation Service (NRCS) Soil Survey of Kittitas County Area, Washington and NRCS Web Soil Survey map of the study area, included in Figure 3.

Frequently flooded areas (KCC Chapter 17A.05)

- Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Panel 5300950558B, included in Figure 2.

Geologically hazardous areas (KCC Chapter 17A.06)

- Includes erosion, landslide, mine, and seismic hazard areas.
- Kittitas County COMPAS mapping tool.

Habitats (KCC Chapter 17A.07)

- Includes riparian habitats and streams and rivers.
- Washington State Department of Fish and Wildlife (WDFW) SalmonScape online mapper.
- WDFW Priority Habitats and Species (PHS) online mapper, included in Figure 3.

Aquifer recharge areas (KCC Chapter 17A.08)

- No critical aquifer recharge locations have been identified in Kittitas County.

Spatial data obtained during the review of existing information were incorporated into the Penstemon Solar Project base maps (Figures 1 through 3).

2.3 Field Investigation

Following the desktop review of existing information, a team of two biologists conducted a site visit on April 10, 2017, to assess the Penstemon Solar Project study area for the presence of wetland and non-wetland water features and to record data relevant to the Washington State Department of Ecology's (Ecology's) most recently approved version of the *Washington State Wetland Rating System for Eastern Washington, 2014 Update* (Hruby 2014). Visual observations were recorded within 200 feet of the project site, and included wildlife and habitat data.

Precipitation data were obtained from the closest wetlands climate analysis (WETS) climate station, the Ellensburg National Weather Service (NWS) station (ELBW1), approximately 2.75 miles to the west of the project site in southern Ellensburg, Washington. Historical (1971–2000) average annual rainfall is 8.96 inches. Table 1 shows the monthly precipitation at the Ellensburg NWS weather station for the 3 months prior to the April 10, 2017, site visit. Table 2 shows the rainfall received 2 weeks prior to the site visit, and the water-year-to-date (WYTD) rainfall. Rainfall recorded 3 months prior to fieldwork was wetter than normal.

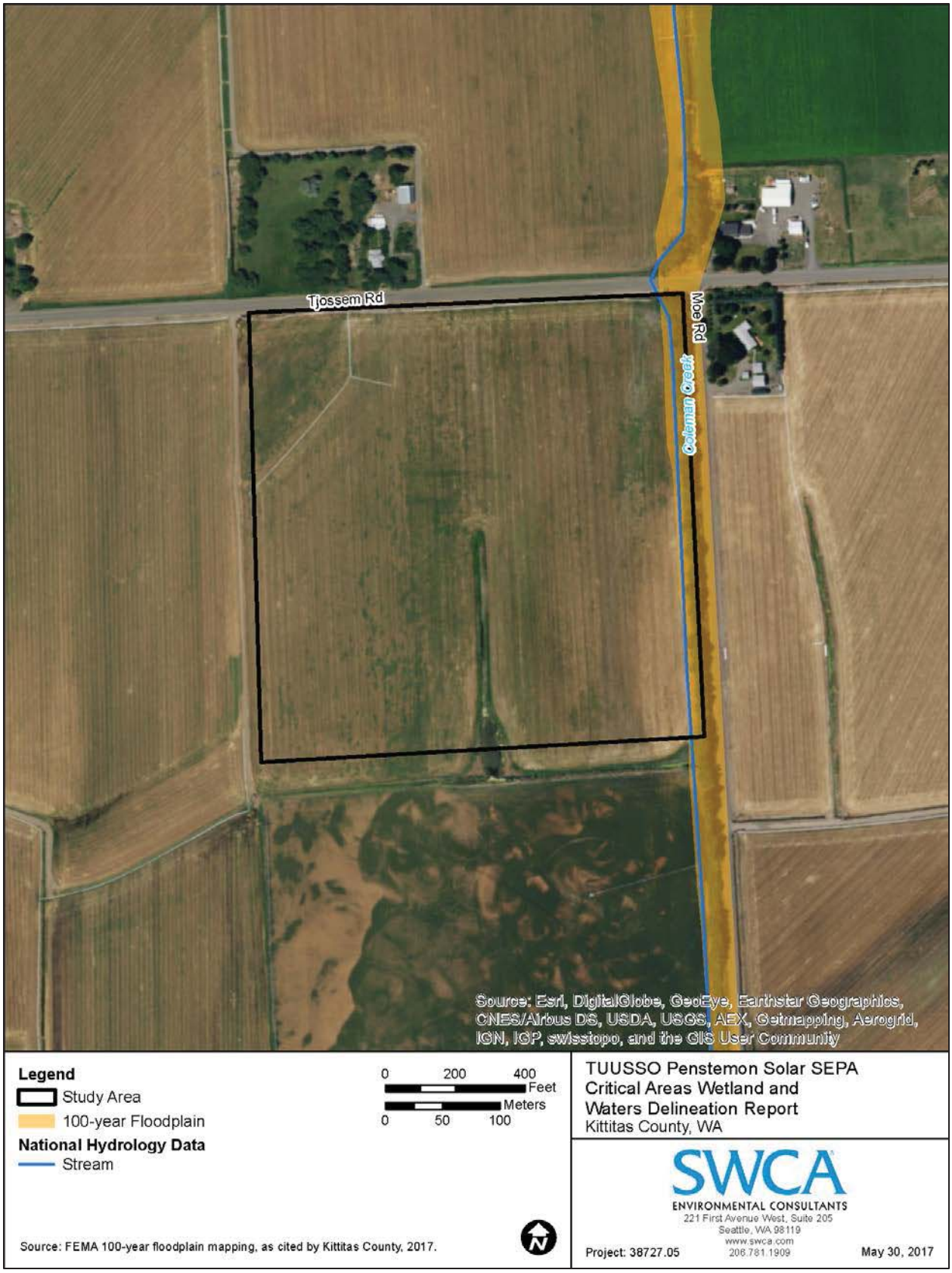


Figure 2. NWI, NHD, and floodplain mapping.

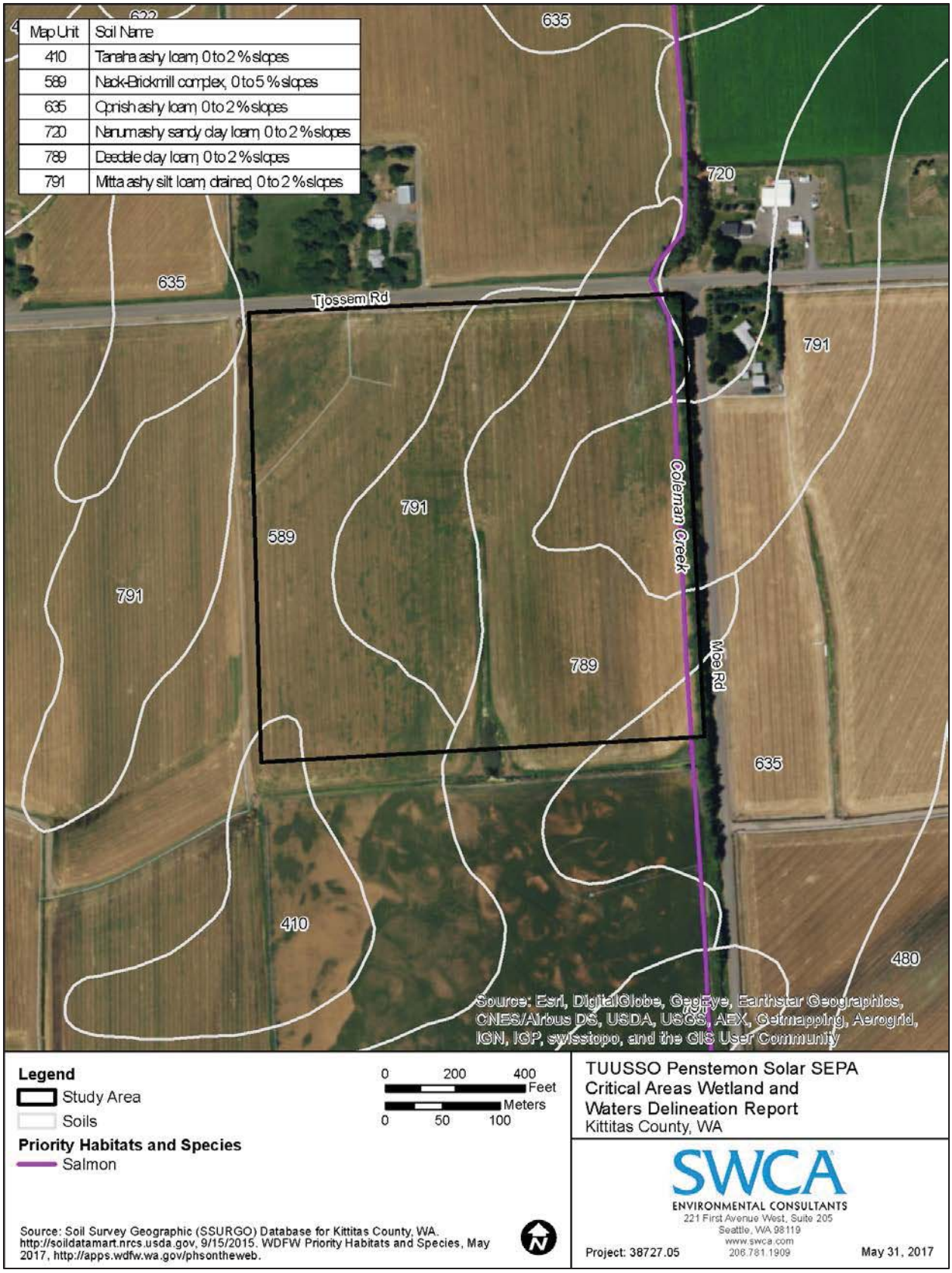


Figure 3. Soils and PHS mapping.

Table 1. Precipitation for 3 Months Prior to Site Visits (in inches)

Month	Average	30% Chance Will Have		Observed Precipitation	Within Normal Range?
		Less Than	More Than		
March	0.76	0.36	0.93	1.49	Above
February	0.91	0.59	1.10	2.04	Above
January	1.19	0.65	1.45	1.54	Above

Source: NRCS 2017b.

Table 2. Precipitation 2 Weeks Prior to Site Visits (in inches)

Field Study	Precipitation 2 Weeks Prior	WYTD	Inches Above or Below Normal WYTD*
April 9–March 27, 2017	0.76	9.37	3.11 above

*Based on average precipitation from 1981 to 2010.
Source: NRCS 2017b.

2.3.1 Wetlands

The Penstemon Solar Project study area was investigated for wetlands in accordance with the current methodology of the U.S. Army Corps of Engineers' (USACE's) 2008 *Arid West Regional Supplement (Version 2)* and the *Wetlands Delineation Manual* (Environmental Laboratory 1987). A detailed description of the field methods used in this study is provided in Appendix A.

A Trimble Geo XT global positioning system (GPS) unit was used by the field team to assist in identifying the project site boundaries and to record site spatial data. This device is capable of submeter accuracy. The full extent of the study area was covered by the team of biologists. Photographs were collected and vegetation, soil, and hydrology characteristics were documented. The boundaries for wetlands located outside of the project site but within the study area were approximated using field observations and aerial imagery to determine the extent of on-site wetland buffers.

Geographic information system (GIS) software were used to analyze data and to produce the report figures (Figure 4). Per WAC 463-60-333 and KCC Chapter 17A, wetlands were rated using the *Washington State Wetland Rating System for Eastern Washington, 2014 Update*. Per KCC 17A.04.020, the resulting wetland ratings were used to determine the County-prescribed range of wetland buffers for each wetland. Table 3 lists Ecology's wetland rating criteria. Kittitas County's definition of a wetland is based on the Revised Code of Washington (RCW) 36.70A.030, which states:

> *(21) "Wetland" or "wetlands" means areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Wetlands do not include those artificial wetlands intentionally created from nonwetland sites, including, but not limited to, irrigation and drainage ditches, grass-lined swales, canals, detention facilities, wastewater treatment facilities, farm ponds, and landscape amenities, or those wetlands created after July 1, 1990, that were unintentionally created as a result of the construction of a road, street, or highway. Wetlands may include those artificial wetlands intentionally created from nonwetland areas created to mitigate conversion of wetlands.*

A detailed analysis of wetland functions is not included in this report; however, a brief description of wetland functions is provided as part of the general description for each wetland.

Table 3. Washington State Department of Ecology Wetland Rating System

Category			
I	**II**	**III**	**IV**
Category I wetlands: Represent a unique or rare wetland type; are more sensitive to disturbance than most wetlands; are relatively undisturbed and contain ecological attributes that are impossible to replace within a human lifetime; or provide a high level of functions. Specific wetlands that meet the Category I criteria include: 1. alkali wetlands, characterized by the presence of shallow saline water with a high pH; 2. natural heritage wetlands, specifically, wetlands identified by the Washington Natural Heritage Program/DNR as high quality relatively undisturbed wetlands; and wetlands that support state-listed threatened or endangered plants; 3. bogs and calcareous fens; 4. mature and old-growth forested wetlands with slow growing trees that are over 0.25 acre in size; and 5. wetlands that perform many functions very well, as indicated by a score of 22 or more points out of 27 on the wetland rating form.	Category II wetlands: Wetlands that are difficult, though not impossible, to replace, and provide high levels of some functions. Specific wetlands that meet the Category II criteria include: 1. forested wetlands in the floodplains of rivers; 2. mature and old-growth forested wetlands with fast growing trees that are over 0.25 acre in size; 3. vernal pool that are located in a landscape with other wetlands and that are relatively undisturbed during the early spring; and 4. wetlands scoring between 19 and 21 points, out of 27, on the wetland rating form.	Category III wetlands: Wetlands that provide a moderate level of functions. Specific wetlands that meet the Category III criteria include: 1. wetlands scoring between 16 and 18 points, out of 27, on the wetland rating form.	Category IV wetlands: Wetlands that have the lowest levels of functions and are heavily disturbed. Specific wetlands that meet the Category IV criteria include: 1. wetlands scoring less than 16 points out of 27 on the wetland rating form.

Source: Hruby (2014).
Kittitas County wetland category definitions defer to Washington Administrative Code for guidance.
Appendix F includes the County-issued guidance.



Figure 4. Wetland and waters delineation map.

2.3.2 Riparian Habitats

Biologists also investigated the Penstemon Solar Project study area for the presence of non-wetland waters and used a GPS device to delineate the ordinary high water marks (OHWMs) of streams per the definitions in WAC 173-22-030 (Figure 4). The OHWMs of streams and rivers outside of the project site but within the study area were approximated using field observations and aerial imagery to determine the extent of on-site stream buffers.

Streams identified in the study area were classified according to the WAC stream typing system (WAC 222-16-030). Criteria for this typing system are described in Table 4. The stream types described in this report are based on the stream reaches within the study area; downstream reaches may be rated higher.

Table 4. Summary of the Water Typing System

Stream Type	Definition [a]
S	All waters, within their bankfull width, as inventoried as "shorelines of the state" under Chapter 90.58 RCW and the rules promulgated pursuant to Chapter 90.58 RCW including periodically inundated areas of their associated wetlands.
F	All segments of natural waters that are not Type S waters, and that contain fish or fish habitat, including: 1) waters diverted for domestic use by more than 10 residential or camping units or by a public accommodation facility; 2) waters diverted for use by a federal, state, or Tribal fish hatchery from the point of diversion for 1,500 feet or the entire tributary if the tributary is highly significant for protection of downstream water quality; 3) waters that are within a federal, state, local, or private campground having more than 10 camping units; or 4) riverine ponds, wall-based channels, and other channel features that are used by fish for off-channel habitat.
Np	All segments of natural waters within the bankfull width of defined channels that are perennial non–fish habitat streams. Perennial streams are flowing waters that do not go dry any time of a year of normal rainfall and include the intermittent dry portions of the perennial channel below the uppermost point of perennial flow.
Ns	All segments of natural waters within the bankfull width of the defined channels that are not Type S, F, or Np waters. These are seasonal, non–fish habitat streams in which surface flow is not present for at least some portion of a year of normal rainfall and the stream is not located downstream from any stream reach that is a Type Np water. Ns waters must be physically connected by an above-ground channel system to Type S, F, or Np waters.

[a] Definitions are summarized from WAC 222-16-030. Kittitas County stream type definitions defer to WAC for guidance.

3 RESULTS AND DISCUSSION

The Penstemon Solar Project site primarily consists of actively managed agriculture for growing broom-corn (*Sorghum bicolor*). At the time of the site visit, the field was plowed and was mostly unvegetated. The southern middle portion of the site previously had an excavated drainage that has since been plowed over within the last two years. This area still retains some water as a topographic low spot where water flows south outside of the project site and meets a ditch to the south, that flows east to meet Coleman Creek.

Coleman Creek enters the Penstemon Solar Project study area through a box culvert beneath Tjossem Road, on the northern project site boundary in the northeast corner of the site. Coleman Creek flows south, meandering in and out of the eastern project site boundary, along Moe Road. The creek continues south and away from the study area for about 2,000 feet before heading southwest to eventually meet with Naneum Creek and the Yakima River.

The majority of the Penstemon Solar Project site is plowed and unvegetated, except along Coleman Creek where the riparian vegetation is dominated by reed canary grass (*Phalaris arundinacea*), prickly lettuce (*Lactuca serriola*), common yarrow (*Achillea millefolium*), Canadian thistle (*Cirsium arvense*),

Canadian goldenrod (*Solidago canadensis*), great mullein (*Verbascum thapsus*), garden yellow-rocket (*Barbarea vulgaris*), downy cheat grass (*Bromus tectorum*), black hawthorn (*Crataegus douglasii*), Nootka rose (*Rosa nutkana*), and crack willow (*Salix* X *fragilis*). Refer to Appendix B for a complete list of vegetation observed within the study area.

The proposed Penstemon Solar Project site is bordered by Tjossem Road to the north, Moe Road to the east, and agricultural fields to the south and west. The project site is approximately 2.6 miles east of the Yakima River and is surrounded by active agricultural land and rural residences in all directions. Access to the proposed project site is via an access road from Tjossem Road, just northwest of the study area.

According to NRCS, the Penstemon Solar Project study area encompasses six different soil map units (Table 5). These soil map units range from somewhat poorly drained to moderately well drained soils that occur on terraces, alluvial fans, flood plains, inset fans, fan skirts, and fan aprons. None of the soil units within the study area are on the National Hydric Soils list (NRCS 2015), which is a list of soils that can be indicative of saturated, flooded, or ponded areas that could meet the definition of a hydric soil.

Table 5. Soil Mapping within the Study Area

Map Unit Symbol	Map Unit Name	Hydric
410	Tanaha ashy loam, 0%–2% slopes	No
589	Nack-Brickmill complex, 0%–5 slopes	No
635	Opnish ashy loam, 0%–2% slopes	No
720	Nanum ashy sandy clay loam, 0%–2% slopes	No
789	Deedale clay loam, 0%–2% slopes	No
791	Mitta ashy silt loam, drained, 0%–2% slopes	No

Source: NRCS 2015 and 2017b.

3.1 Wetlands

One wetland was delineated outside of the Penstemon Solar Project study area, to the south, that would have a protection buffer that extends into the study area. The wetland was distinguished from adjoining uplands by the absence of indicators of wetland hydrology and hydric soils. Wetland delineation data sheets are provided in Appendix C, photographs are provided in Appendix D, and wetland rating forms are provided in Appendix E.

Table 6 summarizes the size, rating, and classification of the wetland found adjacent to the Penstemon Solar Project study area. The delineated wetland would fall under the jurisdiction of the USACE, Ecology, and Kittitas County. Figure 4 show the locations of the wetlands, streams, data plots, and their associated minimum protection buffers. The minimum wetland protection buffers were calculated per KCC guidance, based on Ecology's Wetland Rating for each wetland. Detailed descriptions of each wetland are provided in the following sections.

Table 6. Wetland Size, Rating, and Classification for Wetlands within the Study Area

Wetland Name	Delineated Area within Project Site (Wetland Rating Unit Size) [a] (acres)	Wetland Rating [b]	Hydrogeomorphic Classification	Cowardin Classification [c]	Dominant Species Observed within Wetland
PW01	0.00 (0.14)	III	Depressional	PEM	Remnant cattail along southern property boundary

a Wetland rating unit size is the total area of wetland delineated or estimated based on aerial photograph interpretation and field reconnaissance. Area of delineated portions of the wetlands is based on SWCA survey data.

b Wetland ratings are based on *Washington State Wetland Rating System for Eastern Washington – Revised* (Hruby 2014).

c Cowardin et al. (1979).

3.1.1 Wetland PW01

Palustrine emergent
Category III
0.00 acre within the project site, and 1.14 acres in total

Wetland PW01 is a small depressional wetland located south of the project site (see Figure 4; and wetland rating Figures 1 through 5 in Appendix E). Delineation data were recorded at sample plots PP02 through PP04, provided on datasheets in Appendix C. The wetland does not extend into the project site and drains via overland flow to the offsite ditch to the east and eventually Coleman Creek. The upland boundary is primarily defined by a transition from hydric to non-hydric soils but also coincides with a very subtle rise in elevation and the absence of wetland hydrology indictors.

Wetland PW01 is a palustrine emergent (PEM) wetland habitat type (Cowardin et al. 1979). Refer to Table A-1 in Appendix A for definitions of wetland indictor statuses listed in this section (i.e., OBL). The wetland was recently plowed and lacked vegetation. There were remnants of broadleaf cattail (*Typha latifolia*, OBL) along the southern property boundary and wetland edge.

Soils in Wetland PW01 are mapped as Deedale clay loam, with 0 to 2% slopes (NRCS 2017a) (see Figure 3). The soil profile observed within 16 inches of the soil surface consisted of very dark brown (10YR 2/2) silt loam over a very dark grayish brown (2.5Y 3/2) silt loam with faint redoximorphic features and gleyed black (N 2.5/0) in the matrix starting at 6 inches (Munsell Color 2009). A 2-inch thick layer of gleyed black silt loam was present from 8 to 10 inches with olive gray (5Y 4/2) depletions over a very dark gray (5Y 3/1) silt loam lacking redoximorphic features starting at 10 inches (Munsell Color 2009). The soils in Wetland PW01 meet the hydric soil indicator for Loamy Gleyed Matrix (F2).

Primary indicators of hydrology within the wetland include saturation from 0 to 6 inches and inundation visible on aerial imagery. Surface water was observed during a previous site visit at a depth of 2 inches. The presence of these indicators meets wetland hydrology criteria.

Wetland PW01 is rated as a Category III wetland in the Ecology rating system (see Table 3), with moderate scores for hydrologic function and water quality improvement (6/9 points) and a moderately low score for habitat function (5/9 points). Wetland PW01 has a moderate potential to provide water quality function and hydrologic function because it has an intermittently flowing surface water outlet, it is located in an area with intensive land use that generates pollutants, and it discharges to Coleman Creek, which has water quality and flooding issues.

3.2 Frequently Flooded Areas

FEMA floodplain mapping depicts a 100-year floodplain along Coleman Creek (see Figure 2). The floodplain occupies 1.56 acres of the project site. The floodplain occupies the eastern project site boundary and appears to flood more on Moe Road than on the Penstemon Solar Project site. Development within the 100-year floodplain will be avoided; therefore, no net loss of floodplain storage will be achieved.

3.3 Geologically Hazardous Areas

The Penstemon Solar Project site is not within any mapped geologically hazardous areas. No erosion/landslide geologic hazard areas, snow avalanche hazards, or mine hazard areas are mapped on any of the parcels that encompass the project site (Kittitas County 2017). The project will not require specialized engineering to ascertain that the property is suitable for development.

3.4 Habitats

Based on the criteria provided in KCC Chapter 17A.07, the Penstemon Solar Project study area includes only riparian habitat. The project is not located on federal land or land owned or leased by the WDFW, and therefore is not considered big game winter range. According to PHS mapping, chinook (*Oncorhynchus tshawytscha*) and steelhead/rainbow trout (*O. mykiss*) occur in Coleman Creek and the project site is within the greater sage-grouse (*Centrocercus urophasianus*) breeding area (WDFW 2017a).

3.4.1 Riparian Habitat

One perennial stream (Coleman Creek) is located in the Penstemon Solar Project study area and one ephemeral ditch was mapped just south of the southeast corner of the project site. Based on the field observations, Coleman Creek would be considered a jurisdictional water by the USACE, Ecology, and Kittitas County because it satisfies the definition of "waters of the United States" under the Clean Water Rule 40 CFR 230.3. Because the offsite ditch is hydrologically connected to Coleman Creek, it will likely be considered jurisdictional as well. Table 7 summarizes the size, rating, and classification of the streams found in the study area (see Figure 4). Photographs of these features are provided in Appendix D.

Table 7. Summary of Streams in the Study Area

Stream Name	Tributary to	Stream Type [a]	USACE Jurisdiction [b]	Average Width in Study Area (feet) [c]	Approximate Length in Project Site (feet) [c]
Coleman Creek	Naneum Creek	F	RPW	19	1005
Unnamed Ephemeral Ditch	Coleman Creek	N/A	NRPW	3	0

[a] F = fish-bearing stream (WAC 222-16-030), N/A = not applicable, due to ditches and canals being excluded from the WAC typing system.

[b] RPW = relatively permanent water; NRPW = non-relatively permanent water.

[c] Average widths and approximate lengths were determined based on SWCA survey data and field observations.

3.4.1.1 Coleman Creek

Coleman Creek is a perennial, fish bearing tributary to Naneum Creek. Fish presence was not observed in the field but WDFW maps show Coleman Creek as having spring chinook rearing habitat (WDFW 2017a). Coleman Creek is designated as a Type F water, based on the Washington Water Typing Criteria (WAC 222-16-030).

The reach of Coleman Creek, within the Penstemon Solar Project study area, has been significantly altered from its natural condition. The creek flows into the study area through a box culvert beneath Tjossem Road. The creek then flows south along Moe Road in a mostly linear channel with very low sinuosity. Portions of the banks are armored with large rock. Unarmored sections of the bank are comprised of relatively stable silt loam. The substrate consists of cobbles, gravel, and silt. Riparian vegetation is abundant along most of the reach and the plant community was dominated by reed canary grass, prickly lettuce, common yarrow, Canadian thistle, Canadian goldenrod, great mullein, garden yellow-rocket, downy cheat grass, black hawthorn, Nootka rose, and crack willow. Coleman Creek flows south, in and out of the study area boundary, for about 1,275 feet. The creek flows away from the project site unconstrained.

The unnamed ephemeral ditch south of the southeastern Penstemon Solar Project site boundary corner was artificially created, prior to 2000. It is unclear if the ditch was created from upland or wetland. The ditch presumably contains numerous drain tile outlets associated with the adjacent agricultural operations. The plant community is regularly sprayed with herbicide and consists of only a few weedy species. The unnamed ephemeral ditch flows east into Coleman Creek. Ditches and canals are excluded from the WAC typing system, therefore the unnamed ephemeral ditch has not been assigned a stream type.

3.4.2 Priority Habitats and Species

There are a number of PHS-listed salmonid species mapped in Coleman Creek, in the Penstemon Solar Project study area (WDFW 2017a). Chinook and steelhead/rainbow trout are listed as having migrating and breeding populations within the study area. Coleman Creek provides many habitat functions to these species and could be subject to additional buffers requested by WDFW and Kittitas County. PHS mapping is depicted in Figure 3.

In addition, the PHS mapper shows an overlay for greater sage grouse breeding habitat at an accuracy level of quarter/quarter (1/8) Land Survey System (PLSS) section and encompasses the entire Penstemon Solar Project site. However, there is no suitable habitat for this species within the study area. There is no potential habitat for this species within 1 mile of the project site.

3.5 Aquifer Recharge Areas

As described in KCC 17A.08.010, no critical aquifer recharge locations have been identified in Kittitas County. Additionally, the Penstemon Solar Project will not involve any hazardous materials or disposal of on-site sewage. No well-heads have been identified within the study area.

4 CONCLUSIONS AND RECOMMENDATIONS

EFSEC will provide permitting requirements for the Penstemon Solar Project, but this report evaluates and shows compliance with County requirements. A review of the Penstemon Solar Project study area determined that the following Kittitas County defined critical areas have the potential to be affected by the project:

- Frequently Flooded Areas
- Habitats:
    - Riparian Habitat

A summary of all wetlands, waters, and critical area buffers documented within the Penstemon Solar Project study area is provided in Table 8. The wetland and non-wetland waters identified in and adjacent to the study area will likely be determined jurisdictional by Ecology and the USACE. Although EFSEC will provide permitting requirements for the proposed project, to show compliance with County requirements, KCC guidance (Chapter 17A.07.010) defines a minimum 20-foot protection buffer for Type F waters, such as Coleman Creek. However, up to a 100-foot protection buffer could be requested once Kittitas County has had the opportunity to review the results of this study and has had discussions with TUUSSO Energy (see Figure 4). KCC guidance does not define protection buffers for irrigation ditches, such as the ephemeral ditch located south of the project site, because it does not qualify as a stream.

To show compliance with County requirements , the minimum and maximum wetland protection buffers defined by the KCC (Chapter 17A.04.020) are listed in Appendix F, and are provided for these wetlands in Table 8, but only the minimum protection buffers are depicted on Figure 4.

Table 8. Wetland and Waters Summary

Critical Area	Wetland Rating/Water Typing [a]	Kittitas County Minimum/Maximum Buffer Distances (feet) [b]	Total Size of Feature Within the Project Site (acres) [c]
Wetlands			
Wetland PW01	III	0 / 0 [d]	0.00
Frequently Flooded Areas			
100-year flood zone	N/A	N/A	1.56
Riparian Habitat			
Coleman Creek	F	20 / 100	0.32
Ditch	N/A	None	0.00

[a] III = Category III (Hruby 2014); F = fish bearing water (WAC 22-16-030);
[b] Only minimum buffer distances are depicted on maps;
[c] Does not include buffer areas;
[d] No Kittitas County buffer is defined because the wetland is below the minimum size threshold for protection; however, building setbacks may be required based on zoning lot line setbacks, but would not exceed 25 feet.

Design plans are incomplete for the proposed Penstemon Solar Project; however, TUUSSO Energy will attempt to design the project to avoid, reduce, or eliminate impacts to wetlands, waters, and their buffers. Following the finalization of the design footprint, all removal-fill activities proposed within jurisdictional features would require a Joint Aquatic Resources Permit Application (JARPA) submitted for USACE and Ecology review

There is no minimum threshold to implement mitigation sequencing for potential impacts to wetland and waters features. Where possible, the Penstemon Solar Project should demonstrate avoidance of jurisdictional features and then minimization of impacts. Avoidance and minimization could be achieved by making minor design alterations around delineated feature boundaries.

Where impact avoidance is not possible, mitigation measures should be implemented to minimize temporary construction disturbance and other permanent alterations to the features. Mitigation would include the implementation of construction best management practices. Where permanent alterations to wetland and water features are unavoidable, wetland mitigation measures to achieve “no net loss” would be required. Desktop research shows that there are no approved mitigation banks or in-lieu fee programs in Kittitas County; therefore, any mitigation that would be required must be conducted as Advance Permittee-Responsible Mitigation. Under KCC guidance (Chapter 17A.04.050), the mitigation ratio for a Category III wetland is 1:1.

5 DISCLAIMER

This report documents the investigation, best professional judgment, and conclusions of the investigators. This should be considered a Preliminary Jurisdictional Determination of wetlands and other waters and is not a final determination.

6 LITERATURE CITED AND REVIEWED

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. FWS/OBS-79/31. Washington, D.C.: U.S. Fish and Wildlife Service. Available at: http://www.fws.gov/wetlands/Documents/Classification-of-Wetlands-and-Deepwater-Habitats-of-the-United-States.pdf.

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual*. Technical Report Y-87-1. Online edition. Vicksburg, Mississippi: U.S. Army Engineer Waterways Experiment Station. Available at: http://el.erdc.usace.army.mil/wetlands/pdfs/wlman87.pdf.

Hruby, T. 2014. *Washington State Wetland Rating System for Eastern Washington – Revised.* Washington State Department of Ecology Publication No. 14-06-030. Olympia, Washington: Department of Ecology. Available at: https://fortress.wa.gov/ecy/publications/SummaryPages/1406030.html. Accessed March 10, 2017.

Kittitas County Code (KCC). 2017. Kittitas County, Washington, Ordinances and Resolutions. Available at: http://co.kittitas.wa.us/boc/countycode/. Accessed March 13, 2017.

Kittitas County. 2017. COMPAS Mapping Tool Parcel Report. Available at: https://gis.co.kittitas.wa.us/compas/default.aspx. Accessed May 15, 2017.

Lichvar, R.W., D.L. Banks, W.N. Kirchner, and N.C. Melvin. 2016. *The National Wetland Plant List: 2016 Wetland Ratings.* Phytoneuron 2016-30:1–17. Available at: http://www.phytoneuron.net/ and http://rsgisias.crrel.usace.army.mil/NWPL/. Accessed May 3, 2016.

Munsell Color. 2009. Munsell Soil-Color Charts. Revised Edition. Grand Rapids, Michigan: Munsell Color.

Natural Resources Conservation Service (NRCS). 2008. *Hydrogeomorphic Wetland Classification System: An Overview and Modification to Better Meet the Needs of the Natural Resources Conservation Service*. Technical Note No. 190-8-79. Available at: http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs143_010784.pdf.

———. 2015. List of Hydric Soils. December 2015. Available at: http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/use/hydric/. Accessed March 9, 2016.

———. 2017a. Web soil survey. Available at: http://websoilsurvey.nrcs.usda.gov/app/. Accessed March 10, 2017.

———. 2017b. WETS and precipitation data for Ellensburg, Washington. Available at: http://agacis.rcc-acis.org/. Accessed May 2, 2017.

Olson, P., and E. Stockdale. 2010. *Determining the Ordinary High Water Mark on Streams in Washington State*. Second Review Draft. Ecology Publication No. 08-06-001. Lacey, Washington: Washington State Department of Ecology, Shorelands and Environmental Assistance Program.

U.S. Army Corps of Engineers (USACE). 2008. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0)*, edited by J.S. Wakeley, R.W. Lichvar, and C.V. Noble. ERDC/EL TR-08-28. Vicksburg, Mississippi: U.S. Army Engineer Research and Development Center.

U. S. Department of Agriculture (USDA). 1954. Kittitas County. Central Washington Historical Aerial Photograph Project. Central Washington University, Department of Geography. Available at: http://www.gis.cwu.edu/geog/historical_airphotos/. Accessed on June 23, 2017.

U. S. Fish and Wildlife Service (USFWS). 2017. National Wetland Inventory. Wetlands Online Mapper. Available at: http://wetlandsfws.er.usgs.gov/wtlnds/launch.html. Accessed March 10, 2017.

Washington State Department of Ecology (Ecology). 1997. Washington State Wetland Identification and Delineation Manual. Publication No. 96-94. Olympia, Washington: Washington State Department of Ecology.

Washington State Department of Fish and Wildlife (WDFW). 2017a. Priority Habitats and Species on the Web. Available at: http://wdfw.wa.gov/mapping/phs/. Accessed March 10, 2017.

———. 2017b. SalmonScape. Available at: http://wdfw.wa.gov/mapping/salmonscape. Accessed March 10, 2017.

APPENDIX A: WETLAND DELINEATION METHODOLOGY

Wetlands are defined as areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and which under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. The methods used to delineate wetlands within the study area conform to guidance in the *Washington State Wetland Identification and Delineation Manual* (Ecology 1997), the *Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987), and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0)* (USACE 2008).

To be considered a wetland by the U.S. Army Corps of Engineers (USACE), an area must express hydrophytic vegetation, hydric soils, and wetland hydrology. SWCA Environmental Consultants (SWCA) staff documented site conditions for these parameters in areas representative of the study area and in areas most likely to exhibit wetland features. Staff collected additional data in associated uplands, as needed, to confirm wetland boundaries. Wetland boundaries, stream boundaries, and wetland data plot locations in the study area were recorded with a Trimble Geo XT global positioning system (GPS) unit. All delineated wetlands and streams were processed and projected onto existing base maps using ArcGIS software.

Vegetation

The dominant and sub-dominant plants were identified and recorded at each sample plot location. These plants were evaluated based on their wetland indicator status to determine if the vegetation was hydrophytic. SWCA biologists utilized the 50/20 rule per USACE recommendations to determine which plants were dominant at each sample plot. Under this guidance, absolute cover estimates were made for each species found rooted within the sample plot radius for each vegetative strata found in the habitat (tree, sapling/shrub, herb, and woody vine). Refer to the USACE regional supplement for exact applications of this method of determining dominance (USACE 2008).

Sample plot radii varied in size depending on site topography and habitat complexity. When documenting vegetation in smaller or oddly-shaped wetlands or habitat features, vegetation strata radii may be adjusted to more accurately depict vegetation rooted within the wetland or habitat feature being delineated.

Hydrophytic vegetation is defined as vegetation adapted to wetland conditions, such as inundation or prolonged saturation. To meet the hydrophytic vegetation criterion, more than 50% of the total dominant plants across all stratums must have a wetland indicator status of Facultative (FAC), Facultative Wetland (FACW), or Obligate (OBL). The wetland indicator status is assigned to plant species that have the potential to occur in wetlands by the USACE (Lichvar et al. 2016). Table A-1 lists the definitions for each wetland indicator status.

Table A-1. Definitions for Each Wetland Plant Indicator Status

Wetland Indicator Status	Symbol	Definition
Obligate Wetland Plants	OBL	Plants that almost always (> 99% of the time) occur in wetlands, but which may rarely (< 1% of the time) occur in non-wetlands.
Facultative Wetland Plants	FACW	Plants that often (67 to 99% of the time) occurs in wetlands, but sometimes (1 to 33% of the time) occur in non-wetlands.
Facultative Plants	FAC	Plants with a similar likelihood (34 to 66% of the time) of occurring in both wetlands and non-wetlands.
Facultative Upland Plants	FACU	Plants that sometimes (1 to 33% of the time) occur in wetlands, but occur more often (67 to 99% of the time) in non-wetlands.
Upland Plants	UPL	Plants that rarely (< 1% of the time) occur in wetlands, and almost always (> 99% of the time) occur in non-wetlands.

Source: Lichvar et al. (2016).

SWCA biologists identified plants found in the field to species whenever possible, when adequate vegetative or flowering characteristics were available. Scientific and common plant names were reported with the currently accepted nomenclature.

Soils

An area typically must contain hydric soils to be considered a wetland, except when problematic site conditions occur. Hydric soils typically form under an area that experiences durations of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper portion of the soil profile. Chemical and biological processes in saturated soil result in reduced oxygen concentrations and promote anaerobic metabolism in microorganisms. These prolonged anaerobic conditions often create mottling and other distinct patterns in the soil, which are used as indicators of hydric soils. The hue, value, and chroma and relative percentage of mottling are recorded in the field at each data plot location. Other important hydric soil indicators include organic matter accumulations in the surface horizon, reduced sulfur odors, and organic matter staining in the soil profile (Natural Resource Conservation Service [NRCS] 2017a).

SWCA staff examined soil profiles at each data plot location by excavating sample pits to a depth of 16 to 20 inches to observe the soil profile, colors, and textures. In some cases, a shallower soil pit was used due to shovel refusal from obstructions in the soil profile, such as gravel, bedrock, thick roots, or clay hardpan. Munsell color charts (Munsell Color 2009) were used to determine soil colors in the field.

Hydrology

SWCA staff investigated the entire Penstemon Solar Project area for evidence of wetland hydrology. Where data plot locations were taken, additional notes were recorded to fully document the presence of primary and secondary wetland hydrology indicators at the sample location. According to the USACE, wetland hydrology criteria were considered to be satisfied if the soil was seasonally inundated or saturated to the surface for a consecutive number of days greater than or equal to 12.5% of the growing season. The growing season for the area was determined based on the period in which temperatures are above 28 degrees Fahrenheit 5 out of 10 years (Ecology 1997) using the long-term climatological data collected by the NRCS (2017). Using the wetlands climate analysis (WETS) table for the nearest station (Ellensburg, Washington), the growing season was approximated as typically between April 20 and October 10, or a total of 173 days (NRCS 17b).

However, often times multiple site visits to determine the duration of seasonal inundation or saturation are not possible. Therefore, field indicators are used in an attempt to determine an area's hydro-period through field observations. Wetland hydrology indicators are divided into two categories: primary and secondary indicators (USACE 2008). Primary indicators of hydrology include, but are not limited to, surface inundation and high water table and saturated soils within 12 inches of the soil surface. The presence of one primary indicator is sufficient to conclude that wetland hydrology is present. Secondary hydrology indicators are also recorded and may substitute in the case of a lack of any primary indicators if multiple secondary indicators are observed. Secondary indicators of hydrology include, but are not limited to, drainage patterns, crayfish burrows, and dry-season water table (USACE 2008). If no primary indicators, and fewer than two secondary indicators, are observed within the sample area, then it is likely that the area is not considered a wetland, unless problematic conditions exist on-site. Aerial and historic imagery are often reviewed before and after site visits to ensure all possible hydrology indicators are taken into account.

References

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual*. Technical Report Y-87-1. Online edition. Vicksburg, MSMississippi: U.S. Army Engineer Waterways Experiment Station. Available at: http://el.erdc.usace.army.mil/wetlands/pdfs/wlman87.pdf.

Lichvar, R.W., D.L. Banks, W.N. Kirchner, and N.C. Melvin. 2016. *The National Wetland Plant List: 2016 Wwetland Rratings.* Phytoneuron 2016-30:1–17. Available at: http://www.phytoneuron.net/ and http://rsgisias.crrel.usace.army.mil/NWPL/. Accessed May 3, 2016.

Munsell Color. 2009. Munsell Soil-Color Charts. Revised Edition. Grand Rapids, Michigan: Munsell Color.

Natural Resources Conservation Service (NRCS). 2017a. *Field Indicators of Hydric Soils in the United States, a Guide for Identifying and Delineating Hydric Soils, Version 8.1*. Edited by L.M. Vasilas, G.W. Hurt, and J.F. Berkowitz. Available at: https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_053171.pdf. Accessed March 10, 2017.

———. 2017b. WETS and precipitation data for Ellensburg, Washington. Available at: http://agacis.rcc-acis.org/. Accessed May 2, 2017.

U.S. Army Corps of Engineers (USACE). 2008. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0)*, edited by. J.S. Wakeley, R.W. Lichvar, and C.V. Noble. ERDC/EL TR-08-28. Vicksburg, Mississippi: U.S. Army Engineer Research and Development Center.

United States Geological Survey (USGS). 2017. Kittitas Quadrangle, Washington – Kittitas County, 7.5 Minute Series. Available at: https://store.usgs.gov/map-locator

Washington State Department of Ecology (Ecology). 1997. Washington State Wetland Identification and Delineation Manual. Publication No. #96-94. Olympia, Washington: Washington State Department of Ecology.

APPENDIX B: VEGETATION LIST

Penstemon Solar Project
Vegetation Table
April 10, 2017

Common Name	Scientific Name	Wetland Indicator Status[1]	Native / Introduced and Invasive / Noxious
Common Yarrow	*Achillea millefolium*	FACU	native
Garden Yellow-Rocket	*Barbarea vulgaris*	FAC	non-native
Smooth Brome	*Bromus inermis*	FACU	native
downy cheat grass	*Bromus tectorum*	NOL	non-native
Canadian Thistle	*Cirsium arvense*	FACU	invasive, noxious
Black Hawthorn	*Crataegus douglasii*	FAC	native
Fuller's Teasel	*Dipsacus fullonum*	FAC	invasive, noxious
Tall Scouring-Rush	*Equisetum hyemale*	FACW	native
Hairy Cat's-Ear	*Hypochaeris radicata*	FACU	non-native, noxious
Prickly Lettuce	*Lactuca serriola*	FACU	non-native
Gorman's desert-parsley	*Lomatium gormanii*	NOL	native
Spearmint	*Mentha spicata*	FACW	non-native
Common Panic Grass	*Panicum capillare*	FACU	native
Dock-Leaf Smartweed	*Persicaria lapathifolia*	FACW	non-native
Reed Canary Grass	*Phalaris arundinacea*	FACW	invasive, noxious
Common Timothy	*Phleum pratense*	FACU	non-native
Nootka Rose	*Rosa nutkana*	FACU	native
crack willow	*Salix X fragilis*	FAC	non-native
Canadian Goldenrod	*Solidago canadensis*	NOL	native
Broom-Corn	*Sorghum bicolor*	FACU	non-native
Common Dandelion	*Taraxacum officinale*	FACU	non-native
Broad-Leaf Cat-Tail	*Typha latifolia*	OBL	native
Great Mullein	*Verbascum thapsus*	FACU	non-native

[1]Wetland Indicator Status (WIS) from the NWPL AW Region - see below.
A question mark (?) preceded by a space indicates our default assumption that the plant is FAC.

Wetland Indicator Status (WIS) and taxonomy for the AW Region per the National Wetland Plant List 2016v3.3:
(common names are capitalized) http://wetland-plants.usace.army.mil/ Accessed January 10, 2017
WIS for non-wetland plants and taxonomy from Reed 1988 and Reed et al. 1993, and the USDA PLANTS database:
(common names are not capitalized) http://plants.usda.gov/ Accessed multiple dates

Native per Hitchcock & Cronquist 1973 and http://plants.usda.gov/
Noxious per Washington State NWCB 2017 http://www.nwcb.wa.gov/

WETLAND INDICATOR STATUS - Arid West Region	
OBL	**Obligate Wetland** – Almost always is a hydrophyte, rarely in uplands. Examples: broad-leaf cat-tail, yellow-skunk-cabbage
FACW	**Facultative Wetland** - Usually is a hydrophyte but occasionally found in uplands. Examples: Oregon ash, red osier
FAC	**Facultative** – Commonly occurs as either a hydrophyte or non-hydrophyte. Examples: red alder, salmon raspberry
FACU	**Facultative Upland** - Occasionally is a hydrophyte but usually occurs in uplands. Examples: big-leaf maple, Himalayan blackberry
UPL	**Upland** - Rarely is a hydrophyte, almost always in uplands. These plants have been removed from the NWPL WMVC Region.
NOL	**Not Listed** - Not on the list; assumed to be UPL.

APPENDIX C: WETLAND DATA SHEETS

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Penstemon Solar Project City/County: - / Kittitas Sampling Date: 4/10/2017

Applicant/Owner: TUUSSO Energy, LLC State: WA Sampling Point: **PP01**

Investigator(s): Evan Dulin, Jamie Young Section, Township, Range: Section 17, T17N, R19E

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Concave Slope (%): 1

Subregion (LRR): B, Columbia/Snake River Plateau Lat: 46.959458 Long: -120.477313 Datum: NAD 1983

Soil Map Unit Name: Opnish ashy loam, 0 to 2 percent slopes (635) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X* (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Hydric Soil Present?	Yes ____	No X		
Wetland Hydrology Present?	Yes X	No ____		

Precipitation prior to fieldwork: 0.76" two weeks prior, 2.65" above normal for CYTD, 3.11" above normal for WYTD. *Wetter than normal.

Remarks:

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1. *Salix X fragilis*	5%	Yes	FAC
2.			
3.			
4.			
5.			
	5% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Phalaris arundinacea*	5%	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	5% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 95%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

	Total % Cover of:	Multiply by:	
OBL species	0	x 1 =	0
FACW species	5	x 2 =	10
FAC species	5	x 3 =	15
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	10 (A)		25 (B)

Prevalence Index = B/A = 2.50

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ____ 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks:
Mostly bare ground from recent plowing, >90%.

Entered by: KL/ED QC by: TJD

SOIL

Sampling Point: **PP01**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-13	10YR 2/2	100					SiCL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distrubed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): N/A

Hydric Soil Present? Yes ___ **No** X

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)
Some burned plant material observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- X Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- X Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes	___	No	X	Depth (inches): N/A
Water Table Present?	Yes	___	No	X	Depth (inches): >13
Saturation Present? (includes capillary fringe)	Yes	X	No	___	Depth (inches): 0-4

Wetland Hydrology Present?

Yes X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
0-4" layer saturated from overland flow into adjacent ditch.

Entered by: KL/ED QC by: TJD

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Penstemon Solar Project City/County: - / Kittitas Sampling Date: 4/10/2017

Applicant/Owner: TUUSSO Energy, LLC State: WA Sampling Point: **PP02**

Investigator(s): Evan Dulin, Jamie Young Section, Township, Range: Section 17, T17N, R19E

Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope (%): 0

Subregion (LRR): B, Columbia/Snake River Plateau Lat: 46.959386 Long: -120.479571 Datum: NAD 1983

Soil Map Unit Name: Deedale clay loam, 0 to 2 percent slopes (789) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X* (If no, explain in Remarks)

Are Vegetation X, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No X

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes **N/A**	No **N/A**		
Hydric Soil Present?	Yes **X**	No ____	**Is the Sampled Area within a Wetland?**	**Yes X** **No** ____
Wetland Hydrology Present?	Yes **X**	No ____		

Precipitation prior to fieldwork: 0.76" two weeks prior, 2.65" above normal for CYTD, 3.11" above normal for WYTD. *Wetter than normal.

Remarks:

PW01. Sample plot located in plowed field (no vegetation). Assumed hydric vegetation based on soils and hydrology.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1.			
2.			
3.			
4.			
5.			
	0% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. None			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	0% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 100%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 0 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species 0	x 1 =	0
FACW species 0	x 2 =	0
FAC species 0	x 3 =	0
FACU species 0	x 4 =	0
UPL species 0	x 5 =	0
Column Totals: 0 (A)		0 (B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- ____ 2 - Dominance Test is >50%
- ____ 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes N/A** **No N/A**

Remarks: Entered by: KL/ED QC by: TJD

No vegetation present, freshly plowed field. *Typha latifolia* remnant stems were observed on edge of wetland (south).

SOIL

Sampling Point: **PP02**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 2/2	100					SiL	
6-8	2.5Y 3/2	65	10YR 3/3	10	C	M	SiL	faint redox
	N 2.5/0	25						gleyed
8-10	N 2.5/0	85	5Y 4/2	15	D	M	SiL	gleyed
10-13	5Y 3/1	100					SiL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- X Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distrubed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): N/A

Hydric Soil Present? Yes X No ___

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)
Soils are heavily compacted below 10" and smell of manure (could be from a large aplication of manure in the past).

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- X Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- X Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations: 4/7/2017

Surface Water Present?	Yes	X*	No	Depth (inches):	2"
Water Table Present?	Yes		No	X	Depth (inches): >13"
Saturation Present? (includes capillary fringe)	Yes	X	No		Depth (inches): 0-6"

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Entered by: KL/ED QC by: TJD

No surface water present on the 4/10/17 site visit. However, *standing water was observed on a previous walk of the site on 4/7/17 at a 2" depth. Ponded area visible on aerial imagery (2015) has been plowed over and no longer exists.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Penstemon Solar Project City/County: - / Kittitas Sampling Date: 4/10/2017

Applicant/Owner: TUUSSO Energy, LLC State: WA Sampling Point: **PP03**

Investigator(s): Evan Dulin, Jamie Young Section, Township, Range: Section 17, T17N, R19E

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): None Slope (%): 1

Subregion (LRR): B, Columbia/Snake River Plateau Lat: 46.959945 Long: -120.479386 Datum: NAD 1983

Soil Map Unit Name: Deedale clay loam, 0 to 2 percent slopes (789) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X* (If no, explain in Remarks)

Are Vegetation X ,Soil ____ , or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No X

Are Vegetation ____ ,Soil ____ , or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes **N/A**	No **N/A**		
Hydric Soil Present?	Yes ____	No **X**	**Is the Sampled Area within a Wetland?**	Yes ____ No **X**
Wetland Hydrology Present?	Yes ____	No **X**		

Precipitation prior to fieldwork: 0.76" two weeks prior, 2.65" above normal for CYTD, 3.11" above normal for WYTD. *Wetter than normal.

Remarks:
Sample plot located in plowed field (no vegetation). Additional soil test pits were taken to determine the wetland/upland boundary.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1.			
2.			
3.			
4.			
5.			
	0% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. None			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	0% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 100%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 0 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: (A/B)

Prevalence Index worksheet:

	Total % Cover of:	Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	0 (A)		0 (B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- ____ 2 - Dominance Test is >50%
- ____ 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes **N/A** No **N/A**

Remarks:

Entered by: KL/ED QC by: TJD

SOIL

Sampling Point: **PP03**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 2/1	100					SiL	
3-12	7.5YR 3/2	50					SiL	
	2.5Y 2.5/1	50					SiL	mixed matrix

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distrubed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): N/A

Hydric Soil Present? Yes ___ **No** X

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)
Large rocks on surface and throughout soil. Bottom soil layer is not as compacted as soils at PP02 until 12". Shoval refusal at 12".

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches):	N/A
Water Table Present?	Yes ___	No X	Depth (inches):	>12
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches):	0-3

Wetland Hydrology Present? Yes ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Surface saturated from 0-3" from surface runoff and recent rainfall.

Entered by: KL/ED QC by: TJD

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Penstemon Solar Project City/County: - / Kittitas Sampling Date: 4/10/2017

Applicant/Owner: TUUSSO Energy, LLC State: WA Sampling Point: **PP04**

Investigator(s): Evan Dulin, Jamie Young Section, Township, Range: Section 17, T17N, R19E

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): None Slope (%): 1

Subregion (LRR): B, Columbia/Snake River Plateau Lat: 46.959480 Long: -120.479646 Datum: NAD 1983

Soil Map Unit Name: Deedale clay loam, 0 to 2 percent slopes (789) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X* (If no, explain in Remarks)

Are Vegetation X ,Soil ____ , or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No X

Are Vegetation ____ ,Soil ____ , or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes **N/A**	No **N/A**		
Hydric Soil Present?	Yes ____	No **X**	**Is the Sampled Area within a Wetland?**	Yes ____ No **X**
Wetland Hydrology Present?	Yes ____	No **X**		

Precipitation prior to fieldwork: 0.76" two weeks prior, 2.65" above normal for CYTD, 3.11" above normal for WYTD. *Wetter than normal.

Remarks:
Sample plot located in plowed field (no vegetation). Additional soil test pits were taken to determine the wetland/upland boundary.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1.			
2.			
3.			
4.			
5.			
	0% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. None			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	0% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 100%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 0 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: (A/B)

Prevalence Index worksheet:

	Total % Cover of:	Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	0 (A)		0 (B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- ____ 2 - Dominance Test is >50%
- ____ 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes **N/A** No **N/A**

Remarks:

Entered by: KL/ED QC by: TJD

SOIL

Sampling Point: **PP04**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-7	7.5YR 3/2	100					SiL	
7-13+	2.5Y 2.5/1	100					SiL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distrubed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): N/A

Hydric Soil Present? Yes ___ **No** X

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)
Soils are heavily compacted below 7" and smell of manure (could be from a large aplication of manure in the past).

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches):	N/A
Water Table Present?	Yes ___	No X	Depth (inches):	>13
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches):	0-7

Wetland Hydrology Present? Yes ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Entered by: KL/ED QC by: TJD
Surface saturated from 0-7" from surface runoff and recent rainfall.

APPENDIX D: WETLAND AND STREAM PHOTOGRAPHS



Photo A. View north of northern portion of Coleman Creek.



Photo B. View south of Coleman Creek.



Photo C. View east of the ditch that feeds into Coleman Creek.



Photo D. View west of the ditch that feeds into Coleman Creek.



Photo E. View down of frog egg masses in ditch.



Photo F. View west of Wetland PW01 (PP02).



Photo G. View north of Wetland PW01 (PP02).



Photo H. View southeast of raptor nest south of the study area.

APPENDIX E: ECOLOGY RATING FORMS

Wetland name or number PW01

RATING SUMMARY – Eastern Washington

Name of wetland (or ID #): PW01 Date of site visit: 4/16/17

Rated by N. Evan Dulin Trained by Ecology? ✓ Yes ___ No Date of training 2/24/17

HGM Class used for rating Depressional Wetland has multiple HGM classes? ___Y ✓N

NOTE: Form is not complete without the figures requested (*figures can be combined*).

Source of base aerial photo/map Google Earth (2015 – old imagery showing ponded area that no longer exists)

OVERALL WETLAND CATEGORY III (based on functions ✓ or special characteristics ___)

1. Category of wetland based on FUNCTIONS

___**Category I** – Total score = 22-27

___**Category II** – Total score = 19-21

✓ **Category III** – Total score = 16-18

___**Category IV** – Total score = 9-15

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
	Circle the appropriate ratings			
Site Potential	H M (L)	H M (L)	H M (L)	
Landscape Potential	H (M) L	H (M) L	H M (L)	
Value	(H) M L	(H) M L	(H) M L	TOTAL
Score Based on Ratings	6	6	5	17

Score for each function based on three ratings *(order of ratings is not important)*

9 = H,H,H
8 = H,H,M
7 = H,H,L
7 = H,M,M
6 = H,M,L
6 = M,M,M
5 = H,L,L
5 = M,M,L
4 = M,L,L
3 = L,L,L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	CATEGORY *Circle the appropriate category*
Vernal Pools	II III
Alkali	I
Wetland of High Conservation Value	I
Bog and Calcareous Fens	I
Old Growth or Mature Forest – slow growing	I
Aspen Forest	I
Old Growth or Mature Forest – fast growing	II
Floodplain forest	II
None of the above	✓

Wetland name or number PW01

Maps and figures required to answer questions correctly for Eastern Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	D 1.3, H 1.1, H 1.5	1
Hydroperiods (including area of open water for H 1.3)	D 1.4, H 1.2, H 1.3	1
Location of outlet (*can be added to map of hydroperiods)*	D 1.1, D 4.1	1
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	1
Map of the contributing basin	D 5.3	2
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	3
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	4
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	D 3.3	5

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	R 2.4	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of wetland vs. width of stream *(can be added to another figure)*	R 4.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	R 3.2, R 3.3	

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	L 1.1, L 4.1, H 1.1, H 1.5	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants *(can be added to figure above)*	S 4.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	S 3.3	

Wetland name or number PW01

HGM Classification of Wetland in Eastern Washington

For questions 1-4, the criteria described must apply to the entire unit being rated.

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-4 apply, and go to Question 5.

1. Does the entire unit **meet both** of the following criteria?
   ___The vegetated part of the wetland is on the water side of the Ordinary High Water Mark of a body of permanent open water (without any plants on the surface) that is at least 20 ac (8 ha) in size
   ___At least 30% of the open water area is deeper than 10 ft (3 m)

   NO – go to 2 **YES –** The wetland class is **Lake Fringe** (Lacustrine Fringe)

2. Does the entire wetland unit **meet all** of the following criteria?
   ___The wetland is on a slope (*slope can be very gradual*),
   ___The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks;
   ___The water leaves the wetland **without being impounded.**

   NO - go to 3 YES – The wetland class is **Slope**
   NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 foot deep).

3. Does the entire wetland unit **meet all** of the following criteria?
   ___ The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river;
   ___ The overbank flooding occurs at least once every 10 years.

   NO - go to 4 YES – The wetland class is **Riverine**
   NOTE: The Riverine wetland can contain depressions that are filled with water when the river is not flooding.

4. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year. *This means that any outlet, if present, is higher than the interior of the wetland.*

   NO – go to 5 YES – The wetland class is **Depressional**

5. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-4 APPLY TO DIFFERENT AREAS IN THE WETLAND UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

Wetland name or number PW01

NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the wetland unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM Class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine (the riverine portion is within the boundary of depression)	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine

If you are still unable to determine which of the above criteria apply to your wetland, or if you have ***more than 2 HGM classes*** *within a wetland boundary, classify the wetland as Depressional for the rating.*

Wetland name or number PW01

DEPRESSIONAL WETLANDS **Water Quality Functions** - Indicators that the site functions to improve water quality	Points (only 1 score per box)
D 1.0. Does the site have the potential to improve water quality?	
D 1.1. Characteristics of surface water outflows from the wetland: Wetland has no surface water outlet — points = 5 — Wetland has an intermittently flowing outlet (Ephemeral seeps to ag. ditch to East) — points = 3 Wetland has a highly constricted permanently flowing outlet — points = 3 Wetland has a permanently flowing, unconstricted, surface outlet — points = 1	3
D 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic *(use NRCS definitions of soils)* YES = 3 (NO = 0)	0
D 1.3. Characteristics of persistent vegetation (Emergent, Scrub-shrub, and/or Forested Cowardin classes) Wetland has persistent, ungrazed, vegetation for > 2/3 of area — points = 5 Wetland has persistent, ungrazed, vegetation from 1/3 to 2/3 of area — points = 3 Wetland has persistent, ungrazed vegetation from 1/10 to < 1/3 of area (Unvegetated) — points = 1 — Wetland has persistent, ungrazed vegetation < 1/10 of area — points = 0	0
D 1.4. Characteristics of seasonal ponding or inundation: *This is the area of ponding that fluctuates every year. Do not count the area that is permanently ponded.* Area seasonally ponded is > ½ total area of wetland — points = 3 Area seasonally ponded is ¼ - ½ total area of wetland — points = 1 — Area seasonally ponded is < ¼ total area of wetland (19%) — points = 0	0
Total for D 1 — Add the points in the boxes above	3

Rating of Site Potential If score is: ___12- 16 = H ___6- 11 = M ✓ 0- 5 = L *Record the rating on the first page*

D 2.0. Does the landscape have the potential to support the water quality function of the site?	
D 2.1. Does the wetland receive stormwater discharges? (Yes = 1) (No = 0)	0
D 2.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate pollutants? (Yes = 1) No = 0	1
D 2.3. Are there septic systems within 250 ft of the wetland? Yes = 1 (No = 0)	0
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1- D 2.3? Source_____ (Yes = 1) (No = 0)	0
Total for D 2 — Add the points in the boxes above	1

Rating of Landscape Potential If score is: ___3 or 4 = H ✓ 1 or 2 = M ___0 = L *Record the rating on the first page*

D 3.0. Is the water quality improvement provided by the site valuable to society?	
D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, or lake that is on the 303(d) list? (Coleman Creek) (Yes = 1) No = 0	1
D 3.2. Is the wetland in a basin or sub-basin where water quality is an issue in some aquatic resource [303(d) list, eutrophic lakes, problems with nuisance and toxic algae]? (Yes = 1) No = 0	1
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality (*answer YES if there is a TMDL for the drainage or basin in which the wetland is found*)? (Yes = 2) No = 0	2
Total for D 3 — Add the points in the boxes above	4

Rating of Value If score is: ✓ 2-4 = H ___1 = M ___0 = L *Record the rating on the first page*

Wetland name or number PW01

DEPRESSIONAL WETLANDS **Hydrologic Functions** - Indicators that the site functions to reduce flooding and erosion.	Points (only 1 score per box)
D 4.0. Does the site have the potential to reduce flooding and erosion?	
D 4.1. Characteristics of surface water outflows from the wetland: Wetland has no surface water outlet — points = 8 — Wetland has an intermittently flowing outlet See D.1.1. — points = 4 Wetland has a highly constricted permanently flowing outlet — points = 4 Wetland has a permanently flowing unconstricted surface outlet — points = 0 *(If outlet is a ditch and not permanently flowing treat wetland as "intermittently flowing")*	4
D 4.2. Depth of storage during wet periods: *Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or deepest part (if dry).* Seasonal ponding: > 3 ft above the lowest point in wetland or the surface of permanent ponding — points = 8 Seasonal ponding: 2 ft - < 3 ft above the lowest point in wetland or the surface of permanent ponding — points = 6 The wetland is a headwater wetland — points = 4 Seasonal ponding: 1 ft - < 2 ft — points = 4 Seasonal ponding: 6 in - < 1 ft — points = 2 — Seasonal ponding: < 6 in or wetland has only saturated soils — points = 0	0
Total for D 4 — Add the points in the boxes above	4

Rating of Site Potential If score is: ___ **12-16 = H** ___ **6-11 = M** ✓ **0-5 = L** *Record the rating on the first page*

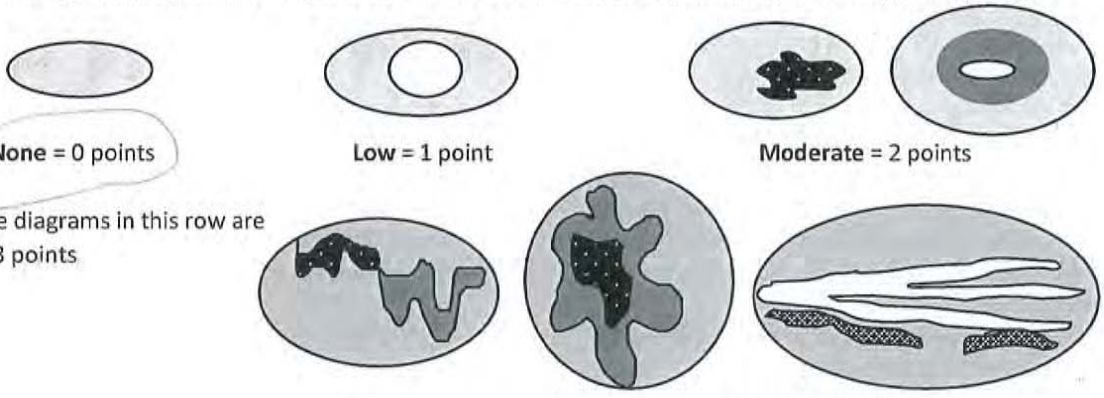
D 5.0. Does the landscape have the potential to support the hydrologic functions of the site?	
D 5.1. Does the wetland receive stormwater discharges? Yes = 1 (No = 0)	0
D 5.2. Is > 10% of the area within 150 ft of the wetland in a land use that generates runoff? Yes = 1 (No = 0)	0
D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land uses? (Yes = 1) No = 0	1
Total for D 5 — Add the points in the boxes above	1

Rating of Landscape Potential If score is: ___ **3 = H** ✓ **1 or 2 = M** ___ **0 = L** *Record the rating on the first page*

D 6.0. Are the hydrologic functions provided by the site valuable to society?	
D 6.1. The wetland is in a landscape that has flooding problems. Choose the description that best matches conditions around the wetland being rated. *Do not add points. Choose the highest score if more than one condition is met.* The wetland captures surface water that would otherwise flow down-gradient into areas where flooding has damaged human or natural resources (e.g., houses or salmon redds), AND — Flooding occurs in sub-basin that is immediately down-gradient of wetland — points = 2 Surface flooding problems are in a sub-basin farther down-gradient — points = 1 The existing or potential outflow from the wetland is so constrained by human or natural conditions that the water stored by the wetland cannot reach areas that flood. *Explain why* _____ — points = 0 There are no problems with flooding downstream of the wetland — points = 0	2
D 6.2. Has the site has been identified as important for flood storage or flood conveyance in a regional flood control plan? Yes = 2 (No = 0)	0
Total for D 6 — Add the points in the boxes above	2

Rating of Value If score is: ✓ **2-4 = H** ___ **1 = M** ___ **0 = L** *Record the rating on the first page*

Wetland name or number Pwo1

These questions apply to wetlands of all HGM classes. **HABITAT FUNCTIONS** - Indicators that site functions to provide important habitat	(only 1 score per box)
H 1.0. Does the wetland have the potential to provide habitat for many species?	
H 1.1. Structure of the plant community: *Check the Cowardin vegetation classes present and categories of emergent plants. Size threshold for each category is >= ¼ ac or >= 10% of the wetland if wetland is < 2.5 ac.* ____Aquatic bed ____Emergent plants 0-12 in (0-30 cm) high are the highest layer and have > 30% cover ____Emergent plants >12-40 in (>30-100 cm) high are the highest layer with >30% cover ____Emergent plants > 40 in (> 100 cm) high are the highest layer with >30% cover ____Scrub-shrub (areas where shrubs have >30% cover) ____Forested (areas where trees have >30% cover) unvegetated 4 or more checks: points = 3 3 checks: points = 2 2 checks: points = 1 1 check: points = 0	0
H 1.2. Is one of the vegetation types Aquatic Bed? Yes = 1 (No = 0)	0
H 1.3. Surface water H 1.3.1. Does the wetland have areas of open water (without emergent or shrub plants) over at least ¼ ac **OR** 10% of its area during the March to early June **OR** in August to the end of September? *Answer YES for Lake Fringe wetlands.* Yes = 3 points & go to H 1.4 (No = go to H 1.3.2) H 1.3.2. Does the wetland have an intermittent or permanent, and unvegetated stream within its boundaries, or along one side, over at least ¼ ac or 10% of its area? *Answer yes only if H 1.3.1 is No.* Yes = 3 (No = 0)	0
H 1.4. Richness of plant species Count the number of plant species in the wetland that cover at least 10 ft^2. *Different patches of the same species can be combined to meet the size threshold. You do not have to name the species.* *Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Russian olive, Phragmites, Canadian thistle, yellow-flag iris, and saltcedar (Tamarisk)* # of species 0 Scoring: > 9 species: points = 2 4-9 species: points = 1 < 4 species: points = 0	0
H 1.5. Interspersion of habitats Decide from the diagrams below whether interspersion among types of plant structures (described in H 1.1), and unvegetated areas (open water or mudflats) is high, moderate, low, or none. *Use map of Cowardin and emergent plant classes prepared for questions H 1.1 and map of open water from H 1.3. If you have four or more plant classes or three classes and open water, the rating is always high.*  **None** = 0 points **Low** = 1 point **Moderate** = 2 points All three diagrams in this row are **High** = 3 points Riparian braided channels with 2 classes	Figure__ 0

Wetland name or number PW01

H 1.6. Special habitat features *Check the habitat features that are present in the wetland. The number of checks is the number of points.* ____Loose rocks larger than 4 in OR large, downed, woody debris (> 4 in diameter) within the area of surface ponding or in stream. ____Cattails or bulrushes are present within the wetland. ____Standing snags (diameter at the bottom > 4 in) in the wetland or within 30 m (100 ft) of the edge. ____Emergent or shrub vegetation in areas that are permanently inundated/ponded. ____Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 45 degree slope) OR signs of recent beaver activity → ✓ Invasive species cover less than 20% in each stratum of vegetation *(canopy, sub-canopy, shrubs, herbaceous, moss/ground cover)* (Un-vegetated)	1
Total for H 1 Add the points in the boxes above	1

Rating of Site Potential If score is: ___**15-18 = H** ___**7-14 = M** ✓**0-6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support habitat functions of the site?	
H 2.1. Accessible habitat (only area of habitat abutting wetland). If total accessible habitat is: *Calculate:* % undisturbed habitat 0 + [(% moderate and low intensity land uses)/2] 0 = 0 % > 1/3 (33.3%) of 1 km Polygon points = 3 20-33% of 1km Polygon points = 2 10-19% of 1km Polygon points = 1 —<10% of 1km Polygon points = 0	0
H 2.2. Undisturbed habitat in 1 km Polygon around wetland. (5+ patches) *Calculate:* % undisturbed habitat 0 + [(% moderate and low intensity land uses)/2] 7.5 = 7.5 % Undisturbed habitat > 50% of Polygon points = 3 Undisturbed habitat 10 - 50% and in 1-3 patches points = 2 Undisturbed habitat 10 - 50% and > 3 patches points = 1 —Undisturbed habitat < 10% of Polygon points = 0 Undis 0 / 810 ac = 0% Mid 53 / 810 ac = 7%	0
H 2.3. Land use intensity in 1 km Polygon: 93% > 50% of Polygon is high intensity land use points = (- 2) Does not meet criterion above points = 0	-2
H 2.4. The wetland is in an area where annual rainfall is less than 12 in, and its water regime is not influenced by irrigation practices, dams, or water control structures. *Generally, this means outside boundaries of reclamation areas, irrigation districts, or reservoirs* Yes = 3 (No = 0)	0
Total for H 2 Add the points in the boxes above	-2

Rating of Landscape Potential If score is: ___**4-9 = H** ___**1-3 = M** ✓**< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose the highest score that applies to the wetland being rated* Site meets ANY of the following criteria: points = 2 ✓— It has 3 or more priority habitats within 100 m (see Appendix B) — It provides habitat for Threatened or Endangered species (any plant or animal on state or federal lists) — It is mapped as a location for an individual WDFW species — It is a Wetland of High Conservation Value as determined by the Department of Natural Resources — It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan Site has 1 or 2 priority habitats within 100 m (see Appendix B) points = 1 Site does not meet any of the criteria above points = 0	2

Rating of Value If score is: ✓**2 = H** ___**1 = M** ___**0 = L** *Record the rating on the first page*

Appendix B: WDFW Priority Habitats in Eastern Washington

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp. http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here: http://wdfw.wa.gov/conservation/phs/list/)

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland: ***NOTE:*** *This question is independent of the land use between the wetland and the priority habitat.*

— **Aspen Stands:** Pure or mixed stands of aspen greater than 1 ac (0.4 ha).

✓ — **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).

— **Old-growth/Mature forests:** Old-growth east of Cascade crest – Stands are highly variable in tree species composition and structural characteristics due to the influence of fire, climate, and soils. In general, stands will be >150 years of age, with 10 trees/ac (25 trees/ha) that are > 21 in (53 cm) dbh, and 1-3 snags/ac (2.5-7.5 snags/ha) that are > 12-14 in (30-35 cm) diameter. Downed logs may vary from abundant to absent. Canopies may be single or multi-layered. Evidence of human-caused alterations to the stand will be absent or so slight as to not affect the ecosystem's essential structures and functions. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west and 80-160 years old east of the Cascade crest.

— **Oregon White Oak:** Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).

✓ — **Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

✓ — **Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.

— **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

— **Cliffs:** Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.

— **Talus:** Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

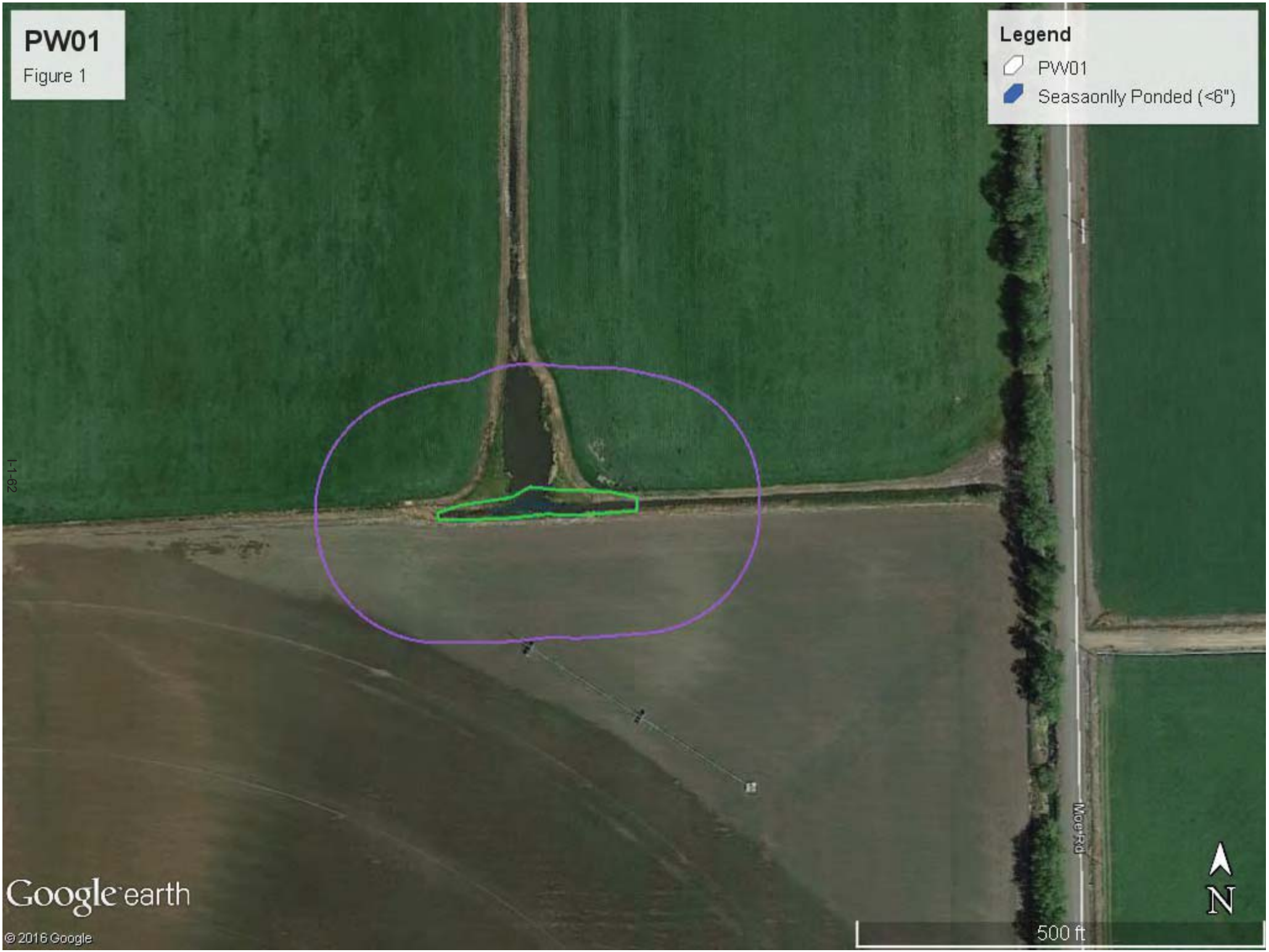
— **Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 12 in (30 cm)in eastern Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

— **Shrub-steppe:** A nonforested vegetation type consisting of one or more layers of perennial bunchgrasses and a conspicuous but discontinuous layer of shrubs (see Eastside Steppe for sites with little or no shrub cover).

— **Eastside Steppe:** Nonforested vegetation type dominated by broadleaf herbaceous flora (i.e., forbs), perennial bunchgrasses, or a combination of both. Bluebunch wheatgrass (*Pseudoroegneria spicata*) is often the prevailing cover component along with Idaho fescue (*Festuca idahoensis*), Sandberg bluegrass (*Poa secunda*), rough fescue (*F. campestris*), or needlegrasses (*Achnatherum* spp.).

— **Juniper Savannah:** All juniper woodlands.

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list because they are addressed elsewhere.

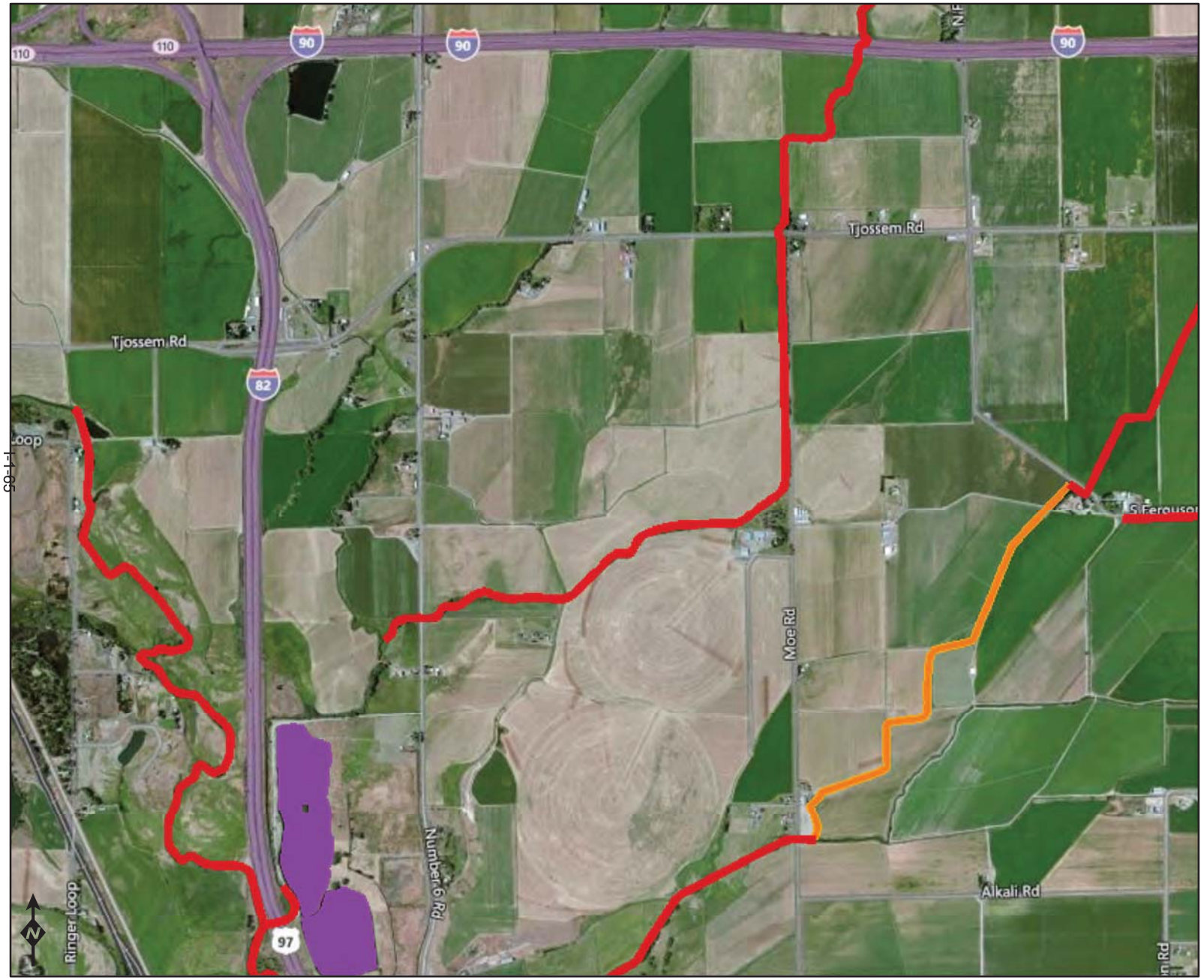

PW01
Figure 1
Legend
PW01
Seasaonlly Ponded (<6")
I-1-62
Moe Rd
Google earth
© 2016 Google
500 ft
N


PW01
Figure 2
Legend
Contributing Basin
PW01
I-1-63
Google earth
© 2016 Google
N
1000 ft


PW01
Figure 3
Legend
Mid-intensity
PW01
I-1-64
Number 6 Rd
Moe Rd
Google earth
© 2016 Google
N
3000 ft

April 28, 2017

PW01 - Figure 4



Assessed Waters/Sediment

Water
- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

Sediment
- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

Image courtesy of USGS Earthstar Geographics SIO © 2017 Microsoft Corporation © 2010 NAVTEQ © AND

Miles
0 0.25 0.5 1

DEPARTMENT OF ECOLOGY
State of Washington

Water Quality Improvement Projects (TMDLs)

WATER QUALITY IMPROVEMENT PROJECTS (TMDLs)

Overview of the process
Project Catalog
- by WRIA
- by County

Funding Opportunities
Project Development Priority Lists
Related Information
TMDL Contacts

RELATED ECOLOGY PROGRAMS

Water Quality

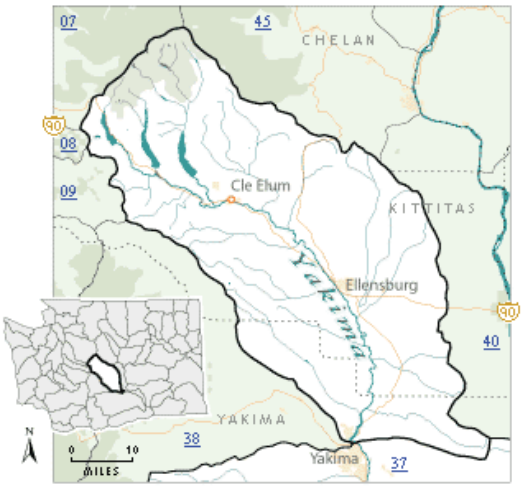
Water Quality Improvement > Water Quality Improvement Projects by WRIA > WRIA 39: Upper Yakima

WRIA 39: Upper Yakima

The following table lists overview information and links to specific water quality improvement projects (including total maximum daily loads, or TMDLs) for this water resource inventory area (WRIA). Please use links (where available) for more information on a project.

Yakima River basin project index:
www.ecy.wa.gov/programs/wq/tmdl/yakima_wq/index.html
Counties

- Kittitas
- Yakima



Project Name	Pollutants	Status**	TMDL Lead
Crystal Creek	Ammonia-N BOD (5-day) Chlorine Fecal Coliform	EPA approved	Jane Creech 509-454-7860
Selah Ditch	Fecal Coliform Temperature	EPA approved	Greg Bohn 509-454-4174
Teanaway River segments: • Upper West Fork Teanaway River • Upper Middle Fork Teanaway River • Upper North Fork Teanaway River • Stafford Creek • Lower West Fork Teanaway River • Lower Middle Fork Teanaway River • Lower North Fork Teanaway River • Mainstem Teanaway River	Temperature	EPA approved	Jane Creech 509-454-7860
Wilson/Cooke Creek Tributaries: • Badger Creek • Bull Ditch • Caribou Creek • Cherry Creek • CID Canal • Coleman Creek • Cook Creek • EWC Canal • Johnson Drain • KRD Canal	Fecal Coliform	EPA approved Has an implementation plan Post-TMDL monitoring report	Jane Creech 509-454-7860 Greg Bohn 509-454-4174

• Mercer Creek • Naneum Creek • Parke Creek • Whiskey Creek • Wilson Creek • Wipple Wasteway			
Yakima River, Upper	Dieldrin DDT Suspended Sediments Turbidity	EPA approved	Jane Creech 509-454-7860
	Temperature	EPA approved Has an implementation plan	Jane Creech 509-454-7860
Yakima River	Toxics	Under development	Jane Creech 509-454-7860

**** Status*** *will be listed as one of the following: Approved by EPA, Under Development or Implementation. No status means project work has not yet started.*

For more information about WRIA 39:

- Waterbodies in WRIA 39 - using the Water Quality Assessment Query Tool
- Watershed Information for WRIA 39

* The Department of Ecology and other state resource agencies frequently use a system of 62 "Water Resource Inventory Areas" or "WRIAs" to refer to the state's major watershed basins.

Back to top of page

Last updated December 2016

Feedback?

About us
Director Maia Bellon
Tracking progress
Newsroom
Jobs
Staff only
Contact us

Publications & forms
Databases
Laws & rules
Public records disclosure
Public input & events
Environmental education
Sustainability information

中文 | Chinese
Tiếng Việt | Vietnamese
한국어 | Korean
Русский | Russian
Español | Spanish
Accessibility

Access Washington®
Welcome to the State of Washington

Copyright © Washington State Department of Ecology
Privacy Notice | Site Info | Accessibility | Contact the web team |

SHARE

APPENDIX F: KITTITAS COUNTY WETLAND BUFFER GUIDANCE

Chapter 17A.04
CRITICAL AREAS DESIGNATION AND DEVELOPMENT STANDARDS

Sections

17A.04.010 Wetlands.
17A.04.015 No net loss of wetland areas.
17A.04.020 Buffer width requirements.
17A.04.025 Wetland buffer ranges.
17A.04.030 Wetland buffer averaging.
17A.04.035 Natural condition of wetland buffer.
17A.04.040 Allowed uses.
17A.04.045 Building setback lines from wetland buffers.
17A.04.050 Wetland replacement ratios.

17A.04.010 Wetlands.
Wetlands in Kittitas County are defined in Section 17A.02.310 and classified in four categories: Category I (extreme high value), Category II (high value), Category III (average value), Category IV (less than average value). Critical area wetlands in Kittitas County are defined as Category I, Category II, Category III and Category IV wetlands as determined by the planning manager.

Category IV wetlands may be determined by the director to constitute a critical area based upon application of the criteria in this chapter. (Ord. 95-15 (part), 1995; Ord. 94-22 (part), 1994).

17A.04.015 No net loss of wetland areas.
Kittitas County shall require, to the extent practical, and except for Category IV wetlands, a zero net loss of natural wetlands functions and values together with, if reasonably possible through voluntary agreements or government incentives, a gain of wetlands in the long term. (Ord. 94-22 (part), 1994).

17A.04.020 Buffer width requirements.
Wetland buffer requirements apply to all nonexempt activities on regulated wetlands. All wetland buffers shall be measured from the wetland boundary.

Category	**Size of Wetland**	**Required Buffer**
I	any size	50 - 200 feet
II	over 2,000 sq. ft.	25 - 100 feet
III	over 10,000 sq. ft.	20 - 80 feet
IV*	43,560 sq. ft. (1 acre)	Building setbacks will be determined by the zoning lot line setbacks, but shall not exceed 25 feet.

*Includes only nonirrigation induced or enhanced Category IV wetlands. Irrigation water does influence ground water table elevations in Kittitas County.

(Ord. 96-14 (part), 1996; Ord. 95-15 (part), 1995; Ord. 94-22 (part), 1994).

17A.04.025 Wetland buffer ranges.
The wetland buffer ranges have been established to reflect the impact of certain intense land uses on wetland function and values. The director shall base the buffer size on the following criteria and shall establish the least restrictive width of buffer necessary to account for all of the following considerations:

1. The overall intensity of the proposed use;
2. The presence of threatened, endangered, or sensitive species;
3. The site's susceptibility to severe erosion;
4. The use of a buffer enhancement plan by the applicant which uses native vegetation or other measures which will enhance the functions and values of the wetland or buffer. (Ord. 94-22 (part), 1994).

17A.04.030 Wetland buffer averaging.
Wetland buffers may be modified by averaging buffer widths. Wetland buffer width averaging shall be allowed only where the applicant demonstrates that the following exists:

1. That averaging is necessary to avoid an extraordinary hardship to the applicant caused by circumstances peculiar to the property;
2. That the wetland contains variations in sensitivity due to existing physical characteristics;
3. That the proposed use would be located adjacent to areas where buffer width is reduced, and that such land uses are low in impact;
4. That width averaging will not adversely impact wetland function and values. (Ord. 9422 (part), 1994).

17A.04.035 Natural condition of wetland buffer.
Natural condition of wetland buffer. Wetland buffer areas shall be retained in their natural condition or may be improved to enhance buffer functions and values. Where buffer disturbance has occurred during construction, revegetation with native vegetation may be required. The Kittitas County noxious weed ordinance shall be adhered to. (Ord. 94-22 (part), 1994).

17A.04.040 Allowed uses.
In addition to exempt activities otherwise identified herein, the following activities are allowed to occur on wetland and wetland buffer areas: nonmotorized outdoor recreational activities including hunting and fishing; educational activities; existing and ongoing agricultural activities, silviculture and mining; and maintenance of existing facilities, structures, ditches, roads, bridges and other utility systems. Up to two acres of Class IV wetlands may be filled, drained or modified with no approval required from the planning manager. If more than two acres of Class IV wetlands are filled, drained or modified, approval of the planning manager is required. Such development activity shall provide mitigation in accordance with Section 17A.04.050 for that portion of the wetland fill or modification that exceeds two acres. Category IV wetlands may be used for secondary stormwater management facilities having no reasonable alternative on-site location, provided there is no significant adverse impact to the functions and values of those wetlands. (Ord. 95-15 (part), 1995; Ord. 94-22 (part), 1994).

17A.04.045 Building setback lines from wetland buffers.
A building setback line equal to the side yard setback requirement of the applicable zoning district is required from the edge of any wetland buffer. Minor intrusions into the area of the building setback may be allowed if the director determines that such intrusions will not negatively impact the wetland. The setbacks shall be shown on all site plans submitted with the application. (Ord. 94-22 (part), 1994).

17A.04.050 Wetland replacement ratios.
Wetland replacement ratios are expressed in gross area required for replacement. The actual replacement, enhancement or rehabilitation of wetlands shall be determined by the director and meet all applicable standards for such. Replacement areas shall be determined according to function, acreage, type, location, time factors, ability to be self sustaining and projected success. Wetland functions and values shall be calculated using the Kittitas County critical areas policy document and the professional judgment of the director.

Category of Wetland	**Replacement Ratio**
I	3:1
II	2:1
III	1.5:1
IV	1:1 for the portion of a wetland fill or modification

(Ord. 96-14 (part), 1996; Ord. 95-15 (part), 1995; Ord. 94-22 (part), 1994).

Appendix I-2: Penstemon Solar Project Cultural Resources Report



CULTURAL RESOURCES ASSESSMENT
PENSTEMON SOLAR PROJECT
KITTITAS COUNTY, WASHINGTON



June 8, 2017

SWCA ENVIRONMENTAL CONSULTANTS
SEATTLE, WASHINGTON

This report has been redacted due to archaeological site confidentiality

Appendix I-3: Penstemon Solar Project Permit Applications

KITTITAS COUNTY
DEPARTMENT OF PUBLIC WORKS

ACCESS AND ADDRESS APPLICATION

Application for: ☐ **Address $100.00** ☐ **Access $270.00** **Payment Method:** ☐ **Check** _____ ☐ **Cash**
☒ **Access and Address $330.00**

Owner Name Valley Land Company LLC **Permit #**_____
Mailing Address 1585 Tjossem Rd
Ellensburg, WA 98926
Phone Number 509-962-2840
Email Address jbrunson@fairpoint.net

Applicant Name TUUSSO Energy, LLC
Mailing Address 500 Yale Ave North
Seattle, WA 98109
Phone Number 206-303-0198
Email Address jason.evans@tuusso.com

DATE STAMP

Request Access and/or Address for:

☐ Approved Subdivision ☐ Pending Subdivision ☐ Agricultural Access
☐ Single Family Dwelling ☐ Commercial Access ☐ Temporary Access
☒ Other Photovoltaic Solar Project

Number of Lots to be served by the Access: 1

Assessor's Map No.: 17-19-17000-0004

Plat Name N/A Lot N/A

Road Name of Access Location: Tjossem Road

Distance and Direction to Nearest Intersection or Adjacent Address:
at southwest corner of intersection with Moe Rd

Desired Width of Driveway: 12 FT (Minimum Width Requirement is based on length of driveway)

CALL BEFORE YOU DIG 1-800-424-5555 OR 811

Applicant is responsible for calling for underground utility locates 48 hours prior to construction.

☒ **I have attached a site map with details on the access, driveway and any buildings (existing or proposed).**
☒ **Applicant will stake along right-of-way to mark desired location of access.**
☒ **Applicant agrees to perform the work in compliance with the Kittitas County Road Standards and the requirements on the Access Permit.**
☒ **Applicant certifies that the access applied for is only for the purpose indicated.**

Applicant declares he/she is the owner or owner's agent of the real property whose access is under construction.
Applicant Signature _____ Date _____

Reviewers Notes:

NEW ADDRESS: _____

CITY: _____ ZIP: _____

☐ PRIVATE ROAD CERTIFICATION REQUIRED PRIOR TO_____

ACCESS REQUIREMENTS PRIOR TO BUILDING PERMIT:

☐ PAVED APRON REQUIRED – WSDOT DESIGN STANDARDS
☐ CULVERT REQUIRED-MUST BE BEDDED ON A MINIMUM OF 4" OF 5/8 GRAVEL OR EQUIVALENT
-Minimum Culvert Diameter: _____ Inches
-Minimum Beveled End Length: _____ Feet
-Total Culvert Length: _____ Feet
-Minimum Cover of: _____ Inches
☐ 4:1 BEVELS REQUIRED ON CULVERT ENDS
☐ CONSTRUCT APRON(FIRST 20 FEET) WITH NO MORE THAN 6% GRADE
☐ COMPACTED GRAVEL SURFACE LAYER REQUIRED
☐ 10 FOOT TURNING RADIUS ON APRON
☐ SIDE SLOPES OFF OF APRON NOT TO EXCEED A 4:1 SLOPE

☐ PERMIT EXPIRES ON: _____

DRIVEWAY REQUIREMENTS PRIOR TO OCCUPANCY PERMIT:

☐ DRIVEWAY NOT TO EXCEED 15% GRADE
☐ DRIVEWAYS LESS THAN 150 FEET IN LENGTH TO BE A MINIMUM OF 12 FEET WIDE WITH COMPACTED GRAVEL SURFACE LAYER
☐ DRIVEWAYS LONGER THAN 150 FEET IN LENGTH TO BE A MINIMUM OF 16 FEET WIDE WITH COMPACTED GRAVEL SURFACE LAYER
☐ DRIVEWAY SET BACK OF 5 FEET FROM SIDE PROPERTY BOUNDARIES
☐ SIDE SLOPE OFF DRIVEWAY SURFACE LAYER NOT TO EXCEED A 2:1 SLOPE

NOTES: _____

Reviewers Signature Title Date

411 N. Ruby St. Suite 1
Ellensburg, WA 98926
TEL (509) 962-7523
FAX (509) 962-7663

TUUSSO ENERGY - PENSTEMON SITE

A PORTION OF THE NE 1/4 OF THE SE 1/4 OF SECTION 17, T. 17 N., R. 19 E., W.M.
KITTATAS COUNTY, STATE OF WASHINGTON



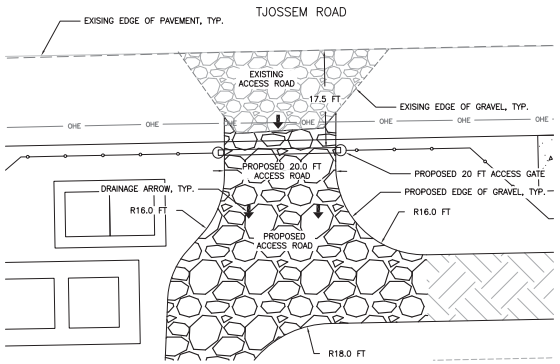
NORTH

0 25 50 100

SCALE 1" = 100'

PROPERTY INFORMATION:

APPLICANT:	TUUSSO ENERGY, LLC 500 YALE AVE N. SEATTLE, WA 98109
PARCEL NUMBER:	840233
PARCEL SIZE:	39.38 ACRES
PROPERTY ADDRESS:	TBD, ELLENSBURG, WA 98926
ZONE: IRRIGATION DISTRICT:	COMMERCIAL AGRICULTURAL ELLENSBURG WATER



SITE ACCESS DETAIL

1"=10'

REVISIONS

DESCRIPTION	BY	DATE

© THE PLANS SET FORTH ON THIS SHEET ARE AND SHALL REMAIN THE PROPERTY OF ENCOMPASS ENGINEERING & SURVEYING

NOT FOR CONSTRUCTION

TUUSSO ENERGY, LLC
PENSTEMON SITE
ACCESS SITE PLAN

Encompass
ENGINEERING & SURVEYING
Western Washington Division
165 NE Juniper Street, Suite 201 ■ Issaquah, WA 98027 ■ Phone: (425) 392-0250 ■ Fax: (425) 391-3055
Eastern Washington Division
407 Southeaster Blvd ■ Cle Elum, WA 98922 ■ Phone: (509) 674-7433 ■ Fax: (509) 674-7419

JOB NO.	17020
DATE	JULY 2017
SCALE	AS SHOWN
DESIGNED	SF
DRAWN	SF
CHECKED	TML
APPROVED	TML
SHEET	EX-1

KITTITAS COUNTY
COMMUNITY DEVELOPMENT SERVICES
411 NORTH RUBY STREET SUITE #2 ■ ELLENSBURG, WA 98926
PHONE (509) 962-7506 ■ FAX (509) 962-7682

General Application for Construction

Assessor Map Number:	Official Use Only:
(Use http://www.co.kittitas.wa.us/assessor/property.asp if needed) Example 21-12-35000-0021 1 7 - 1 9 - 1 8 0 4 0 - ___ ___ ___ ___	**Permit #:**
Short Plat/ Subdivision: / Lot #:	**Date Applied:**
	Intake:

Site Address: 4561 No. 6 Road and 2100 Tjossem Road, Ellensburg, WA 98926			
Project Description/ Nature of Work: Camas 5-MW Solar Project		~~Square Foot~~ Total:	
Specific Use of Structure: To generate renewable electricity		No. of Bedrooms: 0	
Heating System Type & Location: N/A	Heating System Fuel Type: N/A	Fireplace Fuel Type: N/A	Hot Water Location & Fuel: N/A
☐ New Residential ☐ Residential Alteration ☐ Residential Addition ☐ Foundation	☐ New Commercial ☐ Commercial Alteration ☐ Commercial Addition ☐ Tenant Improvement	☐ Multi-Family ☐ Demolition ☐ Mobile Home ☐ Accessory Building	☐ Accessory Building Alteration ☐ Agricultural Building ■ Other New Industrial

PROPERTY OWNER:	Valley Land Company, LLC	Day Phone: 509-962-2840
Mailing Address:	1585 Tjossem Road	
City, State, ZIP:	Ellensburg, WA 98926	
E-mail:	jbrunson@fairpoint.net	Cell Phone: 509-899-2840
CONTRACTOR:		Day Phone:
Contact:		
Address, City, State, ZIP:		
E-mail:		Cell Phone:
Contractor License #:		Expiration Date:
ARCHITECT/ ENGINEER/ DESIGNER:		Day Phone:
Contact:		
Address, City, State, ZIP:		
E-mail:		Cell Phone:
Professional License No.:		Expiration Date:

APPLICANT/ AGENT:	Jason Evans	Day Phone: 206-708-6055
Company (if any):	TUUSSO Energy LLC	
Address, City, State, ZIP:	500 Yale Avenue North, Seattle, WA 98109	
E-mail:	Jason.evans@tuusso.com	Cell Phone: 206-303-0198

This Section To Be Completed For Construction Permits Only

Pursuant to RCW 19.27.095 (2)(i-ii) The requirements for a fully completed construction application shall include:

i. The name, address, and phone number of the office of the lender administering the interim construction financing, if any: OR

ii. The name and address of the firm that has issued a payment bond, if any, on behalf of the prime contractor for the protection of the owner, if the bond is for an amount not less than 50% of the total amount of the construction project.

If for any reason the information requested below is not available at the time of application, the applicant shall provide the information as soon as it can be reasonably be obtained.

☐ Lending Agency Name: Phone:

Mailing Address: City: State: ZIP:

☐ I acknowledge by checking this box that this project has no lending agency for construction financing.

☐ Bonding Agency Name: Phone:

Mailing Address: City: State: ZIP

☐ I acknowledge by checking this box that this project has no bonding agency.

If you are the Owner and Acting As Your Own Contractor, please complete the following declaration:

I acknowledge that I am applying for a construction permit through the Kittitas County Community Development Services. I also acknowledge that I *am* not a licensed contractor, specialty or general, or that I am not acting as a contractor and wish to be exempt from the requirements of the Washington State Contractor's Act, per RCW 18.27.090, and will abide by all provisions and conditions of the exemption as stated. I agree that if I use the assistance of any person(s) to provide labor and/or assistance, I will retain only contractors registered and currently licensed as required under the laws of the State of Washington.

I (print name) _____ certify under penalty of perjury under the laws of the State of Washington that the foregoing is true and correct.

Owner Signature: _____ Date: _____

1. All permits shall expire by limitation and be declared void if any one of the following apply:
   a. Work is not started within 365 days of obtaining a permit.
   b. Work is abandoned for 365 days or more after beginning work.
   c. An inspection and approval of work completed has not been performed by Kittitas County Community Development Services for 365 days.
2. The building permit card and approved construction plans shall be kept on the site of work until completion of the project.
3. It shall be the duty of the permit holder or their agent to notify the building official that such work is ready for inspection. It shall by the duty of the person requesting any inspections required by code to provide access to and means for inspection of such work. Work shall not be done beyond the point indicated in each successive inspection without first obtaining the approval of the building official. Any portion that does not comply shall be corrected and such portion shall not be covered or concealed until authorized by the building official.
4. No building or structure shall be used or occupied, and no change in the existing occupancy classification of a building or structure or portion thereof shall be made until the building official has issued a Certificate of Occupancy.
5. Work shall be installed in accordance with the approved construction documents, and any changes made during construction that are not in compliance with the approved construction documents shall be resubmitted for approval as an amended set of construction documents.

I hereby acknowledge that I have read this application and certify under penalty of perjury under the laws of the State of Washington that the above answers are true and complete to the best of my knowledge. I agree to comply with all current codes, laws, regulations and permit requirements related to this project. I hereby certify that I will pay all fees as required by law, including any applicable review fees if I do not purchase the permit. I further agree to, and hereby grant to Kittitas County Community Development Services and Department of Public Works a right to enter onto the premises as described for this permit application, for the purpose of making such inspections and tests as may be required. By signing this application, the Owner certifies that they are the legal owner of the property. All permit fees are non-refundable.

Owners Signature: (Required)		Authorized Agent Signature:	
Print Name:		Print Name:	
Date:		Date:	

Tuusso Energy: Penstemon Solar Project

NOI Application

September 5, 2017

SECTION 1. CONTACT INFO

Contact Information Section Help

This Notice of Intent application requires the following contact types: **Permittee, Site Owner, and Site Contact**. Please use the table below to fill in your required contacts. You may add additional contact types that are not pre-listed.

Note: Please remember you are responsible for notifying the Department of Ecology when your contact information changes.

Contact Type	First Name	Last Name	Organization Name	Action
Permittee	Jason	Evans	Tuusso Energy	Edit - Remove
Site Contact	Jason	Evans	Tuusso Energy	Edit - Remove
Site Owner	Jeff	Brunson	Valley Land Company LLC	Edit - Remove

Your mailing address will be standardized against the postal service (USPS) mailing database when you click on the "Update" button. Verfication may be necessary.

Honorific: | **Contact Type:** Permittee
First Name: Jason | **Last Name:** Evans
Organization Name: Tuusso Energy | Title:
Mailing Address: 500 Yale Ave N
Country: UNITED STATES
City: Seattle **State:** WA **Zip:** 98109 - 5680
Email Address: jason.evans@tuusso.com
Business Phone: 206 - 708 - 6055 Ext. | Fax Number: - -
Cell Phone: 206 - 303 - 0198 | UBI Number:

Your mailing address will be standardized against the postal service (USPS) mailing database when you click on the "Update" button. Verfication may be necessary.

Honorific: | **Contact Type:** Site Owner
First Name: Jeff | **Last Name:** Brunson
Organization Name: Valley Land Company LL | Title:
Mailing Address: 1585 Tjossem Rd
Country: UNITED STATES
City: Ellensburg **State:** WA **Zip:** 98926 - 8925
Email Address: jbrunson@fairpoint.net
Business Phone: 509 - 962 - 2840 Ext. | Fax Number: - -
Cell Phone: - - | UBI Number:

Copy From... My Profile | Save Contact | Cancel

SECTION 2. FACILITY/SITE INFO

Facility/Site Information Section Help

Your facility address will be standardized against the postal service (USPS) mailing database when you click on the "Select facility from map" link. Verfication may be necessary.

This Facility/Site's Ownership Type is: Private

Facility/Site Name: Penstemon Solar Project

Street Address:

City: Zip:

Or

If the site lacks a street address, list its specific location. Example: Intersection of Highway 61 and 34.

Location Description: SW corner of intersection of Tjossem Rd and Moe Rd, Ellensburg,WA 98926

Find my facility/site on a map

Please use the pop up map to complete the latitude, longitude and county information below. Use the pencil tool on the map to locate your facility at the front door or site entrance. *(The map may take a second to pop up.)*

Select facility/site from map

Latitude: 46.963135 **Longitude:** -120.480647 **County:** Kittitas

SECTION 3. SITE/PROJECT INFO

Project Information

Section Help

Type of Construction Activity: *(check all that apply)*

☐ Highway or Road (city, county, state) ☐ Residential ☐ Commercial ☐ Industrial

☐ Utilities ☑ Other *(specify):* Photovoltaic solar panel s

Project/Site Size: 39.38 acres

The total size of the project site in acres. This is all land that is owned or controlled by the permittee.

Soil Disturbance Size: 36.55 acres

Total area of soil disturbance for your site/project over the life of the project. Include grading, equipment staging, excavation, borrow pit, material storage areas, dump areas, haul roads, side-cast areas, off-site construction support areas, and all other soil disturbance acreage associated with the project. (Note: 1 acre = 43,500 ft²).

Estimated Project Start Date: 4/1/2018

Estimated Project End Date: 10/31/2018

Will 1,000 cubic yards or more of poured concrete or recycled concrete be used over the life of the project? ○ Yes ◉ No

Site Conditions

Are you aware of contaminated soils present on the site? ○ Yes ◉ No

Are you aware of groundwater contamination located within the site boundary? ○ Yes ◉ No

Other Permits

Please enter other permits issued by Water Quality for this site.

Permit Number	Action
	Add

SECTION 4. DISCHARGE LOCATION

Discharge Location/Outfall Information

Section Help

Will water discharge directly or indirectly (through a storm drain system or roadside ditch) into one or more surface waterbodies (wetlands, creeks, lakes, and all other surface waters and water courses)?

No, no discharge to surface waters (100% infiltration) ▼

If your project includes dewatering, you must include dewatering plans and discharge locations in your site Stormwater Pollution Prevention Plan.

Location of Discharge into Surface Waterbody (Outfall Location)

Select the waterbody location (outfall) on the pop up map where the site has the potential to discharge into a waterbody (enter all locations). If you have 100% infiltration, you must select where the infiltration point is as your outfall. *(The map may take a second to pop up.)*

Outfall Number	Outfall Name	Lat/Long	Action
1	Infiltration	46.959452/-120.479649	Edit - Remove

SECTION 5. NOI INFORMATION

Stormwater Pollution Prevention Plan (SWPPP)

You must develop a SWPPP prior to starting construction. Do **not** submit your SWPPP with your application. The exception is that Ecology may request a copy of all or part of your SWPPP if you answered yes to the questions under the Site Conditions heading on the Site/Project Info tab.

☑ I have read and agree to the information above

Best Management Practices (BMPs)

You must use the BMPs listed in the Stormwater Management Manual for Western Washington or the Stormwater Management Manual for Eastern Washington or other manuals approved by Ecology. Alternatively, you may use demonstrably equivalent BMPs on the basis of permit condition S9.C.4. If you intend to use a BMP at your site that is not included in these manuals, but that you believe meets the definition of a demostrably equivalent BMP, you must notify the appropriate regional office. (See Definitions in the Construction Stormwater General Permit).

Note that if you receive permit coverage without indicating the preference for a demostrably equivalent BMP and later decide to use one, you must provide Ecology with notice of the selection of an equivalent BMP no less than 60 days before the intended use of the equivalent BMP.

http://www.ecy.wa.gov/programs/wq/stormwater/construction/contacts.html

☑ I have read and agree to the information above

SECTION 6. DMR

Discharge Monitoring Reports (DMRs)

Permittees must submit monitoring data using Ecology's WQWebDMR program.

To sign up for WQWebDMR, or to register a new site, go to http://www.ecy.wa.gov/programs/wq/permits/paris/webdmr.html. If you are unable to submit your DMRs electronically, you may contact Ecology to request a waiver. Ecology will generally only grant waiver requests to those permittees without internet access. Only a permittee or representative, designated in writing, may request access to or a waiver from WQWebDMR. If you have questions on this process, contact Ecology's WQWebDMR staff at WQWebPortal@ecy.wa.gov or 1-800-633-6193, Option 3 (toll free).

☑ I have read and agree to the information above

SECTION 7. SEPA

State Environmental Policy Act (SEPA)

Section Help

This Notice of Intent (NOI) is incomplete and cannot be approved until the applicable SEPA requirements under Chapter 197-11 WAC are met.

Who is the SEPA lead agency on your site? Energy Facility Site Evaluation Council

Has the SEPA lead agency issued a final decision on your checklist? ○ No ○ Yes ○ Exempt

More SEPA information is available at: http://www.ecy.wa.gov/programs/sea/sepa/e-review.html

SECTION 8. PUBLIC NOTICE

Public Notice

Section Help

You must publish a public notice at least **once** a week for **two** consecutive weeks with **seven days** between publications, in at least a **single** newspaper of general circulation in the county in which the construction is to take place. Ecology cannot grant permit coverage sooner than the end of the 30-day public comment period, which begins on the date of the **second** public notice.

You may choose to use a system generated public notice and download it below. If not, you need to upload the public notice used.

- (•) I will use the system generated public notice document
- ( ) I will upload my own public notice

```
Tuusso Energy, Jason Evans, 500 Yale Ave N Seattle, WA 98109, is seeking coverage under the
Washington State Department of Ecology's Construction Stormwater NPDES and State Waste Discharge
General Permit.
The proposed project, Penstemon Solar Project, is located at  SW corner of intersection of Tjossem
Rd and Moe Rd, Ellensburg,WA 98926 in  in Kittitas county.
This project involves 36.55 acres of soil disturbance for Other (Photovoltaic solar panel site)
construction activities.
All discharges and runoff goes to ground water.
Any persons desiring to present their views to the Washington State Department of Ecology regarding
this Application, or interested in Ecology's action on this Application, may notify Ecology in
writing no later than 30 days of the last date of publication of this notice. Ecology reviews
public comments and considers whether discharges from this project would cause a measurable change
in receiving water quality, and, if so, whether the project is necessary and in the overriding
public interest according to Tier II antidegradation requirements under WAC 173-201A-320.

Comments can be submitted to:
Department of Ecology
Attn: Water Quality Program, Construction Stormwater
P.O. Box 47696, Olympia, WA 98504-7696
```

Clicking the text will copy it to your clipboard, if allowed. Open notice in a new window for printing.

To add a public notice to your application, select the newspaper name and enter your public notice dates, then click on the "Add" link. If you do not click the "Add" link, the public notice entry will be lost.

Note: This system does not publish your public notice in the newspaper for you. You must submit your public notice text to your selected newspaper.

Newspaper Name	First Notice	Second Notice	Action
Ellensburg - Daily Record ▼	*	*	Add

* First notice date is required.
* Second notice date is required.

SECTION 9. QUESTIONS

For Questions...

Please contact the following staff per your construction site's location.

If your construction site is located in:	Contact the following staff:
City of Seattle, Kitsap, Pierce, or Thurston County	Josh Klimek 360-407-7451 josh.klimek@ecy.wa.gov
Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Skagit, Snohomish, Spokane, Stevens, Walla Walla, Whatcom, or Whitman County	Shawn Hopkins 360-407-6442 shawn.hopkins@ecy.wa.gov
Benton, Chelan, Clallam, Clark, Cowlitz, Douglas, Grays Harbor, Jefferson, Kittitas, Klickitat, Lewis, Mason, Okanogan, Pacific, Skamania, Wahkiakum, or Yakima County	Joyce Smith 360-407-6858 joyce.smith@ecy.wa.gov
Island, King, or San Juan County	RaChelle Stane 360-407-6556 rachelle.stane@ecy.wa.gov

Tuusso Energy, Jason Evans, 500 Yale Ave N Seattle, WA 98109, is seeking coverage under the Washington State Department of Ecology's Construction Stormwater NPDES and State Waste Discharge General Permit.

The proposed project, Penstemon Solar Project, is located at SW corner of intersection of Tjossem Rd and Moe Rd, Ellensburg,WA 98926 in in Kittitas county.

This project involves 36.55 acres of soil disturbance for Other (Solar Panel Farm) construction activities.

All discharges and runoff goes to ground water.

Any persons desiring to present their views to the Washington State Department of Ecology regarding this application, or interested in Ecology's action on this application, may notify Ecology in writing no later than 30 days of the last date of publication of this notice. Ecology reviews public comments and considers whether discharges from this project would cause a measurable change in receiving water quality, and, if so, whether the project is necessary and in the overriding public interest according to Tier II antidegradation requirements under WAC 173-201A-320.

Comments can be submitted to:

Department of Ecology

Attn: Water Quality Program, Construction Stormwater

P.O. Box 47696, Olympia, WA 98504-7696

Construction Stormwater General Permit

Stormwater Pollution Prevention Plan (SWPPP)

for

Tuusso Energy: Penstemon Solar Project

Prepared for:

The Washington State Department of Ecology

Central Regional Office

Permittee / Owner	Developer	Operator / Contractor
Tuusso Energy LLC	Jason Evans	TBD

TBD (Near 3950 Tjossem Rd), Ellensburg, WA 98926

Certified Erosion and Sediment Control Lead (CESCL)

Name	Organization	Contact Phone Number
TBD	TBD	TBD

SWPPP Prepared By

Name	Organization	Contact Phone Number
Sarah Foster, EI	Encompass Engineering & Surveying	(509) 674- 7433

SWPPP Preparation Date

July 28, 2017

Project Construction Dates

Activity / Phase	Start Date	End Date
Phase 1	4/1/2018	10/31/2018

Table of Contents

1 Project Information 4
1.1 Existing Conditions 4
1.2 Proposed Construction Activities 4
2 Construction Stormwater Best Management Practices (BMPs) 6
2.1 The 13 Elements 6
2.1.1 Element 1: Preserve Vegetation / Mark Clearing Limits 6
2.1.2 Element 2: Establish Construction Access 6
2.1.3 Element 3: Control Flow Rates 6
2.1.4 Element 4: Install Sediment Controls 7
2.1.5 Element 5: Stabilize Soils 7
2.1.6 Element 6: Protect Slopes 8
2.1.7 Element 7: Protect Drain Inlets 8
2.1.8 Element 8: Stabilize Channels and Outlets 9
2.1.9 Element 9: Control Pollutants 9
2.1.10 Element 10: Control Dewatering 11
2.1.11 Element 11: Maintain BMPs 11
2.1.12 Element 12: Manage the Project 12
2.1.13 Element 13: Protect Low Impact Development (LID) BMPs 12
3 Pollution Prevention Team 13
4 Monitoring and Sampling Requirements 14
4.1 Site Inspection 14
4.2 Stormwater Quality Sampling 14
4.2.1 Turbidity Sampling 14
4.2.2 pH Sampling 16
5 Discharges to 303(d) or Total Maximum Daily Load (TMDL) Waterbodies 17
5.1 303(d) Listed Waterbodies 17
5.2 TMDL Waterbodies 17
6 Reporting and Record Keeping 18
6.1 Record Keeping 18
6.1.1 Site Log Book 18
6.1.2 Records Retention 18
6.1.3 Updating the SWPPP 18
6.2 Reporting 18
6.2.1 Discharge Monitoring Reports 18
6.2.2 Notification of Noncompliance 19

List of Tables

Table 1 – Summary of Site Pollutant Constituents 4
Table 2 – Pollutants 9
Table 3 – pH-Modifying Sources 10
Table 4 – Dewatering BMPs 11
Table 5 – Management 12
Table 6 – BMP Implementation Schedule Error! Bookmark not defined.
Table 7 – Team Information 13
Table 8 – Turbidity Sampling Method 14
Table 9 – pH Sampling Method 16

List of Appendices

A. Site Map
B. BMP Details
C. Correspondence
D. Site Inspection Form
E. Construction Stormwater General Permit
F. 303(d) List Waterbodies / TMDL Waterbodies Information
G. Contaminated Site Information
H. Engineering Calculations

List of Acronyms and Abbreviations

Acronym / Abbreviation	Explanation
303(d)	Section of the Clean Water Act pertaining to Impaired Waterbodies
BFO	Bellingham Field Office of the Department of Ecology
BMP(s)	Best Management Practice(s)
CESCL	Certified Erosion and Sediment Control Lead
CO_2	Carbon Dioxide
CRO	Central Regional Office of the Department of Ecology
CSWGP	Construction Stormwater General Permit
CWA	Clean Water Act
DMR	Discharge Monitoring Report
DO	Dissolved Oxygen
Ecology	Washington State Department of Ecology
EPA	United States Environmental Protection Agency
ERO	Eastern Regional Office of the Department of Ecology
ERTS	Environmental Report Tracking System
ESC	Erosion and Sediment Control
GULD	General Use Level Designation
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Units
NWRO	Northwest Regional Office of the Department of Ecology
pH	Power of Hydrogen
RCW	Revised Code of Washington
SPCC	Spill Prevention, Control, and Countermeasure
su	Standard Units
SWMMEW	Stormwater Management Manual for Eastern Washington
SWMMWW	Stormwater Management Manual for Western Washington
SWPPP	Stormwater Pollution Prevention Plan
TESC	Temporary Erosion and Sediment Control
SWRO	Southwest Regional Office of the Department of Ecology
TMDL	Total Maximum Daily Load
VFO	Vancouver Field Office of the Department of Ecology
WAC	Washington Administrative Code
WSDOT	Washington Department of Transportation
WWHM	Western Washington Hydrology Model

1 Project Information

Project/Site Name: Penstemon Solar Project
Street/Location: TBD (Near 3950 Tjossem Rd)
City: Ellensburg State: WA Zip code: 98926
Subdivision: NA
Receiving waterbody: Existing irrigation ditch

1.1 Existing Conditions

Total acreage (including support activities such as off-site equipment staging yards, material storage areas, borrow areas).

Total acreage:	39.38
Disturbed acreage:	36.55
Existing structures:	None
Landscape topography:	Gently sloped grassland/range, sloping to the south.
Drainage patterns:	Flows through the center of the lot towards the south, into an offsite irrigation ditch.
Existing Vegetation:	Range/grassland
Critical Areas (wetlands, streams, high erosion risk, steep or difficult to stabilize slopes):	Coleman Creek borders the eastern boundary of the site and an existing irrigation ditch borders the southern boundary of the site.

List of known impairments for 303(d) listed or Total Maximum Daily Load (TMDL) for the receiving waterbody: None

Table 1 includes a list of suspected and/or known contaminants associated with the construction activity.

No known contamination n site or associated with the construction activity.

Table 1 – Summary of Site Pollutant Constituents

Constituent (Pollutant)	Location	Depth	Concentration
NA	NA	NA	NA

1.2 Proposed Construction Activities

Description of site development (example: subdivision):
Photovoltaic solar facility project site with all weather-access roads, inverter stations, and modular trackers with solar panels

Description of construction activities (example: site preparation, demolition, excavation):

1. Pre-construction meeting

2. Grade and install construction entrance
3. Install perimeter protection
4. Grade and stabilize construction roads
5. Install vibratory driven H piles for wide flange steel beams
6. Install electrical underground and mechanical trackers
7. Install panels
8. Perform any required site restoration

Description of site drainage including flow from and onto adjacent properties. Must be consistent with Site Map in Appendix A:
The site drains towards the south, into an existing irrigation ditch that flows to the east.

Description of final stabilization (example: extent of revegetation, paving, landscaping):
The site will be revegetated with native vegetation.

Contaminated Site Information:
Proposed activities regarding contaminated soils or groundwater (example: on-site treatment system, authorized sanitary sewer discharge):
No contamination is known to be on site.

2 Construction Stormwater Best Management Practices (BMPs)

The SWPPP is a living document reflecting current conditions and changes throughout the life of the project. These changes may be informal (i.e., hand-written notes and deletions). Update the SWPPP when the CESCL has noted a deficiency in BMPs or deviation from original design.

2.1 The 13 Elements

2.1.1 Element 1: Preserve Vegetation / Mark Clearing Limits

List and describe BMPs:

BMP C101: Preserving Natural Vegetation

Natural vegetation will be preserved along the eastern border of the site near Coleman creek and near the offsite irrigation ditch along the southern boundary of the site.

BMP C102: Buffer Zones

Buffer zones will be established at the limits of the proposed facility to protect existing wetlands and relieve downstream impacts. Existing vegetation will be maintained within the buffer zones throughout construction.

Installation Schedules: TBD

Inspection and Maintenance plan: TBD

Responsible Staff: TBD

2.1.2 Element 2: Establish Construction Access

List and describe BMPs:

BMP C105 – Stabilized Construction Entrance

A single, stabilized construction entrance will be provided off of Tjossem Rd, where vehicles will be entering/exiting, in order to prevent tracking out from the site.

Installation Schedules: TBD

Inspection and Maintenance plan: TBD

Responsible Staff: TBD

2.1.3 Element 3: Control Flow Rates

Will you construct stormwater retention and/or detention facilities?
☐ Yes ☒ No

Will you use permanent infiltration ponds or other low impact development (example: rain gardens, bio-retention, porous pavement) to control flow during construction?

☐ Yes ☒ No

Project will not impair or alter downstream conveyance systems. Full dispersion on site will be used to account for increased flows due to proposed impervious areas. Per Chapter 2.2.6 of the SWMMEW there are exemptions for new development when flow control is not required as long as certain conditions are met. Per exemption 1, “Any project able to disperse, without discharging to surface waters, the total 25-year runoff volume for the proposed development condition” is exempt from meeting the flow control requirements. The Penstemon project will use full dispersion as the main way to handle increased flows due to impervious areas. As outlined in SWMMEW Chapter 6.5, BMP F6.42, full dispersion allows up to 10% of the site that is impervious to be characterized as non-effective impervious area by dispersing runoff into the native vegetation area. On the Penstemon site, the impervious areas may conservatively make up to 3.3% of the site while the rest of the site maintains plantings similar to existing vegetation. This is under the 10% threshold, making full dispersion a viable option.

List and describe BMPs:

BMP F6.42- Full dispersion: Runoff from impervious areas within the site will be dispersed within the site utilizing the native vegetation.

BMP C102 – Buffer Zones (See Element 1)

BMP C233 – Silt Fence will also control flow rates from the site during construction (See Element 4).

Installation Schedules: TBD

Inspection and Maintenance plan: TBD

Responsible Staff: TBD

2.1.4 Element 4: Install Sediment Controls

BMP C233- Silt Fence: Silt Fence will surround the site at all areas downslope of all disturbed areas and will be placed upslope of any existing water bodies and wetlands. The silt fence will also serve to mark the clearing limits per Element 1 above.

Installation Schedules: TBD

Inspection and Maintenance plan: TBD

Responsible Staff: TBD

2.1.5 Element 5: Stabilize Soils

The Central Basin*, East of the Cascade Mountain Crest

Season	Dates	Number of Days Soils Can be Left Exposed
During the Dry Season	July 1 – September 30	30 days

During the Wet Season	October 1 – June 30	15 days

*Note: The Central Basin is defined as the portions of Eastern Washington with mean annual precipitation of less than 12 inches.

Soils must be stabilized at the end of the shift before a holiday or weekend if needed based on the weather forecast.

Anticipated project dates: Start date: 4/1/2018 End date: 10/31/2018

Will you construct during the wet season?
☒ Yes ☐ No

List and describe BMPs:

BMP C123- Plastic Covering: Plastic covering will be used as necessary to protect any soil stockpiles that are produced from construction activity.

Installation Schedules: TBD

Inspection and Maintenance plan: TBD

Responsible Staff: TBD

2.1.6 Element 6: Protect Slopes

Will steep slopes be present at the site during construction?
☐ Yes ☒ No
The site is relatively flat and is not expected to require protection for slopes.

List and describe BMPs: None

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

2.1.7 Element 7: Protect Drain Inlets

There are no storm drain inlets on the site

List and describe BMPs: None

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

2.1.8 Element 8: Stabilize Channels and Outlets

Provide stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent stream banks, slopes, and downstream reaches, will be installed at the outlets of all conveyance systems.

List and describe BMPs: None

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

2.1.9 Element 9: Control Pollutants

The following pollutants are anticipated to be present on-site: No known pollutants

Table 2 – Pollutants

Pollutant (List pollutants and source, if applicable)
NA

List and describe BMPs: None

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

Will maintenance, fueling, and/or repair of heavy equipment and vehicles occur on-site?
☒ Yes ☐ No

Contractor is required to keep a spill kit on site and use spill prevention measures throughout the construction process, in order to address any potential fuel spills or equipment breakdowns.

List and describe BMPs: None

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

Will wheel wash or tire bath system BMPs be used during construction?
☐ Yes ☒ No

List and describe BMPs: Wheel wash is not proposed at this time; however, if construction activities are such that sediment may be tracked with tires off-site a wheel wash will be used and any wastewater generated would be disposed at a local permitted facility.

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

Will pH-modifying sources be present on-site?

☐ Yes ☒ No

Table 3 – pH-Modifying Sources

☒	None
☐	Bulk cement
☐	Cement kiln dust
☐	Fly ash
☐	Other cementitious materials
☐	New concrete washing or curing waters
☐	Waste streams generated from concrete grinding and sawing
☐	Exposed aggregate processes
☐	Dewatering concrete vaults
☐	Concrete pumping and mixer washout waters
☐	Recycled concrete
☐	Recycled concrete stockpiles
☐	Other (i.e., calcium lignosulfate) [please describe:]

List and describe BMPs: None

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

Concrete trucks must not be washed out onto the ground, or into storm drains, open ditches, streets, or streams. Excess concrete must not be dumped on-site, except in designated concrete washout areas with appropriate BMPs installed.

Will uncontaminated water from water-only based shaft drilling for construction of building, road, and bridge foundations be infiltrated provided the wastewater is managed in a way that prohibits discharge to surface waters?

☐ Yes ☒ No

List and describe BMPs: None

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

2.1.10 Element 10: Control Dewatering

No dewatering is proposed or expected to occur as part of this project.

Table 4 – Dewatering BMPs

☐	Infiltration
☐	Transport off-site in a vehicle (vacuum truck for legal disposal)
☐	Ecology-approved on-site chemical treatment or other suitable treatment technologies
☐	Sanitary or combined sewer discharge with local sewer district approval (last resort)
☐	Use of sedimentation bag with discharge to ditch or swale (small volumes of localized dewatering)

List and describe BMPs: None

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

2.1.11 Element 11: Maintain BMPs

All temporary and permanent Erosion and Sediment Control (ESC) BMPs shall be maintained and repaired as needed to ensure continued performance of their intended function.

Maintenance and repair shall be conducted in accordance with each particular BMP specification (see *Volume II of the SWMMWW or Chapter 7 of the SWMMEW*).

Visual monitoring of all BMPs installed at the site will be conducted at least once every calendar week and within 24 hours of any stormwater or non-stormwater discharge from the site. If the site becomes inactive and is temporarily stabilized, the inspection frequency may be reduced to once every calendar month.

All temporary ESC BMPs shall be removed within 30 days after final site stabilization is achieved or after the temporary BMPs are no longer needed.

Trapped sediment shall be stabilized on-site or removed. Disturbed soil resulting from removal of either BMPs or vegetation shall be permanently stabilized.

Additionally, protection must be provided for all BMPs installed for the permanent control of stormwater from sediment and compaction. BMPs that are to remain in place following completion of construction shall be examined and restored to full operating condition. If sediment enters these BMPs during construction, the sediment shall be removed and the facility shall be returned to conditions specified in the construction documents.

2.1.12 Element 12: Manage the Project

The project will be managed based on the following principles:

- Projects will be phased to the maximum extent practicable and seasonal work limitations will be taken into account.
- Inspection and monitoring:
    - Inspection, maintenance and repair of all BMPs will occur as needed to ensure performance of their intended function.
    - Site inspections and monitoring will be conducted in accordance with Special Condition S4 of the CSWGP. Sampling locations are indicated on the Site Map. Sampling station(s) are located in accordance with applicable requirements of the CSWGP.
- Maintain an updated SWPPP.
    - The SWPPP will be updated, maintained, and implemented in accordance with Special Conditions S3, S4, and S9 of the CSWGP.

As site work progresses the SWPPP will be modified routinely to reflect changing site conditions. The SWPPP will be reviewed monthly to ensure the content is current.

Table 5 – Management

☒	Design the project to fit the existing topography, soils, and drainage patterns
☒	Emphasize erosion control rather than sediment control
☒	Minimize the extent and duration of the area exposed
☒	Keep runoff velocities low
☒	Retain sediment on-site
☒	Thoroughly monitor site and maintain all ESC measures
☐	Schedule major earthwork during the dry season
☐	Other (please describe)

2.1.13 Element 13: Protect Low Impact Development (LID) BMPs

There are no existing or proposed LID facilities associated with the project site. Buffer zones will be established during construction to protect the Coleman Creek and the offsite irrigation system.

3 Pollution Prevention Team

Table 7 – Team Information

Title	Name(s)	Phone Number
Certified Erosion and Sediment Control Lead (CESCL)	TBD	TBD
Resident Engineer	TBD	TBD
Emergency Ecology Contact	TBD	TBD
Emergency Permittee/ Owner Contact	TBD	TBD
Non-Emergency Owner Contact	TBD	TBD
Monitoring Personnel	TBD	TBD
Ecology Regional Office	Central Regional Office	(509)-575-2490

4 Monitoring and Sampling Requirements

Monitoring includes visual inspection, sampling for water quality parameters of concern, and documentation of the inspection and sampling findings in a site log book. A site log book will be maintained for all on-site construction activities and will include:

- A record of the implementation of the SWPPP and other permit requirements
- Site inspections
- Stormwater sampling data

File a blank form under Appendix D.

The site log book must be maintained on-site within reasonable access to the site and be made available upon request to Ecology or the local jurisdiction.

Numeric effluent limits may be required for certain discharges to 303(d) listed waterbodies. See CSWGP Special Condition S8 and Section 5 of this template.

4.1 Site Inspection

Site inspections will be conducted at least once every calendar week and within 24 hours following any discharge from the site. For sites that are temporarily stabilized and inactive, the required frequency is reduced to once per calendar month.

The discharge point(s) are indicated on the Site Map (see Appendix A) and in accordance with the applicable requirements of the CSWGP.

4.2 Stormwater Quality Sampling

4.2.1 Turbidity Sampling

Requirements include calibrated turbidity meter or transparency tube to sample site discharges for compliance with the CSWGP. Sampling will be conducted at all discharge points at least once per calendar week.

Method for sampling turbidity:

Table 8 – Turbidity Sampling Method

☒	Turbidity Meter/Turbidimeter (required for disturbances 5 acres or greater in size)
☐	Transparency Tube (option for disturbances less than 1 acre and up to 5 acres in size)

The benchmark for turbidity value is 25 nephelometric turbidity units (NTU) and a transparency less than 33 centimeters.

If the discharge's turbidity is 26 to 249 NTU **or** the transparency is less than 33 cm but equal to or greater than 6 cm, the following steps will be conducted:

1. Review the SWPPP for compliance with Special Condition S9. Make appropriate revisions within 7 days of the date the discharge exceeded the benchmark.

2. Immediately begin the process to fully implement and maintain appropriate source control and/or treatment BMPs as soon as possible. Address the problems within 10 days of the date the discharge exceeded the benchmark. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when the Permittee requests an extension within the initial 10-day response period.
3. Document BMP implementation and maintenance in the site log book.

If the turbidity exceeds 250 NTU **or** the transparency is 6 cm or less at any time, the following steps will be conducted:

1. Telephone or submit an electronic report to the applicable Ecology Region's Environmental Report Tracking System (ERTS) within 24 hours.
    - **Central Region** (Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, Yakima): (509) 575-2490 or http://www.ecy.wa.gov/programs/spills/forms/nerts_online/CRO_nerts_online.html
    - **Eastern Region** (Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman): (509) 329-3400 or http://www.ecy.wa.gov/programs/spills/forms/nerts_online/ERO_nerts_online.html
    - **Northwest Region** (King, Kitsap, Island, San Juan, Skagit, Snohomish, Whatcom): (425) 649-7000 or http://www.ecy.wa.gov/programs/spills/forms/nerts_online/NWRO_nerts_online.html
    - **Southwest Region** (Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Lewis, Mason, Pacific, Pierce, Skamania, Thurston, Wahkiakum,): (360) 407-6300 or http://www.ecy.wa.gov/programs/spills/forms/nerts_online/SWRO_nerts_online.html
2. Immediately begin the process to fully implement and maintain appropriate source control and/or treatment BMPs as soon as possible. Address the problems within 10 days of the date the discharge exceeded the benchmark. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when the Permittee requests an extension within the initial 10-day response period
3. Document BMP implementation and maintenance in the site log book.
4. Continue to sample discharges daily until one of the following is true:
    - Turbidity is 25 NTU (or lower).
    - Transparency is 33 cm (or greater).
    - Compliance with the water quality limit for turbidity is achieved.
        - 1 - 5 NTU over background turbidity, if background is less than 50 NTU
        - 1% - 10% over background turbidity, if background is 50 NTU or greater
    - The discharge stops or is eliminated.

4.2.2 pH Sampling

pH monitoring is required for “Significant concrete work” (i.e., greater than 1000 cubic yards poured concrete over the life of the project). The use of recycled concrete or engineered soils (soil amendments including but not limited to Portland cement-treated base [CTB], cement kiln dust [CKD] or fly ash) also requires pH monitoring.

For significant concrete work, pH sampling will start the first day concrete is poured and continue until it is cured, typically three (3) weeks after the last pour.

For engineered soils and recycled concrete, pH sampling begins when engineered soils or recycled concrete are first exposed to precipitation and continues until the area is fully stabilized.

If the measured pH is 8.5 or greater, the following measures will be taken:

1. Prevent high pH water from entering storm sewer systems or surface water.
2. Adjust or neutralize the high pH water to the range of 6.5 to 8.5 su using appropriate technology such as carbon dioxide (CO_2) sparging (liquid or dry ice).
3. Written approval will be obtained from Ecology prior to the use of chemical treatment other than CO_2 sparging or dry ice.

Method for sampling pH: None required

Table 9 – pH Sampling Method

☐	pH meter
☐	pH test kit
☐	Wide range pH indicator paper

5 Discharges to 303(d) or Total Maximum Daily Load (TMDL) Waterbodies

5.1 303(d) Listed Waterbodies

Is the receiving water 303(d) (Category 5) listed for turbidity, fine sediment, phosphorus, or pH?

☐ Yes ☒ No

List the impairment(s):

NA

5.2 TMDL Waterbodies

Waste Load Allocation for CWSGP discharges:

NA

List and describe BMPs:

NA

Discharges to TMDL receiving waterbodies will meet in-stream water quality criteria at the point of discharge.

The Construction Stormwater General Permit Proposed New Discharge to an Impaired Water Body form is included in Appendix F.

6 Reporting and Record Keeping

6.1 Record Keeping

6.1.1 Site Log Book

A site log book will be maintained for all on-site construction activities and will include:

- A record of the implementation of the SWPPP and other permit requirements
- Site inspections
- Sample logs

6.1.2 Records Retention

Records will be retained during the life of the project and for a minimum of three (3) years following the termination of permit coverage in accordance with Special Condition S5.C of the CSWGP.

Permit documentation to be retained on-site:

- CSWGP
- Permit Coverage Letter
- SWPPP
- Site Log Book

Permit documentation will be provided within 14 days of receipt of a written request from Ecology. A copy of the SWPPP or access to the SWPPP will be provided to the public when requested in writing in accordance with Special Condition S5.G.2.b of the CSWGP.

6.1.3 Updating the SWPPP

The SWPPP will be modified if:

- Found ineffective in eliminating or significantly minimizing pollutants in stormwater discharges from the site.
- There is a change in design, construction, operation, or maintenance at the construction site that has, or could have, a significant effect on the discharge of pollutants to waters of the State.

The SWPPP will be modified within seven (7) days if inspection(s) or investigation(s) determine additional or modified BMPs are necessary for compliance. An updated timeline for BMP implementation will be prepared.

6.2 Reporting

6.2.1 Discharge Monitoring Reports

Cumulative soil disturbance is one (1) acre or larger; therefore, Discharge Monitoring Reports (DMRs) will be submitted to Ecology monthly. If there was no discharge during a given monitoring period the DMR will be submitted as required, reporting “No Discharge”. The DMR due date is fifteen (15) days following the end of each calendar month.

DMRs will be reported online through Ecology's WQWebDMR System.

6.2.2 Notification of Noncompliance

If any of the terms and conditions of the permit is not met, and the resulting noncompliance may cause a threat to human health or the environment, the following actions will be taken:

1. Ecology will be notified within 24-hours of the failure to comply by calling the applicable Regional office ERTS phone number (Regional office numbers listed below).
2. Immediate action will be taken to prevent the discharge/pollution or otherwise stop or correct the noncompliance. If applicable, sampling and analysis of any noncompliance will be repeated immediately and the results submitted to Ecology within five (5) days of becoming aware of the violation.
3. A detailed written report describing the noncompliance will be submitted to Ecology within five (5) days, unless requested earlier by Ecology.

Anytime turbidity sampling indicates turbidity is 250 NTUs or greater, or water transparency is 6 cm or less, the Ecology Regional office will be notified by phone within 24 hours of analysis as required by Special Condition S5.A of the CSWGP.

- **Central Region** at (509) 575-2490 for Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, or Yakima County
- **Eastern Region** at (509) 329-3400 for Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, or Whitman County
- **Northwest Region** at (425) 649-7000 for Island, King, Kitsap, San Juan, Skagit, Snohomish, or Whatcom County
- **Southwest Region** at (360) 407-6300 for Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Lewis, Mason, Pacific, Pierce, Skamania, Thurston, or Wahkiakum

Include the following information:

1. Your name and / Phone number
2. Permit number
3. City / County of project
4. Sample results
5. Date / Time of call
6. Date / Time of sample
7. Project name

In accordance with Special Condition S4.D.5.b of the CSWGP, the Ecology Regional office will be notified if chemical treatment other than CO_2 sparging is planned for adjustment of high pH water.

Please see Page G-3-35 for shared SWPPP Appendices

Appendix I-4: Penstemon Solar Project Geotechnical Engineering Study

June 9, 2017

Tuusso Energy, LLC
500 Yale Avenue North
Seattle, WA 98109

Attention: Ms. Joy Potter

Subject: Geotechnical Engineering Study – Phase I
Penstemon – Proposed Solar Array Installation
1585 Tjossem Road
Ellensburg, Washington

Dear Ms. Potter,

In accordance with our proposal dated April 11, 2017, we have completed our field work at the subject site and have prepared this report with detailed descriptions of the site soils and geotechnical recommendations for the proposed project. The approximate site location is shown on the attached Site Vicinity Map (Figure 1). On April 26, 2017, we observed installation of two test borings using a GeoProbe 8140-LC track-mounted drill rig, provided by Holocene Drilling, Inc. of Puyallup, Washington. Based on our observation of soil conditions at the site, it is our opinion that the site is satisfactory for installation of the proposed solar panel array supported on driven H-beams.

The following is a summary of our observations of soils conditions at the subject site. We encountered one (1.0) to two (2.0) feet of dark brown, moist, loose to medium dense silty fine sand to sandy silt with varying amounts of gravel. This unit comprises a topsoil-like horizon. Underlying this unit, we observed a dense to very dense lightly to moderately cemented sandy gravel with varying amounts of silt and clay minerals. N-Values in the upper, loose, topsoil-like material ranged from 3 to 4. N-Values in the underlying gravel unit were observed to be up to 50 which indicates very high density. Soil profiles observed in the borings appeared quite uniform across the site from northwest to southeast and we expect that soils across the site will be uniform for the purpose of installation of the H-beams. We expect there will be some variation in the soil profile, however, given the apparent depositional environment and the existing site topography, we expect that the soil profile variation will be minimal. As noted above, given appropriate pile embedment, the site soils will be capable of supporting our estimated loads for the solar panels and ancillary equipment. Once we have been provided with live and dead loads for the H-beams, we will be able to compute pile bearing capacities and pile embedment lengths.

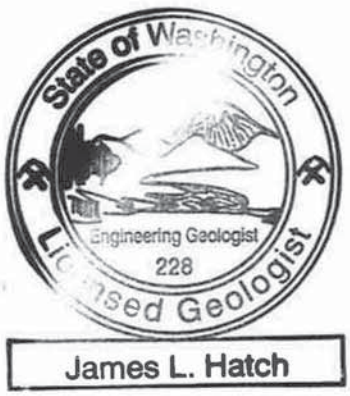
Based on the results of our study, and on our understanding of the proposed project, we believe that the site can be developed with the solar panel array, as planned. Swiftwater Environmental and Geotechnical (SEG) should be retained to observe installation of one or more test piles. Further, it might be prudent to perform pile load testing. SEG should also be retained to provide construction monitoring services during

construction to ensure that the recommendations for pile embedment are adhered to during installation. SEG should be provided with a set of the final plans and specifications for review to ensure that the recommendations contained in this and in subsequent reports have been incorporated into the plans and specifications.

Please let me know if you have any questions or need additional information regarding this phase of the project. Thank your allowing SEG to assist you with this first phase and we look forward to assisting you with subsequent phases as the project comes to fruition. I look forward to hearing from you.

Sincerely,

James Hatch, P.G., L.E.G.
Principal



Geotechnical Engineering Study, Phase 1
Penstemon Solar Array Site
1585 Tjossem Road
Ellensburg, Washington
Project No. 170016:GES

Site Description

The subject site is a single tax lot, Kittitas County Tax Parcel No. 840233, and is located at 1585 Tjossem Road in Ellensburg, Washington. The site is nearly square and comprises 39.2 acres that is currently being used to grow hay. The site is currently undeveloped. There are no structures on or immediately adjacent to the property. The site is flat with a very slight inclination from north to south. Access to the lot is via a driveway that is located along Tjossem Road.

Proposed Site Development

It is our understanding that a series of linear solar panel racks will be constructed on the property along with access/maintenance roads and power infrastructure for distribution to the power grid. We have not been provided with detailed plans and specifications for installation of the solar panels nor have we been provided with a grading plan. However, based on review of similar projects, we believe that very little grading will be required to construct the solar panel racks. We understand that the solar panels are then attached to horizontal steel rods that are supported on driven H-beams. The solar panels are attached to the horizontal supports which are oriented north-south. The panels rotate so that they are always exposed to the sun as it moves from east to west. We assume that the maintenance roads will run between the racks, provide access to the electrical infrastructure elements, and will probably run around the perimeter of the array.

If development plans should change or if our assumptions regarding development are incorrect, Swiftwater Environmental and Geotechnical (SEG) should be contacted as soon as possible to review

and/or revise the recommendations contained herein. SEG should be provided an opportunity to review final plans and specifications to confirm that these recommendations have been incorporated into the plans.

Subsurface Conditions

On April 24, 2017, SEG personnel observed the installation of two test borings using a track-mounted vibratory drilling rig known as a "sonic" rig. A 4" steel hollow-stem drill string is driven into the soil under high-frequency vibratory loading. Standard Penetration Testing (SPT) is then carried out at standard depths for this type of report. For this project, we directed the drillers to complete at least one SPT at the surface before drilling commenced to collect N-values for the surficial soils. SPTs were then variously carried out at standard depths of 2.5', 5.0', 7.5', 10.0', 12.5' and 15.0'. Samples were collected from the SPT split-spoons. One of the advantages of using the sonic drill rig is that a continuous 4-inch diameter sample is collected in the hollow stem drill string as it is advanced. The continuous soil sample is then extruded into polyethylene bags and removed from the immediate area of the drill rig. The continuous sample can then be examined by cutting the bag open to expose the sample. We were thus able to closely examine the site soil profile and to identify bearing soils with unusual precision. The borings were advanced to a maximum depth of 16.5 feet below existing grade. We understand that standard H-beam penetration for this type of installation is 6 to 8 feet below grade. Boring locations are shown on the attached Boring Location Plan (Figure 2) along with the Boring Logs on subsequent pages. Please refer to the Boring Logs for detailed descriptions of the site soils. A general description of soils and groundwater conditions is provided below.

The boring locations were selected to attempt to be representative of the entire site. Boring P-1 was completed in the northwestern quadrant of the site and Boring P-2 was located in the southeastern quadrant of the site. The soil profiles in both borings were very consistent and we believe that based on the likely depositional environment and also on the locally flat topography that the soil profile across the site will be similar to the profiles found in the borings.

In Boring P-1, we observed about one and one-half feet of dark brown topsoil-like material comprising a moist, very loose to loose silty SAND to sandy SILT with varying amounts of gravel. Immediately underlying the topsoil unit we observed a dark gray to light gray, slightly moist to moist, very dense and partially cemented sandy GRAVEL with varying amounts of silt. Below about 10 feet, we observed thin (<6 inches) reddish-brown fine sand seams with minor amounts of perched groundwater. This boring was terminated in the sandy gravel unit.

In Boring P-2, we observed a soil profile that was nearly identical to that found in P-1. The only difference is that in P-2, we observed a reddish-brown, stiff to very stiff silty CLAY to clayey SILT unit below about 12.5 feet. Boring P-2 was terminated in this unit.

In both borings, we observed that drilling became more difficult with depth indicating increasing density, increasing cementation, or both. It should be noted that the upper topsoil unit is probably quite moisture-sensitive and will be difficult or impossible to drive on or compact should the moisture content exceed optimum. If these soils are to be used as fill anywhere on the site, they should be stockpiled and protected from rainfall. We recommend that these soils be removed from the areas that are intended to be maintenance roads and replaced with either crushed rock or suitable structural fill.

Groundwater

As noted above, we observed minor groundwater seepage from the thin, fine sand seams found in boring P-2 below about 10 feet. We believe that this water was probably "perched" groundwater from within the reddish-brown sand seams. Otherwise, we did not observe any groundwater seepage in the borings. It is possible, though not likely, that groundwater seepage might be encountered elsewhere on the site.

If grading and/or construction is carried out during the winter or spring months, the contractor should anticipate that more significant groundwater seepage might be present and should plan accordingly. The upper unit of the site soil profile is moisture sensitive and those soils will be difficult to use as structural fill during the rainy winter and spring months. The underlying partially cemented sandy gravel soils will be less moisture-sensitive, but natural variability of the fine-grained fraction (e.g. silts and clay minerals) might cause these soils to be moisture-sensitive as well. In any case, if excavated site soils are to be used as structural fill, they should be protected from moisture while stock-piled.

Geologic Setting

According to the USGS Open File Report 1127, *Late Cenozoic Deposits, Landforms, Stratigraphy, and Tectonism in Kittitas Valley, Washington*, Richard B. Waitt, Jr., 1979, the subject site and surrounding area are underlain by Qs (Quaternary Alluvium, Sidestream Facies) which is characterized as downstream aggradation deposits with their source being upstream glacial moraines located to the west and northwest areas of the Kittitas Valley. These deposits consist primarily of basaltic gravels and sands with varying amounts of silt and clay minerals. The gravels vary from fine to coarse with occasional specimens in excess of 1.5 meters. These undifferentiated sandy GRAVEL deposits are overlain by varying thicknesses of topsoil, weathered sandy gravel horizons, and loessal (wind) deposits that comprise the silty SAND and sandy SILT units that we observed from the surface down to the relatively un-weathered partially cemented gravels. The gravel deposits consistently displayed some level of cementation that is most likely caused by breakdown of the basaltic rock to silt and clay minerals and then subsequent re-lithification under normal loading. The soils we observed in our borings at the subject site are consistent with this mapping.

In Boring P-2, we encountered a fine-grained, reddish brown to tan silty clay to clayey silt unit underlying the sandy gravel deposits. We contacted Dr. Nick Zentner, Professor of Geological Sciences at Central Washington University about this unit. Dr. Zentner indicated that it is probably an alluvial deposit that develops in slow-water areas and ox-bows proximate to streams and to the Yakima River. Dr. Zentner stated that these deposits are horizontally discontinuous and are found throughout the valley. The deposit on the subject site is thus likely limited in lateral extent, especially given that we did not encounter it in Boring P-1.

General Discussion and Recommendations

Based on the results of our site investigation, construction of the proposed solar panel array is feasible from a geotechnical standpoint. We understand that the site will be developed by constructing linear racks, oriented north to south, which support the solar panels on oscillating horizontal members. Those horizontal members are in turn supported on a series of driven steel H-beams. We have reviewed plans for similar installations and it appears that there is variation in the length of the horizontal supports meaning there will be variation on the total loading for each individual H-beam. For example, some H-

beams will support 8 solar panels along with their mounting and support equipment while others will support 6 panels, etc. This means that for a design bearing capacity, pile embedment will vary or possibly, H-beam sizing will vary. In either case, it is critical that final plans be reviewed by SEG to ensure that appropriate bearing capacities and embedment lengths have been incorporated into the plans and specifications. Further, SEG should be retained to provide construction monitoring to ensure that the H-beams are installed in accordance with the plans and specifications and to document that adequate bearing capacity is developed.

Final bearing capacities and embedment lengths can be computed once the loading for the piles has been provided to us. Alternatively, we can estimate the loading for each pile if we are provided with information about the weight of the panels, supporting members and ancillary equipment. In either case, we have been informed that this information will be forthcoming and we can then complete the pile designs. We have attached a figure that shows the appropriate embedment zone for the H-beams.

We strongly recommend that once the bearing capacities and embedment lengths have been determined, a series of test piles should be driven using the same equipment that will be used during construction. The purpose of this testing is two-fold: 1) it is necessary to determine that the piles can be driven into the bearing soils to the required embedment depth without damaging the pile and, 2) it is required in order to load test the resulting piles to determine that adequate bearing capacity is being developed.

Wind Loading

The Kittitas Valley, particularly the Ellensburg area, is known for year-around windy conditions. We understand that the solar panels that will be used for this project are 32-square-foot panels mounted immediately adjacent to one another in linear "bays" of 7 or 8 panels. Therefore, for purposes of computing wind-loading, each "bay" will effectively be a single panel of 224 or 256 square feet.

We computed the maximum wind load for a 32-square-foot panel using the Uniform Building Code (UBC, 1997) formula with the preferred alternate methodology for computing wind pressure. The following are wind loads for a 4-foot by 8-foot panel erected vertically that is exposed to wind that is moving over a flat surface with few obstructions. Wind speeds were obtained from the Applied Technology Council (ATC) website wherein maximum wind speeds are obtained by location. The ASCE site-specific wind speed values are obtained from the ASCE manuals noted, but were retrieved from the ATC Windspeed by Location website. The wind speed values were then used in the UBC formula to calculate the following values for wind pressure in pounds for a single 4-foot by 8-foot solar panel.

• ASCE 7-93 Wind speed (fastest mile in mph	70 mph	593 lbs
• ASCE 7-05 Wind speed (3 second peak gust)	85 mph	878 lbs
• ASCE 7-10 100-year Mean Recurrence Interval	91 mph	1006 lbs
• ASCE 7-10 Risk Category II	110 mph	1470 lbs

The wind pressure values are the functional equivalent of lateral pressure on the H-beams. These values are maximum values. Wind pressure and equivalent lateral pressure will be less than the values shown because the solar panels are rarely, or never, in a vertical position and presumably can be rotated to a horizontal position before or during high-wind events. Once we have received the H-beam size information, we can compute actual lateral loads based on the wind pressure values above.

Site Preparation and Earthwork

We anticipate that site preparation for the subject site will consist of installation of Temporary Erosion and Sedimentation Control (TESC) measures, installation of grade staking, establishing clearing and grading limits, site clearing and stripping, and possible stockpiling of strippings and organic material in non-structural areas. Once these activities have been completed, installation of underground utilities and final grading can occur and construction of the solar panel array can commence.

Infiltration and Temporary Erosion and Sedimentation Control (TESC)

It is important to understand and utilize Low Impact Development (LID) practices and LID Best Management Practices (BMP) in Eastern Washington to reduce or eliminate concentrated storm water runoff and erosion. BMPs also help limit the introduction of pollutants/contamination into Eastern Washington's arid land soils and rangeland soils. BMPs that address these issues can be found in the Washington State Department of Ecology (DOE) publication 13-10-036, *Eastern Washington Low Impact Development Guidance Manual*, June 13, 2013.

Construction of the solar array will tend to create a *variable* increase in the total *and effective* impervious area of the site that is equivalent to the area of the solar panels and associated infrastructure. The increase is variable because the panels move in accordance with the position of the sun and are tilted most of the time. There will also be an increase in less pervious area because of the proposed gravel access roads.

Based on the results of our subsurface investigation, we believe that infiltration into the upper, topsoil-like silty sand/sandy silt soils is not only feasible, but is ongoing. This site, like many others in the vicinity of Ellensburg, have been cultivated using flood irrigation methods. This consists of running a perforated PVC pipe along the upslope side of a site and simply flooding the entire area. Irrigation water percolates into the soil and is stored above the underlying relatively impervious layer found throughout the area. Based on our observations at several of these sites and on publications and anecdotal testimonies, it is clear that these soils are quite capable of infiltrating storm water during an average year. According to the referenced DOE publication, Ellensburg is located in Climate Region 2 – Central Basin – and receives an average of about 8 inches of precipitation per year, some of it in the form of snow. Given the variable nature of the solar panel position, and relatively low precipitation in the area, combined with the natural permeability of the upper soil horizon, it is our opinion that infiltration of normal storm water amounts will occur and that normal levels of storm water will not be concentrated to a significant extent.

Based on the texture and class of the soil types that we encountered, and on a review of various documents related to storm water control in Eastern Washington, it is our opinion that it is reasonable to assume an infiltration rate of 1.02 inches/hour for the upper, silty sand unit and 0.27 inches/hour for the underlying sandy gravel. The rate for the sandy gravel unit is assumed to be low because of the presence of fine-grained silt and clay minerals in the interstitial spaces and fractures of this partially cemented unit.

Temporary construction ingress and egress should be completed prior to the start of on-going construction traffic. A temporary construction entrance should be constructed of 8-12 inches of quarry spalls. If the soils in the entrance location are soft, a layer of geotextile fabric can be laid down as a barrier prior to placement of quarry spalls. The quarry spalls will provide a stable entrance/exit to the site and will limit tracking of mud onto Tjossem Road during and after wet weather. TESC measures consist of

installation of silt fencing *as needed* around the site entrance, around the perimeter of the low side of the site, and at discharge points where sediment-laden surface water may enter off-site drainage features. Because the subject site is flat and slopes very gently to the south, silt fencing will probably not be required at the south perimeter unless desired by Kittitas County.

Stripping

No well-developed sod or heavily organic topsoil layer was observed at this site because of ongoing cultivation, thus stripping should not be required. If a topsoil horizon is observed in areas where maintenance roads are proposed, the topsoil should be removed down to mineral soil and replaced with crushed rock or structural fill. It is important that all deleterious material is removed prior to placement of structural fill. Topsoil strippings can be stockpiled for use in non-structural areas, as desired, but should not be allowed to mix with soils that will be used for structural fill.

Native Soils and Imported Soils

Native site soils encountered below the surface contain significant fines and are very moisture sensitive. However, if moisture content is near optimum, the soil can be used as compacted structural fill. Excavated site soils should be stockpiled and covered immediately if they are to be saved and used as structural fill. If the soils are above optimum moisture content, it may be possible to aerate them to reduce moisture content. This is possible during the warmer summer months, but it is difficult to achieve uniform moisture content. It may also be possible to use Portland cement as an admixture to reduce moisture content. If the site soils cannot be adequately compacted, it may be necessary to use imported soil for structural fill. Imported soil should be a well-graded granular mineral soil with fines content below 5 percent (i.e. less than 5 percent passing the No. 200 sieve) and should be at or slightly above the optimum moisture content. If construction is scheduled to occur during periods where precipitation is expected, a contingency should be built into the project budget for imported soil/crushed rock base (CRB) and other costs associated with placement of imported structural fill.

Subgrade Preparation

Once the site has been prepared for construction of the maintenance roads and placement of the H-beams, a SEG representative should observe subgrade conditions to confirm that they are as expected and to provide additional recommendations, if necessary. If disturbed native soil is encountered in structural areas (e.g. maintenance road prism or foundations for solar panel infrastructure) the fill should re-compacted in accordance with the specifications for structural fill or should be removed and replaced with structural fill as required to reach design grade. As an alternative, CRB can be placed and compacted. SEG should observe and confirm subgrade conditions as construction progresses. The contractor should be prepared to retain a local materials testing firm to sample soils to be used as structural fill, collect samples for Proctor testing, and to provide compaction testing as structural fill is placed, as needed.

Structural Fill

Structural fill is fill that is deliberately placed in thin lifts and compacted to a design specification. Structural fill is intended to support overlying structures in a manner that produces little or no post-construction movement. It is typically used under foundations, slabs, in utility trenches, roads, behind retaining walls, and in constructed slopes. Structural fill should be placed in loose lifts that do not exceed 12 inches and compacted to a relative compaction of 95 percent of maximum dry density as determined

by Modified Proctor (ASTM D1557). Compaction specifications may vary, especially in utility trenches in public or private roads as specified by the local jurisdiction. Moisture content is critical to achieving adequate densification (compaction) and the upper unit of the site soils is very moisture sensitive, e.g. a small change in moisture content can make them unusable as structural fill. *If the soils are stockpiled and not covered, precipitation will make them difficult or impossible to use as structural fill.*

Foundations

We believe that foundations for the electrical infrastructure elements of the project can be supported on undisturbed, competent, native sandy gravel soils found below the upper topsoil-like horizon, on re-compacted native soils, on structural fill, or on CRB. Where loose or unsuitable soils are encountered at design subgrade, it will be necessary to re-compact the native soils to structural fill specifications or to over-excavate down to competent native soils then place structural fill or CRB up to design subgrade.

If the subgrade is prepared as described above, the following parameters may be used for design:

• Allowable soil bearing capacity	1,500 psf
• Passive earth pressure	300 pcf (equivalent fluid)
• Coefficient of friction	0.35

A one-third increase in the allowable soil bearing capacity may be assumed for short-term wind and seismic loading conditions. The passive pressure and friction values above include a factor-of-safety of at least 1.5. With anticipated structural loads, total settlement of one inch and differential settlement of one-half inch is anticipated. Most settlement should occur during construction, as dead loads are applied.

Seismic Design

The 2015 International Building Code recognizes the American Society of Civil Engineers (ASCE) for seismic site class definitions. In accordance with Table 20.3-1 of the ASCE Minimum Design Loads for Buildings and Other Structures manual, Site Class D should be used for design.

Based on our observations of the upper native silty sand soils and the underlying partially cemented sandy gravels, it is our opinion that the subject site has very low susceptibility to liquefaction. Liquefaction is a phenomenon wherein loose, saturated soils suddenly lose shear strength and begin to behave as a fluid. Liquefaction typically occurs under seismic loading conditions and if structures are supported on soils that liquefy, structural damage can occur. The site groundwater and native soil conditions we observed in the test borings have allowed us to reach this conclusion.

Drainage

We observed light to moderate seepage in TP-2, but not in any other of the test pits. We did observe occasional mottling/rust-staining in the weathered till units indicating presence of water at some time in the past. During the rainy winter months, it is prudent to anticipate seepage in excavations and groundwater control measures should be on-site or readily available, including trash pumps, sumps and discharge ditches. Seepage may create instability in the walls of excavations – SEG should be notified if seepage is observed in excavations so that control measures may be discussed with the contractor and properly implemented. The site should be graded such that surface water is directed away from structures and slopes. Surface water must never be allowed to pond near the tops or toes of slopes.

Based on the soil types observed in our test pits, it is our opinion that infiltration is not feasible at this site. Storm water discharge BMPs should be implemented to control runoff from the site. Sediment-laden surface water must be treated such that water discharged from the site meet all water quality requirements. Storm water should not be discharged over the slope to the north of the site.

Excavations/Slopes

Soils observed in the upper 1.5 to 2.0 feet of the test borings would be classified as OSHA/WISHA Type C. Temporary excavations like utility excavations and foundation excavations with heights in excess of 4 feet must be sloped no steeper than 1.5H:1V. If seepage is observed in these excavations, they may need to sloped at 2H:1V to prevent sloughing due to seepage pressure. The dense native sandy gravel soil observed below about 2.0 feet would be considered OSHA/WISHA Type B soils and can be laid back at 1H:1V.

SEG should be contacted to observe temporary slopes and utility excavations as they are constructed or excavated to assess slope stability and recommend additional measures, if necessary.

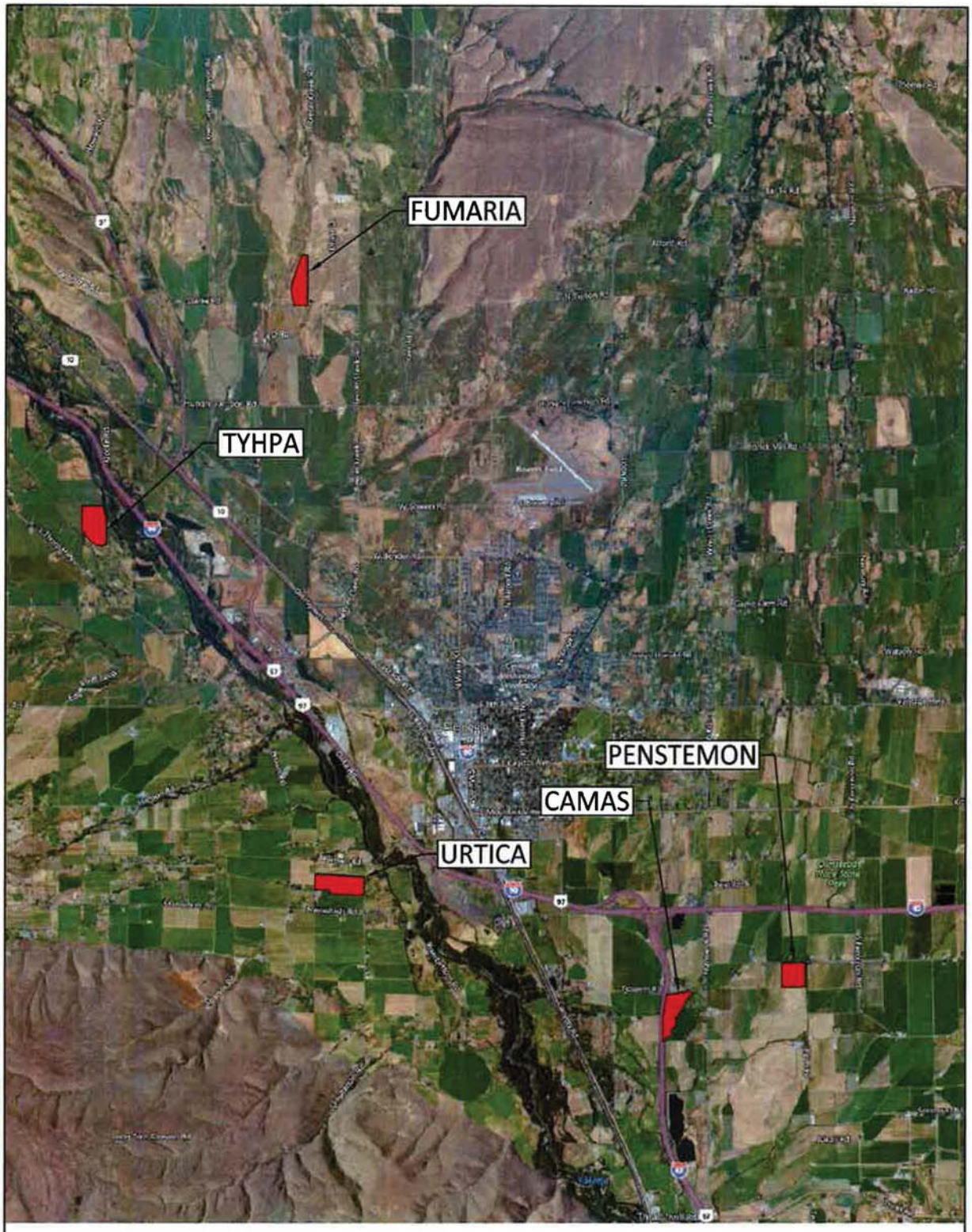
Utility Support, Trenches, and Trench Backfill

Site soils should be suitable for support of solar panel infrastructure and utilities. In shallower trenches, particularly shallower than about 2 feet, it may be necessary to over-excavate loose or wet soil down to suitable, stable soils, and then replace them with compacted structural fill or CRB. Groundwater seepage may be encountered in trench walls, particularly if deeper than 2 to 3 feet. Seepage may cause caving of the trench walls and temporary shoring may be required. Dewatering measures may also be needed to control seepage and SEG should be contacted to assess the need for such measures.

Site soils may be suitable for use as backfill provided the moisture content is optimal as determined in the laboratory. Trench backfill should be placed and compacted in accordance with the specifications for structural fill as described above or in accordance with specifications provided by the local jurisdiction. CRB should be placed in 6-8 inch lifts and compacted with a plate compactor or other compaction device.

Limitations

This report is an instrument of service and has been prepared for the exclusive use of Tuusso Energy, LLC and their representatives and agents. The recommendations and conclusions provided in this study are professional opinions consistent with the level of care and skill that is typical of other members of the profession currently practicing in this area. A warranty is neither expressed nor implied. Variations in the soil and groundwater conditions observed in the test boring locations may exist and may not become apparent until construction commences. SEG should reevaluate the conclusions contained in this study if such variations are encountered.



TUUSO ENERGY, LLC
ELLENSBURG SOLAR PROJECTS
LOCATION MAP

Swiftwater
Environmental & Geotechnical
Western Washington Division
165 NE Juniper Street, Suite 201A • Issaquah, WA 98027 • Phone: (425) 321-0787
Eastern Washington Division
407 Swiftwater Blvd., Suite A • Cle Elum, WA 98922 • Phone: (425) 321-0787



FIG. 2
PENSTEMON SITE
TEST BORING LOCATIONS

Swiftwater
Environmental & Geotechnical
Western Washington Division
165 NE Juniper Street, Suite 201A • Issaquah, WA 98027 • Phone: (425) 321-0787
Eastern Washington Division
407 Swiftwater Blvd., Suite A • Cle Elum, WA 98922 • Phone: (425) 321-0787

Swiftwater
Environmental & Geotechnical

Project:	Tuusso - Penstemon Site	Project No.	170016	Date:	4/26/2017
Location	1585 Tjossem Road	Surface Elevation	1511	Groundwater	N/A
Earthwork Contractor	Excavation Equip.	Logged By		Test Boring No.	
Holocene Drilling	Geoprobe 8104	JH		P - 1	

Depth (feet) From	Depth (feet) To	Tests	USCS Soil Class.	Generalized Soil Description
0.0	-1.5	N = 3	SM	Brown silty fine **SAND**, trace gravel and cobble,
				moist, very loose (recently tilled) scattered organics.
-1.5	-6.5	N = 38	SM - SP	Brown to gray gravelly **SAND** to sandy **GRAVEL**, trace to some
				silt, moist, dense. Difficult drilling from -3.0 to -5.5
				Same - slightly easier drilling from -5.0 to -8.0, denser below -8.0
-10.0	-11.5	N = 50/4"	SM - SP	Same, very dense
				6" red **SAND** lense at -14.0, slightly less dense, wet
-15.0	16.5	N = 50/5"	SM - SP	Same, Boring P - 1 terminated at 16.5

Notes:

BORING NO.	P-1
Page	1 OF 1

Swiftwater
Environmental & Geotechnical

Project:	Tuusso - Penstemon Site	Project No.	170016	Date:	4/26/2017
Location	1585 Tjossem Road	Surface Elevation	1504	Groundwater	N/A
Earthwork Contractor	Excavation Equip.	Logged By		Test Boring	
Holocene Drilling	Geoprobe 8104	JH		P - 2	

Depth (feet) From	Depth (feet) To	Tests	USCS Soil Class.	Generalized Soil Description
0.0	-1.5	N = 4	SM	Brown silty fine **SAND (topsoil-like)**, trace to some gravel and cobble,
				moist, loose, scattered organics.
-1.5	-6.5	N = 64	SM - SP	Brown gravelly **SAND** to sandy **GRAVEL**, trace to some
				silt, moist to -2.0 then wet, very dense.
				Same - color change to gray below -6.0,
				some partial cementation observed -6.0 to -10.0
-10.0	-11.5	N = 28	SM	Brown silty **SAND** to sandy **SILT**, trace to some gravel, wet, medium dense.
-12.0	-16.5	N = 27	SM	Same, reddish brown, no gravel, some clay mineral,
				moist, medium dense.
				Same, Boring P - 2 terminated at 16.5

Notes:

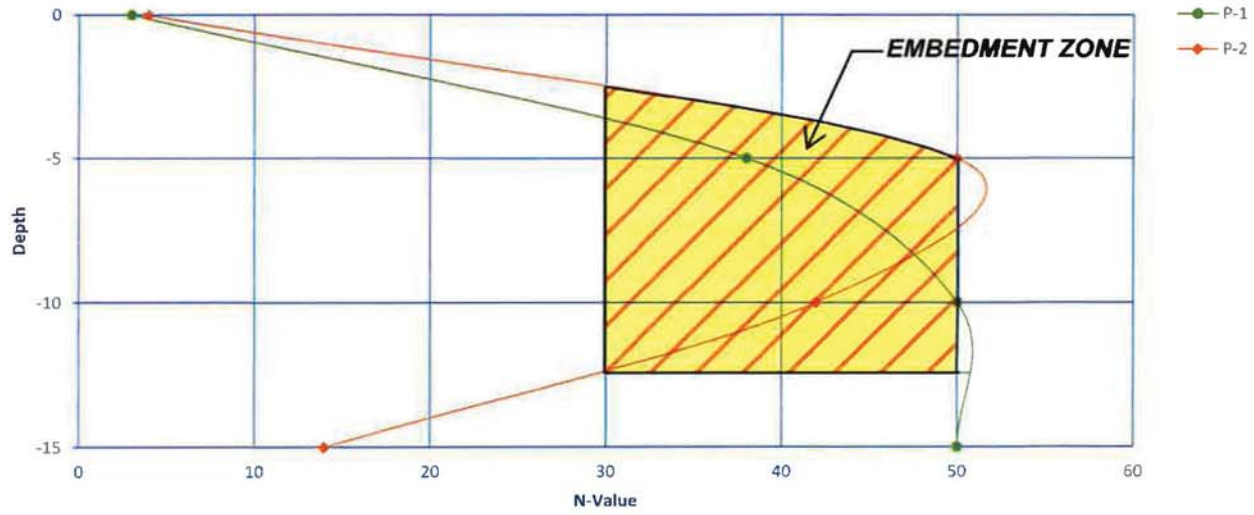
BORING NO.	P - 2
Page	1 OF 1

Swiftwater
Environmental & Geotechnical

Project:	Tuusso - Penstemon Site	Project No. 170016	Date: 6/6/2017
Location	1585 Tjossem Road	Surface Elevation	Groundwater N/A
Earthwork Contractor	Excavation Equip.	Logged By	
Holocene Driling	Geoprobe 8104	JH	

P-1		P-2	
Depth (ft)	N	Depth (ft)	N
0.0	3.0	0.0	4.0
-5.0	38.0	-5.0	50.0
-10.0	50.0	-10.0	42.0
-15.0	50.0	-15.0	14.0

Approximate Embedment Depth



Note: Tests conducted per ASTM D1586-11 (Standard test method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils)

SWIFTWATER ENVIRONMENTAL & GEOTECHNICAL
SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		(LITTLE OR NO FINES)		GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SANDS		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		(LITTLE OR NO FINES)		SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES		SM	SILTY SANDS, SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

DUAL SYMBOLS are used to indicate borderline soil classifications.

The discussion in the text of this report is necessary for a proper understanding of the nature of the material presented in the attached logs.

Swiftwater
Environmental & Geotechnical

Important Information about Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely on Your ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your ASFE-member geotechnical engineer for more information.

ASFE
THE BEST PEOPLE ON EARTH
8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@asfe.org www.asfe.org

Copyright 2004 by ASFE, Inc. Duplication, reproduction, or copying of this document, in whole or in part, by any means whatsoever, is strictly prohibited, except with ASFE's specific written permission. Excerpting, quoting, or otherwise extracting wording from this document is permitted only with the express written permission of ASFE, and only for purposes of scholarly research or book review. Only members of ASFE may use this document as a complement to or as an element of a geotechnical engineering report. Any other firm, individual, or other entity that so uses this document without being an ASFE member could be commiting negligent or intentional (fraudulent) misrepresentation.

IIGER06085.0MRP

Appendix I-5: Penstemon Solar Project Drainage Report

Tuusso Energy
Penstemon Solar Project:
DRAINAGE REPORT

Date: July 2017

Prepared by:
Encompass Engineering & Surveying
407 Swiftwater Blvd
Cle Elum, WA 98922

Table of Contents

I. INTRODUCTION 2
II. EXISTING CONDITIONS 3
a. Drainage Basins 3
b. Downstream Analysis 3
c. Soil Report 3
III. PROPOSED CONDITIONS 3
a. Solar Panel Array 4
b. Drainage Basin 4
IV. HYDROLOGIC MODELING- SANTA BARBARA URBAN HYDROGRAPH METHOD 4
a. Precipitation 4
b. Curve Number 4
c. Time of Concentration 5
d. Flow Calculations 5
V. HYDROLOGIC ANALYSIS 5
VI. COMPLIANCE WITH SWMMEW CORE ELEMENTS 6
VII. CONCLUSION 7

List of Figures

Figure 1- Existing Conditions Exhibit
Figure 2- Proposed Conditions Exhibit

Appendix

Appendix A- NRCS Web Soil Survey
Appendix B- *SWMMEW* Isopluvial Maps
Appendix C- Curve Number Calculations
Appendix D- HydroCAD Report: Existing Basin
Appendix E- HydroCAD Report: Proposed Basin

I. INTRODUCTION

Per Kittitas County assessor records the Tuusso Energy: Penstemon Solar Project site is located within Tax Parcel No. 840233, at the intersection of Tjossem Road and Moe Road in Ellensburg, WA, in the NE ¼ of the SE ¼ of Section 17, Township 17 North, Range 19 East W.M. The project site is 39.38 acres and currently used as agricultural land to produce hay. See Vicinity Map below.



VICINITY MAP

The purpose of this project is to convert the site to a photovoltaic solar project with minimal change to the existing topography and site features. The proposed site will consist of rows of modular trackers with solar panels, all-weather access roads, and inverter stations to convert power from the solar panels. The solar panels are attached to horizontal supports that run north-south, and the panels themselves rotate east to west, in order to maximize sun exposure. Access to the site is from the north off of Tjossem Road.

II. EXISTING CONDITIONS

The site is currently an open field used to make hay using flood irrigation methods. The overall topography of the site gently slopes to the south. The surface water that does not infiltrate flows to the south. This runoff is captured in an irrigation ditch along the southern property line. The ditch flows to the east and into Coleman creek at the southeast corner of the site. Existing conditions can be seen in Figure 1.

a. Drainage Basins

For the purpose of this report, the site is considered to be a single drainage basin since all runoff is either infiltrated or captured in the existing irrigation ditch at the southern border of the site. The existing drainage contains no impervious surfaces, meaning the entire 39.38 acres is pervious.

b. Downstream Analysis

As noted above, all runoff from the site flows into the existing irrigation ditch at the southern end of the site. This ditch is currently maintained by the landowner. The irrigation ditch is part of a larger irrigation network that serves the rural areas south of Ellensburg, and the flow rates are currently controlled as needed. The ditch discharges into Coleman Creek, immediately to the southeast of the project site. Coleman Creek is well defined, with thick vegetation on its edges, and flows south along Moe road for 0.5 miles. It then flows southeast, ultimately joining Wilson Creek, before discharging into the Yakima River. No issues have been brought up in relation to the existing irrigation infrastructure downstream of the project site.

c. Soil Report

An NRCS Web Soil Survey was performed for the site in order to obtain onsite soil types. The results of the report give descriptions of the soils found in the project area and the corresponding hydrologic soil groups. The results can be seen in APPENDIX A. The site is composed of Tanaha ashy loam (0-2% slopes), Nack-Brickmill complex (0-5% slopes), Opnish ashy loam (0-2% slopes), Nanum ashy sandy clay loam (0-2% slopes), Deedale clay loam (0-2% slopes), and Mitta ashy silt loam (0-2% slopes). Tanaha ashy loam, Opnish ashy loam, and Mitta ashy silt loam all belong to Hydrologic Soil Group C. Deedale clay loam belongs to group D. Nack-Brickmill complex and Nanum ashy sandy clay both have a dual classification of C when drained and D when undrained. For this report, they are classified as Group D, which is the more conservative classification.

III. PROPOSED CONDITIONS

The proposed development on this site consists of adding solar trackers, access roads, fencing, and associated electrical infrastructure. The new impervious surface will be a portion of the solar trackers (described below), the proposed all-weather access roads (which may be compacted soil or gravel) that will run north/south through the site, and the electrical infrastructure that is made up of five inverters and one utility disconnect with a project metering location. Each inverter as well as the utility disconnect, resides on its own concrete pad. The access roads were conservatively modeled as gravel roads.

a. Solar Panel Array

A series of modular trackers will be installed throughout the site. Each tracker is essentially a long horizontal support (of various lengths), held in place by evenly spaced, driven H-beams. The trackers are oriented north-south, with solar panels attached to the entire length of the tracker. The solar panels rotate and tilt east to west to maximize sun exposure. The panels will generate runoff within the site, however, due to the way the panels tilt and that they are not continuous structures, they are not considered impervious in the proposed conditions calculations. The panels do not reduce available ground surface for infiltration. The ground below the solar panels will have native plantings, and therefore it will continue to intercept and infiltrate runoff water from the panels. The only impervious area due to the solar panels is from the posts in the ground upon which the solar panels are attached. For impervious calculations, the posts are conservatively estimated to make up 5% of the total area of the solar tracker configuration.

b. Drainage Basin

Minimal grading and ground disturbance will take place as part of this project. The access roads, concrete pads for the electrical infrastructure, and solar tracker posts are the only impervious proposed for the site. The portion of the solar panel array installation that actually disturbs the ground is very minimal as well. Because of this, existing topography and drainage patterns will remain relatively undisturbed, and the proposed drainage basin encompasses the same area as the existing drainage basin. Proposed conditions can be seen in Figure 2.

IV. HYDROLOGIC MODELING- SANTA BARBARA URBAN HYDROGRAPH METHOD

Hydrologic analysis for the proposed project is consistent with Title 12 of the Kittitas County Code and the 2004 *SWMMEW*. In order to properly analyze the impacts of the proposed development on the watershed, runoff modeling was done using the Santa Barbara Urban Hydrograph method (SBUH), SCS Type 1A 24-hour storm event for Region 2 per the 2004 *SWMMEW*. This was done to determine peak runoff during the 2-year, 10-year, 25-year and 100-year storm events. Calculations were performed utilizing HydroCAD version 10.00-18, which is accepted by the Department of Ecology as a proper simulation modeling program.

a. Precipitation

The precipitation information used for the pre-development and post-development run-off calculations is based on the isopluvial maps provided in the 2004 *SWMMEW* and can be seen in APPENDIX B. The inputs for this project site north of Ellensburg are seen below:

P_{2yr} = 1.0”
P_{10yr} = 1.2”
P_{25yr} = 1.6”
P_{100yr} = 2.0”

b. Curve Number

The SCS Curve Number (CN) is a function of the soil type and ground cover. It is used to determine the portion of the precipitation depth that will be conveyed as runoff. The curve numbers are pulled from *Technical Release 55 Urban Hydrology for Small Watersheds*, and the curve numbers used can be seen in Table 1.

Table 1: Curve Numbers Used

DESCRIPTION	HYDROLOGIC SOIL GROUP			
	A	B	C	D
Meadow	30	58	71	78
Impervious areas	98	98	98	98
Gravel Roads	76	85	89	91

Using the soils report and the curve number table, a composite curve number was determined for the proposed and existing basins. A detailed curve number breakdown can be seen in APPENDIX C. Calculations can also be seen in APPENDIX D and E as part of the HydroCAD report.

c. Time of Concentration

Time of concentration is the time it takes for the runoff to get from the most hydrologically distant location to the point of collection for the basin. The flow path is broken up into three segments, with the hydrologic travel time calculated separate for each segment.

- Sheet flow- flow over plane surfaces which usually occurs at the headwaters of a catchment area. The maximum allowable length for sheet flow is 300-ft
- Shallow concentrated flow-flow in headwater areas where flow begins to concentrate in small rills or rough channels
- Channel flow- flow that is concentrated in defined channels

The time of concentration is the total of the travel times for each flow segment. Time of concentration calculations can be seen in APPENDIX D and E as part of the HydroCAD report.

d. Flow Calculations

HydroCAD uses all of the inputs described above in order to determine the peak flows for various storm events. All the inputs are combined to create an instantaneous hydrograph which is then routed through a modeled reservoir with a time delay equal to the time of concentration in order to generate the runoff hydrograph. The runoff hydrograph can be found in APPENDIX D and E as part of the HydroCAD report. The peak runoff values for the 2, 10, 25, and 100-year storms can be seen below in Table 2.

Table 2: Flow Computations

Q (cfs)				
Time Span	**2-yr**	10-yr	**25-yr**	100-yr
Existing	**0.14**	0.28	**0.83**	1.58
Proposed	**0.14**	0.28	**0.83**	1.58

V. HYDROLOGIC ANALYSIS

As seen in the calculated peak flow rates, the increase in impervious surfaces with the proposed conditions is not enough to alter the existing runoff rates. Both the 2-yr and 25-yr flow rates remain unchanged. Typically, *SWMMEW* requires developments to release runoff at or below one half of the existing 2-yr peak flow and at or below the existing 25-yr peak flow, as well as for that runoff to be treated. The site is meeting the flow requirement for the 25-yr storm, however the proposed 2-yr storm event is greater than one half of the existing 2-yr storm event.

Per Chapter 2.2.6 of the *SWMMEW* there are exemptions for new development when flow control is not required as long as certain conditions are met. Per chapter 2.6.6 exemption 1, "Any project able to disperse, without discharging to surface waters, the total 25-year runoff volume for the proposed development condition" is exempt from meeting the flow control requirements. The Penstemon project will use full dispersion to handle stormwater runoff. As outlined in *SWMMEW* Chapter 6.5, BMP F6.42, full dispersion allows up to 10% of the site that is impervious to be characterized as non-effective impervious area by dispersing runoff into the native vegetation area. On the Penstemon site, the impervious areas may conservatively make up to 3.3% of the site while the rest of the site maintains plantings similar to existing vegetation. This is under the 10% threshold, making full dispersion a viable option.

Chapter 2.2.5 of the *SWMMEW* summarizes the requirements for treating storm water runoff to reduce pollutant loads and concentrations. Runoff treatment is required for all projects creating 5,000 square feet or more of pollutant-generating impervious surfaces (PGIS). The Penstemon site is not classified as a high use site and all of the proposed impervious surfaces are considered Non-Pollutant Generating Impervious Surfaces (NPGIS). Infrequently used maintenance access roads are classified as NPGIS, and thus are exempt from basic treatment requirements. The solar panels are detached impervious surfaces which the water flows off of and into natural vegetation below. The inverter pads are concrete pads, which the inverters and transformers sit on. The inverters contain no fluids. The transformers may be "dry", meaning they contain no fluids, or they may contain fluids, that has not been finalized yet. If they do contain fluid, it would be Envirotemp or a similar biodegradable vegetable based coolant. Therefore, the inverter pads will be considered NPGIS as well, however if that classification is challenged, they make up no more than 3,600 square feet, which is below the 5,000 square feet threshold. The Penstemon site meets the exemption requirement, therefore no treatment measures will be necessary or put in place.

While analyzing the effects of increased impervious surfaces and stormwater runoff, it is also important to note any other changes that will occur on the site due to the development. One thing of note on the Penstemon site is that it is currently cultivated using flood irrigation methods. In this method, an excess amount of water is applied to the site for irrigation, and the general assumption is that half of the applied water actually goes to the crop while the other half is lost to evaporation, runoff, infiltration or transpiration (*Alliance for Water Efficiency: Flood Irrigation Introduction*). With the construction of this project, the flood irrigation will be minimized, if not stopped completely. The net loss of surface water due to reducing flood irrigation will be greater than the effects of increased impervious areas due to the proposed solar panel farm. Therefore, the increased impervious area is considered negligible when analyzing the site as a whole.

VI. COMPLIANCE WITH *SWMMEW* CORE ELEMENTS

All new development projects must comply with the 8 Core Elements outlined in Chapter 2 in the *SWMMEW* when applicable. Exemptions exist for each Core Element and vary depending on requirements that must be met. The Core Elements are listed below in relation to the proposed development of the Tuusso Energy: Penstemon Solar Project, and exemptions are noted when applicable.

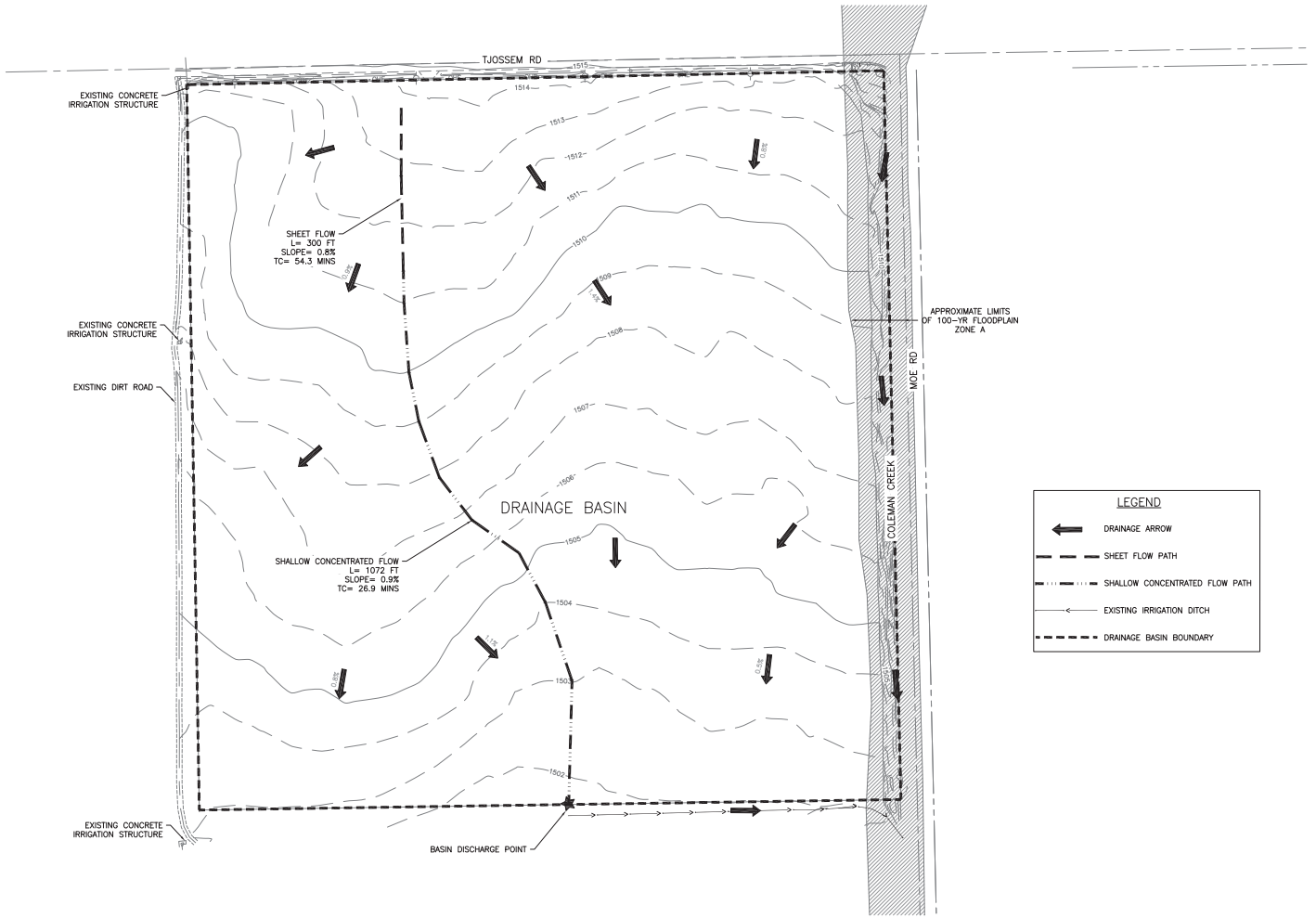
1. Preparation of a Stormwater Site Plan:
    - This can be seen in Figure 2- Proposed Drainage Basin Map, and will be included in the civil plans.
2. Construction Stormwater Pollution Prevention:
    - This will be included as part of the SWPPP submittal.
3. Source Control Pollution
    - The only potential fluid on the site is a biodegradable vegetable based coolant, which is not classified as a pollutant. Therefore, no point source pollutants are on the site.
4. Preservation of Natural Drainage Systems
    - Minimal grading will occur on site and natural drainage patterns will be maintained.
5. Runoff Treatment
    - The site satisfies the requirement for full dispersion and is not a high use site, making it exempt from runoff treatment.
6. Flow Control
    - Per Exemption 1 in chapter 2.6.6 of *SWMMEW*, the site will use full dispersion to control the 2 and 25-yr flows.
7. Operation and Maintenance
    - No on-site maintenance is required for full dispersion. Maintenance of existing off-site drainage ditches will be performed by the current landowner.
8. Local Requirements
    - There are no local ordinances above and beyond what is outlined in *SWMMEW*

VII. CONCLUSION

The Tuusso Energy: Penstemon Solar Project involves transforming 39.38 acres of an existing hay field, into a solar project. The project consists of adding an array of solar panels, access roads, and the associated electrical infrastructure. Existing topography will be preserved to the maximum extent possible and native plantings will be made throughout the site. From a stormwater and drainage standpoint, the biggest impacts of the project will be from converting 1.31 acres into impervious surfaces in the form of all-weather access roads, electrical infrastructure, and posts for the solar trackers. 1.31 acres is an overestimate of impervious area, as it maxes out the percentage of impervious to pervious surfaces based on the design of the solar tracker modules. All site and location factors were taken into account in order to perform the SBUH hydrologic modelling method. The calculations from the modelling showed that the runoff generated from the 2-yr storm and 25-yr storm remained the same at 0.14 cfs and 0.83 cfs respectively. The runoff can be handled by full dispersion throughout the site, due to maintaining a majority of the existing pervious area with minimal grading. The runoff is also considered negligible, due to the reduction of flood irrigation to the site which will accompany the project.

TUUSSO ENERGY - PENSTEMON SITE

A PORTION OF THE NE 1/4 OF THE SE 1/4 OF SECTION 17, T. 17 N., R. 19 E., W.M.
KITTITAS COUNTY, STATE OF WASHINGTON



0 100 200
SCALE: 1" = 100'

I-5-9

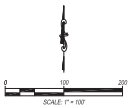
TUUSSO ENERGY, LLC
PENSTEMON SITE
EXISTING DRAINAGE CONDITIONS

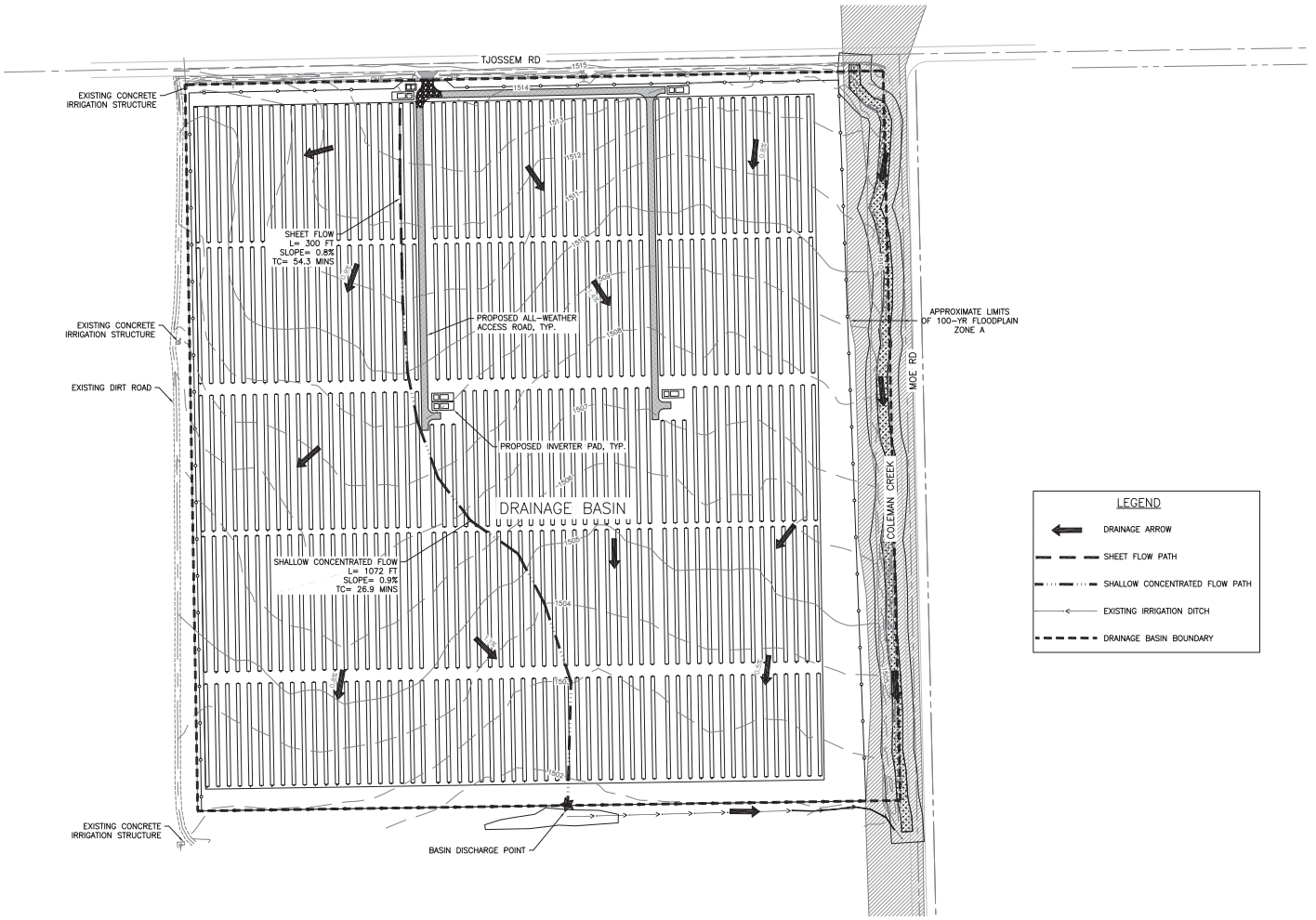
Encompass
ENGINEERING & SURVEYING
Western Washington Division
165 NE Juniper Street, Suite 201 ▪ Issaquah, WA 98027 ▪ Phone: (425) 392-0250 ▪ Fax: (425) 391-3055
Eastern Washington Division
407 Southwater Blvd. ▪ Ste Elum, WA 98922 ▪ Phone: (509) 674-7433 ▪ Fax: (509) 674-7419

JOB NO.	17016
DATE	July 2017
SCALE	AS SHOWN
DESIGNED	SF
DRAWN	SF
CHECKED	TML
APPROVED	TML
SHEET	FIG-1

TUUSSO ENERGY - PENSTEMON SITE

A PORTION OF THE NE 1/4 OF THE SE 1/4 OF SECTION 17, T. 17 N., R. 19 E., W.M.
KITTITAS COUNTY, STATE OF WASHINGTON





I-5-10

TUUSSO ENERGY, LLC
PENSTEMON SITE
PROPOSED DRAINAGE CONDITIONS

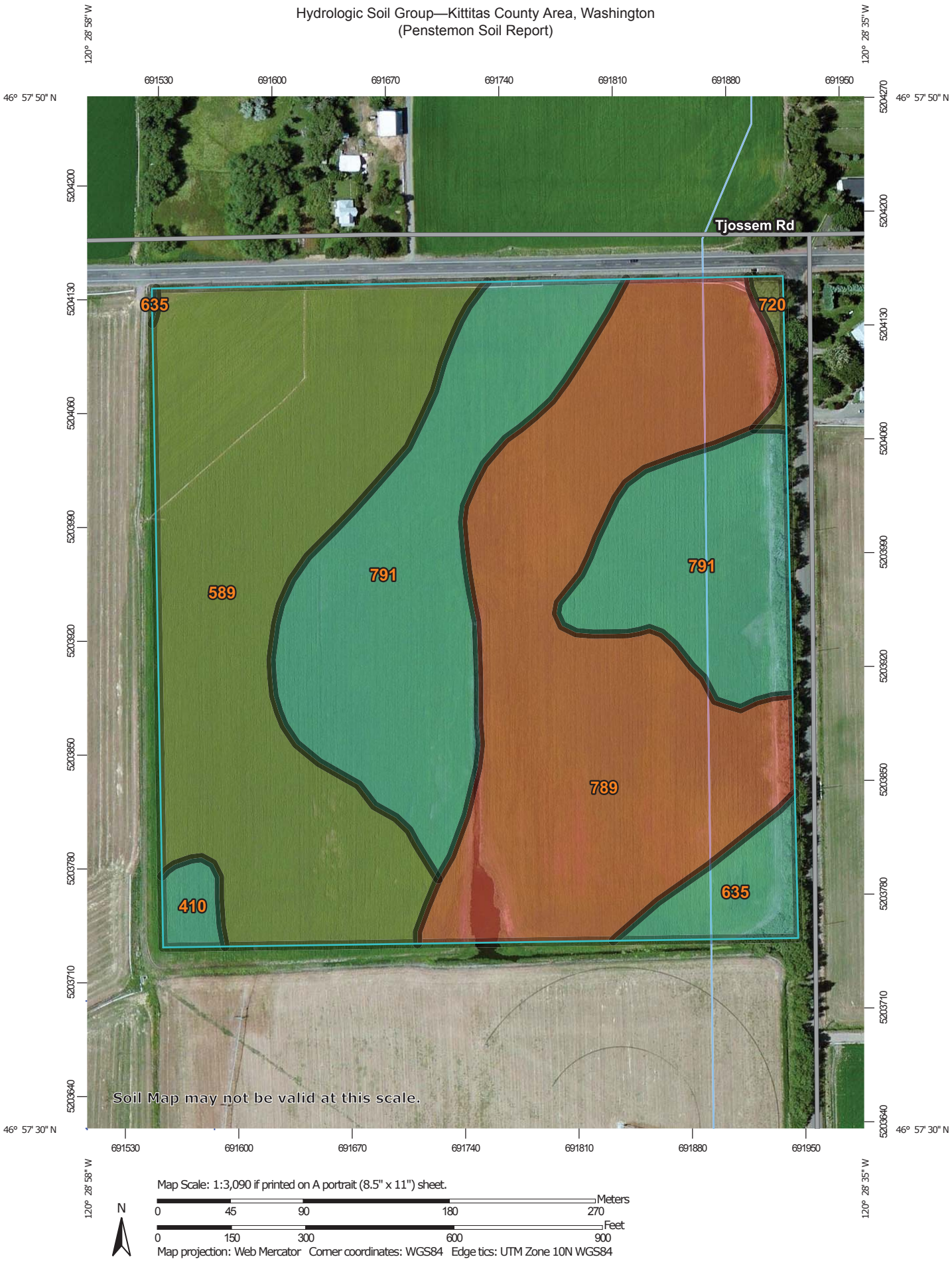
Encompass
ENGINEERING & SURVEYING
Western Washington Division
165 NE Juniper Street, Suite 201 ■ Issaquah, WA 98027 ■ Phone: (425) 392-0250 ■ Fax: (425) 391-3055
Eastern Washington Division
407 Southwater Blvd. ■ Ste Elum, WA 98922 ■ Phone: (509) 674-7433 ■ Fax: (509) 674-7419

JOB NO.	17016
DATE	July 2017
SCALE	AS SHOWN
DESIGNED	SF
DRAWN	SF
CHECKED	TML
APPROVED	TML
SHEET	FIG-2

Appendix A:

NRCS WEB SOIL SURVEY

Hydrologic Soil Group—Kittitas County Area, Washington
(Penstemon Soil Report)



Map Scale: 1:3,090 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 45 90 180 270

Feet: 0 150 300 600 900

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Kittitas County Area, Washington
Survey Area Data: Version 9, Sep 9, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 19, 2010—Aug 19, 2010

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Kittitas County Area, Washington (WA637)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
410	Tanaha ashy loam, 0 to 2 percent slopes	C	0.5	1.2%
589	Nack-Brickmill complex, 0 to 5 percent slopes	C/D	12.7	32.1%
635	Opnish ashy loam, 0 to 2 percent slopes	C	1.3	3.2%
720	Nanum ashy sandy clay loam, 0 to 2 percent slopes	C/D	0.2	0.6%
789	Deedale clay loam, 0 to 2 percent slopes	D	13.1	33.2%
791	Mitta ashy silt loam, drained, 0 to 2 percent slopes	C	11.7	29.7%
Totals for Area of Interest			**39.4**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

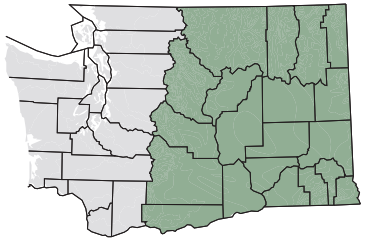
Tie-break Rule: Higher

Appendix B:

SWMMEW ISOPLUVIAL MAPS



Eastern Washington Stormwater Manual



2-Year 24-Hour Isopluvials

Source: NOAA Atlas 2, Volume IX, 1973
Precipitation in inches

County(2003, 1:24,000)
City(2003, 1:24,000)
Latitude/Longitude(1/10 degree)
Isopluvial(1973, 1:2,000,000)
NOAA/NWS Station(1931-1998)

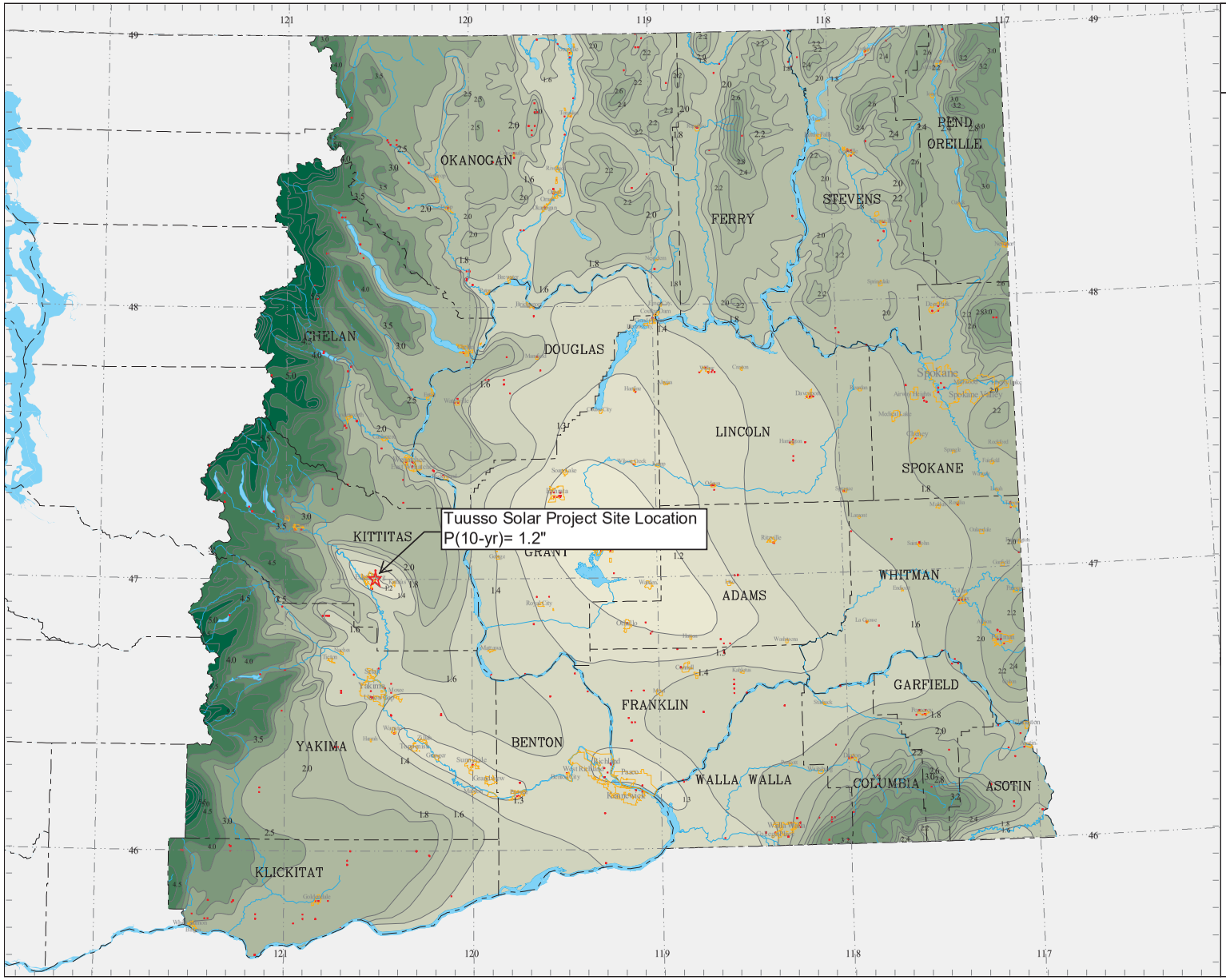
N

Scale 1:1,600,000
Miles
0 16.5 33

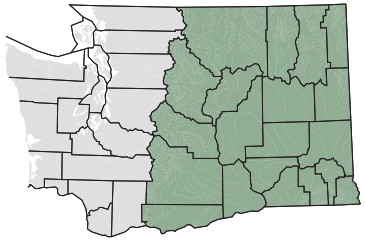
Water Quality Program

WASHINGTON STATE DEPARTMENT OF ECOLOGY

GIS Technical Services
02/25/04
Figure_4.3.3



Eastern Washington Stormwater Manual



10-Year 24-Hour Isopluvials

Source: NOAA Atlas 2, Volume IX, 1973
Precipitation in inches

County(2003, 1:24,000)
City(2003, 1:24,000)
Latitude/Longitude(1/10 degree)
Isopluvial(1973, 1:2,000,000)
NOAA/NWS Station(1931-1998)

N

Scale 1:1,600,000
Miles
0 16.5 33

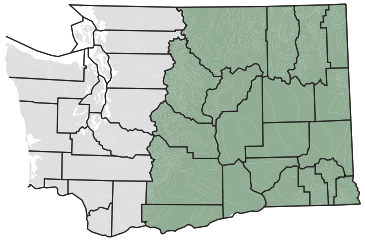
Water Quality Program

WASHINGTON STATE DEPARTMENT OF ECOLOGY

GIS Technical Services
02/25/04
Figure_4.3.4



Eastern Washington Stormwater Manual



25-Year 24-Hour Isopluvials

Source: NOAA Atlas 2, Volume IX, 1973
Precipitation in inches

County(2003, 1:24,000)
City(2003, 1:24,000)
Latitude/Longitude(1/10 degree)
Isopluvial(1973, 1:2,000,000)
NOAA/NWS Station(1931-1998)

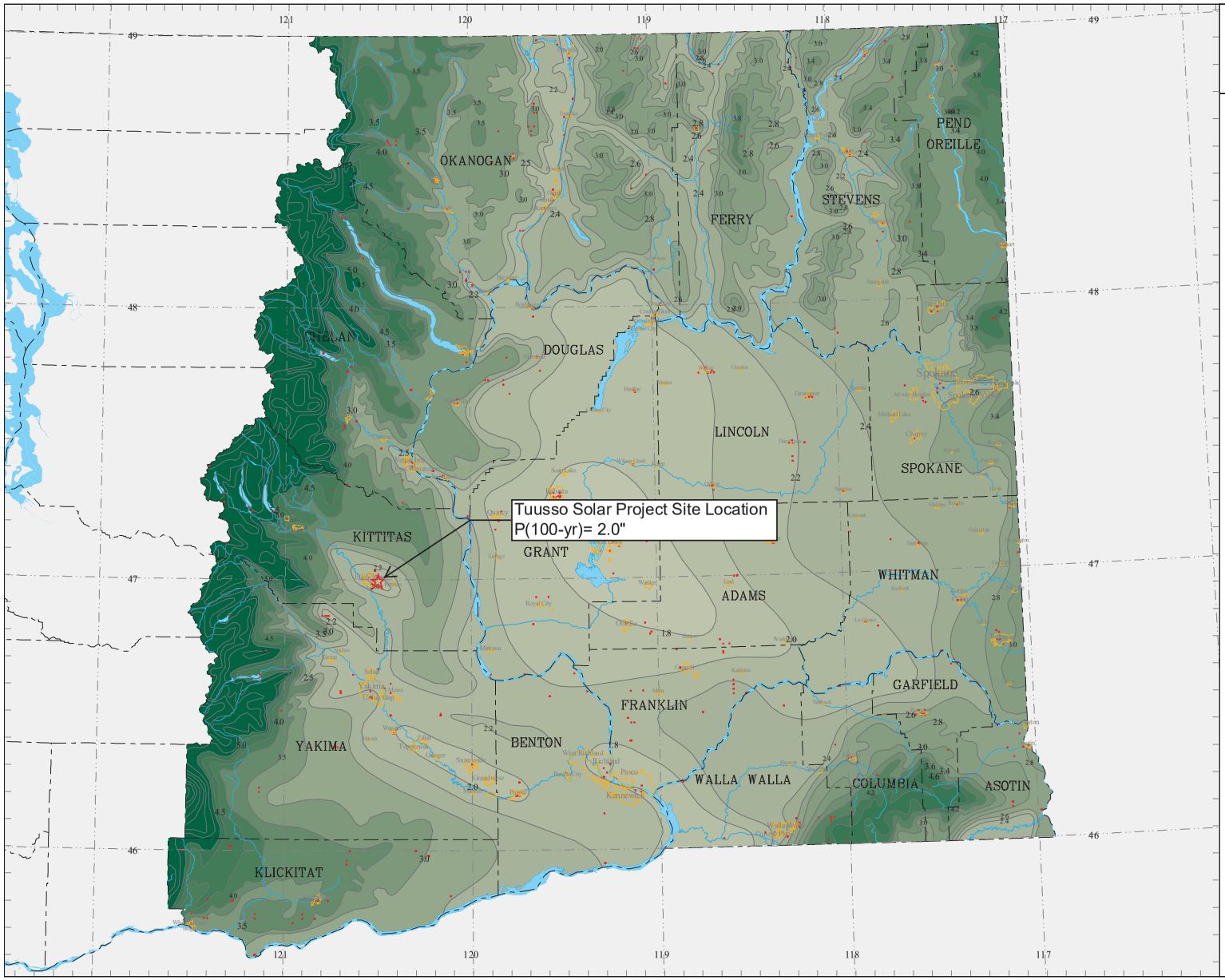
N

Scale 1:1,600,000
Miles
0 16.5 33

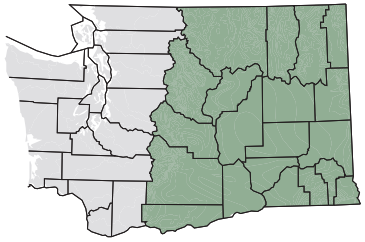
Water Quality Program

WASHINGTON STATE DEPARTMENT OF ECOLOGY

GIS Technical Services
02/25/04
Figure_4.3.5



Eastern Washington Stormwater Manual



100-Year 24-Hour Isopluvials

Source: NOAA Atlas 2, Volume IX, 1973
Precipitation in inches

County(2003, 1:24,000)
City(2003, 1:24,000)
Latitude/Longitude(1/10 degree)
Isopluvial(1973, 1:2,000,000)
NOAA/NWS Station(1931-1998)

Scale 1:1,600,000
Miles
0 16.5 33

Water Quality Program

WASHINGTON STATE DEPARTMENT OF ECOLOGY

GIS Technical Services
02/25/04
Figure_4.3.7

Appendix C:

CURVE NUMBER CALCULATIONS

Predeveloped Conditions											
Basin Name	Total Area (sf)	Total Area (ac)	Meadow (sf)	Meadow (ac)	HSG	CN	Meadow (sf)	Meadow (ac)	HSG	CN	**Composite Curve Number**
Exisiting Basin	1716264	39.40	588066	13.50	C	71	1128198	25.90	D	78	**76**

Postdeveloped Conditions															
Basin Name	Total Area (sf)	Total Area (ac)	Impervious Area (sf)	Impervious Area (ac)	HSG	CN	Meadow (sf)	Meadow (ac)	HSG	CN	Meadow (sf)	Meadow (ac)	HSG	CN	**Composite Curve Number**
Proposed Basin	1716264	39.40	57181.3	1.31	D	94	569005.57	13.06	C	71	1090077.13	25.02	D	78	**76**

Impervious Area Break Down			
Lot or Tract	Area (sf)	CN classification	CN
Road	32000	Gravel	91
Inverters	3600	Impervious	98
Post	21581.3	Impervious	98
		Composite CN	94

Post Area

Solar Trackers	Length	Width	#	area (sf)
72 ft trackers	248	6.5	220	354640
52 ft trackers	188	6.5	63	76986
36 ft traclers	121	6.5	0	0
			Total	431626
			assumed % impervious (posts)	5%
			impervious area	21581.3

Appendix D:

HydroCAD REPORT:
EXISTING BASIN

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
13.500	71	HSG C Meadow (1S)
25.900	78	HSG D Meadow (1S)
39.400	**76**	**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	13.500	25.900	0.000	39.400		1S
0.000	**0.000**	**13.500**	**25.900**	**0.000**	**39.400**	**TOTAL AREA**	

Summary for Subcatchment 1S: Existing

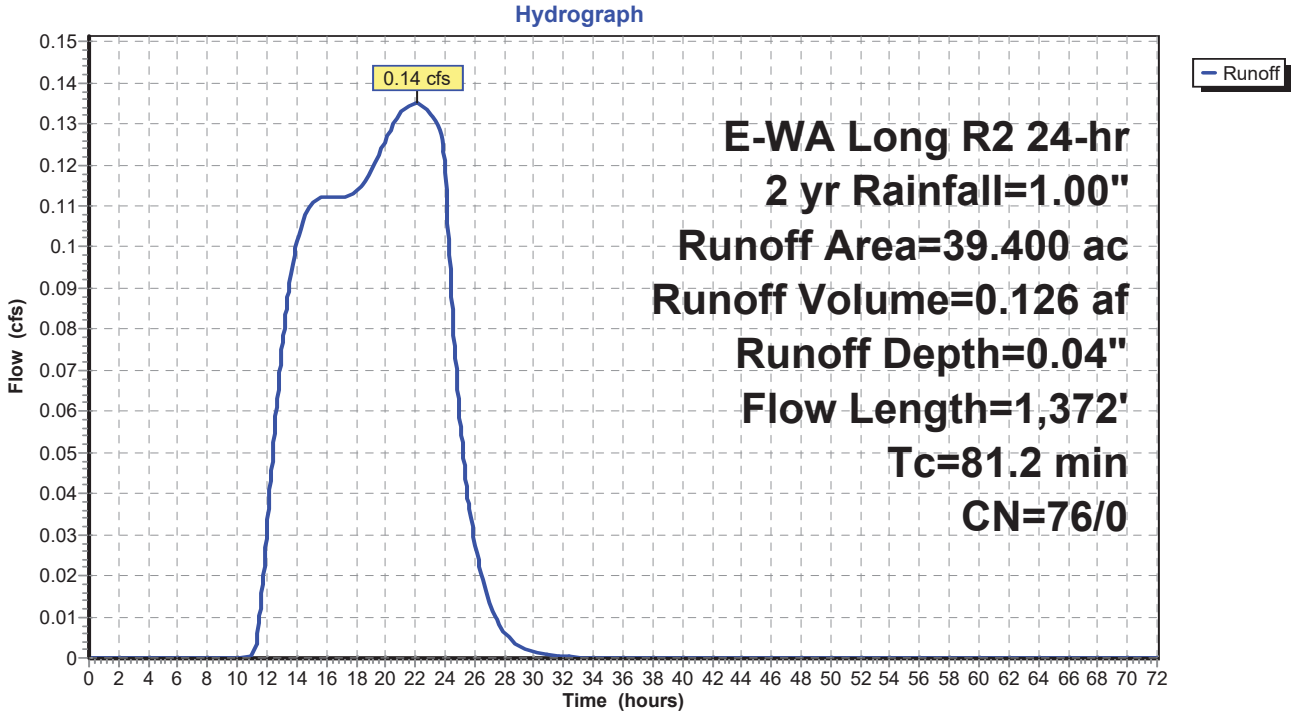
Runoff = 0.14 cfs @ 22.08 hrs, Volume= 0.126 af, Depth= 0.04"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 2 yr Rainfall=1.00"

	Area (ac)	CN	Description
*	13.500	71	HSG C Meadow
*	25.900	78	HSG D Meadow
	39.400	76	Weighted Average
	39.400	76	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
54.3	300	0.0080	0.09		**Sheet Flow,** Range n= 0.130 P2= 1.00"
26.9	1,072	0.0090	0.66		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
81.2	1,372	Total			

Subcatchment 1S: Existing



Summary for Subcatchment 1S: Existing

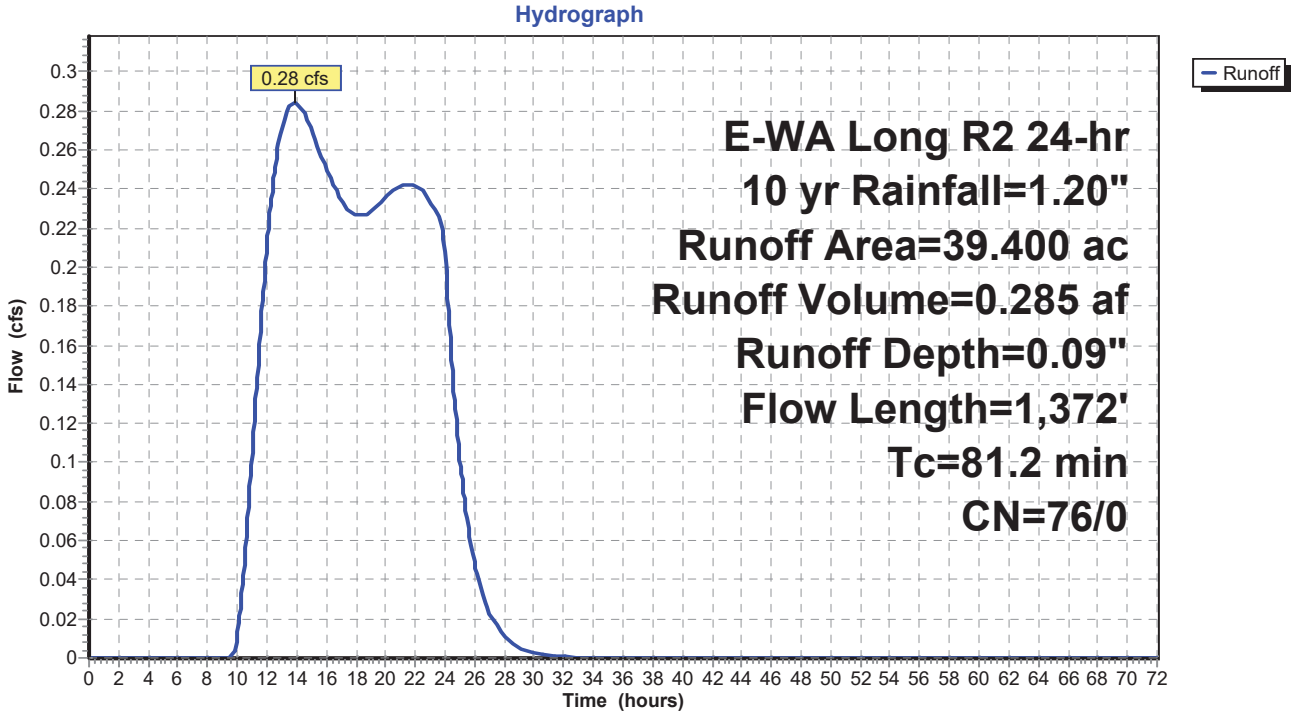
Runoff = 0.28 cfs @ 13.84 hrs, Volume= 0.285 af, Depth= 0.09"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 10 yr Rainfall=1.20"

	Area (ac)	CN	Description
*	13.500	71	HSG C Meadow
*	25.900	78	HSG D Meadow
	39.400	76	Weighted Average
	39.400	76	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
54.3	300	0.0080	0.09		**Sheet Flow,** Range n= 0.130 P2= 1.00"
26.9	1,072	0.0090	0.66		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
81.2	1,372	Total			

Subcatchment 1S: Existing



Summary for Subcatchment 1S: Existing

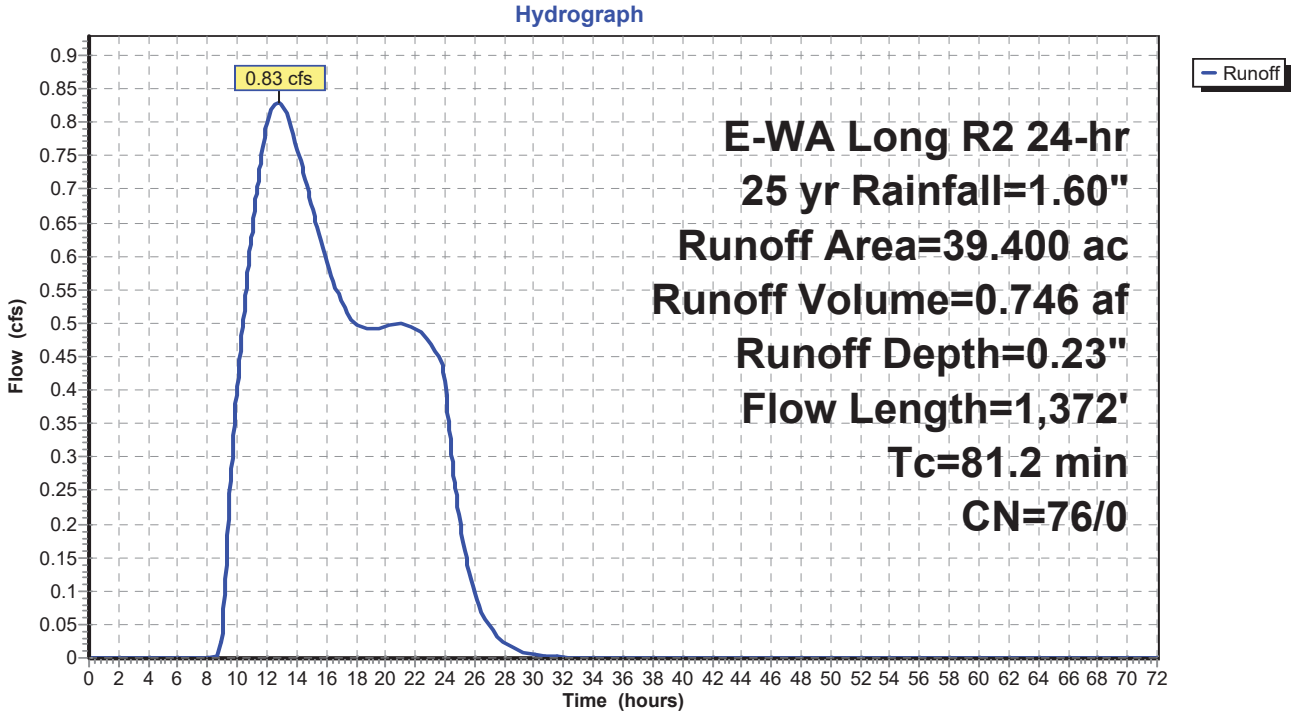
Runoff = 0.83 cfs @ 12.75 hrs, Volume= 0.746 af, Depth= 0.23"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 25 yr Rainfall=1.60"

	Area (ac)	CN	Description
*	13.500	71	HSG C Meadow
*	25.900	78	HSG D Meadow
	39.400	76	Weighted Average
	39.400	76	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
54.3	300	0.0080	0.09		**Sheet Flow,** Range n= 0.130 P2= 1.00"
26.9	1,072	0.0090	0.66		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
81.2	1,372	Total			

Subcatchment 1S: Existing



Summary for Subcatchment 1S: Existing

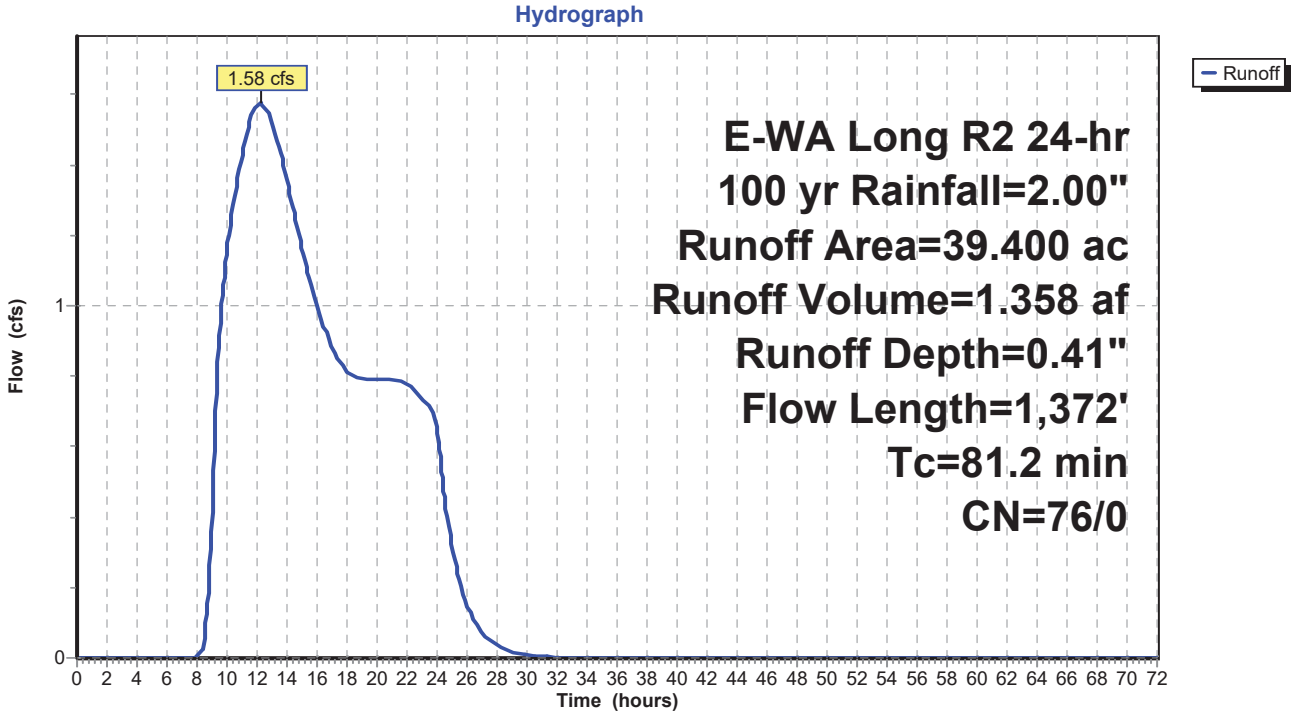
Runoff = 1.58 cfs @ 12.21 hrs, Volume= 1.358 af, Depth= 0.41"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 100 yr Rainfall=2.00"

	Area (ac)	CN	Description
*	13.500	71	HSG C Meadow
*	25.900	78	HSG D Meadow
	39.400	76	Weighted Average
	39.400	76	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
54.3	300	0.0080	0.09		**Sheet Flow,** Range n= 0.130 P2= 1.00"
26.9	1,072	0.0090	0.66		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
81.2	1,372	Total			

Subcatchment 1S: Existing



Appendix E:

HydroCAD REPORT:
PROPOSED BASIN

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
13.060	71	HSG C Meadow (3S)
25.020	78	HSG D Meadow (3S)
1.310	94	Impervious (3S)
39.390	**76**	**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	13.060	25.020	0.000	38.080		3S
0.000	0.000	0.000	0.000	1.310	1.310	Impervious	3S
0.000	**0.000**	**13.060**	**25.020**	**1.310**	**39.390**	**TOTAL AREA**	

Summary for Subcatchment 3S: Proposed

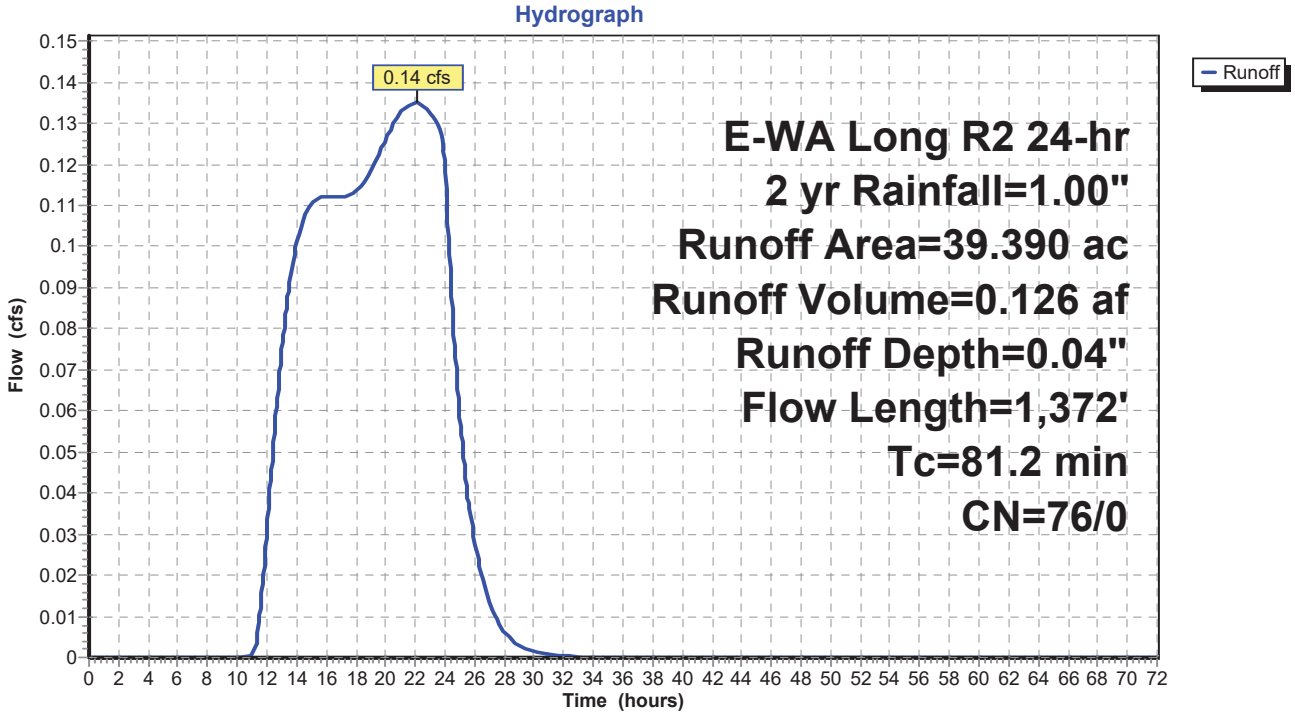
Runoff = 0.14 cfs @ 22.08 hrs, Volume= 0.126 af, Depth= 0.04"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 2 yr Rainfall=1.00"

	Area (ac)	CN	Description
*	1.310	94	Impervious
*	13.060	71	HSG C Meadow
*	25.020	78	HSG D Meadow
	39.390	76	Weighted Average
	39.390	76	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
54.3	300	0.0080	0.09		**Sheet Flow,** Range n= 0.130 P2= 1.00"
26.9	1,072	0.0090	0.66		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
81.2	1,372	Total			

Subcatchment 3S: Proposed



Summary for Subcatchment 3S: Proposed

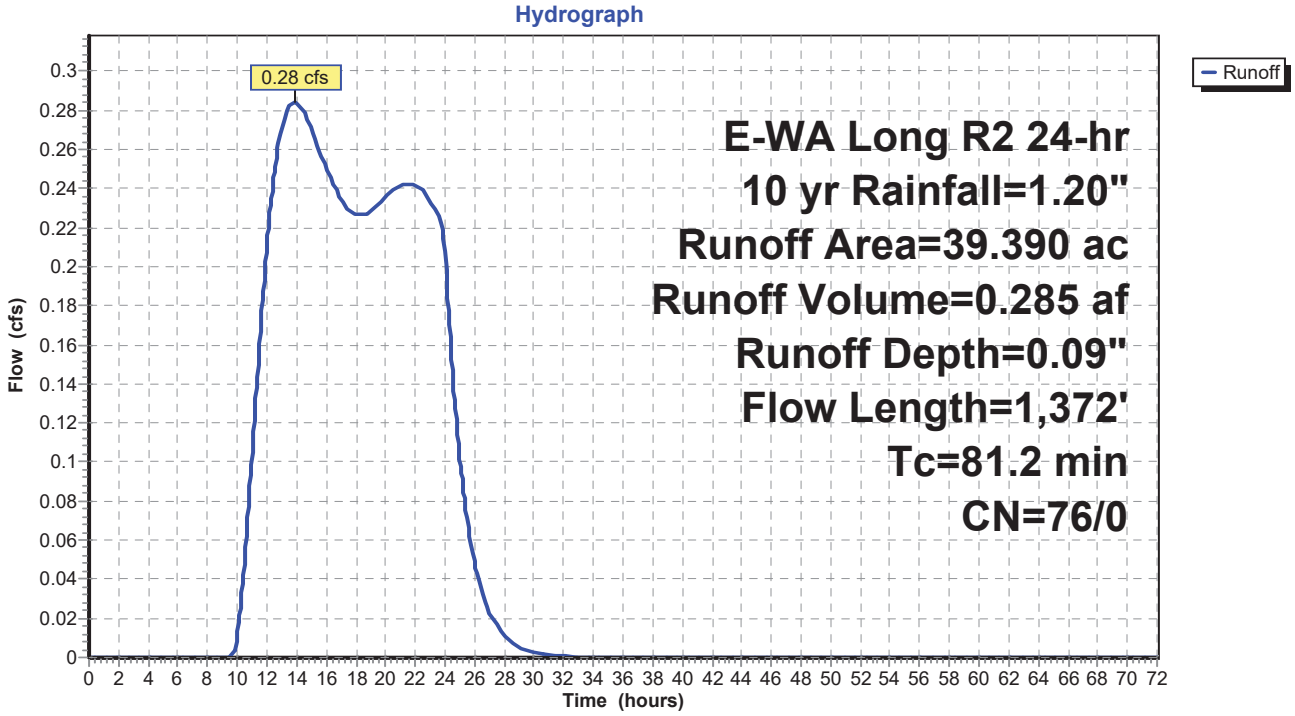
Runoff = 0.28 cfs @ 13.84 hrs, Volume= 0.285 af, Depth= 0.09"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 10 yr Rainfall=1.20"

	Area (ac)	CN	Description
*	1.310	94	Impervious
*	13.060	71	HSG C Meadow
*	25.020	78	HSG D Meadow
	39.390	76	Weighted Average
	39.390	76	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
54.3	300	0.0080	0.09		**Sheet Flow,** Range n= 0.130 P2= 1.00"
26.9	1,072	0.0090	0.66		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
81.2	1,372	Total			

Subcatchment 3S: Proposed



Summary for Subcatchment 3S: Proposed

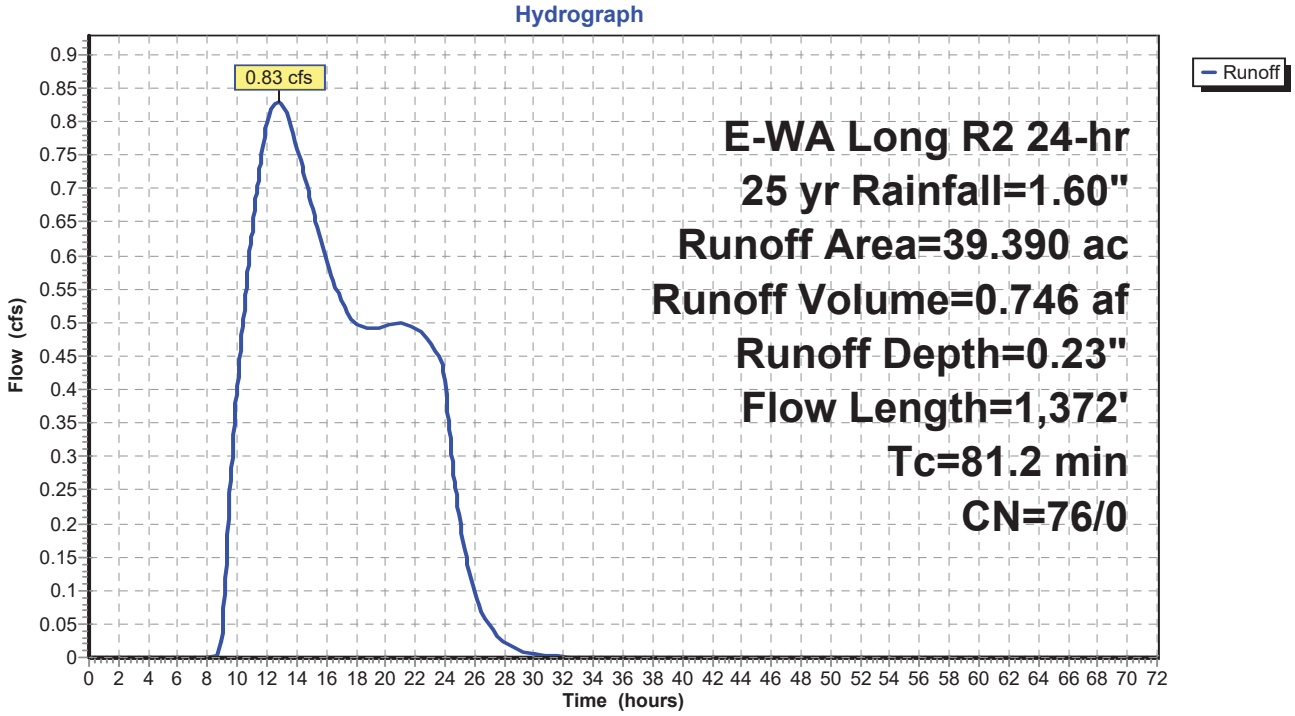
Runoff = 0.83 cfs @ 12.75 hrs, Volume= 0.746 af, Depth= 0.23"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 25 yr Rainfall=1.60"

	Area (ac)	CN	Description
*	1.310	94	Impervious
*	13.060	71	HSG C Meadow
*	25.020	78	HSG D Meadow
	39.390	76	Weighted Average
	39.390	76	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
54.3	300	0.0080	0.09		**Sheet Flow,** Range n= 0.130 P2= 1.00"
26.9	1,072	0.0090	0.66		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
81.2	1,372	Total			

Subcatchment 3S: Proposed



Summary for Subcatchment 3S: Proposed

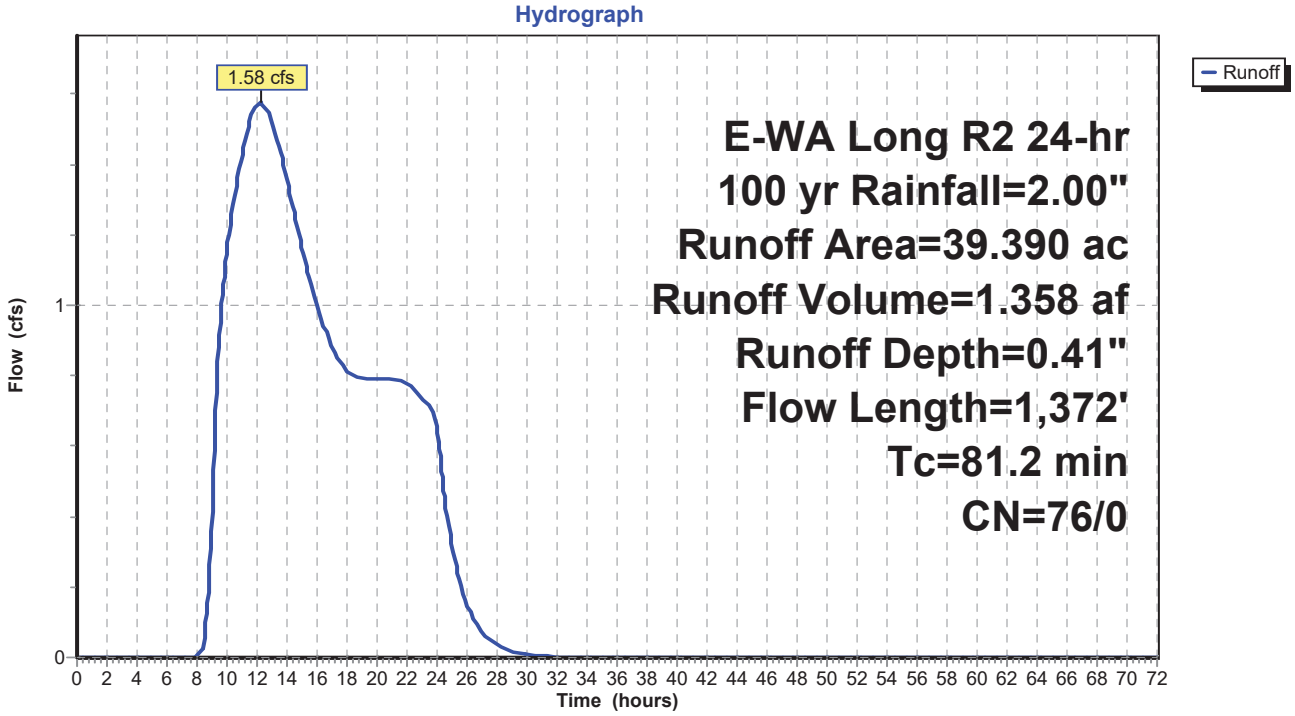
Runoff = 1.58 cfs @ 12.21 hrs, Volume= 1.358 af, Depth= 0.41"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 100 yr Rainfall=2.00"

	Area (ac)	CN	Description
*	1.310	94	Impervious
*	13.060	71	HSG C Meadow
*	25.020	78	HSG D Meadow
	39.390	76	Weighted Average
	39.390	76	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
54.3	300	0.0080	0.09		**Sheet Flow,** Range n= 0.130 P2= 1.00"
26.9	1,072	0.0090	0.66		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
81.2	1,372	Total			

Subcatchment 3S: Proposed



Appendix J: Typha Solar Project Site Reports and Permit Applications

J-1: Typha Solar Project Critical Areas Report

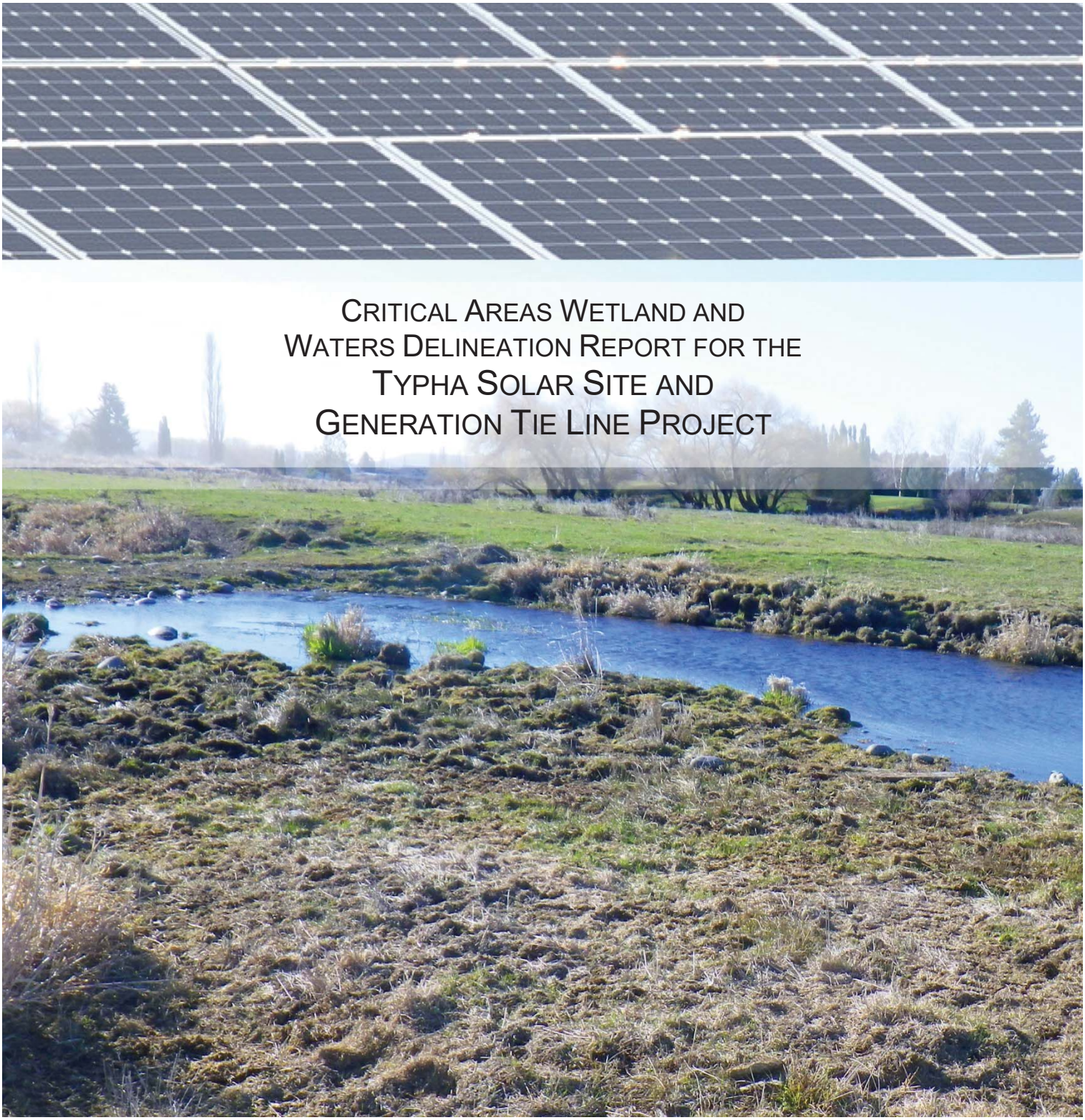
J-2: Typha Solar Project Cultural Resources Report

J-3: Typha Permit Applications

J-4: Typha Solar Project Geotechnical Engineering Study

J-5: Typha Solar Project Drainage Report

Appendix J-1: Typha Solar Project Critical Areas Report



CRITICAL AREAS WETLAND AND WATERS DELINEATION REPORT FOR THE TYPHA SOLAR SITE AND GENERATION TIE LINE PROJECT

July 10, 2017

SWCA ENVIRONMENTAL CONSULTANTS
SEATTLE, WASHINGTON

CRITICAL AREAS WETLAND AND WATERS DELINEATION REPORT FOR THE TYPHA SOLAR SITE AND GENERATION TIE LINE PROJECT KITTITAS COUNTY, WASHINGTON

Section 30, Township 18 North, Range 18 East
Parcel Numbers 712633, 752633, 802633, and 832633

Report Prepared for

TUUSSO Energy, LLC

By
Evan Dulin

July 10, 2017

Project Number 38727.05

SWCA Environmental Consultants
221 1st Ave W, Suite 205
Seattle, Washington 98119

TABLE OF CONTENTS

1 INTRODUCTION 1
1.1 Background 1
1.2 Project Setting 1
2 METHODS 1
2.1 Study Area 1
2.2 Review of Existing Information 1
2.3 Field Investigation 3
2.3.1 Wetlands 6
2.3.2 Riparian Habitats 10
3 RESULTS AND DISCUSSION 10
3.1 Wetlands 11
3.1.1 Wetland TW01 12
3.1.2 Wetland TW02 13
3.1.3 Wetland TW03 14
3.1.4 Wetland TW04 15
3.1.5 Wetland TW05 15
3.2 Frequently Flooded Areas 16
3.3 Geologically Hazardous Areas 16
3.4 Habitats 16
3.4.1 Riparian Habitat 16
3.4.2 Priority Habitats and Species 18
3.5 Aquifer Recharge Areas 18
4 CONCLUSIONS AND RECOMMENDATIONS 18
5 DISCLAIMER 20
6 LITERATURE CITED AND REVIEWED 21
APPENDIX A: WETLAND DELINEATION METHODOLOGY A-1
APPENDIX B: VEGETATION LIST B-1
APPENDIX C: WETLAND DATA SHEETS C-1
APPENDIX D: WETLAND AND STREAM PHOTOGRAPHS D-1
APPENDIX E: ECOLOGY RATING FORMS E-1
APPENDIX F: KITTITAS COUNTY WETLAND BUFFER GUIDANCE F-1

LIST OF TABLES

Table 1. Precipitation for 3 Months Prior to Site Visits (in inches) 6
Table 2. Precipitation 2 Weeks Prior to Site Visits (in inches) 6
Table 3. Washington State Department of Ecology Wetland Rating System 7
Table 4. Summary of the Water Typing System 10
Table 5. Soil Mapping within the Study Area 11
Table 6. Wetland Size, Rating, and Classification for Wetlands within the Study Area 12
Table 7. Summary of Streams in the Study Area 17
Table 8. Wetland and Waters Summary 19

LIST OF FIGURES

Figure 1. Project vicinity map. 2
Figure 2. NWI, NHD, and floodplain mapping. 4
Figure 3. Soils and PHS mapping. 5
Figure 4. Wetland and waters delineation map, north portion. 8
Figure 5. Wetland and waters delineation map, south portion. 9

1 INTRODUCTION

This report describes the methods and findings of wetland, stream, and other critical areas delineation for the proposed Typha Solar Site and Transmission Line Project (Typha Solar Project). The report was prepared by SWCA Environmental Consultants (SWCA), and is intended to address permitting requirements under Energy Facility Site Evaluation Council (EFSEC) Washington Administrative Code (WAC) 463-60-322, -332, and -333, and to show compliance of the proposed project with Kittitas County's Code for Critical Areas Ordinance (KCC Chapter 17A).

1.1 Background

TUUSSO Energy, LLC (TUUSSO) is proposing to construct a new photovoltaic solar facility installation on approximately 49.7 acres of private agricultural land, including the construction of a switchyard with a short (0.45-mile-long, 4.4-acre) generation tie line into an existing Puget Sound Energy (PSE) distribution transmission line, located northwest of Ellensburg, Kittitas County, Washington. The project is intended to provide up to 5 MW of solar energy to PSE for use within their service area.

1.2 Project Setting

The Typha Solar Project site primarily consists of fallow agricultural land located just west of the Yakima River and north of Thorp Highway, west of Ellensburg in unincorporated Kittitas County, Washington. The Typha Solar Project would be located approximately 1.1 miles east of the intersection of Thorp Highway and Cove Road, in Section 30 of Township 18 North, Range 18 East, Willamette Meridian (Figure 1). The generation tie line would originate from the southwestern project site boundary and follow existing power poles to cross south along an existing access road, crossing the Ellensburg Power (EP) Canal three times and passing through the Ellensburg Golf and Country Club, to connect to the existing PSE distribution transmission line along Thorp Highway. The Typha Solar Project site is approximately 54.1 acres and the generation tie line is approximately 4.4 acres, totaling 54.1 acres for the overall project. Topography of the site generally slopes to the east toward the Yakima River. Surface elevation within the solar site and generation tie line ranges from 1,570 to 1,614 feet above mean sea level, the lowest elevation being along the eastern site boundary closest to the Yakima River and the highest elevation being at the southern end of the generation tie line near Thorp Highway.

2 METHODS

2.1 Study Area

The Typha Solar Project site is approximately 54.1 acres and the generation tie line is approximately 4.4 acres, totaling 54.1 acres for the overall project. The generation tie line portion of the project is 80 feet wide centered on the existing power poles and new proposed line connecting the solar site to the existing poles (Figure 1). Wetlands and streams outside of the project site and generation tie line but that occur within 200 feet of these boundaries and had the potential to have buffers extend into the project were included in the study area. Wetlands and streams outside of the project site and within the study area were visually inspected but not formally delineated.

2.2 Review of Existing Information

Prior to conducting fieldwork, background materials were reviewed to determine the potential for wetlands, floodplains, habitats, and other critical areas and their buffers to occur within the study area. Materials referenced during the desktop study are listed below. The following checklist follows the KCC Critical Areas required checklist outlined in KCC Chapter 17A.03.035.

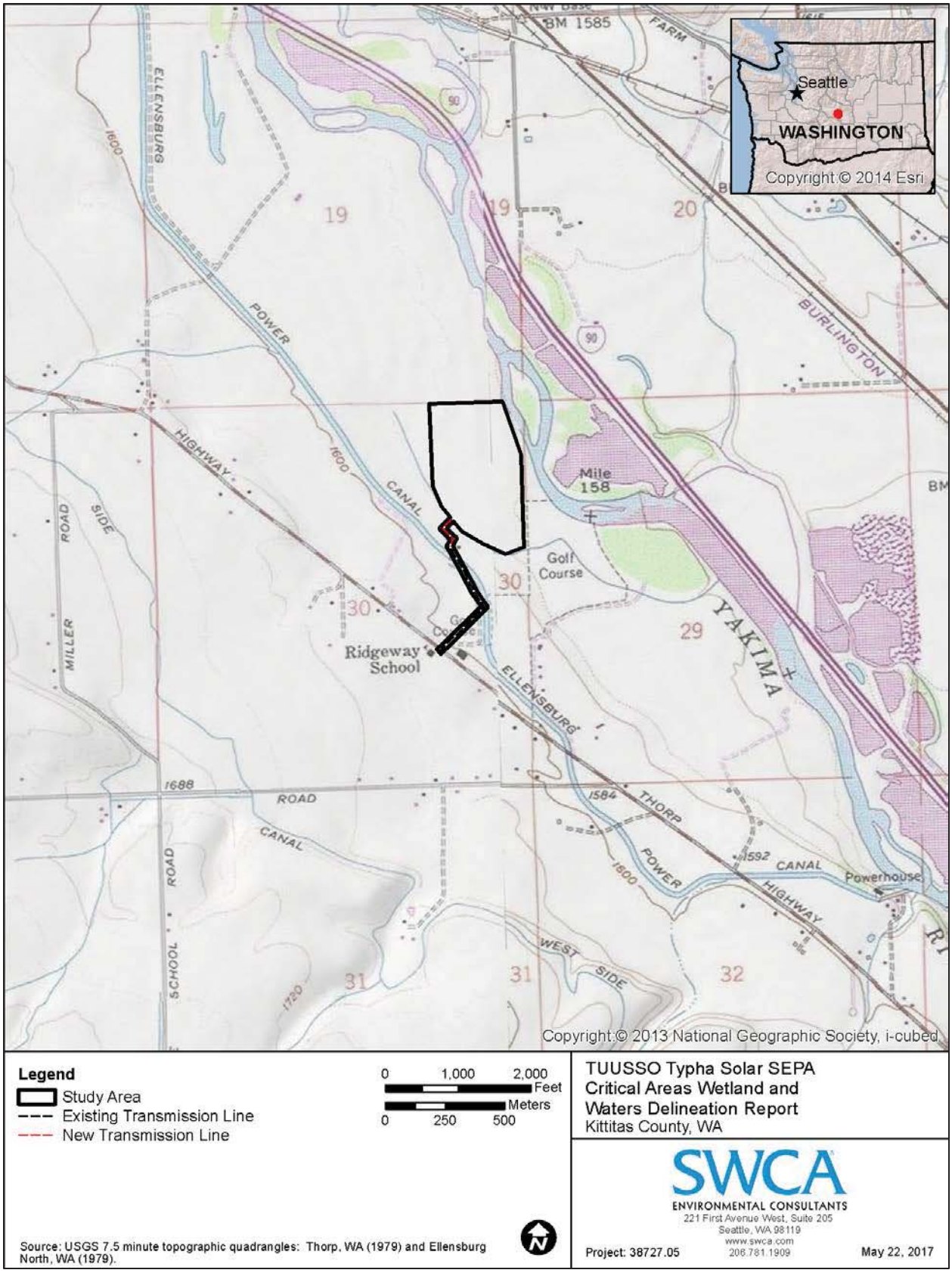


Figure 1. Project vicinity map.

Wetlands (KCC Chapter 17A.04)

- Historical Google Earth aerial photography (2000–2015).
- U.S. Department of Agriculture (USDA) historical imagery (USDA 1954).
- U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle maps for Ellensburg North and Thorp, Washington, included in Figure 1.
- USFWS National Wetlands Inventory (NWI) data and USGS National Hydrography Dataset (NHD), included in Figure 2.
- Natural Resources Conversation Service (NRCS) Soil Survey of Kittitas County Area, Washington and NRCS Web Soil Survey map of the study area, included in Figure 3.

Frequently flooded areas (KCC Chapter 17A.05)

- Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Panel 5300950438C (as cited by Kittitas County 2017), included in Figure 2.

Geologically hazardous areas (KCC Chapter 17A.06)

- Includes erosion, landslide, mine, and seismic hazard areas.
- Kittitas County COMPAS mapping tool.

Habitats (KCC Chapter 17A.07)

- Includes riparian habitats and streams and rivers.
- Washington State Department of Fish and Wildlife (WDFW) SalmonScape online mapper.
- WDFW Priority Habitats and Species (PHS) online mapper, included in Figure 3.

Aquifer recharge areas (KCC Chapter 17A.08)

- No critical aquifer recharge locations have been identified in Kittitas County.

Spatial data obtained during the review of existing information were incorporated into Typha Solar Project base maps (Figures 1–3).

2.3 Field Investigation

Following the desktop review of existing information, a team of two biologists conducted site visits on April 3, 4, and 12, 2017, to assess the study area for the presence of wetland and waterbody features and to record data relevant to the Washington State Department of Ecology's (Ecology's) most recently approved version of the *Washington State Wetland Rating System for Eastern Washington, 2014 Update* (Hruby 2014). Visual observations were recorded within 200 feet of the project site and generation tie line, and included wildlife and habitat data.

Precipitation data were obtained from the closest wetlands climate analysis (WETS) climate station, the Ellensburg National Weather Service (NWS) station (ELBW1), approximately 5.5 miles to the southeast of the project site in southern Ellensburg, Washington. Historical (1971–2000) average annual rainfall is listed as 8.96 inches. Table 1 shows the monthly precipitation at the Ellensburg NWS weather station for the 3 months prior to the April 3, 4, and 12, 2017, site visits. Table 2 shows the rainfall received 2 weeks prior to the site visits, and the water-year-to-date (WYTD) rainfall. Rainfall recorded 3 months prior to fieldwork was wetter than normal.

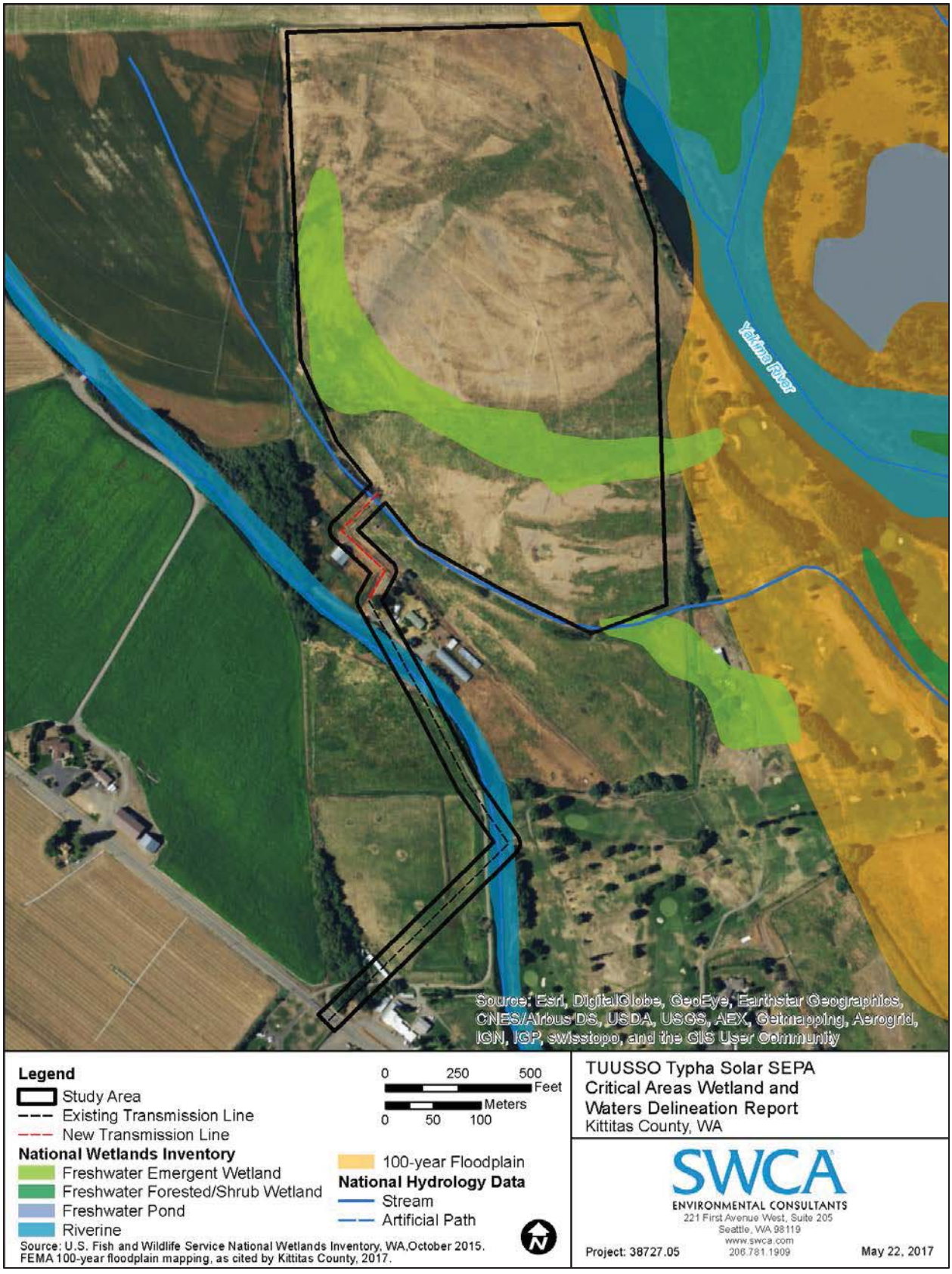


Figure 2. NWI, NHD, and floodplain mapping.

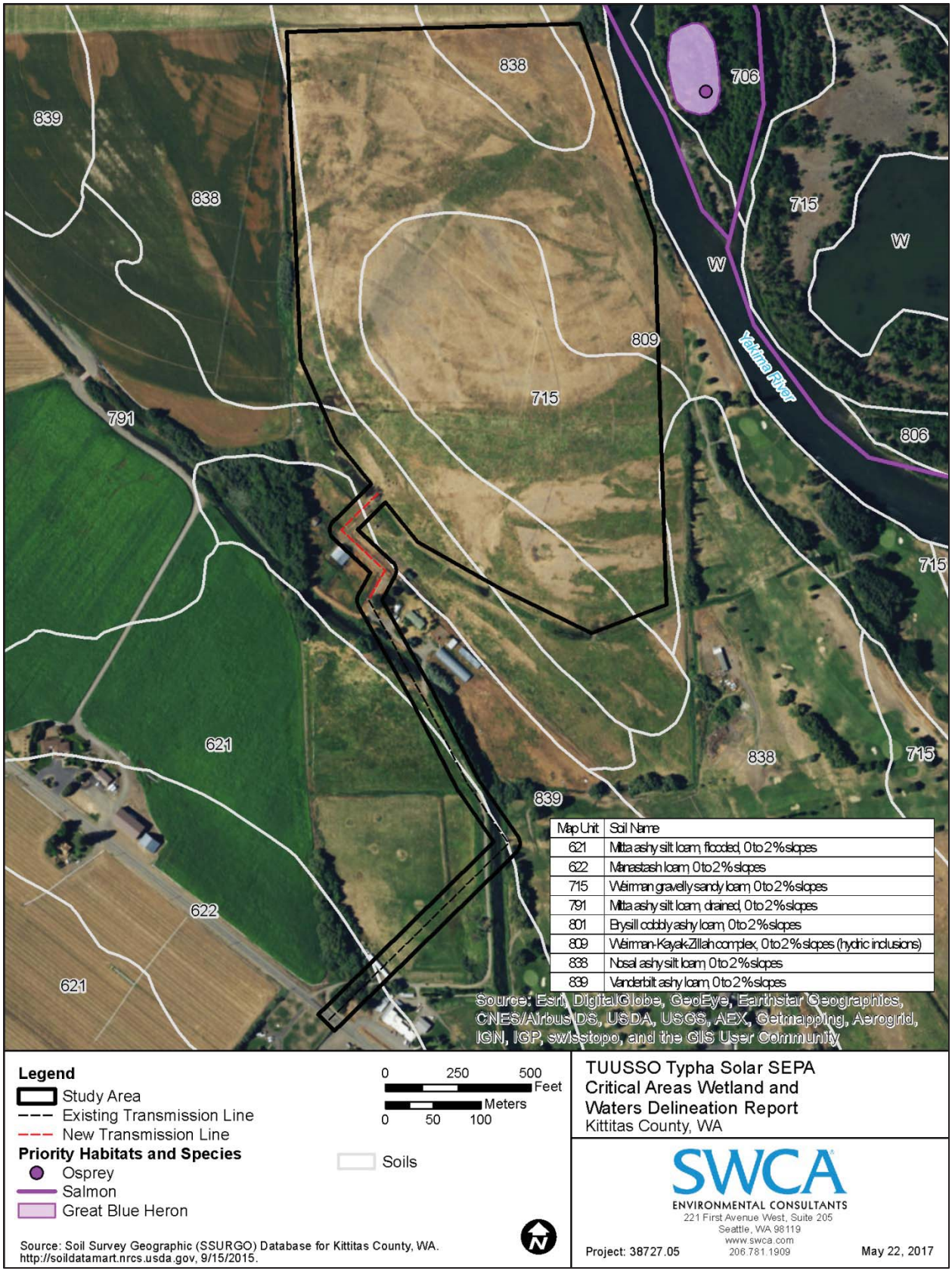


Figure 3. Soils and PHS mapping.

Table 1. Precipitation for 3 Months Prior to Site Visits (in inches)

Month	Average	30% Chance Will Have		Observed Precipitation	Within Normal Range?
		Less Than	More Than		
March	0.76	0.36	0.93	1.49	Above
February	0.91	0.59	1.10	2.04	Above
January	1.19	0.65	1.45	1.54	Above

Source: NRCS 2017b.

Table 2. Precipitation 2 Weeks Prior to Site Visits (in inches)

Field Study	Precipitation 2 Weeks Prior	WYTD	Inches Above or Below Normal WYTD*
April 2–March 20, 2017	0.79	8.93	2.80 above
April 3–March 21, 2017	0.79	8.93	2.78 above
April 11–March 29, 2017	0.61	9.38	3.08 above

*Based on average precipitation from 1981 to 2010.
Source: NRCS 2017b.

2.3.1 Wetlands

The study area was investigated for wetlands in accordance with the current methodology of the U.S. Army Corps of Engineers' (USACE's) 2008 *Arid West Regional Supplement (Version 2)* and the *Wetlands Delineation Manual* (Environmental Laboratory 1987). A detailed description of the field methods used in this study is provided in Appendix A.

A Trimble Geo XT global positioning system (GPS) unit was used by the field team to assist in identifying the project site and generation tie line boundaries and to record site spatial data. This device is capable of submeter accuracy. The full extent of the study area was covered by the team of biologists. Photographs were collected and vegetation, soil, and hydrology characteristics were documented. The boundaries for wetlands located outside of the project site and generation tie line but within the study area were approximated using field observations and aerial imagery to determine the extent of on-site wetland buffers.

Geographic information system (GIS) software were used to analyze data and to produce the report figures (Figures 4 and 5). Per WAC 463-60-333 and KCC Chapter 17A, wetlands were rated using the *Washington State Wetland Rating System for Eastern Washington, 2014 Update*. Per KCC 17A.04.020, the resulting wetland ratings were used to determine the County-prescribed range of wetland buffers for each wetland. Table 3 lists Ecology's wetland rating criteria. Kittitas County's definition of a wetland is based on the Revised Code of Washington (RCW) 36.70A.030, which states:

> *(21) "Wetland" or "wetlands" means areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Wetlands do not include those artificial wetlands intentionally created from nonwetland sites, including, but not limited to, irrigation and drainage ditches, grass-lined swales, canals, detention facilities, wastewater treatment facilities, farm ponds, and landscape amenities, or those wetlands created after July 1, 1990, that were unintentionally created as a result of the construction of a road, street, or highway. Wetlands may include those artificial wetlands intentionally created from nonwetland areas created to mitigate conversion of wetlands.*

Table 3. Washington State Department of Ecology Wetland Rating System

Category			
I	**II**	**III**	**IV**
Category I wetlands: Represent a unique or rare wetland type; are more sensitive to disturbance than most wetlands; are relatively undisturbed and contain ecological attributes that are impossible to replace within a human lifetime; or provide a high level of functions. Specific wetlands that meet the Category I criteria include: 1. alkali wetlands, characterized by the presence of shallow saline water with a high pH; 2. natural heritage wetlands, specifically, wetlands identified by the Washington Natural Heritage Program/DNR as high quality relatively undisturbed wetlands; and wetlands that support state-listed threatened or endangered plants; 3. bogs and calcareous fens; 4. mature and old-growth forested wetlands with slow growing trees that are over 0.25 acre in size; and 5. wetlands that perform many functions very well, as indicated by a score of 22 or more points out of 27 on the wetland rating form.	Category II wetlands: Wetlands that are difficult, though not impossible, to replace, and provide high levels of some functions. Specific wetlands that meet the Category II criteria include: 1. forested wetlands in the floodplains of rivers; 2. mature and old-growth forested wetlands with fast growing trees that are over 0.25 acre in size; 3. vernal pool that are located in a landscape with other wetlands and that are relatively undisturbed during the early spring; and 4. wetlands scoring between 19 and 21 points, out of 27, on the wetland rating form.	Category III wetlands: Wetlands that provide a moderate level of functions. Specific wetlands that meet the Category III criteria include: 1. wetlands scoring between 16 and 18 points, out of 27, on the wetland rating form.	Category IV wetlands: Wetlands that have the lowest levels of functions and are heavily disturbed. Specific wetlands that meet the Category IV criteria include: 1. wetlands scoring less than 16 points out of 27 on the wetland rating form.

Source: Hruby (2014).
Kittitas County wetland category definitions defer to Washington Administrative Code for guidance.
Appendix F includes the County-issued guidance.

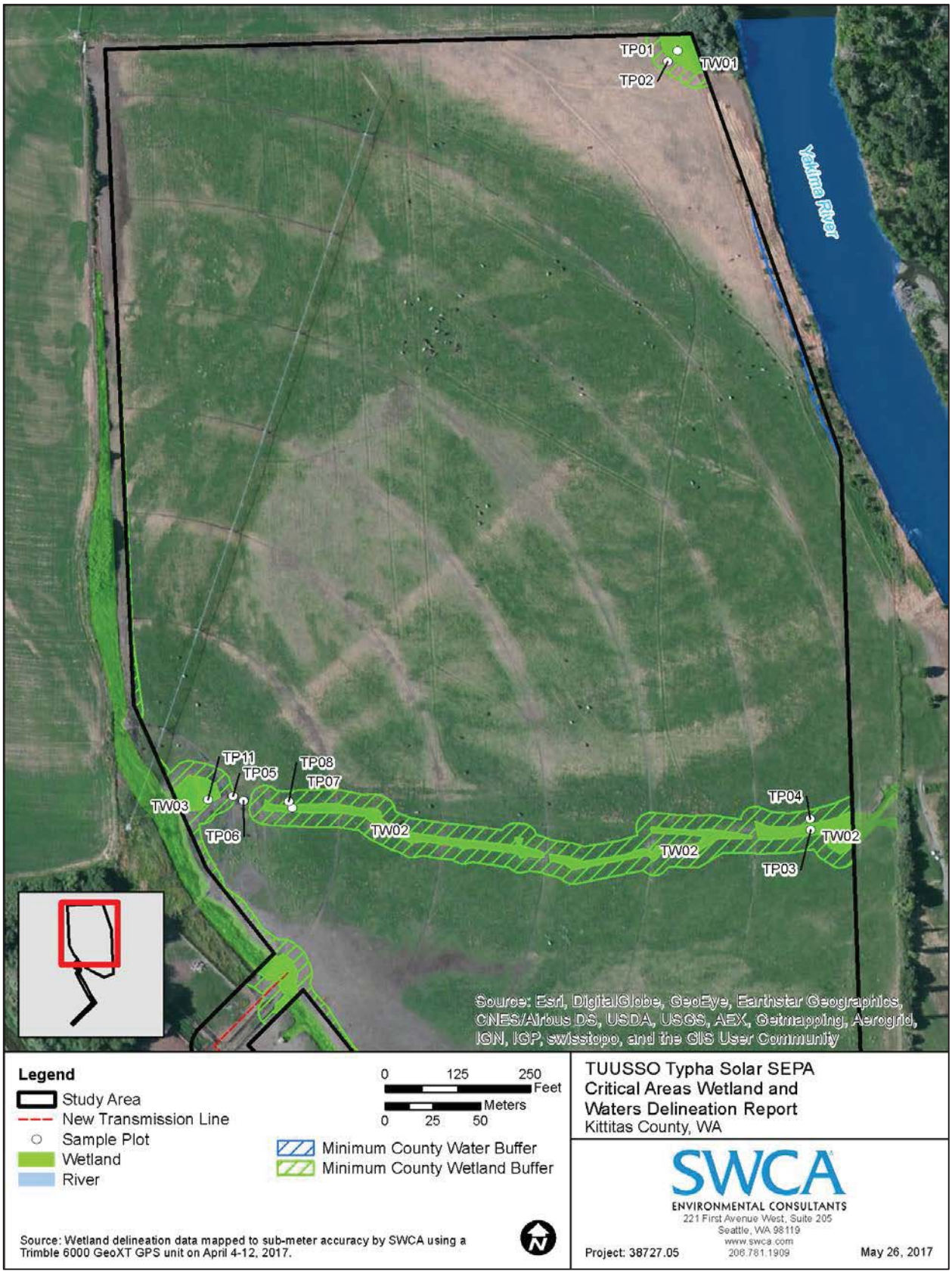


Figure 4. Wetland and waters delineation map, north portion.

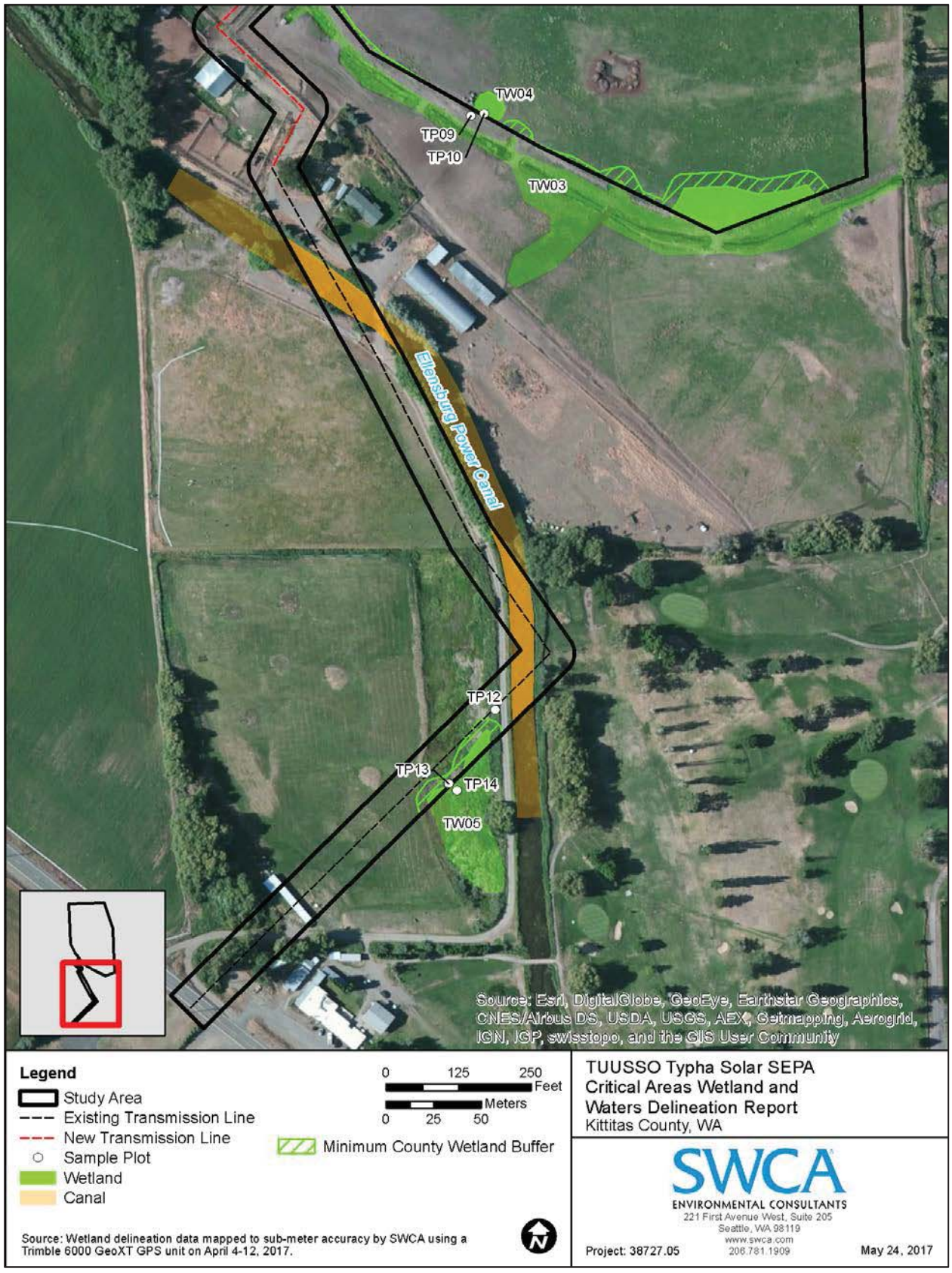


Figure 5. Wetland and waters delineation map, south portion.

A detailed analysis of wetland functions is not included in this report; however, a brief description of wetland functions is provided as part of the general description for each wetland.

2.3.2 Riparian Habitats

Biologists also investigated the Typha Solar Project study area for the presence of non-wetland waters and used a GPS device to delineate the ordinary high water marks (OHWMs) of streams per the definitions in WAC 173-22-030 (Figure 5). The OHWMs of streams and rivers outside of the project site and generation tie line but within the study area were approximated using field observations and aerial imagery to determine the extent of on-site stream buffers.

Streams identified in the study areas were classified according to the WAC stream typing system (WAC 222-16-030). Criteria for this typing system are described in Table 4. The stream types described in this report are based on the stream reaches within the study area; downstream reaches may be rated higher.

Table 4. Summary of the Water Typing System

Stream Type	Definition [a]
S	All waters, within their bankfull width, as inventoried as "shorelines of the state" under Chapter 90.58 RCW and the rules promulgated pursuant to Chapter 90.58 RCW including periodically inundated areas of their associated wetlands.
F	All segments of natural waters that are not Type S waters, and that contain fish or fish habitat, including: 1) waters diverted for domestic use by more than 10 residential or camping units or by a public accommodation facility; 2) waters diverted for use by a federal, state, or Tribal fish hatchery from the point of diversion for 1,500 feet or the entire tributary if the tributary is highly significant for protection of downstream water quality; 3) waters that are within a federal, state, local, or private campground having more than 10 camping units; or 4) riverine ponds, wall-based channels, and other channel features that are used by fish for off-channel habitat.
Np	All segments of natural waters within the bankfull width of defined channels that are perennial non–fish habitat streams. Perennial streams are flowing waters that do not go dry any time of a year of normal rainfall and include the intermittent dry portions of the perennial channel below the uppermost point of perennial flow.
Ns	All segments of natural waters within the bankfull width of the defined channels that are not Type S, F, or Np waters. These are seasonal, non–fish habitat streams in which surface flow is not present for at least some portion of a year of normal rainfall and the stream is not located downstream from any stream reach that is a Type Np water. Ns waters must be physically connected by an above-ground channel system to Type S, F, or Np waters.

[a] Definitions are summarized from WAC 222-16-030. Kittitas County stream type definitions defer to WAC for guidance.

3 RESULTS AND DISCUSSION

The Typha Solar Project site consists of formerly irrigated and grazed pasture along the right bank (when facing downstream) of the Yakima River. The site is currently fallow and dominated by weeds and non-native herbaceous species in upland areas, including tall false rye grass (*Schedonorus arundinaceus*), bluegrass (*Poa* spp.), remnant planted common timothy (*Phleum pretense*), garden yellow rocket (*Barbarea vulgaris*), hairy cat's-ear (*Hypochaeris radicata*), common dandelion (*Taraxacum officinale*), and white clover (*Trifolium repens*). In addition, the site has patches of noxious weeds, including Canadian thistle (*Cirsium arvense*), Scotch thistle (*Onopordum acanthium*), yellow nutsedge (*Cyperus esculentus*), and reed canary grass (*Phalaris arundinacea*). The generation tie line crosses areas of rural residential use, existing driveways and access roads, and a manicured gold course, including some areas with mature grand fir (*Abies grandis*), ponderosa pine (*Pinus ponderosa*), quaking aspen (*Populus tremuloides*), and crack willow (*Salix* X *fragilis*) trees, with Nootka rose (*Rosa nutkana*) shrubs along the EP Canal and nearby residences and other structures further south. Refer to Appendix B for a complete list of vegetation observed within the study area.

The proposed solar site is situated between the Yakima River and the Ellensburg Golf and Country Club to the east, active agricultural land to the north and west, and a wetland drainage and rural residence to the south. The generation tie line crosses over the EP Canal three times and over two ephemeral ditches that run along the existing access road and pass under the road through a culvert, until it ultimately terminates at Thorp Highway South to the south.

According to NRCS, the Typha Solar Project study area encompasses four different soil map units within the project site and three different soil map units with the generation tie line (Table 5). These soil map units range from somewhat poorly drained to well drained soils that occur on terraces, floodplains, valleys, and fans. The Weirman-Kayak-Zillah complex soil unit is on the National Hydric Soils list (NRCS 2015), which is a list of soils that can be indicative of saturated, flooded, or ponded areas that could meet the definition of a hydric soil.

Table 5. Soil Mapping within the Study Area

Map Unit Symbol	Map Unit Name	Hydric
621	Mitta ashy silt loam, flooded, 0%–2% slopes	No
622	Manastash loam, 0%–2% slopes	No
715	Weirman gravelly sandy loam, 0%–2% slopes	No
791	Mitta ashy silt loam, drained, 0%–2% slopes	No
809	Weirman-Kayak-Zillah complex, 0%–2% slopes	Yes
838	Nosal ashy silt loam, 0%–2% slopes	No
839	Vanderbilt ashy loam, 0%–2% slopes	No

Source: NRCS 2015 and 2017b.

3.1 Wetlands

Five wetlands were delineated within the Typha Solar Project study area (three only on the solar site, one only on the generation tie line, and one on both). Wetlands were distinguished from adjoining uplands by the presence or absence of indicators for wetland hydrology, hydric soils, and hydrophytic vegetation. Wetland delineation data sheets are provided in Appendix C, photographs are provided in Appendix D, and wetland rating forms are provided in Appendix E.

Table 6 summarizes the size, rating, and classification of wetlands found within the study area. All delineated wetlands would fall under the jurisdiction of the USACE, Ecology, and Kittitas County. Figures 4 and 5 show the locations of the wetlands, streams, data plots, and their associated minimum protection buffers. The minimum wetland protection buffers were calculated per KCC guidance based on Ecology's Wetland Rating for each wetland. Detailed descriptions of each wetland are provided in the following sections.

Table 6. Wetland Size, Rating, and Classification for Wetlands within the Study Area

Wetland Name	Delineated Area within the Project (Wetland Rating Unit Size) [a] (acres)	Wetland Rating [b]	Hydrogeomorphic Classification	Cowardin Classification [c]	Dominant Species Observed within Wetland
Solar Site					
TW01	0.07 (estimated 0.33)	II	Riverine	PEM/PSS	Narrow-leaf willow, Nootka rose, red osier dogwood, common panic grass, and hairy cat's-ear
TW02	0.38 (estimated 0.68)	II	Riverine	PEM	Baltic rush, tall false rye grass, common timothy, reed canary grass, and Fuller's teasel
TW03	0.35 (estimated 8.45)	II	Riverine	PEM/PSS	Reed canary grass, common duckweed, Rocky Mountain iris, and bluegrass
TW04	0.04 (0.05)	III	Depressional	PEM	Broad-leaf cat-tail, reed canary grass, and tall false rye grass
Generation Tie Line					
TW03	0.07 (estimated 8.45)	II	Riverine	PEM/PSS	Reed canary grass, common duckweed, Rocky Mountain iris, and bluegrass
TW05	0.03 (estimated 0.47)	III	Riverine	PEM	Broad-leaf cat-tail, reed canary grass, and Baltic rush

a Wetland rating unit size is the total area of wetland delineated or estimated based on aerial photograph interpretation and field reconnaissance. Area of delineated portions of the wetlands is based on SWCA survey data.

b Wetland ratings are based on *Washington State Wetland Rating System for Eastern Washington – Revised* (Hruby 2014).

c Cowardin et al. (1979).

3.1.1 Wetland TW01

Palustrine emergent/scrub-shrub
Category II
0.07 acre within the project site, approximately 0.33 acre in total

Wetland TW01 is a riverine wetland located in the northeastern corner of the Typha Solar Project site, within the floodplain of the Yakima River (see Figure 5; and wetland rating Figures 1 through 4 in Appendix E). Delineation data were recorded at sample plots TP01 and TP02, provided on datasheets in Appendix C. The wetland extends off-site to the east to connect to the Yakima River, with its southwestern boundary defined by a subtle rise in topography and a change in the plant community. Wetland TW01 is located within the 100-year floodplain for the Yakima River (see Figure 2).

Wetland TW01 is composed of two Cowardin types, with palustrine emergent (PEM) wetland on the project side of the property boundary fence and palustrine scrub-shrub (PSS) wetland on the other side of the fence toward the Yakima River (Cowardin et al. 1979). Refer to Table A-1 in Appendix A for definitions of wetland indictor statuses listed in this section (i.e., FACU, FAC, FACW, and OBL). The PEM side is sparsely vegetated and consists of narrow-leaf willow (*Salix exigua*, FACW) saplings, common panic grass (*Panicum capillare*, FACU), and hairy cat's-ear (FACU). The off-site PSS portion of the wetland is dominated by narrow-leaf willow, red osier dogwood (*Cornus alba*, FACW), and Nootka rose (FACU).

Soils in Wetland TW01 are mapped as Weirman-Kayak-Zillah complex, with 0% to 2% slopes (NRCS 2017a) (see Figure 3). The typical soil profile observed within 16 inches of the soil surface consists of very dark brown (10YR 2/2) silt loam with redoximorphic features starting at 7 inches (Munsell Color 2009). The soils in Wetland TW01 meet the hydric soil indicator for Redox Dark Surface (F6).

No primary indicators of hydrology within the wetland were observed. The only secondary indicator observed was saturation visible on aerial imagery. This wetland was determined to have problematic hydrology under the USACE's 2008 *Arid West Regional Supplement (Version 2)* and, therefore, the presence of positive hydric soil and wetland vegetation indicators, and relative landscape position within the 100-year floodplain, was relied upon for the wetland determination.

Wetland TW01 is rated as a Category II wetland in the Ecology rating system (see Table 3), with a moderately high score for water quality improvement (7/9 points) and moderate scores for hydrologic function (6/9) and habitat function (5/9 points). Wetland TW01 has moderately high potential to provide water quality improvements because of its position within the Yakima River floodplain, which is a 303(d) listed water, which has total maximum daily load (TMDL) limits, and has flooding problems within its watershed.

3.1.2 Wetland TW02

Palustrine emergent
Category II
0.38 acre within the project site, approximately 0.68 acre in total

Wetland TW02 is a riverine wetland drainage that crosses the southern middle of the site from west to east, is fed from overbank flooding from Wetland TW03, and feeds into the Yakima River east of the Typha Solar Project site (see Figure 5; and wetland rating Figures 1 through 5 in Appendix E). Delineation data were recorded at sample plots TP03, TP04, TP06, TP07, and TP08 and is provided on datasheets in Appendix C. This wetland has small areas of upland separating the wetland areas because of the slight berms along the tracks of the circular irrigator that passes through this wetland. The upland boundary of the wetland is defined by an obvious rise in elevation on either side of this wetland drainage.

Wetland TW02 is a PEM wetland habitat type (Cowardin et al. 1979). The wetland is dominated by Baltic rush (*Juncus balticus*, FACW), tall false rye grass (FACU), and remnant planted common timothy (FACU), with Nootka rose, narrow-leaf willow, Fuller's teasel (*Dipsacus fullonum*, FAC), and reed canary grass off-site to the east of the project site. The dominance of these species meets the wetland vegetation criteria. Wetland TW02 is partially located within a NWI-mapped palustrine emergent, persistent, seasonally flooded (PEM1C) wetland (see Figure 2).

Soils in Wetland TW02 are mapped as Weirman-Kayak-Zillah complex, with 0% to 2% slopes, and Weirman gravelly sandy loam, with 0% to 2% slops (NRCS 2017a) (see Figure 3). The soil profile observed within 16 inches of the soil surface in the eastern portion of the wetland consists of black (2.5Y 2.5/1) silt loam over a black silty clay loam with depletions of dark grayish brown (2.5Y 4/2) and redoximorphic features starting at 3 inches (Munsell Color 2009). The soil profile in the western portion of the wetland consists of black (10YR 2/1) silty clay loam with redoximorphic features starting at 7 inches, with a thin layer of sand at 10 inches. The soils in Wetland TW02 meet the hydric soil indicator for Redox Dark Surface (F6).

Primary indicators of hydrology within the wetland include saturation within the upper 12 inches and surface soil cracks. Secondary indicators of hydrology observed within the wetland include drainage patterns and saturation visible on aerial imagery. The presence of these indicators meets wetland hydrology criteria.

Wetland TW02 is rated as a Category II wetland in the Ecology rating system, with a moderately high score for hydrologic function (7/9 points) and moderate scores for habitat function (6/9 points) and water quality improvement (6/9 points). Wetland TW02 has moderately high potential to provide

hydrologic functions because of its potential to slow down water movement and help reduce flooding issues directly downstream in the Yakima River.

3.1.3 Wetland TW03

Palustrine emergent/scrub-shrub
Category II
0.35 acre in the project site and 0.07 acre in the generation tie line, approximately 8.45 acres in total for the wetland unit

Wetland TW03 is a riverine wetland that surrounds a drainage that starts just outside of the western project site boundary and extends south and east along the southern study area boundary. This wetland is fed by runoff and irrigation from the agricultural fields to the north and west of the wetland and includes areas of open water as the drainage extends south and west, eventually feeding into the Yakima River east of the study area (see Figure 5; and wetland rating Figures 1 through 5 in Appendix E). Delineation data were recorded at sample plots TP05 and TP11 and is provided on datasheets in Appendix C. The drainage passes through many culverts along its route east, but the culverts are partially obstructed, causing the water to flood over the higher elevation areas between the main drainage reaches; therefore, these areas are included in the wetland. The upland boundary of the wetland is defined by an obvious rise in elevation on either side of the overall drainage.

Wetland TW03 is mostly a PEM wetland habitat type with some PSS areas off-site to the east of the project site (Cowardin et al. 1979). The wetland is dominated by reed canary grass, common duckweed (*Lemna minor*, OBL), Rocky Mountain iris (*Iris missouriensis*, FACW), bluegrass (*Poa* spp., FAC), tall false rye grass, and yellow nutsedge (FACW), with some broad-leaf cat-tail (*Typha latifolia*, OBL), Fuller's teasel, and narrow-leaf willow in the eastern portion of the wetland. The dominance of these species meets the wetland vegetation criteria. Wetland TW03 is located within two different NWI-mapped PEM1C wetland polygons, one along the western project site boundary and one in the southeastern corner of the project site that extends off-site (see Figure 2).

Soils in Wetland TW03 are mapped as Nosal ashy silt loam with 0% to 2% slopes; Mitta ashy silt loam, drained with 0% to 2% slopes; Weirman-Kayak-Zillah complex with 0% to 2% slopes; and Weirman gravelly sandy loam with 0% to 2% slopes (NRCS 2017a) (see Figure 3). The soil profile observed within 16 inches of the soil surface consists of black (2.5Y 2.5/1) silty clay loam with depletions of dark grayish brown (10YR 4/2) and redoximorphic features starting at 8 inches (Munsell Color 2009). The soils in Wetland TW03 meet the hydric soil indicator for Redox Dark Surface (F6).

Primary indicators of hydrology within this wetland include aquatic invertebrates. Secondary indicators of hydrology observed within the wetland include drift deposits (riverine) and drainage patterns. The presence of these indicators meets wetland hydrology criteria.

Wetland TW03 is rated as a Category II wetland in the Ecology rating system, with a high score for hydrologic function (8/9 points) and moderate scores for habitat function (6/9 points) and water quality improvement (6/9 points). Wetland TW03 has high potential to provide hydrologic functions because of its large wetland to channel width ratio and its potential to help reduce flooding issues directly downstream in the Yakima River.

3.1.4 Wetland TW04

Palustrine emergent
Category III
0.04 acre within the project site, 0.05 acre in total

Wetland TW04 is a depressional wetland located at the southern project site boundary, approximately 25 feet north of TW03 (see Figure 5; and wetland rating Figures 1 through 5 in Appendix E). Delineation data were recorded at sample plots TP09 and TP10 and is provided on datasheets in Appendix C. This wetland is fed by overland flow that is intercepted before entering TW03 and has seasonal ponding that provides frog habitat. Frog egg masses were observed in this wetland during the site visit. The upland boundary of the wetland is defined by an obvious rise in elevation in all directions.

Wetland TW04 is a PEM wetland habitat type (Cowardin et al. 1979). The wetland is dominated by broad-leaf cat-tail, reed canary grass, and tall false rye grass. The dominance of these species meets the wetland vegetation criteria.

Soils in Wetland TW04 are mapped as Weirman-Kayak-Zillah complex with 0% to 2% slopes, and Mitta ashy silt loam, drained with 0% to 2% slopes (NRCS 2017a) (see Figure 3). The soil profile observed within 16 inches of the soil surface consists of black (10YR 2/1) silt loam with depletions of dark grayish brown (2.5Y 4/2) and medium to large rocks throughout (Munsell Color 2009). This wetland was determined to have problematic soils under the USACE's 2008 *Arid West Regional Supplement (Version 2)* and, therefore, the presence of positive wetland hydrology and wetland vegetation indicators, and the presence of rocks throughout the soil profile, which made detecting redoximorphic features difficult, was relied upon for the wetland determination.

Primary indicators of hydrology within the wetland include saturation and a high water table within the upper 12 inches and drift deposits (nonriverine). The presence of these indicators meets wetland hydrology criteria.

Wetland TW04 is rated as a Category III wetland in the Ecology rating system, with moderate scores for water quality improvement (6/9 points), hydrologic function (6/9 points), and habitat function (6/9 points). Wetland TW04 has moderate potential to provide water quality improvement and hydrologic function because of its lack of a surface water outlet, and it provides moderate habitat function because it provides amphibian egg laying habitat, as positively observed in the field.

3.1.5 Wetland TW05

Palustrine emergent
Category III
0.03 acre within the project site, approximately 0.47 acre in total

Wetland TW05 is a riverine wetland fed by flooding from the EP Canal through a culvert under the access road along the eastern wetland boundary (see Figure 5; and wetland rating Figures 1 through 5 in Appendix E). Delineation data were recorded at sample plots TP12, TP13, and TP14 and is provided on datasheets in Appendix C. This wetland is partially mowed along the western boundary where it overlaps with the Ellensburg Golf and Country Club driving range. The upland boundary of the wetland is defined by an obvious rise in elevation along the access road and a subtle elevation change and vegetation community change to the west.

Wetland TW05 is a PEM wetland habitat type (Cowardin et al. 1979). The wetland is dominated by broad-leaf cat-tail, reed canary grass, and Baltic rush, with a few crack willow (FAC) near the culvert. The dominance of these species meets the wetland vegetation criteria.

Soils in Wetland TW05 are mapped as Mitta ashy silt loam, flooded, with 0% to 2% slopes (NRCS 2017a) (see Figure 3). The soil profile observed within 16 inches of the soil surface consists of black (2.5Y 2.5/1) mucky mineral soil over a black gleyed (N 2.5/0) layer within the upper 5 inches and very dark gray (2.5Y 3/1) silt loam with depletions of greyish brown (2.5Y 5/2) below 5 inches (Munsell Color 2009). The soils in Wetland TW05 meet the hydric soil indicator for Loamy Gleyed Matrix (F2).

Primary indicators of hydrology within the wetland include a water table at 12 inches and saturation to the soil surface. The presence of these indicators meets wetland hydrology criteria.

Wetland TW05 is rated as a Category III wetland in the Ecology rating system, with a moderately high score for hydrologic function (7/9 points), a moderately low score for water quality improvement (5/9 points), and a low score for habitat function (4/9 points). Wetland TW05 has moderately high potential to provide hydrologic functions because of its potential to store floodwaters and help reduce flooding issues directly downstream in the Yakima River, and it has a low score for habitat function because it does not provide adequate habitat structure and is isolated from habitat in the surrounding area.

3.2 Frequently Flooded Areas

FEMA floodplain mapping depicts the 100-year floodplain adjacent to the Yakima River, which extends onto the northeastern corner of the project site (see Figure 2). This area overlaps Wetland TW01 with a total area of 0.11 acre within the project site, and will likely be avoided during project design. Development within the 100-year floodplain will be avoided; therefore, no net loss of floodplain storage will be achieved.

3.3 Geologically Hazardous Areas

The Typha Solar Project site is not within any mapped geologically hazardous areas. No erosion/landslide geologic hazard areas, snow avalanche hazards, or mine hazard areas are mapped on any of the parcels that encompass the project site (Kittitas County 2017). The project will not require specialized engineering to ascertain that the property is suitable for development.

3.4 Habitats

Based on the criteria provided in KCC Chapter 17A.07, the Typha Solar Project study area includes riparian habitat and priority species habitat. The Typha Solar Project is not located on federal land or land owned or leased by the WDFW, and therefore is not considered big game winter range.

3.4.1 Riparian Habitat

One perennial canal (EP Canal) and two ephemeral ditches are located in the Typha Solar Project study area. In addition, the Yakima River is located within 200 feet of the project site. Based on the field observations, the EP Canal and the Yakima River are considered jurisdictional waters for the USACE, Ecology, and Kittitas County because they satisfy the definition of “waters of the United States” under the Clean Water Rule 40 CFR 230.3. The two ephemeral ditches ultimately feed into the EP Canal; one that runs along the south side of the access road and another that crosses under the road from north to south through a culvert, connecting to the first ditch. Because these ditches are hydrologically connected to the EP Canal, they will likely be considered jurisdictional. Table 7 summarizes the size,

rating, and classification of the streams found in the study area (see Figures 4 and 5). Photographs of these features are provided in Appendix D.

Table 7. Summary of Streams in the Study Area

Stream Name	Tributary to	Stream Type [a]	USACE Jurisdiction [b]	Average Width in Study Area (feet) [c]	Approximate Length in the Project (feet) [c]
Yakima River	Columbia River	S	RPW	158	0
EP Canal (TS01)	Yakima River	N/A	RPW	45	540
Unnamed Ephemeral Ditch 1	EP Canal	N/A	NRPW	4	115
Unnamed Ephemeral Ditch 2	EP Canal	N/A	NRPW	10	42

[a] S = shoreline of the state (WAC 222-16-030), N/A = not applicable, due to ditches and canals being excluded from the WAC typing system.

[b] RPW = relatively permanent water; NPRW = non-relatively permanent water.

[c] Average widths and approximate lengths were determined based on SWCA survey data and field observations.

3.4.1.1 Yakima River

The Yakima River is a perennial, fish bearing tributary of the Columbia River with a 6,150-square-mile drainage basin. The Yakima River is located approximately 35 feet outside of the project site, but is within 200 feet of the eastern project site boundary for approximately 1,150 feet. In the vicinity of the study area, the Yakima River is approximately 160 feet wide, with Wetland TW01 delineated within the 100-year floodplain. The project site is located near the cut bank, actively eroding, west side of the Yakima River, which may pose a long-term threat to the stability of the project site near the river. The thin riparian area between the project site and the Yakima River is dominated by herbaceous species, including stinging nettle (*Urtica dioica*), Fuller's teasel, Canadian thistle, and great mullein (*Verbascum thapsus*), with some areas of shrubs and saplings that included ponderosa pine, black hawthorn (*Crataegus douglasii*), narrow-leaf willow, red osier dogwood, and Nootka rose. According to WDFW mapping (WDFW 2017a, WDFW 2017b), coho (*Oncorhynchus kisutch)*, Chinook (*O. tshawytscha*), steelhead (*O. mykiss*), cutthroat (*O. clarki lewisi*), and bull trout (*Salvelinus confluentus*) are present in the Yakima River in the vicinity of the project site. Based on the Washington Water Typing Criteria (WAC 222-16-030) and the Shoreline Management Act's list of streams and rivers constituting shorelines of the state for Kittitas County (WAC 173-18-230), this portion of the Yakima River is designated as a shoreline of the state (Type S).

3.4.1.2 Ellensburg Power Canal

The EP Canal is a perennial canal tributary to the Yakima River, located in the generation tie line, and is spanned three times by the existing line. Wetland TW05 receives floodwater from the EP Canal through a culvert under the access road that passes along the southwestern bank and crosses over the canal to the north. Within the study area, the EP Canal's OHWM is approximately 45 feet wide at each of the crossings. Vegetation on the riparian banks of this stream primarily consists of reed canary grass, stinging nettle, prickly lettuce (*Lactuca serriola*), Nootka rose, crack willow, narrow-leaf willow, black locust (*Robinia pseudoacacia*), quaking aspen, ponderosa pine, and grand fir.

Current WDFW mapping suggests that fish species do not occur in the EP Canal (WDFW 2017a, 2017b). This canal is highly manipulated by flow control measures to manage irrigation in the area; therefore, it is highly unlikely to support fish populations. Based on the Washington Water Typing Criteria (WAC 222-16-031) guidance, EP Canal does not fall into this typing system because it is a managed canal and not a stream.

3.4.2 Priority Habitats and Species

PHS fish species are designated in the portion of the Yakima River that is adjacent to the Typha Solar Project study area and include coho, rainbow trout (*O. mykiss*), summer steelhead, spring Chinook, bull trout (*Salvelinus malma*), and westslope cutthroat (WDFW 2017a). In addition, there is a great blue heron (*Ardea herodias*) rookery and osprey (*Pandion haliaetus*) occurrence point on the east bank of the Yakima River, opposite and within 300 feet of the project site (WDFW 2017a). Great blue heron were observed during site visits foraging in the project site. PHS mapping is depicted in Figure 3.

These PHS-mapped areas occur off-site and within the protection buffers of other wetland and water features; therefore, no additional designation will be required under KCC 17A.07.020.

3.5 Aquifer Recharge Areas

As described in KCC 17A.08.010, no critical aquifer recharge locations have been identified in Kittitas County. Additionally, the Typha Solar Project will not involve any hazardous materials or disposal of on-site sewage. No well-heads have been identified within the study area.

4 CONCLUSIONS AND RECOMMENDATIONS

EFSEC will provide permitting requirements for the Typha Solar Project, but this report evaluates and shows compliance with County requirements. A review of the Typha Solar Project study area determined that the following Kittitas County defined critical areas have the potential to be affected by the project:

- Wetlands
- Frequently Flooded Areas
- Habitats:
    - Riparian Habitat

A summary of all wetlands, waters, and critical area buffers documented within the study area is provided in Table 8. The wetland and non-wetland waters identified in and adjacent to the study area will likely be determined jurisdictional by Ecology and the USACE. Although EFSEC will provide permitting requirements for the proposed project, to show compliance with County requirements, KCC guidance (Chapter 17A.07.010) defines a minimum 40-foot protection buffer for Type S waters, such as the Yakima River. However, up to a 200-foot protection buffer could be requested once Kittitas County has had the opportunity to review the results of this study and has had discussions with TUUSSO Energy (see Figures 4 and 5). KCC guidance does not define protection buffers for irrigation canals and ditches, such as The EP Canal and the delineated ephemeral ditches, because they do not qualify as streams. The minimum and maximum wetland protection buffers required by the KCC (Chapter 17A.04.020) are listed in Appendix F, and are provided for these wetlands in Table 8, but only the minimum protection buffers are depicted on Figures 4 and 5. Consultation with the County would be required to determine exact buffer distances.

Table 8. Wetland and Waters Summary

Critical Area	Wetland Rating/Water Typing [a]	Kittitas County Minimum/Maximum Buffer Distances (feet) [b]	Total Size of Feature Within the Project (acres) [c]
Wetlands			
Wetland TW01	II	25 / 100	0.07
Wetland TW02	II	25 / 100	0.38
Wetland TW03	II	25 / 100	0.42
Wetland TW04	III	0 / 0 [d]	0.04
Wetland TW05	III	20 / 80	0.03
Frequently Flooded Areas			
Yakima River flood zone	N/A	N/A	0.11
Riparian Habitat			
Yakima River	S	40 / 200	0.00
EP Canal (TS01)	N/A	None	0.44
Ditches	N/A	None	0.02

[a] II = Category II (Hruby 2014); III = Category III (Hruby 2014); S = shoreline of the state (WAC 22-16-030);
[b] Only minimum buffer distances are depicted on maps;
[c] Does not include buffer areas;
[d] No Kittitas County buffer is defined because the wetland area is below the minimum size threshold for protection; however, building setbacks may be required based on zoning lot line setbacks, but would not exceed 25 feet.

Design plans are incomplete for the proposed Typha Solar Project; however, TUUSSO Energy will attempt to design the project to avoid, reduce, or eliminate impacts to wetlands, waters, and their buffers. Following the finalization of the design footprint, all removal-fill activities proposed within jurisdictional features would require a Joint Aquatic Resources Permit Application (JARPA) submitted for USACE and Ecology review.

There is no minimum threshold to implement mitigation sequencing for potential impacts to wetland and waters features. Where possible, the Typha Solar Project should demonstrate avoidance of jurisdictional features and then minimization of impacts. Avoidance and minimization could be achieved by making minor design alterations around delineated feature boundaries.

Where impact avoidance is not possible, mitigation measures should be implemented to minimize temporary construction disturbance and other permanent alterations to the features. Mitigation would include the implementation of construction best management practices. Where permanent alterations to wetland and waters features are unavoidable, wetland mitigation measures to achieve “no net loss” would be required. Desktop research shows that there are no approved mitigation banks or in-lieu fee programs in Kittitas County; therefore, any mitigation that would be required must be conducted as an Advance Permittee-Responsible Mitigation. Under KCC guidance (Chapter 17A.04.050), the mitigation ratio for a Category II wetland is 2:1, and the mitigation ratio for a Category III wetland is 1:1.

5 DISCLAIMER

This report documents the investigation, best professional judgment, and conclusions of the investigators. This should be considered a Preliminary Jurisdictional Determination of wetlands and other waters and is not a final determination.

6 LITERATURE CITED AND REVIEWED

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. FWS/OBS-79/31. Washington, D.C.: U.S. Fish and Wildlife Service. Available at: http://www.fws.gov/wetlands/Documents/Classification-of-Wetlands-and-Deepwater-Habitats-of-the-United-States.pdf.

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual*. Technical Report Y-87-1. Online edition. Vicksburg, Mississippi: U.S. Army Engineer Waterways Experiment Station. Available at: http://el.erdc.usace.army.mil/wetlands/pdfs/wlman87.pdf.

Hruby, T. 2014. *Washington State Wetland Rating System for Eastern Washington – Revised.* Washington State Department of Ecology Publication No. 14-06-030. Olympia, Washington: Department of Ecology. Available at: https://fortress.wa.gov/ecy/publications/SummaryPages/1406030.html. Accessed March 10, 2017.

Kittitas County Code (KCC). 2017. Kittitas County, Washington, Ordinances and Resolutions. Available at: http://co.kittitas.wa.us/boc/countycode/. Accessed March 13, 2017.

Kittitas County. 2017. COMPAS Mapping Tool Parcel Report. Available at: https://gis.co.kittitas.wa.us/compas/default.aspx. Accessed May 2, 2017.

Lichvar, R.W., D.L. Banks, W.N. Kirchner, and N.C. Melvin. 2016. *The National Wetland Plant List: 2016 Wetland Ratings.* Phytoneuron 2016-30:1–17. Available at: http://www.phytoneuron.net/ and http://rsgisias.crrel.usace.army.mil/NWPL/. Accessed May 3, 2016.

Munsell Color. 2009. Munsell Soil-Color Charts. Revised Edition. Grand Rapids, Michigan: Munsell Color.

Natural Resources Conservation Service (NRCS). 2008. *Hydrogeomorphic Wetland Classification System: An Overview and Modification to Better Meet the Needs of the Natural Resources Conservation Service*. Technical Note No. 190-8-79. Available at: http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs143_010784.pdf.

———. 2015. List of Hydric Soils. December 2015. Available at: http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/use/hydric/. Accessed March 9, 2016.

———. 2017a. Web soil survey. Available at: http://websoilsurvey.nrcs.usda.gov/app/. Accessed March 10, 2017.

———. 2017b. WETS and precipitation data for Ellensburg, Washington. Available at: http://agacis.rcc-acis.org/. Accessed May 2, 2017.

Olson, P., and E. Stockdale. 2010. *Determining the Ordinary High Water Mark on Streams in Washington State*. Second Review Draft. Ecology Publication No. 08-06-001. Lacey, Washington: Washington State Department of Ecology, Shorelands and Environmental Assistance Program.

U.S. Army Corps of Engineers (USACE). 2008. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0)*, edited by J.S. Wakeley, R.W. Lichvar, and C.V. Noble. ERDC/EL TR-08-28. Vicksburg, Mississippi: U.S. Army Engineer Research and Development Center.

U. S. Department of Agriculture (USDA). 1954. Kittitas County. Central Washington Historical Aerial Photograph Project. Central Washington University, Department of Geography. Available at: http://www.gis.cwu.edu/geog/historical_airphotos/. Accessed on June 23, 2017.

U. S. Fish and Wildlife Service (USFWS). 2017. National Wetland Inventory. Wetlands Online Mapper. Available at: http://wetlandsfws.er.usgs.gov/wtlnds/launch.html. Accessed March 10, 2017.

Washington State Department of Ecology (Ecology). 1997. Washington State Wetland Identification and Delineation Manual. Publication No. 96-94. Olympia, Washington: Washington State Department of Ecology.

Washington State Department of Fish and Wildlife (WDFW). 2017a. Priority Habitats and Species on the Web. Available at: http://wdfw.wa.gov/mapping/phs/. Accessed March 10, 2017.

———. 2017b. SalmonScape. Available at: http://wdfw.wa.gov/mapping/salmonscape. Accessed March 10, 2017.

APPENDIX A: WETLAND DELINEATION METHODOLOGY

Wetlands are defined as areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and which under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. The methods used to delineate wetlands within the study area conform to guidance in the *Washington State Wetland Identification and Delineation Manual* (Ecology 1997), the *Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987), and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0)* (USACE 2008).

To be considered a wetland by the U.S. Army Corps of Engineers (USACE), an area must express hydrophytic vegetation, hydric soils, and wetland hydrology. SWCA Environmental Consultants (SWCA) staff documented site conditions for these parameters in areas representative of the study area and in areas most likely to exhibit wetland features. Staff collected additional data in associated uplands, as needed, to confirm wetland boundaries. Wetland boundaries, stream boundaries, and wetland data plot locations in the study area were recorded with a Trimble Geo XT global positioning system (GPS) unit. All delineated wetlands and streams were processed and projected onto existing base maps using ArcGIS software.

Vegetation

The dominant and sub-dominant plants were identified and recorded at each sample plot location. These plants were evaluated based on their wetland indicator status to determine if the vegetation was hydrophytic. SWCA biologists utilized the 50/20 rule per USACE recommendations to determine which plants were dominant at each sample plot. Under this guidance, absolute cover estimates were made for each species found rooted within the sample plot radius for each vegetative strata found in the habitat (tree, sapling/shrub, herb, and woody vine). Refer to the USACE regional supplement for exact applications of this method of determining dominance (USACE 2008).

Sample plot radii varied in size depending on site topography and habitat complexity. When documenting vegetation in smaller or oddly-shaped wetlands or habitat features, vegetation strata radii may be adjusted to more accurately depict vegetation rooted within the wetland or habitat feature being delineated.

Hydrophytic vegetation is defined as vegetation adapted to wetland conditions, such as inundation or prolonged saturation. To meet the hydrophytic vegetation criterion, more than 50% of the total dominant plants across all stratums must have a wetland indicator status of Facultative (FAC), Facultative Wetland (FACW), or Obligate (OBL). The wetland indicator status is assigned to plant species that have the potential to occur in wetlands by the USACE (Lichvar et al. 2016). Table A-1 lists the definitions for each wetland indicator status.

Table A-1. Definitions for Each Wetland Plant Indicator Status

Wetland Indicator Status	Symbol	Definition
Obligate Wetland Plants	OBL	Plants that almost always (> 99% of the time) occur in wetlands, but which may rarely (< 1% of the time) occur in non-wetlands.
Facultative Wetland Plants	FACW	Plants that often (67 to 99% of the time) occurs in wetlands, but sometimes (1 to 33% of the time) occur in non-wetlands.
Facultative Plants	FAC	Plants with a similar likelihood (34 to 66% of the time) of occurring in both wetlands and non-wetlands.
Facultative Upland Plants	FACU	Plants that sometimes (1 to 33% of the time) occur in wetlands, but occur more often (67 to 99% of the time) in non-wetlands.
Upland Plants	UPL	Plants that rarely (< 1% of the time) occur in wetlands, and almost always (> 99% of the time) occur in non-wetlands.

Source: Lichvar et al. (2016).

SWCA biologists identified plants found in the field to species whenever possible, when adequate vegetative or flowering characteristics were available. Scientific and common plant names were reported with the currently accepted nomenclature.

Soils

An area typically must contain hydric soils to be considered a wetland, except when problematic site conditions occur. Hydric soils typically form under an area that experiences durations of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper portion of the soil profile. Chemical and biological processes in saturated soil result in reduced oxygen concentrations and promote anaerobic metabolism in microorganisms. These prolonged anaerobic conditions often create mottling and other distinct patterns in the soil, which are used as indicators of hydric soils. The hue, value, and chroma and relative percentage of mottling are recorded in the field at each data plot location. Other important hydric soil indicators include organic matter accumulations in the surface horizon, reduced sulfur odors, and organic matter staining in the soil profile (Natural Resource Conservation Service [NRCS] 2017a).

SWCA staff examined soil profiles at each data plot location by excavating sample pits to a depth of 16 to 20 inches to observe the soil profile, colors, and textures. In some cases, a shallower soil pit was used due to shovel refusal from obstructions in the soil profile, such as gravel, bedrock, thick roots, or clay hardpan. Munsell color charts (Munsell Color 2009) were used to determine soil colors in the field.

Hydrology

SWCA staff investigated the entire project area for evidence of wetland hydrology. Where data plot locations were taken, additional notes were recorded to fully document the presence of primary and secondary wetland hydrology indicators at the sample location. According to the USACE, wetland hydrology criteria were considered to be satisfied if the soil was seasonally inundated or saturated to the surface for a consecutive number of days greater than or equal to 12.5% of the growing season. The growing season for the area was determined based on the period in which temperatures are above 28 degrees Fahrenheit 5 out of 10 years (Ecology 1997) using the long-term climatological data collected by the NRCS (2017). Using the wetlands climate analysis (WETS) table for the nearest station (Ellensburg, Washington), the growing season was approximated as typically between April 20 and October 10, or a total of 173 days (NRCS 17b).

However, often times multiple site visits to determine the duration of seasonal inundation or saturation are not possible. Therefore, field indicators are used in an attempt to determine an area's hydro-period through field observations. Wetland hydrology indicators are divided into two categories: primary and secondary indicators (USACE 2008). Primary indicators of hydrology include, but are not limited to, surface inundation and high water table and saturated soils within 12 inches of the soil surface. The presence of one primary indicator is sufficient to conclude that wetland hydrology is present. Secondary hydrology indicators are also recorded and may substitute in the case of a lack of any primary indicators if multiple secondary indicators are observed. Secondary indicators of hydrology include, but are not limited to, drainage patterns, crayfish burrows, and dry-season water table (USACE 2008). If no primary indicators, and fewer than two secondary indicators, are observed within the sample area, then it is likely that the area is not considered a wetland, unless problematic conditions exist on-site. Aerial and historic imagery are often reviewed before and after site visits to ensure all possible hydrology indicators are taken into account.

References

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual*. Technical Report Y-87-1. Online edition. Vicksburg, MSMississippi: U.S. Army Engineer Waterways Experiment Station. Available at: http://el.erdc.usace.army.mil/wetlands/pdfs/wlman87.pdf.

Lichvar, R.W., D.L. Banks, W.N. Kirchner, and N.C. Melvin. 2016. *The National Wetland Plant List: 2016 Wwetland Rratings.* Phytoneuron 2016-30:1–17. Available at: http://www.phytoneuron.net/ and http://rsgisias.crrel.usace.army.mil/NWPL/. Accessed May 3, 2016.

Munsell Color. 2009. Munsell Soil-Color Charts. Revised Edition. Grand Rapids, MichiganI: Munsell Color.

Natural Resources Conservation Service (NRCS). 2017a. *Field Indicators of Hydric Soils in the United States, a Guide for Identifying and Delineating Hydric Soils, Version 8.1*. Edited by L.M. Vasilas, G.W. Hurt, and J.F. Berkowitz. Available at: https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_053171.pdf. Accessed March 10, 2017.

———. 2017b. WETS and precipitation data for Ellensburg, Washington. Available at: http://agacis.rcc-acis.org/. Accessed May 2, 2017.

U.S. Army Corps of Engineers (USACE). 2008. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0)*, edited by. J.S. Wakeley, R.W. Lichvar, and C.V. Noble. ERDC/EL TR-08-28. Vicksburg, MississippiS: U.S. Army Engineer Research and Development Center.

Washington State Department of Ecology (Ecology). 1997. Washington State Wetland Identification and Delineation Manual. Publication No. #96-94. Olympia, Washington: Washington State Department of Ecology.

APPENDIX B: VEGETATION LIST

Typha Solar Site and Transmission Line Project
Vegetation Table
April 3, 4, and 12, 2017

Common Name	Scientific Name	Wetland Indicator Status[1]	Native / Introduced and Invasive / Noxious
Grand Fir	*Abies grandis*	FACU	native
Garden Yellow-Rocket	*Barbarea vulgaris*	FAC	non-native
Canadian Thistle	*Cirsium arvense*	FACU	invasive, noxious
Red Osier	*Cornus alba*	FACW	native
Black Hawthorn	*Crataegus douglasii*	FAC	native
Chufa (yellow nutsedge)	*Cyperus esculentus*	FACW	native, noxious
Fuller's Teasel	*Dipsacus fullonum*	FAC	invasive, noxious
Hairy Cat's-Ear	*Hypochaeris radicata*	FACU	non-native, noxious
Rocky Mountain Iris	*Iris missouriensis*	FACW	native
Baltic Rush	*Juncus balticus*	FACW	native
Prickly Lettuce	*Lactuca serriola*	FACU	non-native
Common Duckweed	*Lemna minor*	OBL	native
Spearmint	*Mentha spicata*	FACW	non-native
scotch thistle	*Onopordum acanthium*	NOL	noxious
Common Panic Grass	*Panicum capillare*	FACU	native
Reed Canary Grass	*Phalaris arundinacea*	FACW	invasive, noxious
Common Timothy	*Phleum pratense*	FACU	non-native
Ponderosa Pine	*Pinus ponderosa*	FACU	native
bluegrass	*Poa species*	FAC ?	-
Quaking Aspen	*Populus tremuloides*	FACU	native
Black Locust	*Robinia pseudoacacia*	FACU	non-native
Nootka Rose	*Rosa nutkana*	FACU	native
Curly Dock	*Rumex crispus*	FAC	non-native
Narrow-Leaf Willow	*Salix exigua*	FACW	native
crack willow	*Salix X fragilis*	FAC	non-native
Tall False Rye Grass	*Schedonorus arundinaceus*	FACU	non-native
Common Dandelion	*Taraxacum officinale*	FACU	non-native
False Mayweed	*Tripleurospermum maritimum*	FACU	non-native, noxious
White Clover	*Trifolium repens*	FACU	non-native
Broad-Leaf Cat-Tail	*Typha latifolia*	OBL	native
Stinging Nettle	*Urtica dioica*	FAC	native
Great Mullein	*Verbascum thapsus*	FACU	non-native

[1]Wetland Indicator Status (WIS) from the NWPL AW Region - see below.
A question mark (?) preceded by a space indicates our default assumption that the plant is FAC.

Wetland Indicator Status (WIS) and taxonomy for the AW Region per the National Wetland Plant List 2016v3.3:
(common names are capitalized) http://wetland-plants.usace.army.mil/ Accessed January 10, 2017
WIS for non-wetland plants and taxonomy from Reed 1988 and Reed et al. 1993, and the USDA PLANTS database:
(common names are not capitalized) http://plants.usda.gov/ Accessed multiple dates

Native per Hitchcock & Cronquist 1973 and http://plants.usda.gov/
Noxious per Washington State NWCB 2017 http://www.nwcb.wa.gov/

WETLAND INDICATOR STATUS - Arid West Region	
OBL	**Obligate Wetland** – Almost always is a hydrophyte, rarely in uplands. Examples: broad-leaf cat-tail, yellow-skunk-cabbage
FACW	**Facultative Wetland** - Usually is a hydrophyte but occasionally found in uplands. Examples: Oregon ash, red osier
FAC	**Facultative** – Commonly occurs as either a hydrophyte or non-hydrophyte. Examples: red alder, salmon raspberry
FACU	**Facultative Upland** - Occasionally is a hydrophyte but usually occurs in uplands. Examples: big-leaf maple, Himalayan blackberry
UPL	**Upland** - Rarely is a hydrophyte, almost always in uplands. These plants have been removed from the NWPL WMVC Region.
NOL	**Not Listed** - Not on the list; assumed to be UPL.

APPENDIX C: WETLAND DATA SHEETS

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Typha Solar Project City/County: - / Kittitas Sampling Date: 4/4/2017

Applicant/Owner: TUUSSO Energy, LLC State: WA Sampling Point: **TP01**

Investigator(s): Evan Dulin, Jamie Young Section, Township, Range: Section 30, T18N, R18E

Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): Concave Slope (%): 2

Subregion (LRR): B, Columbia/Snake River Plateau Lat: 47.028478 Long: -120.625543 Datum: NAD 1983

Soil Map Unit Name: Weirman-Kayak-Zillah complex, 0 to 2 percent slopes (809) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X* (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____		
Hydric Soil Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?**	**Yes X No ____**
Wetland Hydrology Present?	Yes X	No ____		

Precipitation prior to fieldwork: 0.79" two weeks prior, 2.32" above normal for CYTD, 2.78" above normal for WYTD. *Wetter than normal.

Remarks:

TWO1. Wetland is located within the 100-year floodplain of the Yakima River. PEM on-site and PSS off-site.

VEGETATION

	Absolute	Dominant	Indicator
Tree Stratum (Plot size: 30' r)	% Cover	Species?	Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1. *Salix exigua*	15%	Yes	FACW
2. *Rosa nutkana*	5%	Yes	FACU
3. *Cornus alba*	5%	Yes	FACW
4.			
5.			
	25% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Panicum capillare*	5%	Yes	FACU
2. *Hypochaeris radicata*	5%	Yes	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	10% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 90%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 40% (A/B)

Prevalence Index worksheet:

	Total % Cover of:	Multiply by:	
OBL species	0	x 1 =	0
FACW species	20	x 2 =	40
FAC species	0	x 3 =	0
FACU species	15	x 4 =	60
UPL species	0	x 5 =	0
Column Totals:	35 (A)		100 (B)

Prevalence Index = B/A = 2.86

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- ____ 2 - Dominance Test is >50%
- X 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes X No ____**

Remarks: Entered by: KL/ED QC by: TJD

The off-site PSS wetland portion is dominated by *Rosa nutkana*, *Salix exigua*, *Cornus alba*, and *Crataegus douglasii*.

SOIL

Sampling Point: **TP01**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-7	10YR 2/2	100					SiL	
7-10+	10YR 2/2	97	7.5YR 3/3	3	C	M, PL	SiL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distrubed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): N/A

Hydric Soil Present? Yes X No ___

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)
Shovel refusal at 10" due to large rocks.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- X Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- X Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches):	N/A	
Water Table Present?	Yes ___	No X	Depth (inches):	>10	**Wetland Hydrology Present?**
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches):	>10	**Yes X No ___**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Entered by: KL/ED QC by: TJD
Snow mold was prevalent in the area. Some old drift deposits were visible in the off-site PSS portion.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Typha Solar Project City/County: - / Kittitas Sampling Date: 4/4/2017

Applicant/Owner: TUUSSO Energy, LLC State: WA Sampling Point: **TP02**

Investigator(s): Evan Dulin, Jamie Young Section, Township, Range: Section 30, T18N, R18E

Landform (hillslope, terrace, etc.): Plain Local relief (concave, convex, none): None Slope (%): 1

Subregion (LRR): B, Columbia/Snake River Plateau Lat: 47.028432 Long: -120.625613 Datum: NAD 1983

Soil Map Unit Name: Weirman-Kayak-Zillah complex, 0 to 2 percent slopes (809) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X* (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No **X**	**Is the Sampled Area within a Wetland?**	Yes ____ No **X**
Hydric Soil Present?	Yes ____	No **X**		
Wetland Hydrology Present?	Yes ____	No **X**		

Precipitation prior to fieldwork: 0.79" two weeks prior, 2.32" above normal for CYTD, 2.78" above normal for WYTD. *Wetter than normal.

Remarks:

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1.			
2.			
3.			
4.			
5.			
	0% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Schedonorus arundinaceus*	20%	Yes	FACU
2. *Barbarea vulgaris*	5%	No	FAC
3. *Panicum capillare*	2%	No	FACU
4. *Hypochaeris radicata*	1%	No	FACU
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	28% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 72%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species 0	x 1 =	0
FACW species 0	x 2 =	0
FAC species 5	x 3 =	15
FACU species 23	x 4 =	92
UPL species 0	x 5 =	0
Column Totals: 28 (A)		107 (B)
Prevalence Index = B/A =		3.82

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- ____ 2 - Dominance Test is >50%
- ____ 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ____ No **X**

Remarks:
Sparsely vegetated.

Entered by: KL/ED QC by: TJD

SOIL

Sampling Point: **TP02**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-10	10YR 3/1	100					SiL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distrubed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): N/A

Hydric Soil Present? Yes ___ **No X**

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)
Large rocks (shovel refusal at 10")

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches):	N/A
Water Table Present?	Yes ___	No X	Depth (inches):	>10
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches):	>10

Wetland Hydrology Present?

Yes ___ **No X**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Entered by: KL/ED QC by: TJD

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Typha Solar Project City/County: - / Kittitas Sampling Date: 4/4/2017

Applicant/Owner: TUUSSO Energy, LLC State: WA Sampling Point: **TP03**

Investigator(s): Evan Dulin, Jamie Young Section, Township, Range: Section 30, T18N, R18E

Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope (%): 1

Subregion (LRR): B, Columbia/Snake River Plateau Lat: 47.024787 Long: -120.624788 Datum: NAD 1983

Soil Map Unit Name: Weirman gravelly sandy loam, 0 to 2 percent slopes (715) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X* (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____		
Hydric Soil Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?**	**Yes X No ____**
Wetland Hydrology Present?	Yes X	No ____		

Precipitation prior to fieldwork: 0.79" two weeks prior, 2.32" above normal for CYTD, 2.78" above normal for WYTD. *Wetter than normal.

Remarks:

TW02. PEM wetland that drains off-site to the east, slightly impounded flow along the wetland every 180' at bermed tracks for the irrigation system.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1.			
2.			
3.			
4.			
5.			
	0% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Juncus balticus*	30%	Yes	FACW
2. *Schedonorus arundinaceus*	15%	Yes	FACU
3. *Poa species*	15%	Yes	FAC ?
4. *Phleum pratense*	15%	Yes	FACU
5. *Rumex crispus*	3%	No	FAC
6. *Barbarea vulgaris*	2%	No	FAC
7.			
8.			
9.			
10.			
11.			
	80% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 20%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50% (A/B)

Prevalence Index worksheet:

	Total % Cover of:	Multiply by:	
OBL species	0	x 1 =	0
FACW species	30	x 2 =	60
FAC species	20	x 3 =	60
FACU species	30	x 4 =	120
UPL species	0	x 5 =	0
Column Totals:	80 (A)		240 (B)

Prevalence Index = B/A = 3.00

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- ____ 2 - Dominance Test is >50%
- X 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes X No ____**

Remarks:

Phalaris arundinacea is dominant further east.

Entered by: KL/ED QC by: TJD

SOIL

Sampling Point: **TP03**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	2.5Y 2.5/1	100					SiL	
3-13	2.5Y 2.5/1	68	2.5Y 4/2	30	D	M	SiCL	
			10YR 4/4	2	C	M, PL		

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distrubed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): N/A

Hydric Soil Present? Yes X No ___

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)
Shoval refusal at 13" due to large rocks.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- X Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- X Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes	___	No	X	Depth (inches): N/A
Water Table Present?	Yes	X	No	___	Depth (inches): 13
Saturation Present? (includes capillary fringe)	Yes	X	No	___	Depth (inches): 12

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Entered by: KL/ED QC by: TJD
In addition, saturation at 0-3" was observed from recent heavy rainfall. Surface water is present to the east. Some hummocky ground.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Typha Solar Project City/County: - / Kittitas Sampling Date: 4/4/2017

Applicant/Owner: TUUSSO Energy, LLC State: WA Sampling Point: **TP04**

Investigator(s): Evan Dulin, Jamie Young Section, Township, Range: Section 30, T18N, R18E

Landform (hillslope, terrace, etc.): Plain Local relief (concave, convex, none): Concave Slope (%): 2

Subregion (LRR): B, Columbia/Snake River Plateau Lat: 47.024839 Long: -120.624789 Datum: NAD 1983

Soil Map Unit Name: Weirman gravelly sandy loam, 0 to 2 percent slopes (715) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X* (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No **X**	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** **X**
Hydric Soil Present?	Yes ____	No **X**		
Wetland Hydrology Present?	Yes ____	No **X**		

Precipitation prior to fieldwork: 0.79" two weeks prior, 2.32" above normal for CYTD, 2.78" above normal for WYTD. *Wetter than normal.

Remarks:

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1.			
2.			
3.			
4.			
5.			
	0% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Schedonorus arundinaceus*	50%	Yes	FACU
2. *Phleum pratense*	45%	Yes	FACU
3. *Onopordum acanthium*	1%	No	NOL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	96% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 4%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species 0	x 1 =	0
FACW species 0	x 2 =	0
FAC species 0	x 3 =	0
FACU species 95	x 4 =	380
UPL species 1	x 5 =	5
Column Totals: 96 (A)		385 (B)

Prevalence Index = B/A = 4.01

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- ____ 2 - Dominance Test is >50%
- ____ 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Remarks:

Entered by: KL/ED QC by: TJD

SOIL

Sampling Point: **TP04**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-10	2.5Y 2.5/1	100					SiL	
10-14	2.5Y 2.5/1	74	2.5Y 4/2	25	D	M	SiCL	
			10YR 3/4	1	C	M, PL		

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distrubed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): N/A

Hydric Soil Present? Yes ___ No X

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)
Thick roots present in the 0-10" layer.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches):	N/A
Water Table Present?	Yes ___	No X	Depth (inches):	>14
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches):	>14

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Entered by: KL/ED QC by: TJD

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Typha Solar Project City/County: - / Kittitas Sampling Date: 4/4/2017

Applicant/Owner: TUUSSO Energy, LLC State: WA Sampling Point: **TP05**

Investigator(s): Evan Dulin, Jamie Young Section, Township, Range: Section 30, T18N, R18E

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Concave Slope (%): 1

Subregion (LRR): B, Columbia/Snake River Plateau Lat: 47.025029 Long: -120.628765 Datum: NAD 1983

Soil Map Unit Name: Nosal ashy silt loam, 0 to 2 percent slopes (838) NWI classification: PEMC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X* (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No **X**	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** **X**
Hydric Soil Present?	Yes ____	No **X**		
Wetland Hydrology Present?	Yes **X**	No ____		

Precipitation prior to fieldwork: 0.79" two weeks prior, 2.32" above normal for CYTD, 2.78" above normal for WYTD. *Wetter than normal.

Remarks:
Sample plot taken in upland area between wetlands TW02 and TW03. Water appears to overflow from TW03 into TW02.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1.			
2.			
3.			
4.			
5.			
	0% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Schedonorus arundinaceus*	50%	Yes	FACU
2. *Phleum pratense*	40%	Yes	FACU
3. *Phalaris arundinacea*	5%	No	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	95% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 5%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species 0	x 1 =	0
FACW species 5	x 2 =	10
FAC species 0	x 3 =	0
FACU species 90	x 4 =	360
UPL species 0	x 5 =	0
Column Totals: 95 (A)		370 (B)

Prevalence Index = B/A = 3.89

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- ____ 2 - Dominance Test is >50%
- ____ 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Remarks:

Entered by: KL/ED QC by: TJD

SOIL

Sampling Point: **TP05**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-7	2.5Y 2.5/1	100					SiL	
7	10YR 4/2	100					Sand	Very thin layer
7-12	2.5Y 2.5/1	100					SiL	
12-14	2.5Y 2.5/1	98	7.5YR 4/6	2	C	M	SiCL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distrubed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): N/A

Hydric Soil Present? Yes ___ **No** X

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)
Sand layer at 7" could be from historic 500-year level flood event.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- X Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- X Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches):	N/A
Water Table Present?	Yes ___	No X	Depth (inches):	>14
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches):	>14

Wetland Hydrology Present? Yes X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Snail shells present nearby towards TW03.

Entered by: KL/ED QC by: TJD

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Typha Solar Project City/County: - / Kittitas Sampling Date: 4/4/2017

Applicant/Owner: TUUSSO Energy, LLC State: WA Sampling Point: **TP06**

Investigator(s): Evan Dulin, Jamie Young Section, Township, Range: Section 30, T18N, R18E

Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope (%): 0

Subregion (LRR): B, Columbia/Snake River Plateau Lat: 47.025004 Long: -120.628694 Datum: NAD 1983

Soil Map Unit Name: Weirman-Kayak-Zillah complex, 0 to 2 percent slopes (809) NWI classification: PEMC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X* (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No **X**	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** **X**
Hydric Soil Present?	Yes ____	No **X**		
Wetland Hydrology Present?	Yes **X**	No ____		

Precipitation prior to fieldwork: 0.79" two weeks prior, 2.32" above normal for CYTD, 2.78" above normal for WYTD. *Wetter than normal.

Remarks:
Sample plot located in dry slight depression between wetlands TW02 and TW03.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1.			
2.			
3.			
4.			
5.			
	0% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Juncus balticus*	35%	Yes	FACW
2. *Schedonorus arundinaceus*	20%	Yes	FACU
3. *Phleum pratense*	20%	Yes	FACU
4. *Poa species*	20%	Yes	FAC ?
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	95% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 5%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50% (A/B)

Prevalence Index worksheet:

	Total % Cover of:	Multiply by:	
OBL species	0	x 1 =	0
FACW species	35	x 2 =	70
FAC species	20	x 3 =	60
FACU species	40	x 4 =	160
UPL species	0	x 5 =	0
Column Totals:	95 (A)		290 (B)

Prevalence Index = B/A = 3.05

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

____ 5 - Wetland Non-Vascular Plants[1]

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Remarks: Entered by: KL/ED QC by: TJD

SOIL

Sampling Point: **TP06**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	2.5Y 2.5/1	100					SiL	
5	10YR 4/2	100					Sand	Very thin layer
5-11	2.5Y 2.5/1	100					SiCL	
11-14	2.5Y 2.5/1	98	7.5YR 4/6	2	C	PL	SiCL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distrubed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): N/A

Hydric Soil Present? Yes ___ No X

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)
Sand layer at 5" could be from historic 500-year level flood event.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) (**Nonriverine**)
- X Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- X Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes	___	No	X	Depth (inches): N/A
Water Table Present?	Yes	X	No	___	Depth (inches): 13
Saturation Present? (includes capillary fringe)	Yes	X	No	___	Depth (inches): 12

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Entered by: KL/ED QC by: TJD

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Typha Solar Project City/County: - / Kittitas Sampling Date: 4/4/2017

Applicant/Owner: TUUSSO Energy, LLC State: WA Sampling Point: **TP07**

Investigator(s): Evan Dulin, Jamie Young Section, Township, Range: Section 30, T18N, R18E

Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope (%): 0

Subregion (LRR): B, Columbia/Snake River Plateau Lat: 47.024964 Long: -120.628357 Datum: NAD 1983

Soil Map Unit Name: Weirman-Kayak-Zillah complex, 0 to 2 percent slopes (809) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X* (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?**	**Yes X No ____**
Hydric Soil Present?	Yes X	No ____		
Wetland Hydrology Present?	Yes X	No ____		

Precipitation prior to fieldwork: 0.79" two weeks prior, 2.32" above normal for CYTD, 2.78" above normal for WYTD. *Wetter than normal.

Remarks:

TW02. Wetland is fed by overflow from TW03. Problematic wetland vegetation, assumed wetland based on soils and hydrology.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1.			
2.			
3.			
4.			
5.			
	0% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Schedonorus arundinaceus*	25%	Yes	FACU
2. *Poa species*	25%	Yes	FAC ?
3. *Phleum pratense*	15%	No	FACU
4. *Juncus balticus*	15%	No	FACW
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	80% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 20%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50% (A/B)

Prevalence Index worksheet:

	Total % Cover of:	Multiply by:	
OBL species	0	x 1 =	0
FACW species	15	x 2 =	30
FAC species	25	x 3 =	75
FACU species	40	x 4 =	160
UPL species	0	x 5 =	0
Column Totals:	80 (A)		265 (B)

Prevalence Index = B/A = 3.31

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- ____ 2 - Dominance Test is >50%
- ____ 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- X Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes X No ____**

Remarks: Entered by: KL/ED QC by: TJD

This site has been actively grazed which may have prevented the growth of wetland plants in the drier areas of the wetland.

SOIL

Sampling Point: **TP07**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-7	10YR 2/1	100					SiCL	
7-10	10YR 2/1	93	7.5YR 4/6	7	C	M. PL	SiCL	
10	10YR 4/2	100					Sand	Very thin layer
10-15	10YR 2/1	93	7.5YR 4/6	7	C	M. PL	SiCL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distrubed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): N/A

Hydric Soil Present? Yes X No ___

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)
Sand layer at 10" could be from historic 500-year level flood event.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- X Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- X Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches):	N/A
Water Table Present?	Yes ___	No X	Depth (inches):	>15
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches):	>15

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Sparsely vegetated concave area along wetland drainage.

Entered by: KL/ED QC by: TJD

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Typha Solar Project City/County: - / Kittitas Sampling Date: 4/4/2017

Applicant/Owner: TUUSSO Energy, LLC State: WA Sampling Point: **TP08**

Investigator(s): Evan Dulin, Jamie Young Section, Township, Range: Section 30, T18N, R18E

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Convex Slope (%): 1

Subregion (LRR): B, Columbia/Snake River Plateau Lat: 47.024995 Long: -120.628381 Datum: NAD 1983

Soil Map Unit Name: Weirman-Kayak-Zillah complex, 0 to 2 percent slopes (809) NWI classification: PEMC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X* (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No **X**	**Is the Sampled Area within a Wetland?**	Yes ____ No **X**
Hydric Soil Present?	Yes ____	No **X**		
Wetland Hydrology Present?	Yes ____	No **X**		

Precipitation prior to fieldwork: 0.79" two weeks prior, 2.32" above normal for CYTD, 2.78" above normal for WYTD. *Wetter than normal.

Remarks:

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1.			
2.			
3.			
4.			
5.			
	0% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Schedonorus arundinaceus*	40%	Yes	FACU
2. *Poa species*	25%	Yes	FAC ?
3. *Phleum pratense*	25%	Yes	FACU
4. *Phalaris arundinacea*	10%	No	FACW
5. *Onopordum acanthium*	1%	No	NOL
6. *Taraxacum officinale*	1%	No	FACU
7.			
8.			
9.			
10.			
11.			
	102% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 0%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species 0	x 1 =	0
FACW species 10	x 2 =	20
FAC species 25	x 3 =	75
FACU species 66	x 4 =	264
UPL species 1	x 5 =	5
Column Totals: 102 (A)		364 (B)

Prevalence Index = B/A = 3.57

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

____ 5 - Wetland Non-Vascular Plants[1]

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes ____ No **X**

Remarks: Entered by: KL/ED QC by: TJD

SOIL

Sampling Point: **TP08**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 2/2	100					SiL	
8-12	10YR 2/1	100					SiCL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distrubed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): N/A

Hydric Soil Present? Yes ___ **No** X

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)
Rocks and gravels (possibly fill material) from 3 to 8 inches. Shoval refusal at 12" due to large rocks.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches):	N/A
Water Table Present?	Yes ___	No X	Depth (inches):	>12
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches):	>12

Wetland Hydrology Present?

Yes ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Entered by: KL/ED QC by: TJD

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Typha Solar Project City/County: - / Kittitas Sampling Date: 4/4/2017

Applicant/Owner: TUUSSO Energy, LLC State: WA Sampling Point: **TP09**

Investigator(s): Evan Dulin, Jamie Young Section, Township, Range: Section 30, T18N, R18E

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Convex Slope (%): 0

Subregion (LRR): B, Columbia/Snake River Plateau Lat: 47.023402 Long: -120.627208 Datum: NAD 1983

Soil Map Unit Name: Mitta ashy silt loam, drained, 0 to 2 percent slopes (791) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X* (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____		
Hydric Soil Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____	No X		

Precipitation prior to fieldwork: 0.79" two weeks prior, 2.32" above normal for CYTD, 2.78" above normal for WYTD. *Wetter than normal.

Remarks:
Sample plot located on berm between TW03 and TW04.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1.			
2.			
3.			
4.			
5.			
	0% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Poa species*	60%	Yes	FAC ?
2. *Schedonorus arundinaceus*	15%	No	FACU
3. *Trifolium repens*	10%	No	FACU
4. *Phleum pratense*	10%	No	FACU
5. *Iris missouriensis*	2%	No	FACW
6. *Taraxacum officinale*	2%	No	FACU
7. *Tripleurospermum maritimum*	1%	No	FACU
8.			
9.			
10.			
11.			
	100% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 0%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species 0	x 1 =	0
FACW species 2	x 2 =	4
FAC species 60	x 3 =	180
FACU species 38	x 4 =	152
UPL species 0	x 5 =	0
Column Totals: 100 (A)		336 (B)

Prevalence Index = B/A = 3.36

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ____ 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: Entered by: KL/ED QC by: TJD

SOIL

Sampling Point: **TP09**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 2/1	100					SiL	
3-13	10YR 3/2	100					SaL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distrubed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): N/A

Hydric Soil Present? Yes ___ **No X**

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)
Large rocks throughout 3-13" layer. Shovel refusal at 13".

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches):	N/A
Water Table Present?	Yes ___	No X	Depth (inches):	>13
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches):	>13

Wetland Hydrology Present?

Yes ___ **No X**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Entered by: KL/ED QC by: TJD

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Typha Solar Project City/County: - / Kittitas Sampling Date: 4/4/2017

Applicant/Owner: TUUSSO Energy, LLC State: WA Sampling Point: **TP10**

Investigator(s): Evan Dulin, Jamie Young Section, Township, Range: Section 30, T18N, R18E

Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Convex Slope (%): 3

Subregion (LRR): B, Columbia/Snake River Plateau Lat: 47.023411 Long: -120.627114 Datum: NAD 1983

Soil Map Unit Name: Mitta ashy silt loam, drained, 0 to 2 percent slopes (791) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X* (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil X, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes **X**	No ____	**Is the Sampled Area within a Wetland?**	**Yes X** **No** ____
Hydric Soil Present?	Yes **X**	No ____		
Wetland Hydrology Present?	Yes **X**	No ____		

Precipitation prior to fieldwork: 0.79" two weeks prior, 2.32" above normal for CYTD, 2.78" above normal for WYTD. *Wetter than normal.

Remarks:

TW04. Depressional wetland intercepting overland runoff before TW03. Frog egg masses observed.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1.			
2.			
3.			
4.			
5.			
	0% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Schedonorus arundinaceus*	25%	Yes	FACU
2. *Poa species*	25%	Yes	FAC ?
3. *Phalaris arundinacea*	20%	Yes	FACW
4. *Typha latifolia*	5%	No	OBL
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	75% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 5%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 67% (A/B)

Prevalence Index worksheet:

	Total % Cover of:	Multiply by:	
OBL species	5	x 1 =	5
FACW species	20	x 2 =	40
FAC species	25	x 3 =	75
FACU species	25	x 4 =	100
UPL species	0	x 5 =	0
Column Totals:	75 (A)		220 (B)

Prevalence Index = B/A = 2.93

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ____ 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes X** **No** ____

Remarks:

20% open water.

Entered by: KL/ED QC by: TJD

SOIL

Sampling Point: **TP10**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-11	10YR 2/1	98	2.5Y 4/2	2	D	M	SiL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- X Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distrubed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): N/A

Hydric Soil Present? Yes X No ___

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)
The large rocks throughout the soil profile may be reducing the ability to locate redox; some small depletions observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) (**Nonriverine**)
- X Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches):	N/A
Water Table Present?	Yes X	No ___	Depth (inches):	9
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches):	11

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Entered by: KL/ED QC by: TJD
Surface water was recorded at 5" deep within 5 feet of the sample plot.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Typha Solar Project City/County: - / Kittitas Sampling Date: 4/4/2017

Applicant/Owner: TUUSSO Energy, LLC State: WA Sampling Point: **TP11**

Investigator(s): Evan Dulin, Jamie Young Section, Township, Range: Section 30, T18N, R18E

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Concave Slope (%): 1

Subregion (LRR): B, Columbia/Snake River Plateau Lat: 47.025016 Long: -120.628938 Datum: NAD 1983

Soil Map Unit Name: Nosal ashy silt loam, 0 to 2 percent slopes (838) NWI classification: PEMC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X* (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?**	**Yes X No ____**
Hydric Soil Present?	Yes X	No ____		
Wetland Hydrology Present?	Yes X	No ____		

Precipitation prior to fieldwork: 0.79" two weeks prior, 2.32" above normal for CYTD, 2.78" above normal for WYTD. *Wetter than normal.

Remarks:

TW03. Sample plot located northeast of the open ponded area where overflowing occurs to feed TW02.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1.			
2.			
3.			
4.			
5.			
	0% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Schedonorus arundinaceus*	45%	Yes	FACU
2. *Poa species*	30%	Yes	FAC ?
3. *Phalaris arundinacea*	20%	Yes	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	95% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 5%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 67% (A/B)

Prevalence Index worksheet:

	Total % Cover of:	Multiply by:	
OBL species	0	x 1 =	0
FACW species	20	x 2 =	40
FAC species	30	x 3 =	90
FACU species	45	x 4 =	180
UPL species	0	x 5 =	0
Column Totals:	95 (A)		310 (B)

Prevalence Index = B/A = 3.26

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ____ 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

Entered by: KL/ED QC by: TJD

SOIL

Sampling Point: **TP11**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	2.5Y 2.5/1	100					SiCL	
8-13	2.5Y 2.5/1	93	10YR 4/2	5	D	M	SiCL	
			7.5YR 3/3	2	C	PL		

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distrubed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): N/A

Hydric Soil Present? Yes X No ___

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- X Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- X Drift Deposits (B3) (**Riverine**)
- X Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches):	N/A	
Water Table Present?	Yes ___	No X	Depth (inches):	>13	**Wetland Hydrology Present?**
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches):	>13	**Yes X No ___**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Snail shells present.

Entered by: KL/ED QC by: TJD

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Typha Solar Project City/County: - / Kittitas Sampling Date: 4/12/2017

Applicant/Owner: TUUSSO Energy, LLC State: WA Sampling Point: **TP12**

Investigator(s): Evan Dulin, Jamie Young Section, Township, Range: Section 30, T18N, R18E

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Convex Slope (%): 1

Subregion (LRR): B, Columbia/Snake River Plateau Lat: 47.020595 Long: -120.627165 Datum: NAD 1983

Soil Map Unit Name: Mitta ashy silt loam, flooded, 0 to 2 percent slopes (621) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X* (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____		
Hydric Soil Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____	No X		

Precipitation prior to fieldwork: 0.61" two weeks prior, 2.62" above normal for CYTD, 3.08" above normal for WYTD. Wetter than normal.

Remarks:
Sample plot located at the toe of slope for the access road.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1.			
2.			
3.			
4.			
5.			
	0% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Phalaris arundinacea*	80%	Yes	FACW
2. *Cirsium arvense*	20%	Yes	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	100% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 0%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50% (A/B)

Prevalence Index worksheet:

	Total % Cover of:	Multiply by:	
OBL species	0	x 1 =	0
FACW species	80	x 2 =	160
FAC species	0	x 3 =	0
FACU species	20	x 4 =	80
UPL species	0	x 5 =	0
Column Totals:	100 (A)		240 (B)

Prevalence Index = B/A = 2.40

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- ____ 2 - Dominance Test is >50%
- X 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: Entered by: KL/ED QC by: TJD

SOIL

Sampling Point: **TP12**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-7	10YR 3/1	90					SiL	
	10YR 3/1	10					LS	mixed matrix
7-14	2.5Y 3/1	77	7.5YR 4/6	3	C	PL	SiL	
	10YR 4/2	20					LS	mixed matrix

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distrubed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): N/A

Hydric Soil Present? Yes X No ___

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)
Mixed matrix throughout loamy sand and silty loam from disturbance, likely during road construction.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches):	N/A
Water Table Present?	Yes ___	No X	Depth (inches):	>14
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches):	>14

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Entered by: KL/ED QC by: TJD

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Typha Solar Project City/County: - / Kittitas Sampling Date: 4/12/2017

Applicant/Owner: TUUSSO Energy, LLC State: WA Sampling Point: **TP13**

Investigator(s): Evan Dulin, Jamie Young Section, Township, Range: Section 30, T18N, R18E

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Concave Slope (%): 0

Subregion (LRR): B, Columbia/Snake River Plateau Lat: 47.020253 Long: -120.627497 Datum: NAD 1983

Soil Map Unit Name: Mitta ashy silt loam, flooded, 0 to 2 percent slopes (621) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X* (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____		
Hydric Soil Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes X	No ____		

Precipitation prior to fieldwork: 0.61" two weeks prior, 2.62" above normal for CYTD, 3.08" above normal for WYTD. Wetter than normal.

Remarks:
Determined not to be a wetland based on lack of hydric soils.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1.			
2.			
3.			
4.			
5.			
	0% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Phalaris arundinacea*	85%	Yes	FACW
2. *Typha latifolia*	10%	No	OBL
3. *Juncus balticus*	5%	No	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	100% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 0%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species 10	x 1 =	10
FACW species 90	x 2 =	180
FAC species 0	x 3 =	0
FACU species 0	x 4 =	0
UPL species 0	x 5 =	0
Column Totals: 100 (A)		190 (B)

Prevalence Index = B/A = 1.90

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ____ 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: Entered by: KL/ED QC by: TJD

SOIL

Sampling Point: **TP13**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 2/1	100						
5-14	2.5Y 3/1	100						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distrubed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): N/A

Hydric Soil Present? **Yes** ___ **No** **X**

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes	___	No	X	Depth (inches): N/A
Water Table Present?	Yes	X	No	___	Depth (inches): 12
Saturation Present? (includes capillary fringe)	Yes	X	No	___	Depth (inches): to surface

Wetland Hydrology Present? **Yes** **X** **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Entered by: KL/ED QC by: TJD

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Typha Solar Project City/County: - / Kittitas Sampling Date: 4/12/2017

Applicant/Owner: TUUSSO Energy, LLC State: WA Sampling Point: **TP14**

Investigator(s): Evan Dulin, Jamie Young Section, Township, Range: Section 30, T18N, R18E

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Concave Slope (%): 0

Subregion (LRR): B, Columbia/Snake River Plateau Lat: 47.020219 Long: -120.627443 Datum: NAD 1983

Soil Map Unit Name: Mitta ashy silt loam, flooded, 0 to 2 percent slopes (621) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X* (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?**	**Yes X No ____**
Hydric Soil Present?	Yes X	No ____		
Wetland Hydrology Present?	Yes X	No ____		

Precipitation prior to fieldwork: 0.61" two weeks prior, 2.62" above normal for CYTD, 3.08" above normal for WYTD. Wetter than normal.

Remarks:

TW05. Wetland fed by overbank flooding of EP Canal via a culvert under the access road seperating the wetland from the canal.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1.			
2.			
3.			
4.			
5.			
	0% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Typha latifolia*	50%	Yes	OBL
2. *Phalaris arundinacea*	45%	Yes	FACW
3. *Juncus balticus*	5%	No	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	100% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 0%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species 50	x 1 =	50
FACW species 50	x 2 =	100
FAC species 0	x 3 =	0
FACU species 0	x 4 =	0
UPL species 0	x 5 =	0
Column Totals: 100 (A)		150 (B)

Prevalence Index = B/A = 1.50

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ____ 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes X No ____**

Remarks:

Entered by: KL/ED QC by: TJD

SOIL

Sampling Point: **TP14**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	2.5Y 2.5/1	100					Mucky Mineral	
3-5	N 2.5/0	100					Mucky Mineral	Gleyed
5-15	2.5Y 3/1	98	2.5Y 5/2	2	D	M	SiL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- X Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distrubed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): N/A

Hydric Soil Present? Yes X No ___

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)
3-5" Layer feels mucky mineral. Thick roots in 0-3" layer.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes	___	No	X	Depth (inches): N/A
Water Table Present?	Yes	X	No	___	Depth (inches): 12
Saturation Present? (includes capillary fringe)	Yes	X	No	___	Depth (inches): to surface

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Entered by: KL/ED QC by: TJD

APPENDIX D: WETLAND AND STREAM PHOTOGRAPHS



Photo A. View northeast of Wetland TW01.



Photo B. View east of the eastern portion of Wetland TW02 (TP03).



Photo C. View east of Wetland TW02 at eastern site boundary, extends off-site.



Photo D. View south of the western portion of Wetland TW02 (TP07).



Photo E. View east of Wetland TW03 at eastern site boundary, extends off-site.



Photo F. View east of Wetland TW03 at one of several culverts.



Photo G. View south of open water area in western portion of Wetland TW03 (TP11).



Photo H. View northwest of western portion of Wetland TW03.



Photo I. View north of off-site portion of Wetland TW03 to the west.



Photo J. View west of Wetland TW04.



Photo K. View south of Wetland TW04.



Photo L. View northwest of EP Canal at first crossing near the road crossing bridge.



Photo M. View southeast of EP Canal at second crossing.



Photo N. View northeast of the western wetland boundary for Wetland TW05.



Photo O. View west of culvert entering Wetland TW05 from EP Canal.



Photo P. View west of roadside ditch on the south side of the access road.



Photo Q. View northwest of ditch on the north side of the access road.



Photo R. View east of Great Blue Heron rookery on east side of the Yakima River.



Photo S. View down of frog egg masses in Wetland TW04.



Photo T. View down of dead vole (living voles were abundant throughout the site).

APPENDIX E: ECOLOGY RATING FORMS

Wetland name or number TW01

RATING SUMMARY – Eastern Washington

Name of wetland (or ID #): TW01 Date of site visit: 4/4/17

Rated by N. Evan Dulin Trained by Ecology? ✓ Yes ___ No Date of training 3/29/17

HGM Class used for rating Riverine Wetland has multiple HGM classes? ___Y ✓N

NOTE: Form is not complete without the figures requested (*figures can be combined*).
Source of base aerial photo/map Google Earth

OVERALL WETLAND CATEGORY II (based on functions ✓ or special characteristics ___)

1. Category of wetland based on FUNCTIONS

___**Category I** – Total score = 22-27

✓ **Category II** – Total score = 19-21

___**Category III** – Total score = 16-18

___**Category IV** – Total score = 9-15

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
	Circle the appropriate ratings			
Site Potential	H (M) L	H (M) L	H M (L)	
Landscape Potential	H (M) L	H M (L)	H (M) L	
Value	(H) M L	(H) M L	(H) M L	TOTAL
Score Based on Ratings	7	6	6	19

Score for each function based on three ratings *(order of ratings is not important)*

9 = H,H,H
8 = H,H,M
7 = H,H,L
7 = H,M,M
6 = H,M,L
6 = M,M,M
5 = H,L,L
5 = M,M,L
4 = M,L,L
3 = L,L,L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	CATEGORY *Circle the appropriate category*
Vernal Pools	**II** **III**
Alkali	**I**
Wetland of High Conservation Value	**I**
Bog and Calcareous Fens	**I**
Old Growth or Mature Forest – slow growing	**I**
Aspen Forest	**I**
Old Growth or Mature Forest – fast growing	**II**
Floodplain forest	**II**
None of the above	✓

Wetland name or number TW01

Maps and figures required to answer questions correctly for Eastern Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	D 1.3, H 1.1, H 1.5	
Hydroperiods (including area of open water for H 1.3)	D 1.4, H 1.2, H 1.3	
Location of outlet (*can be added to map of hydroperiods)*	D 1.1, D 4.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	
Map of the contributing basin	D 5.3	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	D 3.3	

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	1
Hydroperiods	H 1.2, H 1.3	1
Ponded depressions – None	R 1.1	1
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	R 2.4	1
Map of the contributing basin	R 2.2, R 2.3, R 5.2	5
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	1
Width of wetland vs. width of stream *(can be added to another figure)*	R 4.1	1
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	2
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	3
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	R 3.2, R 3.3	4

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	L 1.1, L 4.1, H 1.1, H 1.5	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants *(can be added to figure above)*	S 4.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	S 3.3	

Wetland name or number TW01

HGM Classification of Wetland in Eastern Washington

For questions 1-4, the criteria described must apply to the entire unit being rated.

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-4 apply, and go to Question 5.

1. Does the entire unit **meet both** of the following criteria?
   ___The vegetated part of the wetland is on the water side of the Ordinary High Water Mark of a body of permanent open water (without any plants on the surface) that is at least 20 ac (8 ha) in size
   ___At least 30% of the open water area is deeper than 10 ft (3 m)

   NO – go to 2 **YES –** The wetland class is **Lake Fringe** (Lacustrine Fringe)

2. Does the entire wetland unit **meet all** of the following criteria?
   ✓ The wetland is on a slope (*slope can be very gradual*),
   ___The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks;
   ✓ The water leaves the wetland **without being impounded.**

   NO - go to 3 YES – The wetland class is **Slope**
   NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 foot deep).

3. Does the entire wetland unit **meet all** of the following criteria?
   ✓ The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river;
   ✓ The overbank flooding occurs at least once every 10 years.

   NO - go to 4 YES – The wetland class is **Riverine**
   NOTE: The Riverine wetland can contain depressions that are filled with water when the river is not flooding.

4. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year. *This means that any outlet, if present, is higher than the interior of the wetland.*

   NO – go to 5 YES – The wetland class is **Depressional**

5. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-4 APPLY TO DIFFERENT AREAS IN THE WETLAND UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

Wetland name or number TW01

NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the wetland unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM Class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine (the riverine portion is within the boundary of depression)	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine

*If you are still unable to determine which of the above criteria apply to your wetland, or if you have **more than 2 HGM classes** within a wetland boundary, classify the wetland as Depressional for the rating.*

Wetland name or number TW01

RIVERINE WETLANDS **Water Quality Functions** - Indicators that the site functions to improve water quality	Points (only 1 score per box)
R 1.0. Does the site have the potential to improve water quality?	
R 1.1. Area of surface depressions within the Riverine wetland that can trap sediments during a flooding event: Depressions cover > 1/3 area of wetland — points = 6 Depressions cover > 1/10 area of wetland — points = 3 Depressions present but cover < 1/10 area of wetland — points = 1 ~~No depressions present~~ — points = 0	0
R 1.2. Structure of plants in the wetland (areas with >90% cover at person height; **not** Cowardin classes): ~~Forest or shrub > 2/3 the area of the wetland~~ — points = 10 Forest or shrub 1/3 – 2/3 area of the wetland — points = 5 Ungrazed, herbaceous plants > 2/3 area of wetland — points = 5 Ungrazed herbaceous plants 1/3 – 2/3 area of wetland — points = 2 Forest, shrub, and ungrazed herbaceous < 1/3 area of wetland — points = 0	10
Total for R 1 — Add the points in the boxes above	10

Rating of Site Potential If score is: ___ **12-16 = H** ✓ **6-11 = M** ___ **0-5 = L** *Record the rating on the first page*

R 2.0. Does the landscape have the potential to support the water quality function of the site?	
R 2.1. Is the wetland within an incorporated city or within its UGA? Yes = 2 (No = 0)	0
R 2.2. Does the contributing basin include a UGA or incorporated area? Yes = 1 (No = 0)	0
R 2.3. Does at least 10% of the contributing basin contain tilled fields, pastures, or forests that have been clearcut within the last 5 years? (Yes = 1) No = 0	1
R 2.4. Is > 10% of the area within 150 ft of wetland in land uses that generate pollutants (Yes = 1) No = 0	1
R 2.5. Are there other sources of pollutants coming into the wetland that are not listed in questions R 2.1-R 2.4? Source_____ Yes = 1 (No = 0)	0
Total for R 2 — Add the points in the boxes above	2

Rating of Landscape Potential If score is: ___ **3-6 = H** ✓ **1 or 2 = M** ___ **0 = L** *Record the rating on the first page*

R 3.0. Is the water quality improvement provided by the site valuable to society?	
R 3.1. Is the wetland along a stream or river that is on the 303(d) list or on a tributary that drains to one within 1 mi? (Yes = 1) No = 0	1
R 3.2. Does the river or stream have TMDL limits for nutrients, toxics, or pathogens? (Yes = 1) No = 0	1
R 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality? *Answer YES if there is a TMDL for the drainage in which wetland is found.* (Yes = 2) No = 0	2
Total for R 3 — Add the points in the boxes above	4

Rating of Value If score is: ✓ **2-4 = H** ___ **1 = M** ___ **0 = L** *Record the rating on the first page*

Wetland name or number TW01

RIVERINE WETLANDS **Hydrologic Functions** - Indicators that site functions to reduce flooding and stream erosion	Points (only 1 score per box)
R 4.0. Does the site have the potential to reduce flooding and erosion?	
R 4.1. Characteristics of the overbank storage the wetland provides: *Estimate the average width of the wetland perpendicular to the direction of the flow and the width of the stream or river channel (distance between banks). Calculate the ratio: (average width of wetland)/(average width of stream between banks).* If the ratio is more than 2 — points = 10 If the ratio is 1-2 — points = 8 — If the ratio is ½-<1 — points = 4 If the ratio is ¼-< ½ — points = 2 If the ratio is < ¼ — points = 1 ~ 90' / 175' = >½	4
R 4.2. Characteristics of plants that slow down water velocities during floods: *Treat large woody debris as forest or shrub. Choose the points appropriate for the best description (polygons need to have > 90% cover at person height. These are NOT Cowardin classes).* — Forest or shrub for more than $^2/_3$ the area of the wetland ~80% — points = 6 Forest or shrub for > $^1/_3$ area OR emergent plants > $^2/_3$ area — points = 4 Forest or shrub for > $^1/_{10}$ area OR emergent plants > $^1/_3$ area — points = 2 Plants do not meet above criteria — points = 0	6
Total for R 5 — Add the points in the boxes above	10

Rating of Site Potential If score is: ___ **12-16 = H** ✓ **6-11 = M** ___ **0-5 = L** *Record the rating on the first page*

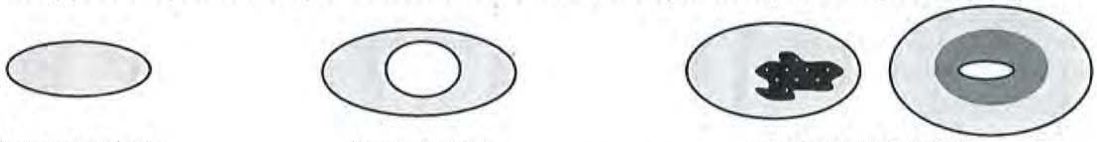
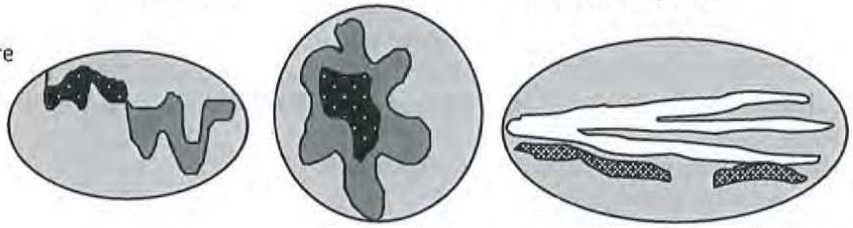
R 5.0. Does the landscape have the potential to support the hydrologic functions of the site?		
R 5.1. Is the stream or river adjacent to the wetland downcut?	(Yes = 0) No = 1	0
R 5.2. Does the up-gradient watershed include a UGA or incorporated area?	Yes = 1 (No = 0)	0
R 5.3. Is the up-gradient stream or river controlled by dams?	(Yes = 0) No = 1	0
Total for R 5 — Add the points in the boxes above		0

Rating of Landscape Potential If score is: ___ **3 = H** ___ **1 or 2 = M** ✓ **0 = L** *Record the rating on the first page*

R 6.0. Are the hydrologic functions provided by the site valuable to society?	
R 6.1. Distance to the nearest areas downstream that have flooding problems? *Choose the description that best fits the site.* — The sub-basin immediately down-gradient of site has surface flooding problems that result in damage to human or natural resources — points = 2 Surface flooding problems are in a basin farther down-gradient — points = 1 No flooding problems anywhere downstream — points = 0	2
R 6.2. Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan? — Yes = 2 (No = 0)	0
Total for R 6 — Add the points in the boxes above	2

Rating of Value If score is: ✓ **2-4 = H** ___ **1 = M** ___ **0 = L** *Record the rating on the first page*

Wetland name or number TW01

These questions apply to wetlands of all HGM classes. **HABITAT FUNCTIONS** - Indicators that site functions to provide important habitat	(only 1 score per box)
H 1.0. Does the wetland have the potential to provide habitat for many species?	
H 1.1. Structure of the plant community: *Check the Cowardin vegetation classes present and categories of emergent plants. Size threshold for each category is >= ¼ ac or >= 10% of the wetland if wetland is < 2.5 ac.* ____Aquatic bed ____Emergent plants 0-12 in (0-30 cm) high are the highest layer and have > 30% cover (<30% cover, lots of bare ground) ____Emergent plants >12-40 in (>30-100 cm) high are the highest layer with >30% cover ____Emergent plants > 40 in (> 100 cm) high are the highest layer with >30% cover ✓ Scrub-shrub (areas where shrubs have >30% cover) — 4 or more checks: points = 3 ____Forested (areas where trees have >30% cover) — 3 checks: points = 2; 2 checks: points = 1; 1 check: points = 0	0
H 1.2. Is one of the vegetation types Aquatic Bed? Yes = 1 No = 0	0
H 1.3. Surface water H 1.3.1. Does the wetland have areas of open water (without emergent or shrub plants) over at least ¼ ac **OR** 10% of its area during the March to early June **OR** in August to the end of September? *Answer YES for Lake Fringe wetlands.* Yes = 3 points & go to H 1.4 No = go to H 1.3.2 H 1.3.2. Does the wetland have an intermittent or permanent, and unvegetated stream within its boundaries, or along one side, over at least ¼ ac or 10% of its area? *Answer yes only if H 1.3.1 is No.* Yes = 3 No = 0	3
H 1.4. Richness of plant species Count the number of plant species in the wetland that cover at least 10 ft^2. *Different patches of the same species can be combined to meet the size threshold. You do not have to name the species.* *Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Russian olive, Phragmites, Canadian thistle, yellow-flag iris, and saltcedar (Tamarisk)* # of species 5 Scoring: > 9 species: points = 2; 4-9 species: points = 1; < 4 species: points = 0	1
H 1.5. Interspersion of habitats Decide from the diagrams below whether interspersion among types of plant structures (described in H 1.1), and unvegetated areas (open water or mudflats) is high, moderate, low, or none. *Use map of Cowardin and emergent plant classes prepared for questions H 1.1 and map of open water from H 1.3. If you have four or more plant classes or three classes and open water, the rating is always high.*  **None** = 0 points **Low** = 1 point **Moderate** = 2 points All three diagrams in this row are **High** = 3 points  Riparian braided channels with 2 classes	Figure__ 1

Wetland name or number TW01

H 1.6. Special habitat features *Check the habitat features that are present in the wetland. The number of checks is the number of points.* ____Loose rocks larger than 4 in OR large, downed, woody debris (> 4 in diameter) within the area of surface ponding or in stream. ____Cattails or bulrushes are present within the wetland. ____Standing snags (diameter at the bottom > 4 in) in the wetland or within 30 m (100 ft) of the edge. ____Emergent or shrub vegetation in areas that are permanently inundated/ponded. ____Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 45 degree slope) OR signs of recent beaver activity ✓ Invasive species cover less than 20% in each stratum of vegetation *(canopy, sub-canopy, shrubs, herbaceous, moss/ground cover)*	1
Total for H 1 — Add the points in the boxes above	6

Rating of Site Potential If score is: ___ **15-18 = H** ___ **7-14 = M** ✓ **0-6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support habitat functions of the site?	
H 2.1. Accessible habitat (only area of habitat abutting wetland). If total accessible habitat is: *Calculate:* % undisturbed habitat 19 + [(% moderate and low intensity land uses)/2] 4.5 = 23.5 % > 1/3 (33.3%) of 1 km Polygon — points = 3 — 20-33% of 1km Polygon — points = 2 10-19% of 1km Polygon — points = 1 <10% of 1km Polygon — points = 0 1 Km poly = ~812 ac Accessible undis = 157 ac = ~19% " mid-intensity = 74 = ~9%	2
H 2.2. Undisturbed habitat in 1 km Polygon around wetland. *Calculate:* % undisturbed habitat 19 + [(% moderate and low intensity land uses)/2] 13 = 32 % Undisturbed habitat > 50% of Polygon — points = 3 — Undisturbed habitat 10 - 50% and in 1-3 patches — points = 2 Undisturbed habitat 10 - 50% and > 3 patches — points = 1 Undisturbed habitat < 10% of Polygon — points = 0 mid-intensity = 74+136/812 = 26% 2 patches	2
H 2.3. Land use intensity in 1 km Polygon: — > 50% of Polygon is high intensity land use — points = (- 2) Does not meet criterion above — points = 0 High intensity 445/812 = 55%	-2
H 2.4. The wetland is in an area where annual rainfall is less than 12 in, and its water regime is not influenced by irrigation practices, dams, or water control structures. *Generally, this means outside boundaries of reclamation areas, irrigation districts, or reservoirs* — Yes = 3 (No = 0)	0
Total for H 2 — Add the points in the boxes above	2

Rating of Landscape Potential If score is: ___ **4-9 = H** ✓ **1-3 = M** ___ **< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose the highest score that applies to the wetland being rated* Site meets ANY of the following criteria: — points = 2 ✓ — It has 3 or more priority habitats within 100 m (see Appendix B) — It provides habitat for Threatened or Endangered species (any plant or animal on state or federal lists) — It is mapped as a location for an individual WDFW species — It is a Wetland of High Conservation Value as determined by the Department of Natural Resources — It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan Site has 1 or 2 priority habitats within 100 m (see Appendix B) — points = 1 Site does not meet any of the criteria above — points = 0	2

Rating of Value If score is: ✓ **2 = H** ___ **1 = M** ___ **0 = L** *Record the rating on the first page*

Appendix B: WDFW Priority Habitats in Eastern Washington

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp. http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here: http://wdfw.wa.gov/conservation/phs/list/)

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland: ***NOTE:*** *This question is independent of the land use between the wetland and the priority habitat.*

— **Aspen Stands:** Pure or mixed stands of aspen greater than 1 ac (0.4 ha).

— **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).

— **Old-growth/Mature forests:** Old-growth east of Cascade crest – Stands are highly variable in tree species composition and structural characteristics due to the influence of fire, climate, and soils. In general, stands will be >150 years of age, with 10 trees/ac (25 trees/ha) that are > 21 in (53 cm) dbh, and 1-3 snags/ac (2.5-7.5 snags/ha) that are > 12-14 in (30-35 cm) diameter. Downed logs may vary from abundant to absent. Canopies may be single or multi-layered. Evidence of human-caused alterations to the stand will be absent or so slight as to not affect the ecosystem's essential structures and functions. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west and 80-160 years old east of the Cascade crest.

— **Oregon White Oak:** Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).

— **Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

— **Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.

— **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

— **Cliffs:** Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.

— **Talus:** Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

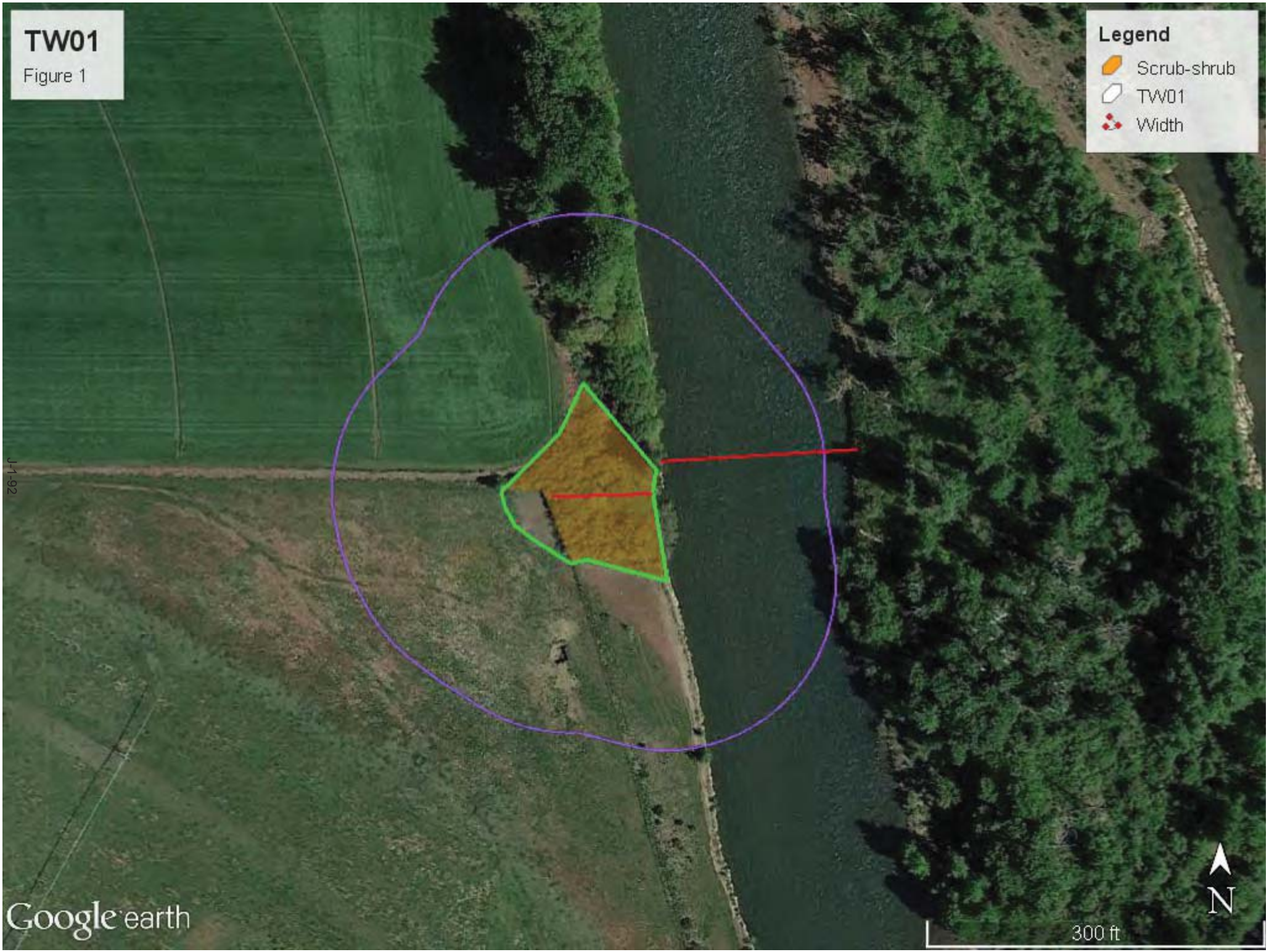
— **Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 12 in (30 cm)in eastern Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

— **Shrub-steppe:** A nonforested vegetation type consisting of one or more layers of perennial bunchgrasses and a conspicuous but discontinuous layer of shrubs (see Eastside Steppe for sites with little or no shrub cover).

— **Eastside Steppe:** Nonforested vegetation type dominated by broadleaf herbaceous flora (i.e., forbs), perennial bunchgrasses, or a combination of both. Bluebunch wheatgrass (*Pseudoroegneria spicata*) is often the prevailing cover component along with Idaho fescue (*Festuca idahoensis*), Sandberg bluegrass (*Poa secunda*), rough fescue (*F. campestris*), or needlegrasses (*Achnatherum* spp.).

— **Juniper Savannah:** All juniper woodlands.

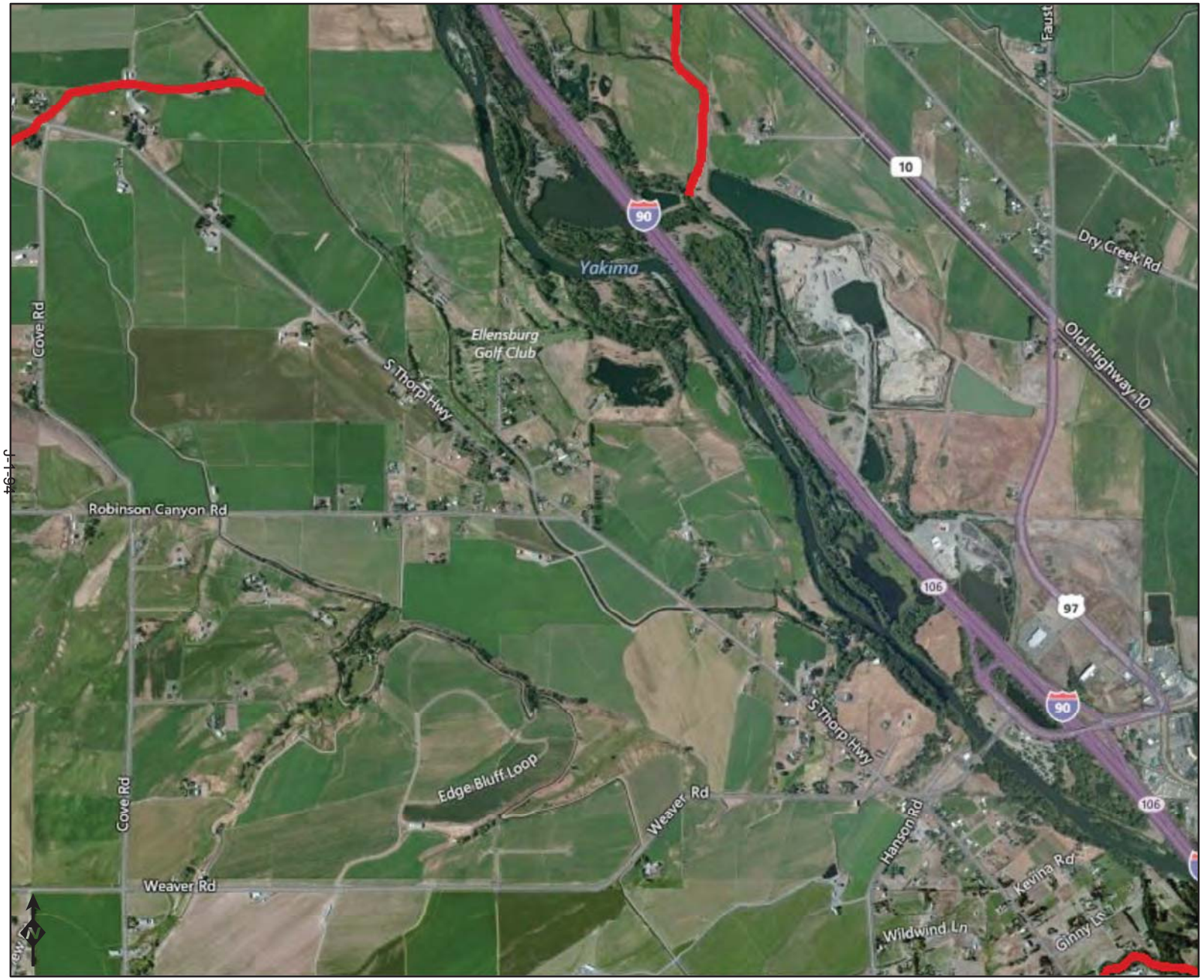
Note: All vegetated wetlands are by definition a priority habitat but are not included in this list because they are addressed elsewhere.


TW01
Figure 1
Legend
Scrub-shrub
TW01
Width
J1-92
Google earth
N
300 ft


TW01
Figure 2
Legend
Mid-intensity
TW01
Undisturbed
Klocke Rd
10
97
J1-93
Tinsdale Hwy S
90
N
3000 ft
Google earth
© 2016 Google

April 24, 2017

TW01 - Figure 3



Assessed Waters/Sediment

Water
- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

Sediment
- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

Miles
0 0.25 0.5 1

Image courtesy of USGS Earthstar Geographics SIO © 2017 Microsoft Corporation © 2017 HERE © AND

DEPARTMENT OF ECOLOGY
State of Washington

Water Quality Improvement Projects (TMDLs)

WATER QUALITY IMPROVEMENT PROJECTS (TMDLs)

Overview of the process

Project Catalog

- by WRIA
- by County

Funding Opportunities

Project Development Priority Lists

Related Information

TMDL Contacts

RELATED ECOLOGY PROGRAMS

Water Quality

Water Quality Improvement > Water Quality Improvement Projects by WRIA > WRIA 39: Upper Yakima

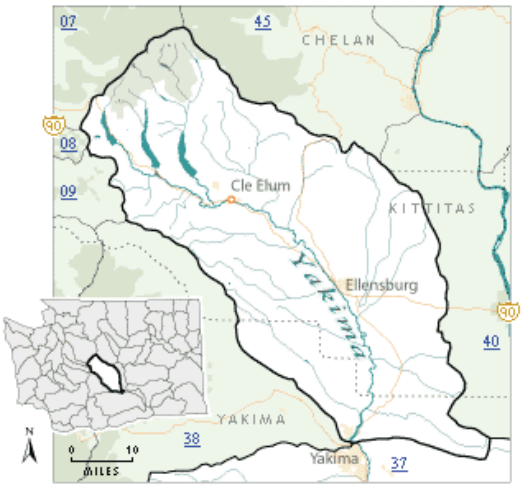
WRIA 39: Upper Yakima

The following table lists overview information and links to specific water quality improvement projects (including total maximum daily loads, or TMDLs) for this water resource inventory area (WRIA). Please use links (where available) for more information on a project.

Yakima River basin project index:
www.ecy.wa.gov/programs/wq/tmdl/yakima_wq/index.html

Counties

- Kittitas
- Yakima



Project Name	Pollutants	Status**	TMDL Lead
Crystal Creek	Ammonia-N BOD (5-day) Chlorine Fecal Coliform	EPA approved	Jane Creech 509-454-7860
Selah Ditch	Fecal Coliform Temperature	EPA approved	Greg Bohn 509-454-4174
Teanaway River segments: • Upper West Fork Teanaway River • Upper Middle Fork Teanaway River • Upper North Fork Teanaway River • Stafford Creek • Lower West Fork Teanaway River • Lower Middle Fork Teanaway River • Lower North Fork Teanaway River • Mainstem Teanaway River	Temperature	EPA approved	Jane Creech 509-454-7860
Wilson/Cooke Creek Tributaries: • Badger Creek • Bull Ditch • Caribou Creek • Cherry Creek • CID Canal • Coleman Creek • Cook Creek • EWC Canal • Johnson Drain • KRD Canal	Fecal Coliform	EPA approved Has an implementation plan Post-TMDL monitoring report	Jane Creech 509-454-7860 Greg Bohn 509-454-4174

• Mercer Creek • Naneum Creek • Parke Creek • Whiskey Creek • Wilson Creek • Wipple Wasteway			
Yakima River, Upper	Dieldrin DDT Suspended Sediments Turbidity	EPA approved	Jane Creech 509-454-7860
	Temperature	EPA approved Has an implementation plan	Jane Creech 509-454-7860
Yakima River	Toxics	Under development	Jane Creech 509-454-7860

**** Status** will be listed as one of the following: Approved by EPA, Under Development or Implementation. No status means project work has not yet started.*

For more information about WRIA 39:

- Waterbodies in WRIA 39 - using the Water Quality Assessment Query Tool
- Watershed Information for WRIA 39

* The Department of Ecology and other state resource agencies frequently use a system of 62 "Water Resource Inventory Areas" or "WRIAs" to refer to the state's major watershed basins.

Back to top of page

Last updated December 2016

Feedback?

About us
Director Maia Bellon
Tracking progress
Newsroom
Jobs
Staff only
Contact us

Publications & forms
Databases
Laws & rules
Public records disclosure
Public input & events
Environmental education
Sustainability information

中文 | Chinese
Tiếng Việt | Vietnamese
한국어 | Korean
Русский | Russian
Español | Spanish
Accessibility

Access Washington®
Welcome to the State of Washington

Copyright © Washington State Department of Ecology
Privacy Notice | Site Info | Accessibility | Contact the web team |

SHARE

Wetland name or number TW02

RATING SUMMARY – Eastern Washington

Name of wetland (or ID #): TW02 Date of site visit: 4/4/17

Rated by N. Evan Dulin Trained by Ecology? ✓ Yes ___ No Date of training 3/24/17

HGM Class used for rating Riverine Wetland has multiple HGM classes? ___Y ✓N

NOTE: Form is not complete without the figures requested (*figures can be combined*).
Source of base aerial photo/map Google Earth

OVERALL WETLAND CATEGORY II (based on functions ✓ or special characteristics ___)

1. Category of wetland based on FUNCTIONS

___**Category I** – Total score = 22-27
✓ **Category II** – Total score = 19-21
___**Category III** – Total score = 16-18
___**Category IV** – Total score = 9-15

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
	Circle the appropriate ratings			
Site Potential	H (M) L	H (M) L	H M (L)	
Landscape Potential	H (M) L	H (M) L	H (M) L	
Value	H (M) L	(H) M L	(H) M L	TOTAL
Score Based on Ratings	6	7	6	19

Score for each function based on three ratings *(order of ratings is not important)*

9 = H,H,H
8 = H,H,M
7 = H,H,L
7 = H,M,M
6 = H,M,L
6 = M,M,M
5 = H,L,L
5 = M,M,L
4 = M,L,L
3 = L,L,L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	CATEGORY *Circle the appropriate category*
Vernal Pools	II III
Alkali	I
Wetland of High Conservation Value	I
Bog and Calcareous Fens	I
Old Growth or Mature Forest – slow growing	I
Aspen Forest	I
Old Growth or Mature Forest – fast growing	II
Floodplain forest	II
None of the above	✓

Wetland name or number TW02

Maps and figures required to answer questions correctly for Eastern Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	D 1.3, H 1.1, H 1.5	
Hydroperiods (including area of open water for H 1.3)	D 1.4, H 1.2, H 1.3	
Location of outlet (*can be added to map of hydroperiods)*	D 1.1, D 4.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	
Map of the contributing basin	D 5.3	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	D 3.3	

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	1
Hydroperiods	H 1.2, H 1.3	1
Ponded depressions	R 1.1	1
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	R 2.4	1
Map of the contributing basin	R 2.2, R 2.3, R 5.2	2
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	1
Width of wetland vs. width of stream *(can be added to another figure)*	R 4.1	1
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	3
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	4
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	R 3.2, R 3.3	5

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	L 1.1, L 4.1, H 1.1, H 1.5	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants *(can be added to figure above)*	S 4.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	S 3.3	

Wetland name or number TW02

HGM Classification of Wetland in Eastern Washington

For questions 1-4, the criteria described must apply to the entire unit being rated.

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-4 apply, and go to Question 5.

1. Does the entire unit **meet both** of the following criteria?
   ___The vegetated part of the wetland is on the water side of the Ordinary High Water Mark of a body of permanent open water (without any plants on the surface) that is at least 20 ac (8 ha) in size
   ___At least 30% of the open water area is deeper than 10 ft (3 m)

   NO – go to 2 **YES –** The wetland class is **Lake Fringe** (Lacustrine Fringe)

2. Does the entire wetland unit **meet all** of the following criteria?
   ✓ The wetland is on a slope (*slope can be very gradual*),
   ✓ The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks;
   ___The water leaves the wetland **without being impounded**.

   NO - go to 3 YES – The wetland class is **Slope**
   NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 foot deep).

3. Does the entire wetland unit **meet all** of the following criteria?
   ✓ The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river;
   ✓ The overbank flooding occurs at least once every 10 years.

   NO - go to 4 YES – The wetland class is **Riverine**
   NOTE: The Riverine wetland can contain depressions that are filled with water when the river is not flooding.

4. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year. *This means that any outlet, if present, is higher than the interior of the wetland.*

   NO – go to 5 YES – The wetland class is **Depressional**

5. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-4 APPLY TO DIFFERENT AREAS IN THE WETLAND UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

Wetland name or number Two2

NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the wetland unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM Class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine (the riverine portion is within the boundary of depression)	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine

If you are still unable to determine which of the above criteria apply to your wetland, or if you have ***more than 2 HGM classes*** *within a wetland boundary, classify the wetland as Depressional for the rating.*

Wetland name or number Two2

RIVERINE WETLANDS **Water Quality Functions** - Indicators that the site functions to improve water quality	Points (only 1 score per box)
R 1.0. Does the site have the potential to improve water quality?	
R 1.1. Area of surface depressions within the Riverine wetland that can trap sediments during a flooding event: Depressions cover > 1/3 area of wetland — points = 6 (13,220 sqft / 29,998 sqft = 44%) Depressions cover > 1/10 area of wetland — points = 3 Depressions present but cover < 1/10 area of wetland — points = 1 No depressions present — points = 0	6
R 1.2. Structure of plants in the wetland (areas with >90% cover at person height; **not** Cowardin classes): Forest or shrub > 2/3 the area of the wetland — points = 10 Forest or shrub 1/3 – 2/3 area of the wetland — points = 5 (14% ungrazed) Ungrazed, herbaceous plants > 2/3 area of wetland — points = 5 Ungrazed herbaceous plants 1/3 – 2/3 area of wetland — points = 2 Forest, shrub, and ungrazed herbaceous < 1/3 area of wetland — points = 0	0
Total for R 1 — Add the points in the boxes above	6

Rating of Site Potential If score is: ___ **12-16 = H** ✓ **6-11 = M** ___ **0-5 = L** *Record the rating on the first page*

R 2.0. Does the landscape have the potential to support the water quality function of the site?	
R 2.1. Is the wetland within an incorporated city or within its UGA? Yes = 2 (No = 0)	0
R 2.2. Does the contributing basin include a UGA or incorporated area? Yes = 1 (No = 0)	0
R 2.3. Does at least 10% of the contributing basin contain tilled fields, pastures, or forests that have been clearcut within the last 5 years? (Yes = 1) No = 0	1
R 2.4. Is > 10% of the area within 150 ft of wetland in land uses that generate pollutants (Yes = 1) No = 0	1
R 2.5. Are there other sources of pollutants coming into the wetland that are not listed in questions R 2.1-R 2.4? Source_____ Yes = 1 (No = 0)	0
Total for R 2 — Add the points in the boxes above	2

Rating of Landscape Potential If score is: ___ **3-6 = H** ✓ **1 or 2 = M** ___ **0 = L** *Record the rating on the first page*

R 3.0. Is the water quality improvement provided by the site valuable to society?	
R 3.1. Is the wetland along a stream or river that is on the 303(d) list or on a tributary that drains to one within 1 mi? Drains to Yakima River within 1 mile (Yes = 1) No = 0	1
R 3.2. Does the river or stream have TMDL limits for nutrients, toxics, or pathogens? Yes = 1 (No = 0)	0
R 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality? *Answer YES if there is a TMDL for the drainage in which wetland is found.* Yes = 2 (No = 0)	0
Total for R 3 — Add the points in the boxes above	1

Rating of Value If score is: ___ **2-4 = H** ✓ **1 = M** ___ **0 = L** *Record the rating on the first page*

Wetland name or number TW02

RIVERINE WETLANDS **Hydrologic Functions** - Indicators that site functions to reduce flooding and stream erosion		Points (only 1 score per box)
R 4.0. Does the site have the potential to reduce flooding and erosion?		
R 4.1. Characteristics of the overbank storage the wetland provides: *Estimate the average width of the wetland perpendicular to the direction of the flow and the width of the stream or river channel (distance between banks). Calculate the ratio: (average width of wetland)/(average width of stream between banks).* 14' wetland / 22' channel		4
If the ratio is more than 2	points = 10	
If the ratio is 1-2	points = 8	
— If the ratio is ½-<1	points = 4	
If the ratio is ¼-< ½	points = 2	
If the ratio is < ¼	points = 1	
R 4.2. Characteristics of plants that slow down water velocities during floods: *Treat large woody debris as forest or shrub. Choose the points appropriate for the best description (polygons need to have > 90% cover at person height. These are NOT Cowardin classes).*		4
Forest or shrub for more than $^2/_3$ the area of the wetland ~7% = 2,095 sqft shrub	points = 6	
— Forest or shrub for > $^1/_3$ area OR emergent plants > $^2/_3$ area ~93% emergent	points = 4	
Forest or shrub for > $^1/_{10}$ area OR emergent plants > $^1/_3$ area	points = 2	
Plants do not meet above criteria	points = 0	
Total for R 5	Add the points in the boxes above	8

Rating of Site Potential If score is: ___ **12-16 = H** ✓ **6-11 = M** ___ **0-5 = L** *Record the rating on the first page*

R 5.0. Does the landscape have the potential to support the hydrologic functions of the site?		
R 5.1. Is the stream or river adjacent to the wetland downcut?	Yes = 0 (No = 1)	1
R 5.2. Does the up-gradient watershed include a UGA or incorporated area?	Yes = 1 (No = 0)	0
R 5.3. Is the up-gradient stream or river controlled by dams?	Yes = 0 (No = 1)	1
Total for R 5	Add the points in the boxes above	2

Rating of Landscape Potential If score is: ___ **3 = H** ✓ **1 or 2 = M** ___ **0 = L** *Record the rating on the first page*

R 6.0. Are the hydrologic functions provided by the site valuable to society?		
R 6.1. Distance to the nearest areas downstream that have flooding problems? *Choose the description that best fits the site.* The sub-basin immediately down-gradient of site has surface flooding problems that result in damage to human or natural resources	— points = 2	2
Surface flooding problems are in a basin farther down-gradient	points = 1	
No flooding problems anywhere downstream	points = 0	
R 6.2. Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan?	Yes = 2 (No = 0)	0
Total for R 6	Add the points in the boxes above	2

Rating of Value If score is: ✓ **2-4 = H** ___ **1 = M** ___ **0 = L** *Record the rating on the first page*

Wetland name or number Two2

These questions apply to wetlands of all HGM classes. **HABITAT FUNCTIONS** - Indicators that site functions to provide important habitat	(only 1 score per box)
H 1.0. Does the wetland have the potential to provide habitat for many species?	
H 1.1. Structure of the plant community: *Check the Cowardin vegetation classes present and categories of emergent plants. Size threshold for each category is >= ¼ ac or >= 10% of the wetland if wetland is < 2.5 ac.* ____Aquatic bed __✓__Emergent plants 0-12 in (0-30 cm) high are the highest layer and have > 30% cover ____Emergent plants >12-40 in (>30-100 cm) high are the highest layer with >30% cover ____Emergent plants > 40 in (> 100 cm) high are the highest layer with >30% cover <10% of wetland ____Scrub-shrub (areas where shrubs have >30% cover) <10% of wetland ____Forested (areas where trees have >30% cover) 4 or more checks: points = 3 3 checks: points = 2 2 checks: points = 1 1 check: points = 0	0
H 1.2. Is one of the vegetation types Aquatic Bed? Yes = 1 No = 0	0
H 1.3. Surface water H 1.3.1. Does the wetland have areas of open water (without emergent or shrub plants) over at least ¼ ac **OR** 10% of its area during the March to early June **OR** in August to the end of September? *Answer YES for Lake Fringe wetlands.* Yes = 3 points & go to H 1.4 No = go to H 1.3.2 H 1.3.2. Does the wetland have an intermittent or permanent, and unvegetated stream within its boundaries, or along one side, over at least ¼ ac or 10% of its area? *Answer yes only if H 1.3.1 is No.* Yes = 3 No = 0	0
H 1.4. Richness of plant species Count the number of plant species in the wetland that cover at least 10 ft^2. *Different patches of the same species can be combined to meet the size threshold. You do not have to name the species.* *Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Russian olive, Phragmites, Canadian thistle, yellow-flag iris, and saltcedar (Tamarisk)* # of species ____ Rush, Fescue, Rush, Rush Scoring: > 9 species: points = 2 4-9 species: points = 1 < 4 species: points = 0	0
H 1.5. Interspersion of habitats Decide from the diagrams below whether interspersion among types of plant structures (described in H 1.1), and unvegetated areas (open water or mudflats) is high, moderate, low, or none. *Use map of Cowardin and emergent plant classes prepared for questions H 1.1 and map of open water from H 1.3. If you have four or more plant classes or three classes and open water, the rating is always high.* **None** = 0 points **Low** = 1 point **Moderate** = 2 points All three diagrams in this row are **High** = 3 points Riparian braided channels with 2 classes	Figure__ 1

Wetland name or number TW02

H 1.6. Special habitat features *Check the habitat features that are present in the wetland. The number of checks is the number of points.* ✓ Loose rocks larger than 4 in OR large, downed, woody debris (> 4 in diameter) within the area of surface ponding or in stream. ✓ Cattails or bulrushes are present within the wetland. ___ Standing snags (diameter at the bottom > 4 in) in the wetland or within 30 m (100 ft) of the edge. ___ Emergent or shrub vegetation in areas that are permanently inundated/ponded. ___ Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 45 degree slope) OR signs of recent beaver activity ✓ Invasive species cover less than 20% in each stratum of vegetation *(canopy, sub-canopy, shrubs, herbaceous, moss/ground cover)*	3
Total for H 1 — Add the points in the boxes above	4

Rating of Site Potential If score is: ___ **15-18 = H** ___ **7-14 = M** ✓ **0-6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support habitat functions of the site?	
H 2.1. Accessible habitat (only area of habitat abutting wetland). If total accessible habitat is: *Calculate:* % undisturbed habitat 16 + [(% moderate and low intensity land uses)/2] 7 = 23 % > 1/3 (33.3%) of 1 km Polygon — points = 3 20-33% of 1km Polygon — points = 2 10-19% of 1km Polygon — points = 1 <10% of 1km Polygon — points = 0 undisturbed 158 ac ≈ 16% / 1 Km Poly 960 ac mid-intensity 131/960 = 14%	2
H 2.2. Undisturbed habitat in 1 km Polygon around wetland. *Calculate:* % undisturbed habitat 16 + [(% moderate and low intensity land uses)/2] 14 = 30 % Undisturbed habitat > 50% of Polygon — points = 3 Undisturbed habitat 10 - 50% and in 1-3 patches — points = 2 Undisturbed habitat 10 - 50% and > 3 patches — points = 1 Undisturbed habitat < 10% of Polygon — points = 0 mid-intensity 273/960 = 28% 3 patches	2
H 2.3. Land use intensity in 1 km Polygon: > 50% of Polygon is high intensity land use — points = (- 2) Does not meet criterion above — points = 0 529/960 = 55%	-2
H 2.4. The wetland is in an area where annual rainfall is less than 12 in, and its water regime is not influenced by irrigation practices, dams, or water control structures. *Generally, this means outside boundaries of reclamation areas, irrigation districts, or reservoirs* — Yes = 3 (No = 0)	0
Total for H 2 — Add the points in the boxes above	2

Rating of Landscape Potential If score is: ___ **4-9 = H** ✓ **1-3 = M** ___ **< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose the highest score that applies to the wetland being rated* Site meets ANY of the following criteria: — points = 2 ✓ — It has 3 or more priority habitats within 100 m (see Appendix B) — It provides habitat for Threatened or Endangered species (any plant or animal on state or federal lists) — It is mapped as a location for an individual WDFW species — It is a Wetland of High Conservation Value as determined by the Department of Natural Resources — It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan Site has 1 or 2 priority habitats within 100 m (see Appendix B) — points = 1 Site does not meet any of the criteria above — points = 0	2

Rating of Value If score is: ✓ **2 = H** ___ **1 = M** ___ **0 = L** *Record the rating on the first page*

Appendix B: WDFW Priority Habitats in Eastern Washington

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp. http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here: http://wdfw.wa.gov/conservation/phs/list/)

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland: ***NOTE:*** *This question is independent of the land use between the wetland and the priority habitat.*

— **Aspen Stands:** Pure or mixed stands of aspen greater than 1 ac (0.4 ha).

— **Biodiversity Areas and Corridors:** Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).

— **Old-growth/Mature forests:** Old-growth east of Cascade crest – Stands are highly variable in tree species composition and structural characteristics due to the influence of fire, climate, and soils. In general, stands will be >150 years of age, with 10 trees/ac (25 trees/ha) that are > 21 in (53 cm) dbh, and 1-3 snags/ac (2.5-7.5 snags/ha) that are > 12-14 in (30-35 cm) diameter. Downed logs may vary from abundant to absent. Canopies may be single or multi-layered. Evidence of human-caused alterations to the stand will be absent or so slight as to not affect the ecosystem's essential structures and functions. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west and 80-160 years old east of the Cascade crest.

— **Oregon White Oak:** Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).

— **Riparian:** The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

— **Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.

— **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

— **Cliffs:** Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.

— **Talus:** Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

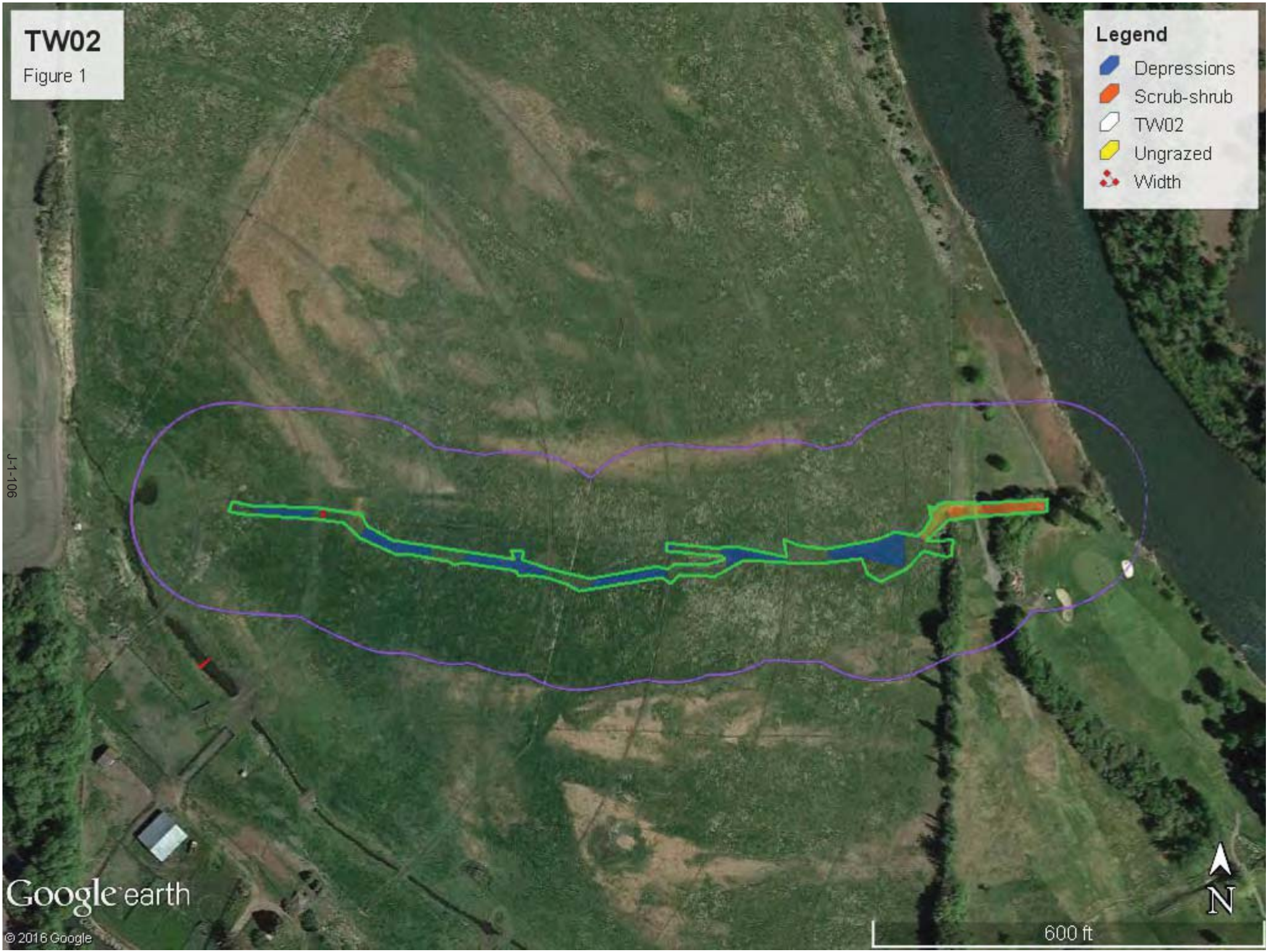
— **Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 12 in (30 cm)in eastern Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

— **Shrub-steppe:** A nonforested vegetation type consisting of one or more layers of perennial bunchgrasses and a conspicuous but discontinuous layer of shrubs (see Eastside Steppe for sites with little or no shrub cover).

— **Eastside Steppe:** Nonforested vegetation type dominated by broadleaf herbaceous flora (i.e., forbs), perennial bunchgrasses, or a combination of both. Bluebunch wheatgrass (*Pseudoroegneria spicata*) is often the prevailing cover component along with Idaho fescue (*Festuca idahoensis*), Sandberg bluegrass (*Poa secunda*), rough fescue (*F. campestris*), or needlegrasses (*Achnatherum* spp.).

— **Juniper Savannah:** All juniper woodlands.

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list because they are addressed elsewhere.


TW02
Figure 1
Legend
Depressions
Scrub-shrub
TW02
Ungrazed
Width
J-1-106
Google earth
© 2016 Google
N
600 ft


TW02
Figure 2
Legend
Contributing Basin
TW02
90
J-1-107
Google earth
© 2016 Google
N
1000 ft


TW02
Figure 3
Legend
Mid-intensity
TW02
Undisturbed
J-1-108
Thorp Hwy S
Parkwood Ln
90
N
3000 ft
Google earth
© 2016 Google

April 25, 2017

TW02 - Figure 4



Assessed Waters/Sediment

Water
- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

Sediment
- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

Miles
0 0.125 0.25 0.5

Image courtesy of USGS Earthstar Geographics SIO © 2017 Microsoft Corporation © 2010 NAVTEQ © AND

DEPARTMENT OF ECOLOGY
State of Washington

Water Quality Improvement Projects (TMDLs)

WATER QUALITY IMPROVEMENT PROJECTS (TMDLs)

Overview of the process
Project Catalog
- by WRIA
- by County

Funding Opportunities
Project Development Priority Lists
Related Information
TMDL Contacts

RELATED ECOLOGY PROGRAMS

Water Quality

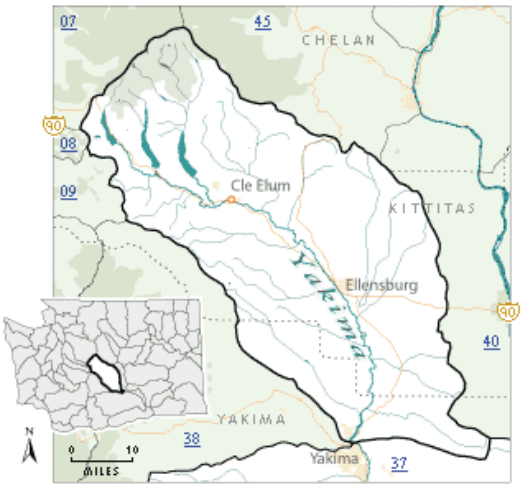
Water Quality Improvement > Water Quality Improvement Projects by WRIA > WRIA 39: Upper Yakima

WRIA 39: Upper Yakima

The following table lists overview information and links to specific water quality improvement projects (including total maximum daily loads, or TMDLs) for this water resource inventory area (WRIA). Please use links (where available) for more information on a project.

Yakima River basin project index:
www.ecy.wa.gov/programs/wq/tmdl/yakima_wq/index.html
Counties

- Kittitas
- Yakima



Project Name	Pollutants	Status**	TMDL Lead
Crystal Creek	Ammonia-N BOD (5-day) Chlorine Fecal Coliform	EPA approved	Jane Creech 509-454-7860
Selah Ditch	Fecal Coliform Temperature	EPA approved	Greg Bohn 509-454-4174
Teanaway River segments: • Upper West Fork Teanaway River • Upper Middle Fork Teanaway River • Upper North Fork Teanaway River • Stafford Creek • Lower West Fork Teanaway River • Lower Middle Fork Teanaway River • Lower North Fork Teanaway River • Mainstem Teanaway River	Temperature	EPA approved	Jane Creech 509-454-7860
Wilson/Cooke Creek Tributaries: • Badger Creek • Bull Ditch • Caribou Creek • Cherry Creek • CID Canal • Coleman Creek • Cook Creek • EWC Canal • Johnson Drain • KRD Canal	Fecal Coliform	EPA approved Has an implementation plan Post-TMDL monitoring report	Jane Creech 509-454-7860 Greg Bohn 509-454-4174

Mercer Creek • Naneum Creek • Parke Creek • Whiskey Creek • Wilson Creek • Wipple Wasteway			
Yakima River, Upper	Dieldrin DDT Suspended Sediments Turbidity	EPA approved	Jane Creech 509-454-7860
	Temperature	EPA approved Has an implementation plan	Jane Creech 509-454-7860
Yakima River	Toxics	Under development	Jane Creech 509-454-7860

**** Status** will be listed as one of the following: Approved by EPA, Under Development or Implementation. No status means project work has not yet started.*

For more information about WRIA 39:

- Waterbodies in WRIA 39 - using the Water Quality Assessment Query Tool
- Watershed Information for WRIA 39

* The Department of Ecology and other state resource agencies frequently use a system of 62 "Water Resource Inventory Areas" or "WRIAs" to refer to the state's major watershed basins.

Back to top of page

Last updated December 2016

Feedback?

About us
Director Maia Bellon
Tracking progress
Newsroom
Jobs
Staff only
Contact us

Publications & forms
Databases
Laws & rules
Public records disclosure
Public input & events
Environmental education
Sustainability information

中文 | Chinese
Tiếng Việt | Vietnamese
한국어 | Korean
Русский | Russian
Español | Spanish
Accessibility

Access Washington®
Welcome to the State of Washington

Copyright © Washington State Department of Ecology
Privacy Notice | Site Info | Accessibility | Contact the web team |

SHARE

Wetland name or number TW03

RATING SUMMARY – Eastern Washington

Name of wetland (or ID #): TW03 Date of site visit: 4/4/17

Rated by N. Evan Dulin Trained by Ecology? ✓ Yes ___ No Date of training 3/24/17

HGM Class used for rating Riverine Wetland has multiple HGM classes? ___Y ✓N

NOTE: Form is not complete without the figures requested (*figures can be combined*).
Source of base aerial photo/map Google Earth

OVERALL WETLAND CATEGORY II (based on functions ✓ or special characteristics ___)

1. Category of wetland based on FUNCTIONS

___**Category I** – Total score = 22-27
✓ **Category II** – Total score = 19-21
___**Category III** – Total score = 16-18
___**Category IV** – Total score = 9-15

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
	Circle the appropriate ratings			
Site Potential	H (M) L	(H) M L	H (M) L	
Landscape Potential	H (M) L	H (M) L	H (M) L	
Value	H (M) L	(H) M L	H (M) L	TOTAL
Score Based on Ratings	6	8	6	20

Score for each function based on three ratings *(order of ratings is not important)*

9 = H,H,H
8 = H,H,M
7 = H,H,L
7 = H,M,M
6 = H,M,L
6 = M,M,M
5 = H,L,L
5 = M,M,L
4 = M,L,L
3 = L,L,L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	CATEGORY *Circle the appropriate category*
Vernal Pools	**II** **III**
Alkali	**I**
Wetland of High Conservation Value	**I**
Bog and Calcareous Fens	**I**
Old Growth or Mature Forest – slow growing	**I**
Aspen Forest	**I**
Old Growth or Mature Forest – fast growing	**II**
Floodplain forest	**II**
None of the above	✓

Wetland name or number TW03

Maps and figures required to answer questions correctly for Eastern Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	D 1.3, H 1.1, H 1.5	
Hydroperiods (including area of open water for H 1.3)	D 1.4, H 1.2, H 1.3	
Location of outlet (*can be added to map of hydroperiods)*	D 1.1, D 4.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	
Map of the contributing basin	D 5.3	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	D 3.3	

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	1
Hydroperiods	H 1.2, H 1.3	1
Ponded depressions	R 1.1	1
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	R 2.4	1
Map of the contributing basin	R 2.2, R 2.3, R 5.2	2
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	1
Width of wetland vs. width of stream *(can be added to another figure)*	R 4.1	1
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	3
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	4
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	R 3.2, R 3.3	5

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	L 1.1, L 4.1, H 1.1, H 1.5	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants *(can be added to figure above)*	S 4.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	S 3.3	

Wetland name or number TW03

HGM Classification of Wetland in Eastern Washington

For questions 1-4, the criteria described must apply to the entire unit being rated.

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-4 apply, and go to Question 5.

1. Does the entire unit **meet both** of the following criteria?
   ___The vegetated part of the wetland is on the water side of the Ordinary High Water Mark of a body of permanent open water (without any plants on the surface) that is at least 20 ac (8 ha) in size
   ___At least 30% of the open water area is deeper than 10 ft (3 m)

   NO – go to 2 **YES –** The wetland class is **Lake Fringe** (Lacustrine Fringe)

2. Does the entire wetland unit **meet all** of the following criteria?
   ___The wetland is on a slope (*slope can be very gradual*),
   ___The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks;
   ___The water leaves the wetland **without being impounded**.

   NO - go to 3 YES – The wetland class is **Slope**
   NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 foot deep).

3. Does the entire wetland unit **meet all** of the following criteria?
   ✓ The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river;
   ✓ The overbank flooding occurs at least once every 10 years.

   NO - go to 4 YES – The wetland class is **Riverine**
   NOTE: The Riverine wetland can contain depressions that are filled with water when the river is not flooding.

4. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year. *This means that any outlet, if present, is higher than the interior of the wetland.*

   NO – go to 5 YES – The wetland class is **Depressional**

5. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-4 APPLY TO DIFFERENT AREAS IN THE WETLAND UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

Wetland name or number TW03

NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the wetland unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM Class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine (the riverine portion is within the boundary of depression)	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine

If you are still unable to determine which of the above criteria apply to your wetland, or if you have ***more than 2 HGM classes*** *within a wetland boundary, classify the wetland as Depressional for the rating.*

Wetland name or number TW03

RIVERINE WETLANDS **Water Quality Functions** - Indicators that the site functions to improve water quality	Points (only 1 score per box)
R 1.0. Does the site have the potential to improve water quality?	
R 1.1. Area of surface depressions within the Riverine wetland that can trap sediments during a flooding event: Depressions cover > 1/3 area of wetland — points = 6 Depressions cover > 1/10 area of wetland — points = 3 Depressions present but cover < 1/10 area of wetland — points = 1 No depressions present — points = 0 0.85ac / 2.8ac = 31%	6
R 1.2. Structure of plants in the wetland (areas with >90% cover at person height; **not** Cowardin classes): Forest or shrub > 2/3 the area of the wetland — points = 10 Forest or shrub 1/3 – 2/3 area of the wetland — points = 5 Ungrazed, herbaceous plants > 2/3 area of wetland — points = 5 Ungrazed herbaceous plants 1/3 – 2/3 area of wetland — points = 2 Forest, shrub, and ungrazed herbaceous < 1/3 area of wetland — points = 0 shrub 0.39ac / 2.8 = 14%	2
Total for R 1 — Add the points in the boxes above	8

Rating of Site Potential If score is: ___ **12-16 = H** ✓ **6-11 = M** ___ **0-5 = L** *Record the rating on the first page*

R 2.0. Does the landscape have the potential to support the water quality function of the site?	
R 2.1. Is the wetland within an incorporated city or within its UGA? Yes = 2 (No = 0)	0
R 2.2. Does the contributing basin include a UGA or incorporated area? Yes = 1 (No = 0)	0
R 2.3. Does at least 10% of the contributing basin contain tilled fields, pastures, or forests that have been clearcut within the last 5 years? (Yes = 1) No = 0	1
R 2.4. Is > 10% of the area within 150 ft of wetland in land uses that generate pollutants (Yes = 1) No = 0	1
R 2.5. Are there other sources of pollutants coming into the wetland that are not listed in questions R 2.1-R 2.4? Source_____ Yes = 1 (No = 0)	0
Total for R 2 — Add the points in the boxes above	2

Rating of Landscape Potential If score is: ___ **3-6 = H** ✓ **1 or 2 = M** ___ **0 = L** *Record the rating on the first page*

R 3.0. Is the water quality improvement provided by the site valuable to society?	
R 3.1. Is the wetland along a stream or river that is on the 303(d) list or on a tributary that drains to one within 1 mi? Drains to Yakima River within 1 mile (Yes = 1) No = 0	1
R 3.2. Does the river or stream have TMDL limits for nutrients, toxics, or pathogens? Yes = 1 (No = 0)	0
R 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality? *Answer YES if there is a TMDL for the drainage in which wetland is found.* Yes = 2 (No = 0)	0
Total for R 3 — Add the points in the boxes above	1

Rating of Value If score is: ___ **2-4 = H** ✓ **1 = M** ___ **0 = L** *Record the rating on the first page*

Wetland name or number TW03

RIVERINE WETLANDS **Hydrologic Functions** - Indicators that site functions to reduce flooding and stream erosion		Points (only 1 score per box)
R 4.0. Does the site have the potential to reduce flooding and erosion?		
R 4.1. Characteristics of the overbank storage the wetland provides: *Estimate the average width of the wetland perpendicular to the direction of the flow and the width of the stream or river channel (distance between banks). Calculate the ratio: (average width of wetland)/(average width of stream between banks).* — If the ratio is more than 2 (50' wetland / 8' stream) If the ratio is 1-2 If the ratio is ½-<1 If the ratio is ¼-< ½ If the ratio is < ¼	points = 10 points = 8 points = 4 points = 2 points = 1	10
R 4.2. Characteristics of plants that slow down water velocities during floods: *Treat large woody debris as forest or shrub. Choose the points appropriate for the best description (polygons need to have > 90% cover at person height. These are NOT Cowardin classes).* Forest or shrub for more than $^2/_3$ the area of the wetland Forest or shrub for > $^1/_3$ area OR emergent plants > $^2/_3$ area ~ Forest or shrub for > $^1/_{10}$ area OR emergent plants > $^1/_3$ area Plants do not meet above criteria	points = 6 points = 4 points = 2 points = 0	2
Total for R 5	Add the points in the boxes above	12

Rating of Site Potential If score is: ✓ **12-16 = H** ___ **6-11 = M** ___ **0-5 = L** *Record the rating on the first page*

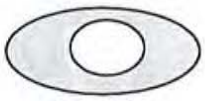
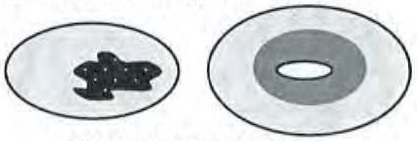
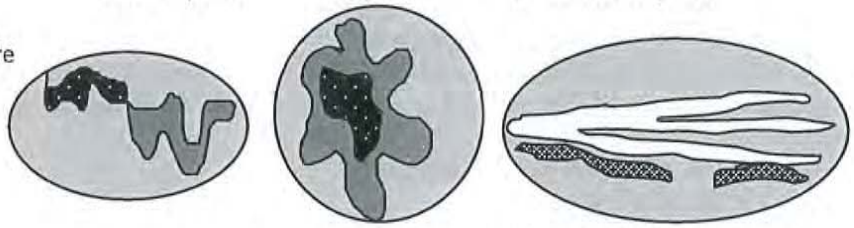
R 5.0. Does the landscape have the potential to support the hydrologic functions of the site?		
R 5.1. Is the stream or river adjacent to the wetland downcut?	Yes = 0 (No = 1)	1
R 5.2. Does the up-gradient watershed include a UGA or incorporated area?	Yes = 1 (No = 0)	0
R 5.3. Is the up-gradient stream or river controlled by dams?	Yes = 0 (No = 1)	1
Total for R 5	Add the points in the boxes above	2

Rating of Landscape Potential If score is: ___ **3 = H** ✓ **1 or 2 = M** ___ **0 = L** *Record the rating on the first page*

R 6.0. Are the hydrologic functions provided by the site valuable to society?		
R 6.1. Distance to the nearest areas downstream that have flooding problems? *Choose the description that best fits the site.* — The sub-basin immediately down-gradient of site has surface flooding problems that result in damage to human or natural resources Surface flooding problems are in a basin farther down-gradient No flooding problems anywhere downstream	points = 2 points = 1 points = 0	2
R 6.2. Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan?	Yes = 2 (No = 0)	0
Total for R 6	Add the points in the boxes above	2

Rating of Value If score is: ✓ **2-4 = H** ___ **1 = M** ___ **0 = L** *Record the rating on the first page*

Wetland name or number TW03

These questions apply to wetlands of all HGM classes. **HABITAT FUNCTIONS** - Indicators that site functions to provide important habitat	(only 1 score per box)
H 1.0. Does the wetland have the potential to provide habitat for many species?	
H 1.1. Structure of the plant community: *Check the Cowardin vegetation classes present and categories of emergent plants. Size threshold for each category is >= ¼ ac or >= 10% of the wetland if wetland is < 2.5 ac.* ✓ Aquatic bed 0.29 acres ✓ Emergent plants 0-12 in (0-30 cm) high are the highest layer and have > 30% cover >33% ✓ Emergent plants >12-40 in (>30-100 cm) high are the highest layer with >30% cover ___ Emergent plants > 40 in (> 100 cm) high are the highest layer with >30% cover ✓ Scrub-shrub (areas where shrubs have >30% cover) ~14% ___ Forested (areas where trees have >30% cover) 4 or more checks: points = 3 3 checks: points = 2 2 checks: points = 1 1 check: points = 0	3
H 1.2. Is one of the vegetation types Aquatic Bed? Yes = 1 No = 0	1
H 1.3. Surface water H 1.3.1. Does the wetland have areas of open water (without emergent or shrub plants) over at least ¼ ac **OR** 10% of its area during the March to early June **OR** in August to the end of September? *Answer YES for Lake Fringe wetlands.* Yes = 3 points & go to H 1.4 No = go to H 1.3.2 H 1.3.2. Does the wetland have an intermittent or permanent, and unvegetated stream within its boundaries, or along one side, over at least ¼ ac or 10% of its area? *Answer yes only if H 1.3.1 is No.* Yes = 3 No = 0	3
H 1.4. Richness of plant species Count the number of plant species in the wetland that cover at least 10 ft^2. *Different patches of the same species can be combined to meet the size threshold. You do not have to name the species.* *Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Russian olive, Phragmites, Canadian thistle, yellow-flag iris, and saltcedar (Tamarisk)* # of species ____ Scoring: > 9 species: points = 2 4-9 species: points = 1 < 4 species: points = 0	1
H 1.5. Interspersion of habitats Decide from the diagrams below whether interspersion among types of plant structures (described in H 1.1), and unvegetated areas (open water or mudflats) is high, moderate, low, or none. *Use map of Cowardin and emergent plant classes prepared for questions H 1.1 and map of open water from H 1.3. If you have four or more plant classes or three classes and open water, the rating is always high.*  **None** = 0 points  **Low** = 1 point  **Moderate** = 2 points All three diagrams in this row are **High** = 3 points  Riparian braided channels with 2 classes	Figure__ 2

Wetland name or number TW03

H 1.6. Special habitat features *Check the habitat features that are present in the wetland. The number of checks is the number of points.* ✓ Loose rocks larger than 4 in OR large, downed, woody debris (> 4 in diameter) within the area of surface ponding or in stream. ✓ Cattails or bulrushes are present within the wetland. ___ Standing snags (diameter at the bottom > 4 in) in the wetland or within 30 m (100 ft) of the edge. ✓ Emergent or shrub vegetation in areas that are permanently inundated/ponded. ___ Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 45 degree slope) OR signs of recent beaver activity ___ Invasive species cover less than 20% in each stratum of vegetation *(canopy, sub-canopy, shrubs, herbaceous, moss/ground cover)*	3
Total for H 1 — Add the points in the boxes above	13

Rating of Site Potential If score is: ___ **15-18 = H** ✓ **7-14 = M** ___ **0-6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support habitat functions of the site?	
H 2.1. Accessible habitat (only area of habitat abutting wetland). If total accessible habitat is: *Calculate:* % undisturbed habitat 15 + [(% moderate and low intensity land uses)/2] 6.5 = 21.5 % > 1/3 (33.3%) of 1 km Polygon — points = 3 — 20-33% of 1km Polygon — points = 2 10-19% of 1km Polygon — points = 1 <10% of 1km Polygon — points = 0 Undisturbed 176 / 1150 ac = 15% mod 154 / 1150 = 13%	2
H 2.2. Undisturbed habitat in 1 km Polygon around wetland. *Calculate:* % undisturbed habitat 15 + [(% moderate and low intensity land uses)/2] 23.5 = 38.5 % Undisturbed habitat > 50% of Polygon — points = 3 Undisturbed habitat 10 - 50% and in 1-3 patches — points = 2 — Undisturbed habitat 10 - 50% and > 3 patches — points = 1 Undisturbed habitat < 10% of Polygon — points = 0 mod 305 / 1150 = 27% (4 patches)	1
H 2.3. Land use intensity in 1 km Polygon: — > 50% of Polygon is high intensity land use 58% — points = (- 2) Does not meet criterion above — points = 0	-2
H 2.4. The wetland is in an area where annual rainfall is less than 12 in, and its water regime is not influenced by irrigation practices, dams, or water control structures. *Generally, this means outside boundaries of reclamation areas, irrigation districts, or reservoirs* — Yes = 3 No = 0	
Total for H 2 — Add the points in the boxes above	1

Rating of Landscape Potential If score is: ___ **4-9 = H** ✓ **1-3 = M** ___ **< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose the highest score that applies to the wetland being rated* Site meets ANY of the following criteria: — points = 2 — It has 3 or more priority habitats within 100 m (see Appendix B) — It provides habitat for Threatened or Endangered species (any plant or animal on state or federal lists) — It is mapped as a location for an individual WDFW species — It is a Wetland of High Conservation Value as determined by the Department of Natural Resources — It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan — Site has 1 or 2 priority habitats within 100 m (see Appendix B) — points = 1 Site does not meet any of the criteria above — points = 0	1

Rating of Value If score is: ___ **2 = H** ✓ **1 = M** ___ **0 = L** *Record the rating on the first page*

Appendix B: WDFW Priority Habitats in Eastern Washington

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp. http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here: http://wdfw.wa.gov/conservation/phs/list/)

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland: ***NOTE:*** *This question is independent of the land use between the wetland and the priority habitat.*

— **Aspen Stands:** Pure or mixed stands of aspen greater than 1 ac (0.4 ha).

— **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).

— **Old-growth/Mature forests:** Old-growth east of Cascade crest – Stands are highly variable in tree species composition and structural characteristics due to the influence of fire, climate, and soils. In general, stands will be >150 years of age, with 10 trees/ac (25 trees/ha) that are > 21 in (53 cm) dbh, and 1-3 snags/ac (2.5-7.5 snags/ha) that are > 12-14 in (30-35 cm) diameter. Downed logs may vary from abundant to absent. Canopies may be single or multi-layered. Evidence of human-caused alterations to the stand will be absent or so slight as to not affect the ecosystem's essential structures and functions. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west and 80-160 years old east of the Cascade crest.

— **Oregon White Oak:** Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).

✓ — **Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

— **Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.

— **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

— **Cliffs:** Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.

— **Talus:** Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

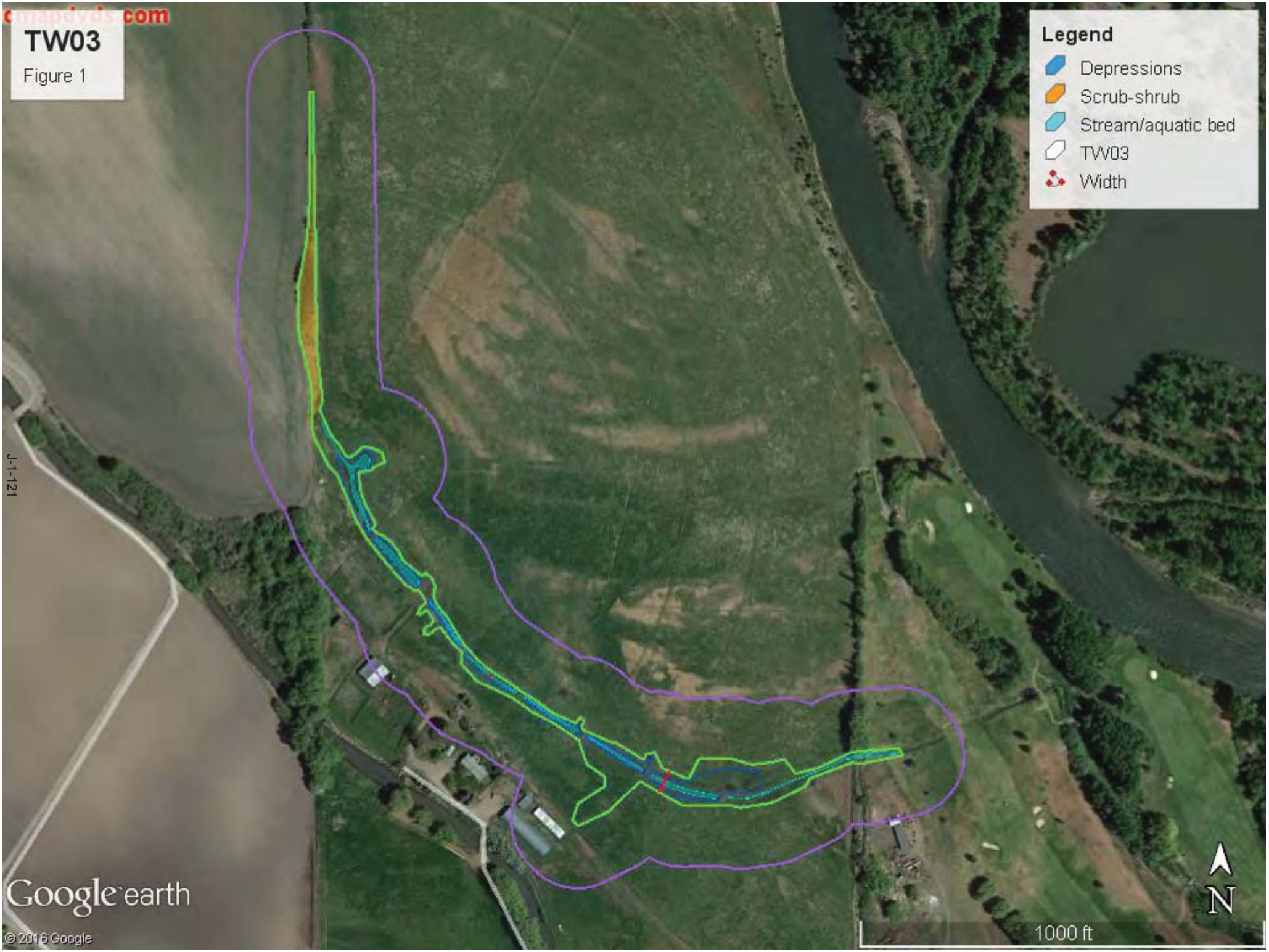
— **Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 12 in (30 cm)in eastern Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

— **Shrub-steppe:** A nonforested vegetation type consisting of one or more layers of perennial bunchgrasses and a conspicuous but discontinuous layer of shrubs (see Eastside Steppe for sites with little or no shrub cover).

— **Eastside Steppe:** Nonforested vegetation type dominated by broadleaf herbaceous flora (i.e., forbs), perennial bunchgrasses, or a combination of both. Bluebunch wheatgrass (*Pseudoroegneria spicata*) is often the prevailing cover component along with Idaho fescue (*Festuca idahoensis*), Sandberg bluegrass (*Poa secunda*), rough fescue (*F. campestris*), or needlegrasses (*Achnatherum* spp.).

— **Juniper Savannah:** All juniper woodlands.

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list because they are addressed elsewhere.


TW03
Figure 1
Legend
Depressions
Scrub-shrub
Stream/aquatic bed
TW03
Width
J-1-121
Google earth
© 2016 Google
N
1000 ft


TW03
Figure 2
Legend
Contributing Basin
TW03
90
J-1-122
Google earth
© 2016 Google
N
1000 ft


TW03
Figure 3
Legend
Mid-intensity
TW03
Undisturbed
10
97
90
Dry Creek Rd
J-1-123
Parkwood Ln
Thorp Hwy S
Robinson Canyon Rd
Google earth
© 2016 Google
4000 ft
N

April 25, 2017

TW03 - Figure 4



Assessed Waters/Sediment

Water
- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

Sediment
- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

J-I-124

Image courtesy of USGS Earthstar Geographics SIO © 2017 Microsoft Corporation © 2010 NAVTEQ © AND

Miles
0 0.125 0.25 0.5

DEPARTMENT OF ECOLOGY
State of Washington

Water Quality Improvement Projects (TMDLs)

WATER QUALITY IMPROVEMENT PROJECTS (TMDLs)

Overview of the process
Project Catalog
- by WRIA
- by County

Funding Opportunities
Project Development Priority Lists
Related Information
TMDL Contacts

RELATED ECOLOGY PROGRAMS

Water Quality

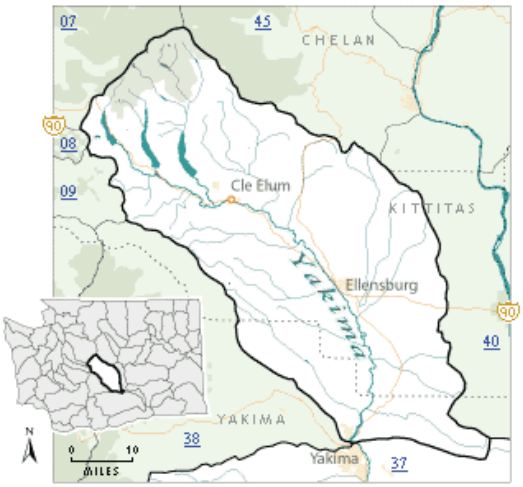
Water Quality Improvement > Water Quality Improvement Projects by WRIA > WRIA 39: Upper Yakima

WRIA 39: Upper Yakima

The following table lists overview information and links to specific water quality improvement projects (including total maximum daily loads, or TMDLs) for this water resource inventory area (WRIA). Please use links (where available) for more information on a project.

Yakima River basin project index:
www.ecy.wa.gov/programs/wq/tmdl/yakima_wq/index.html
Counties

- Kittitas
- Yakima



Project Name	Pollutants	Status**	TMDL Lead
Crystal Creek	Ammonia-N BOD (5-day) Chlorine Fecal Coliform	EPA approved	Jane Creech 509-454-7860
Selah Ditch	Fecal Coliform Temperature	EPA approved	Greg Bohn 509-454-4174
Teanaway River segments: • Upper West Fork Teanaway River • Upper Middle Fork Teanaway River • Upper North Fork Teanaway River • Stafford Creek • Lower West Fork Teanaway River • Lower Middle Fork Teanaway River • Lower North Fork Teanaway River • Mainstem Teanaway River	Temperature	EPA approved	Jane Creech 509-454-7860
Wilson/Cooke Creek Tributaries: • Badger Creek • Bull Ditch • Caribou Creek • Cherry Creek • CID Canal • Coleman Creek • Cook Creek • EWC Canal • Johnson Drain • KRD Canal	Fecal Coliform	EPA approved Has an implementation plan Post-TMDL monitoring report	Jane Creech 509-454-7860 Greg Bohn 509-454-4174

• Mercer Creek • Naneum Creek • Parke Creek • Whiskey Creek • Wilson Creek • Wipple Wasteway			
Yakima River, Upper	Dieldrin DDT Suspended Sediments Turbidity	EPA approved	Jane Creech 509-454-7860
	Temperature	EPA approved Has an implementation plan	Jane Creech 509-454-7860
Yakima River	Toxics	Under development	Jane Creech 509-454-7860

**** Status** will be listed as one of the following: Approved by EPA, Under Development or Implementation. No status means project work has not yet started.*

For more information about WRIA 39:

- Waterbodies in WRIA 39 - using the Water Quality Assessment Query Tool
- Watershed Information for WRIA 39

* The Department of Ecology and other state resource agencies frequently use a system of 62 "Water Resource Inventory Areas" or "WRIAs" to refer to the state's major watershed basins.

Back to top of page

Last updated December 2016

Feedback?

About us
Director Maia Bellon
Tracking progress
Newsroom
Jobs
Staff only
Contact us

Publications & forms
Databases
Laws & rules
Public records disclosure
Public input & events
Environmental education
Sustainability information

中文 | Chinese
Tiếng Việt | Vietnamese
한국어 | Korean
Русский | Russian
Español | Spanish
Accessibility

Access Washington®
Welcome to the State of Washington

Copyright © Washington State Department of Ecology
Privacy Notice | Site Info | Accessibility | Contact the web team |

SHARE

Wetland name or number TW04

RATING SUMMARY – Eastern Washington

Name of wetland (or ID #): TW04 Date of site visit: 4/4/17

Rated by N. Evan Dahl Trained by Ecology? ✓ Yes ___ No Date of training 3/24/17

HGM Class used for rating Depressional Wetland has multiple HGM classes? ___Y ✓N

NOTE: Form is not complete without the figures requested (*figures can be combined*).
Source of base aerial photo/map Google Earth

OVERALL WETLAND CATEGORY III (based on functions ✓ or special characteristics ___)

1. Category of wetland based on FUNCTIONS

___**Category I** – Total score = 22-27
___**Category II** – Total score = 19-21
✓**Category III** – Total score = 16-18
___**Category IV** – Total score = 9-15

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
	Circle the appropriate ratings			
Site Potential	H (M) L	(H) M L	H (M) L	
Landscape Potential	H (M) L	H M (L)	H (M) L	
Value	H (M) L	H (M) L	H (M) L	TOTAL
Score Based on Ratings	6	6	6	18

Score for each function based on three ratings *(order of ratings is not important)*

9 = H,H,H
8 = H,H,M
7 = H,H,L
7 = H,M,M
6 = H,M,L
6 = M,M,M
5 = H,L,L
5 = M,M,L
4 = M,L,L
3 = L,L,L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	CATEGORY *Circle the appropriate category*
Vernal Pools	II III
Alkali	I
Wetland of High Conservation Value	I
Bog and Calcareous Fens	I
Old Growth or Mature Forest – slow growing	I
Aspen Forest	I
Old Growth or Mature Forest – fast growing	II
Floodplain forest	II
None of the above	✓

Wetland name or number Two4

Maps and figures required to answer questions correctly for Eastern Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	D 1.3, H 1.1, H 1.5	1
Hydroperiods (including area of open water for H 1.3)	D 1.4, H 1.2, H 1.3	1
Location of outlet (*can be added to map of hydroperiods)*	D 1.1, D 4.1	1
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	1
Map of the contributing basin	D 5.3	2
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	3
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	4
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	D 3.3	5

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	R 2.4	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of wetland vs. width of stream *(can be added to another figure)*	R 4.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	R 3.2, R 3.3	

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	L 1.1, L 4.1, H 1.1, H 1.5	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants *(can be added to figure above)*	S 4.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	S 3.3	

Wetland name or number TW04

HGM Classification of Wetland in Eastern Washington

For questions 1-4, the criteria described must apply to the entire unit being rated.

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-4 apply, and go to Question 5.

1. Does the entire unit **meet both** of the following criteria?
   ___The vegetated part of the wetland is on the water side of the Ordinary High Water Mark of a body of permanent open water (without any plants on the surface) that is at least 20 ac (8 ha) in size
   ___At least 30% of the open water area is deeper than 10 ft (3 m)

   NO – go to 2 **YES –** The wetland class is **Lake Fringe** (Lacustrine Fringe)

2. Does the entire wetland unit **meet all** of the following criteria?
   ___The wetland is on a slope (*slope can be very gradual*),
   ___The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks;
   ___The water leaves the wetland **without being impounded**.

   NO - go to 3 YES – The wetland class is **Slope**

   NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 foot deep).

3. Does the entire wetland unit **meet all** of the following criteria?
   ___The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river;
   ___The overbank flooding occurs at least once every 10 years. ~10

   NO - go to 4 YES – The wetland class is **Riverine**

   NOTE: The Riverine wetland can contain depressions that are filled with water when the river is not flooding.

4. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year. *This means that any outlet, if present, is higher than the interior of the wetland.*

   NO – go to 5 YES – The wetland class is **Depressional**

5. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-4 APPLY TO DIFFERENT AREAS IN THE WETLAND UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

Wetland name or number TW04

NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the wetland unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM Class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine (the riverine portion is within the boundary of depression)	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine

*If you are still unable to determine which of the above criteria apply to your wetland, or if you have **more than 2 HGM classes** within a wetland boundary, classify the wetland as Depressional for the rating.*

Wetland name or number TW04

DEPRESSIONAL WETLANDS **Water Quality Functions** - Indicators that the site functions to improve water quality	Points (only 1 score per box)
D 1.0. Does the site have the potential to improve water quality?	
D 1.1. Characteristics of surface water outflows from the wetland: — Wetland has no surface water outlet points = 5 Wetland has an intermittently flowing outlet points = 3 Wetland has a highly constricted permanently flowing outlet points = 3 Wetland has a permanently flowing, unconstricted, surface outlet points = 1	5
D 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic *(use NRCS definitions of soils)* YES = 3 (NO = 0)	0
D 1.3. Characteristics of persistent vegetation (Emergent, Scrub-shrub, and/or Forested Cowardin classes) Wetland has persistent, ungrazed, vegetation for > $^2/_3$ of area points = 5 Wetland has persistent, ungrazed, vegetation from $^1/_3$ to $^2/_3$ of area points = 3 — Wetland has persistent, ungrazed vegetation from $^1/_{10}$ to < $^1/_3$ of area points = 1 Wetland has persistent, ungrazed vegetation < $^1/_{10}$ of area points = 0	1
D 1.4. Characteristics of seasonal ponding or inundation: *This is the area of ponding that fluctuates every year. Do not count the area that is permanently ponded.* Area seasonally ponded is > ½ total area of wetland points = 3 — Area seasonally ponded is ¼ - ½ total area of wetland points = 1 Area seasonally ponded is < ¼ total area of wetland points = 0	1
Total for D 1 — Add the points in the boxes above	7

Rating of Site Potential If score is: ___ **12- 16 = H** ___ **6- 11 = M** ___ **0- 5 = L** *Record the rating on the first page*

D 2.0. Does the landscape have the potential to support the water quality function of the site?	
D 2.1. Does the wetland receive stormwater discharges? Yes = 1 (No = 0)	0
D 2.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate pollutants? (Yes = 1) No = 0	1
D 2.3. Are there septic systems within 250 ft of the wetland? *very possibly* (Yes = 1) No = 0	1
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1- D 2.3? Source_____ Yes = 1 (No = 0)	0
Total for D 2 — Add the points in the boxes above	2

Rating of Landscape Potential If score is: ___ **3 or 4 = H** ✓ **1 or 2 = M** ___ **0 = L** *Record the rating on the first page*

D 3.0. Is the water quality improvement provided by the site valuable to society?	
D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, or lake that is on the 303(d) list? Yes = 1 (No = 0)	0
D 3.2. Is the wetland in a basin or sub-basin where water quality is an issue in some aquatic resource [303(d) list, eutrophic lakes, problems with nuisance and toxic algae]? (Yes = 1) No = 0	1
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality (*answer YES if there is a TMDL for the drainage or basin in which the wetland is found*)? Yes = 2 (No = 0)	0
Total for D 3 — Add the points in the boxes above	1

Rating of Value If score is: ___ **2-4 = H** ✓ **1 = M** ___ **0 = L** *Record the rating on the first page*

Wetland name or number TW04

DEPRESSIONAL WETLANDS **Hydrologic Functions** - Indicators that the site functions to reduce flooding and erosion.	Points (only 1 score per box)
D 4.0. Does the site have the potential to reduce flooding and erosion?	
D 4.1. Characteristics of surface water outflows from the wetland: – Wetland has no surface water outlet points = 8 Wetland has an intermittently flowing outlet points = 4 Wetland has a highly constricted permanently flowing outlet points = 4 Wetland has a permanently flowing unconstricted surface outlet points = 0 *(If outlet is a ditch and not permanently flowing treat wetland as "intermittently flowing")*	8
D 4.2. Depth of storage during wet periods: *Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or deepest part (if dry).* Seasonal ponding: > 3 ft above the lowest point in wetland or the surface of permanent ponding points = 8 Seasonal ponding: 2 ft - < 3 ft above the lowest point in wetland or the surface of permanent ponding points = 6 The wetland is a headwater wetland points = 4 Seasonal ponding: 1 ft - < 2 ft points = 4 Seasonal ponding: 6 in - < 1 ft points = 2 Seasonal ponding: < 6 in or wetland has only saturated soils points = 0 ~2ft	6
Total for D 4 — Add the points in the boxes above	14

Rating of Site Potential If score is: ✓ **12-16 = H** ___ **6-11 = M** ___ **0-5 = L** *Record the rating on the first page*

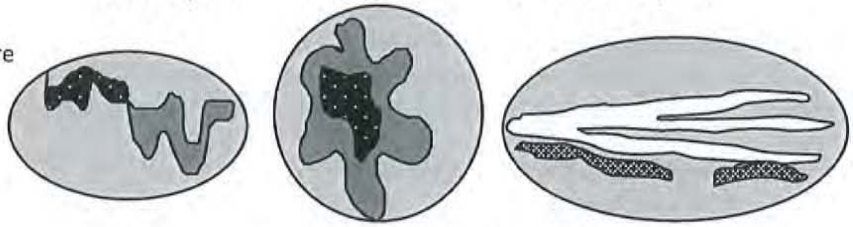
D 5.0. Does the landscape have the potential to support the hydrologic functions of the site?	
D 5.1. Does the wetland receive stormwater discharges? Yes = 1 (No = 0)	0
D 5.2. Is > 10% of the area within 150 ft of the wetland in a land use that generates runoff? Yes = 1 (No = 0)	0
D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land uses? Yes = 1 (No = 0)	0
Total for D 5 — Add the points in the boxes above	0

Rating of Landscape Potential If score is: ___ **3 = H** ___ **1 or 2 = M** ✓ **0 = L** *Record the rating on the first page*

D 6.0. Are the hydrologic functions provided by the site valuable to society?	
D 6.1. The wetland is in a landscape that has flooding problems. Choose the description that best matches conditions around the wetland being rated. *Do not add points. Choose the highest score if more than one condition is met.* The wetland captures surface water that would otherwise flow down-gradient into areas where flooding has damaged human or natural resources (e.g., houses or salmon redds), AND Flooding occurs in sub-basin that is immediately down-gradient of wetland points = 2 – Surface flooding problems are in a sub-basin farther down-gradient points = 1 The existing or potential outflow from the wetland is so constrained by human or natural conditions that the water stored by the wetland cannot reach areas that flood. *Explain why* _____ points = 0 There are no problems with flooding downstream of the wetland points = 0	1
D 6.2. Has the site has been identified as important for flood storage or flood conveyance in a regional flood control plan? Yes = 2 (No = 0)	0
Total for D 6 — Add the points in the boxes above	1

Rating of Value If score is: ___ **2-4 = H** ✓ **1 = M** ___ **0 = L** *Record the rating on the first page*

Wetland name or number Two4

These questions apply to wetlands of all HGM classes. **HABITAT FUNCTIONS** - Indicators that site functions to provide important habitat	(only 1 score per box)
H 1.0. Does the wetland have the potential to provide habitat for many species?	
H 1.1. Structure of the plant community: *Check the Cowardin vegetation classes present and categories of emergent plants. Size threshold for each category is >= ¼ ac or >= 10% of the wetland if wetland is < 2.5 ac.* ✓ Aquatic bed 42% ✓ Emergent plants 0-12 in (0-30 cm) high are the highest layer and have > 30% cover ___ Emergent plants >12-40 in (>30-100 cm) high are the highest layer with >30% cover ✓ Emergent plants > 40 in (> 100 cm) high are the highest layer with >30% cover 12% ___ Scrub-shrub (areas where shrubs have >30% cover) ___ Forested (areas where trees have >30% cover) 4 or more checks: points = 3 3 checks: points = 2 2 checks: points = 1 1 check: points = 0	2
H 1.2. Is one of the vegetation types Aquatic Bed? Yes = 1 No = 0	1
H 1.3. Surface water H 1.3.1. Does the wetland have areas of open water (without emergent or shrub plants) over at least ¼ ac **OR** 10% of its area during the March to early June **OR** in August to the end of September? *Answer YES for Lake Fringe wetlands.* Yes = 3 points & go to H 1.4 No = go to H 1.3.2 H 1.3.2. Does the wetland have an intermittent or permanent, and unvegetated stream within its boundaries, or along one side, over at least ¼ ac or 10% of its area? *Answer yes only if H 1.3.1 is No.* Yes = 3 No = 0	3
H 1.4. Richness of plant species Count the number of plant species in the wetland that cover at least 10 ft^2. *Different patches of the same species can be combined to meet the size threshold. You do not have to name the species.* *Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Russian olive, Phragmites, Canadian thistle, yellow-flag iris, and saltcedar (Tamarisk)* # of species ___ 3 Scoring: > 9 species: points = 2 4-9 species: points = 1 < 4 species: points = 0	0
H 1.5. Interspersion of habitats Decide from the diagrams below whether interspersion among types of plant structures (described in H 1.1), and unvegetated areas (open water or mudflats) is high, moderate, low, or none. *Use map of Cowardin and emergent plant classes prepared for questions H 1.1 and map of open water from H 1.3. If you have four or more plant classes or three classes and open water, the rating is always high.*  **None** = 0 points **Low** = 1 point **Moderate** = 2 points All three diagrams in this row are **High** = 3 points  Riparian braided channels with 2 classes	Figure__ 1

Wetland name or number TW04

H 1.6. Special habitat features *Check the habitat features that are present in the wetland. The number of checks is the number of points.* ✓ Loose rocks larger than 4 in OR large, downed, woody debris (> 4 in diameter) within the area of surface ponding or in stream. ✓ Cattails or bulrushes are present within the wetland. ___ Standing snags (diameter at the bottom > 4 in) in the wetland or within 30 m (100 ft) of the edge. ___ Emergent or shrub vegetation in areas that are permanently inundated/ponded. ___ Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 45 degree slope) OR signs of recent beaver activity ✓ Invasive species cover less than 20% in each stratum of vegetation *(canopy, sub-canopy, shrubs, herbaceous, moss/ground cover)*	3
Total for H 1 — Add the points in the boxes above	10

Rating of Site Potential If score is: ___ **15-18 = H** ✓ **7-14 = M** ___ **0-6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support habitat functions of the site?	
H 2.1. Accessible habitat (only area of habitat abutting wetland). If total accessible habitat is: *Calculate:* % undisturbed habitat 17 + [(% moderate and low intensity land uses)/2] 9 = 26 % > 1/3 (33.3%) of 1 km Polygon — points = 3 — 20-33% of 1km Polygon — points = 2 10-19% of 1km Polygon — points = 1 <10% of 1km Polygon — points = 0 undisturbed 135/785 = 17% mid 139/785 = 18%	2
H 2.2. Undisturbed habitat in 1 km Polygon around wetland. *Calculate:* % undisturbed habitat 17 + [(% moderate and low intensity land uses)/2] 13.5 = 30.5 % Undisturbed habitat > 50% of Polygon — points = 3 — Undisturbed habitat 10 - 50% and in 1-3 patches — points = 2 Undisturbed habitat 10 - 50% and > 3 patches — points = 1 Undisturbed habitat < 10% of Polygon — points = 0 mid 212/785 = 27 (3 patches)	2
H 2.3. Land use intensity in 1 km Polygon: > 50% of Polygon is high intensity land use 56% — points = (- 2) Does not meet criterion above — points = 0	-2
H 2.4. The wetland is in an area where annual rainfall is less than 12 in, and its water regime is not influenced by irrigation practices, dams, or water control structures. *Generally, this means outside boundaries of reclamation areas, irrigation districts, or reservoirs* — Yes = 3 (No = 0)	0
Total for H 2 — Add the points in the boxes above	2

Rating of Landscape Potential If score is: ___ **4-9 = H** ✓ **1-3 = M** ___ **< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose the highest score that applies to the wetland being rated* Site meets ANY of the following criteria: — points = 2 — It has 3 or more priority habitats within 100 m (see Appendix B) — It provides habitat for Threatened or Endangered species (any plant or animal on state or federal lists) — It is mapped as a location for an individual WDFW species — It is a Wetland of High Conservation Value as determined by the Department of Natural Resources — It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan ✓ Site has 1 or 2 priority habitats within 100 m (see Appendix B) — points = 1 Site does not meet any of the criteria above — points = 0	1

Rating of Value If score is: ___ **2 = H** ✓ **1 = M** ___ **0 = L** *Record the rating on the first page*

Appendix B: WDFW Priority Habitats in Eastern Washington

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp. http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here: http://wdfw.wa.gov/conservation/phs/list/)

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland: ***NOTE:*** *This question is independent of the land use between the wetland and the priority habitat.*

— **Aspen Stands:** Pure or mixed stands of aspen greater than 1 ac (0.4 ha).

— **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).

— **Old-growth/Mature forests:** Old-growth east of Cascade crest – Stands are highly variable in tree species composition and structural characteristics due to the influence of fire, climate, and soils. In general, stands will be >150 years of age, with 10 trees/ac (25 trees/ha) that are > 21 in (53 cm) dbh, and 1-3 snags/ac (2.5-7.5 snags/ha) that are > 12-14 in (30-35 cm) diameter. Downed logs may vary from abundant to absent. Canopies may be single or multi-layered. Evidence of human-caused alterations to the stand will be absent or so slight as to not affect the ecosystem's essential structures and functions. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west and 80-160 years old east of the Cascade crest.

— **Oregon White Oak:** Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).

✓— **Riparian:** The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

— **Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.

— **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

— **Cliffs:** Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.

— **Talus:** Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

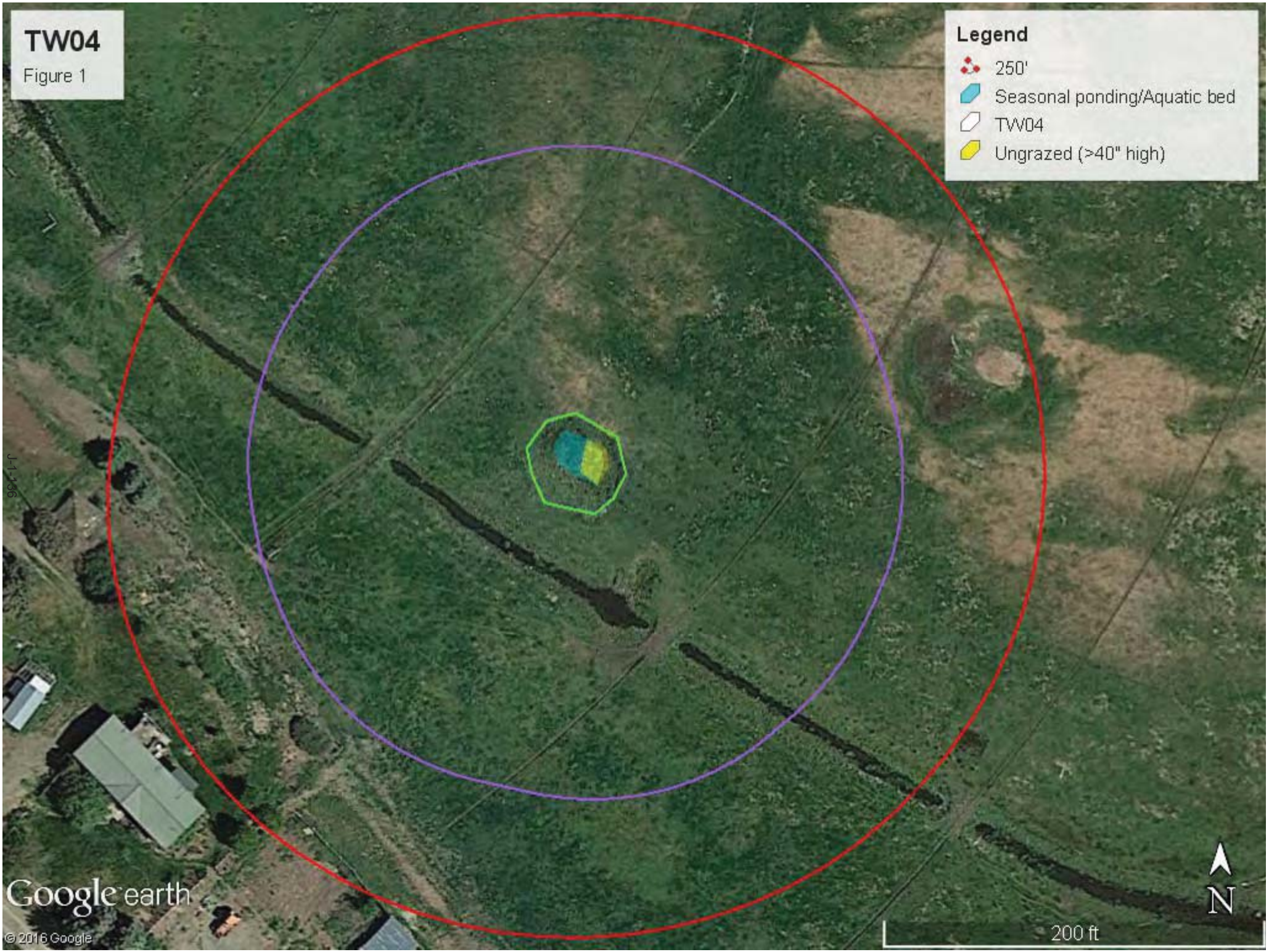
— **Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 12 in (30 cm)in eastern Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

— **Shrub-steppe:** A nonforested vegetation type consisting of one or more layers of perennial bunchgrasses and a conspicuous but discontinuous layer of shrubs (see Eastside Steppe for sites with little or no shrub cover).

— **Eastside Steppe:** Nonforested vegetation type dominated by broadleaf herbaceous flora (i.e., forbs), perennial bunchgrasses, or a combination of both. Bluebunch wheatgrass (*Pseudoroegneria spicata*) is often the prevailing cover component along with Idaho fescue (*Festuca idahoensis*), Sandberg bluegrass (*Poa secunda*), rough fescue (*F. campestris*), or needlegrasses (*Achnatherum* spp.).

— **Juniper Savannah:** All juniper woodlands.

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list because they are addressed elsewhere.


TW04
Figure 1
Legend
250'
Seasonal ponding/Aquatic bed
TW04
Ungrazed (>40" high)
J-1-266
Google earth
© 2016 Google
N
200 ft


TW04
Figure 2
Legend
Contributing Basin
TW04
Google earth
© 2016 Google
N
500 ft


TW04
Figure 3
Legend
Mid-intensity
TW04
Undisturbed
J-1-138
Parkwood Ln
Thorpe Hwy S
Robinson Canyon Rd
Google earth
© 2016 Google
N
3000 ft

April 25, 2017

TW04 - Figure 4



Assessed Waters/Sediment

Water
- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

Sediment
- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

Miles
0 0.125 0.25 0.5

Image courtesy of USGS Earthstar Geographics SIO © 2017 Microsoft Corporation © 2010 NAVTEQ © AND

DEPARTMENT OF ECOLOGY
State of Washington

Water Quality Improvement Projects (TMDLs)

WATER QUALITY IMPROVEMENT PROJECTS (TMDLs)

Overview of the process
Project Catalog
- by WRIA
- by County

Funding Opportunities
Project Development Priority Lists
Related Information
TMDL Contacts

RELATED ECOLOGY PROGRAMS

Water Quality

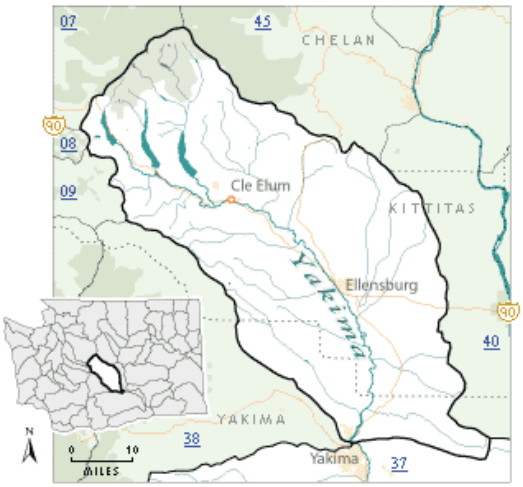
Water Quality Improvement > Water Quality Improvement Projects by WRIA > WRIA 39: Upper Yakima

WRIA 39: Upper Yakima

The following table lists overview information and links to specific water quality improvement projects (including total maximum daily loads, or TMDLs) for this water resource inventory area (WRIA). Please use links (where available) for more information on a project.

Yakima River basin project index:
www.ecy.wa.gov/programs/wq/tmdl/yakima_wq/index.html
Counties

- Kittitas
- Yakima



Project Name	Pollutants	Status**	TMDL Lead
Crystal Creek	Ammonia-N BOD (5-day) Chlorine Fecal Coliform	EPA approved	Jane Creech 509-454-7860
Selah Ditch	Fecal Coliform Temperature	EPA approved	Greg Bohn 509-454-4174
Teanaway River segments: • Upper West Fork Teanaway River • Upper Middle Fork Teanaway River • Upper North Fork Teanaway River • Stafford Creek • Lower West Fork Teanaway River • Lower Middle Fork Teanaway River • Lower North Fork Teanaway River • Mainstem Teanaway River	Temperature	EPA approved	Jane Creech 509-454-7860
Wilson/Cooke Creek Tributaries: • Badger Creek • Bull Ditch • Caribou Creek • Cherry Creek • CID Canal • Coleman Creek • Cook Creek • EWC Canal • Johnson Drain • KRD Canal	Fecal Coliform	EPA approved Has an implementation plan Post-TMDL monitoring report	Jane Creech 509-454-7860 Greg Bohn 509-454-4174

Mercer Creek • Naneum Creek • Parke Creek • Whiskey Creek • Wilson Creek • Wipple Wasteway			
Yakima River, Upper	Dieldrin DDT Suspended Sediments Turbidity	EPA approved	Jane Creech 509-454-7860
	Temperature	EPA approved Has an implementation plan	Jane Creech 509-454-7860
Yakima River	Toxics	Under development	Jane Creech 509-454-7860

**** Status** will be listed as one of the following: Approved by EPA, Under Development or Implementation. No status means project work has not yet started.*

For more information about WRIA 39:

- Waterbodies in WRIA 39 - using the Water Quality Assessment Query Tool
- Watershed Information for WRIA 39

* The Department of Ecology and other state resource agencies frequently use a system of 62 "Water Resource Inventory Areas" or "WRIAs" to refer to the state's major watershed basins.

Back to top of page

Last updated December 2016

Feedback?

About us
Director Maia Bellon
Tracking progress
Newsroom
Jobs
Staff only
Contact us

Publications & forms
Databases
Laws & rules
Public records disclosure
Public input & events
Environmental education
Sustainability information

中文 | Chinese
Tiếng Việt | Vietnamese
한국어 | Korean
Русский | Russian
Español | Spanish
Accessibility

Access Washington®
Welcome to the State of Washington

Copyright © Washington State Department of Ecology
Privacy Notice | Site Info | Accessibility | Contact the web team |

SHARE

Wetland name or number TWO5

RATING SUMMARY – Eastern Washington

Name of wetland (or ID #): TWO5 Date of site visit: 4/12/17

Rated by N. Evan Dulik Trained by Ecology? ✓ Yes ___ No Date of training 3/24/17

HGM Class used for rating Riverine Wetland has multiple HGM classes? ___Y ✓N

NOTE: Form is not complete without the figures requested (*figures can be combined*).
Source of base aerial photo/map Google Earth

OVERALL WETLAND CATEGORY III (based on functions ✓ or special characteristics ___)

1. Category of wetland based on FUNCTIONS

___**Category I** – Total score = 22-27
___**Category II** – Total score = 19-21
✓**Category III** – Total score = 16-18
___**Category IV** – Total score = 9-15

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
	Circle the appropriate ratings			
Site Potential	H (M) L	(H) M L	H M (L)	
Landscape Potential	H (M) L	H M (L)	H M (L)	
Value	H M (L)	(H) M L	H (M) L	TOTAL
Score Based on Ratings	5	7	4	16

Score for each function based on three ratings *(order of ratings is not important)*

9 = H,H,H
8 = H,H,M
7 = H,H,L
7 = H,M,M
6 = H,M,L
6 = M,M,M
5 = H,L,L
5 = M,M,L
4 = M,L,L
3 = L,L,L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	CATEGORY *Circle the appropriate category*
Vernal Pools	II III
Alkali	I
Wetland of High Conservation Value	I
Bog and Calcareous Fens	I
Old Growth or Mature Forest – slow growing	I
Aspen Forest	I
Old Growth or Mature Forest – fast growing	II
Floodplain forest	II
None of the above	✓

Wetland name or number Two S

Maps and figures required to answer questions correctly for Eastern Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	D 1.3, H 1.1, H 1.5	
Hydroperiods (including area of open water for H 1.3)	D 1.4, H 1.2, H 1.3	
Location of outlet (*can be added to map of hydroperiods)*	D 1.1, D 4.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	
Map of the contributing basin	D 5.3	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	D 3.3	

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	1
Hydroperiods	H 1.2, H 1.3	1
Ponded depressions	R 1.1	1
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	R 2.4	1
Map of the contributing basin	R 2.2, R 2.3, R 5.2	2
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	1
Width of wetland vs. width of stream *(can be added to another figure)*	R 4.1	1
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	3
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	4
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	R 3.2, R 3.3	5

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	L 1.1, L 4.1, H 1.1, H 1.5	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants *(can be added to figure above)*	S 4.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	S 3.3	

Wetland name or number TWO S

HGM Classification of Wetland in Eastern Washington

For questions 1-4, the criteria described must apply to the entire unit being rated.

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-4 apply, and go to Question 5.

1. Does the entire unit **meet both** of the following criteria?
   ___The vegetated part of the wetland is on the water side of the Ordinary High Water Mark of a body of permanent open water (without any plants on the surface) that is at least 20 ac (8 ha) in size
   ___At least 30% of the open water area is deeper than 10 ft (3 m)

   NO – go to 2 **YES –** The wetland class is **Lake Fringe** (Lacustrine Fringe)

2. Does the entire wetland unit **meet all** of the following criteria?
   ___The wetland is on a slope (*slope can be very gradual*),
   ___The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks;
   ___The water leaves the wetland **without being impounded**.

   NO - go to 3 YES – The wetland class is **Slope**
   NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 foot deep).

3. Does the entire wetland unit **meet all** of the following criteria?
   ___The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river;
   ___The overbank flooding occurs at least once every 10 years.

   NO - go to 4 YES – The wetland class is **Riverine**
   NOTE: The Riverine wetland can contain depressions that are filled with water when the river is not flooding.

4. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year. *This means that any outlet, if present, is higher than the interior of the wetland.*

   NO – go to 5 YES – The wetland class is **Depressional**

5. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-4 APPLY TO DIFFERENT AREAS IN THE WETLAND UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

Wetland name or number TWO5

NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the wetland unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM Class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine (the riverine portion is within the boundary of depression)	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine

If you are still unable to determine which of the above criteria apply to your wetland, or if you have ***more than 2 HGM classes*** *within a wetland boundary, classify the wetland as Depressional for the rating.*

Wetland name or number Two S

RIVERINE WETLANDS **Water Quality Functions** - Indicators that the site functions to improve water quality		Points (only 1 score per box)
R 1.0. Does the site have the potential to improve water quality?		
R 1.1. Area of surface depressions within the Riverine wetland that can trap sediments during a flooding event:		
Depressions cover > 1/3 area of wetland	points = 6	6
Depressions cover > 1/10 area of wetland (0.18 ac / 0.47 ac = 38%)	points = 3	
Depressions present but cover < 1/10 area of wetland	points = 1	
No depressions present	points = 0	
R 1.2. Structure of plants in the wetland (areas with >90% cover at person height; **not** Cowardin classes):		
Forest or shrub > 2/3 the area of the wetland	points = 10	5
Forest or shrub 1/3 – 2/3 area of the wetland	points = 5	
Ungrazed, herbaceous plants > 2/3 area of wetland (0.31 / 0.47 = 66%)	points = 5	
Ungrazed herbaceous plants 1/3 – 2/3 area of wetland	points = 2	
Forest, shrub, and ungrazed herbaceous < 1/3 area of wetland	points = 0	
Total for R 1	Add the points in the boxes above	11

Rating of Site Potential If score is: ___ **12-16 = H** ✓ **6-11 = M** ___ **0-5 = L** *Record the rating on the first page*

R 2.0. Does the landscape have the potential to support the water quality function of the site?		
R 2.1. Is the wetland within an incorporated city or within its UGA?	Yes = 2 (No = 0)	0
R 2.2. Does the contributing basin include a UGA or incorporated area?	Yes = 1 (No = 0)	0
R 2.3. Does at least 10% of the contributing basin contain tilled fields, pastures, or forests that have been clearcut within the last 5 years? ↳ diverted water from upper Yakima River	Yes = 1 No = 0	1
R 2.4. Is > 10% of the area within 150 ft of wetland in land uses that generate pollutants	(Yes = 1) No = 0	1
R 2.5. Are there other sources of pollutants coming into the wetland that are not listed in questions R 2.1-R 2.4? Source_____	Yes = 1 (No = 0)	0
Total for R 2	Add the points in the boxes above	2

Rating of Landscape Potential If score is: ___ **3-6 = H** ✓ **1 or 2 = M** ___ **0 = L** *Record the rating on the first page*

R 3.0. Is the water quality improvement provided by the site valuable to society?		
R 3.1. Is the wetland along a stream or river that is on the 303(d) list or on a tributary that drains to one within 1 mi? Yakima River > 1 mile	Yes = 1 (No = 0)	0
R 3.2. Does the river or stream have TMDL limits for nutrients, toxics, or pathogens?	Yes = 1 (No = 0)	0
R 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality? *Answer YES if there is a TMDL for the drainage in which wetland is found.*	Yes = 2 (No = 0)	0
Total for R 3	Add the points in the boxes above	0

Rating of Value If score is: ___ **2-4 = H** ___ **1 = M** ✓ **0 = L** *Record the rating on the first page*

Wetland name or number TWO S

RIVERINE WETLANDS **Hydrologic Functions** - Indicators that site functions to reduce flooding and stream erosion		Points (only 1 score per box)
R 4.0. Does the site have the potential to reduce flooding and erosion?		
R 4.1. Characteristics of the overbank storage the wetland provides: *Estimate the average width of the wetland perpendicular to the direction of the flow and the width of the stream or river channel (distance between banks). Calculate the ratio: (average width of wetland)/(average width of stream between banks).* ~75' / 40' = 1.9 x		8
If the ratio is more than 2	points = 10	
_ If the ratio is 1-2	points = 8	
If the ratio is ½-<1	points = 4	
If the ratio is ¼-< ½	points = 2	
If the ratio is < ¼	points = 1	
R 4.2. Characteristics of plants that slow down water velocities during floods: *Treat large woody debris as forest or shrub. Choose the points appropriate for the best description (polygons need to have > 90% cover at person height. These are NOT Cowardin classes).*		4
Forest or shrub for more than $^2/_3$ the area of the wetland	points = 6	
_ Forest or shrub for > $^1/_3$ area OR emergent plants > $^2/_3$ area (66%)	points = 4	
Forest or shrub for > $^1/_{10}$ area OR emergent plants > $^1/_3$ area	points = 2	
Plants do not meet above criteria	points = 0	
Total for R 5	Add the points in the boxes above	12

Rating of Site Potential If score is: ✓ **12-16 = H** ___ **6-11 = M** ___ **0-5 = L** *Record the rating on the first page*

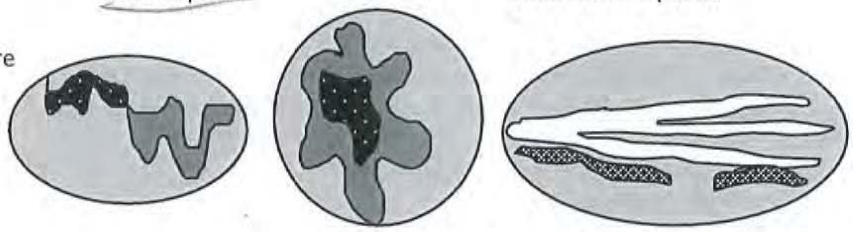
R 5.0. Does the landscape have the potential to support the hydrologic functions of the site?		
R 5.1. Is the stream or river adjacent to the wetland downcut?	(Yes = 0) No = 1	0
R 5.2. Does the up-gradient watershed include a UGA or incorporated area?	Yes = 1 (No = 0)	0
R 5.3. Is the up-gradient stream or river controlled by dams?	(Yes = 0) No = 1	0
Total for R 5	Add the points in the boxes above	0

Rating of Landscape Potential If score is: ___ **3 = H** ___ **1 or 2 = M** ✓ **0 = L** *Record the rating on the first page*

R 6.0. Are the hydrologic functions provided by the site valuable to society?		
R 6.1. Distance to the nearest areas downstream that have flooding problems? *Choose the description that best fits the site.*		2
_ The sub-basin immediately down-gradient of site has surface flooding problems that result in damage to human or natural resources	points = 2	
Surface flooding problems are in a basin farther down-gradient	points = 1	
No flooding problems anywhere downstream	points = 0	
R 6.2. Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan?	Yes = 2 (No = 0)	0
Total for R 6	Add the points in the boxes above	2

Rating of Value If score is: ✓ **2-4 = H** ___ **1 = M** ___ **0 = L** *Record the rating on the first page*

Wetland name or number TWO S

These questions apply to wetlands of all HGM classes. **HABITAT FUNCTIONS** - Indicators that site functions to provide important habitat	(only 1 score per box)
H 1.0. Does the wetland have the potential to provide habitat for many species?	
H 1.1. Structure of the plant community: *Check the Cowardin vegetation classes present and categories of emergent plants. Size threshold for each category is >= ¼ ac or >= 10% of the wetland if wetland is < 2.5 ac.* ____Aquatic bed __✓__Emergent plants 0-12 in (0-30 cm) high are the highest layer and have > 30% cover 20% ____Emergent plants >12-40 in (>30-100 cm) high are the highest layer with >30% cover __✓__Emergent plants > 40 in (> 100 cm) high are the highest layer with >30% cover 60% ____Scrub-shrub (areas where shrubs have >30% cover) 8% ____Forested (areas where trees have >30% cover) 4 or more checks: points = 3 3 checks: points = 2 2 checks: points = 1 1 check: points = 0	1
H 1.2. Is one of the vegetation types Aquatic Bed? Yes = 1 No = 0	0
H 1.3. Surface water H 1.3.1. Does the wetland have areas of open water (without emergent or shrub plants) over at least ¼ ac **OR** 10% of its area during the March to early June **OR** in August to the end of September? ***Answer YES for Lake Fringe wetlands.*** Yes = 3 points & go to H 1.4 No = go to H 1.3.2 H 1.3.2. Does the wetland have an intermittent or permanent, and unvegetated stream within its boundaries, or along one side, over at least ¼ ac or 10% of its area? *Answer yes only if H 1.3.1 is No.* Yes = 3 No = 0	0
H 1.4. Richness of plant species Count the number of plant species in the wetland that cover at least 10 ft^2. *Different patches of the same species can be combined to meet the size threshold. You do not have to name the species.* *Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Russian olive, Phragmites, Canadian thistle, yellow-flag iris, and saltcedar (Tamarisk)* # of species ____ 111 Scoring: > 9 species: points = 2 4-9 species: points = 1 < 4 species: points = 0	0
H 1.5. Interspersion of habitats Decide from the diagrams below whether interspersion among types of plant structures (described in H 1.1), and unvegetated areas (open water or mudflats) is high, moderate, low, or none. *Use map of Cowardin and emergent plant classes prepared for questions H 1.1 and map of open water from H 1.3. If you have four or more plant classes or three classes and open water, the rating is always high.*  **None** = 0 points **Low** = 1 point **Moderate** = 2 points All three diagrams in this row are **High** = 3 points  Riparian braided channels with 2 classes	Figure__ 1

Separated by road

Wetland name or number TWO S

H 1.6. Special habitat features *Check the habitat features that are present in the wetland. The number of checks is the number of points.* ____Loose rocks larger than 4 in OR large, downed, woody debris (> 4 in diameter) within the area of surface ponding or in stream. __✓__Cattails or bulrushes are present within the wetland. ____Standing snags (diameter at the bottom > 4 in) in the wetland or within 30 m (100 ft) of the edge. ____Emergent or shrub vegetation in areas that are permanently inundated/ponded. ____Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 45 degree slope) OR signs of recent beaver activity ____ Invasive species cover less than 20% in each stratum of vegetation *(canopy, sub-canopy, shrubs, herbaceous, moss/ground cover)*	1
Total for H 1 — Add the points in the boxes above	3

Rating of Site Potential If score is:___**15-18 = H** ___**7-14 = M** ✓**0-6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support habitat functions of the site?	
H 2.1. Accessible habitat (only area of habitat abutting wetland). If total accessible habitat is: *Calculate:* % undisturbed habitat 0 + [(% moderate and low intensity land uses)/2] 0 = 0 % > 1/3 (33.3%) of 1 km Polygon — points = 3 20-33% of 1km Polygon — points = 2 10-19% of 1km Polygon — points = 1 —<10% of 1km Polygon — points = 0 undis 0/830 ac = 0 mid 0/830 = 0	0
H 2.2. Undisturbed habitat in 1 km Polygon around wetland. *Calculate:* % undisturbed habitat 12 + [(% moderate and low intensity land uses)/2] 12.5 = 24.5 % Undisturbed habitat > 50% of Polygon — points = 3 —Undisturbed habitat 10 - 50% and in 1-3 patches — points = 2 Undisturbed habitat 10 - 50% and > 3 patches — points = 1 Undisturbed habitat < 10% of Polygon — points = 0 undis 103/830 = 12% mid 206/830 = 25% 2 Patches	2
H 2.3. Land use intensity in 1 km Polygon: > 50% of Polygon is high intensity land use 63% — points = (- 2) Does not meet criterion above — points = 0	-2
H 2.4. The wetland is in an area where annual rainfall is less than 12 in, and its water regime is not influenced by irrigation practices, dams, or water control structures. *Generally, this means outside boundaries of reclamation areas, irrigation districts, or reservoirs* — Yes = 3 (No = 0)	0
Total for H 2 — Add the points in the boxes above	0

Rating of Landscape Potential If score is:___**4-9 = H** ___**1-3 = M** ✓**< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose the highest score that applies to the wetland being rated* Site meets ANY of the following criteria: — points = 2 — It has 3 or more priority habitats within 100 m (see Appendix B) — It provides habitat for Threatened or Endangered species (any plant or animal on state or federal lists) — It is mapped as a location for an individual WDFW species — It is a Wetland of High Conservation Value as determined by the Department of Natural Resources — It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan —Site has 1 or 2 priority habitats within 100 m (see Appendix B) — points = 1 Site does not meet any of the criteria above — points = 0	1

Rating of Value If score is:___**2 = H** ✓**1 = M** ___**0 = L** *Record the rating on the first page*

Appendix B: WDFW Priority Habitats in Eastern Washington

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp. http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here: http://wdfw.wa.gov/conservation/phs/list/)

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland: ***NOTE:*** *This question is independent of the land use between the wetland and the priority habitat.*

— **Aspen Stands:** Pure or mixed stands of aspen greater than 1 ac (0.4 ha).

— **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).

— **Old-growth/Mature forests:** Old-growth east of Cascade crest – Stands are highly variable in tree species composition and structural characteristics due to the influence of fire, climate, and soils. In general, stands will be >150 years of age, with 10 trees/ac (25 trees/ha) that are > 21 in (53 cm) dbh, and 1-3 snags/ac (2.5-7.5 snags/ha) that are > 12-14 in (30-35 cm) diameter. Downed logs may vary from abundant to absent. Canopies may be single or multi-layered. Evidence of human-caused alterations to the stand will be absent or so slight as to not affect the ecosystem's essential structures and functions. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west and 80-160 years old east of the Cascade crest.

— **Oregon White Oak:** Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).

✓— **Riparian:** The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

— **Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.

— **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

— **Cliffs:** Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.

— **Talus:** Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

— **Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 12 in (30 cm)in eastern Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

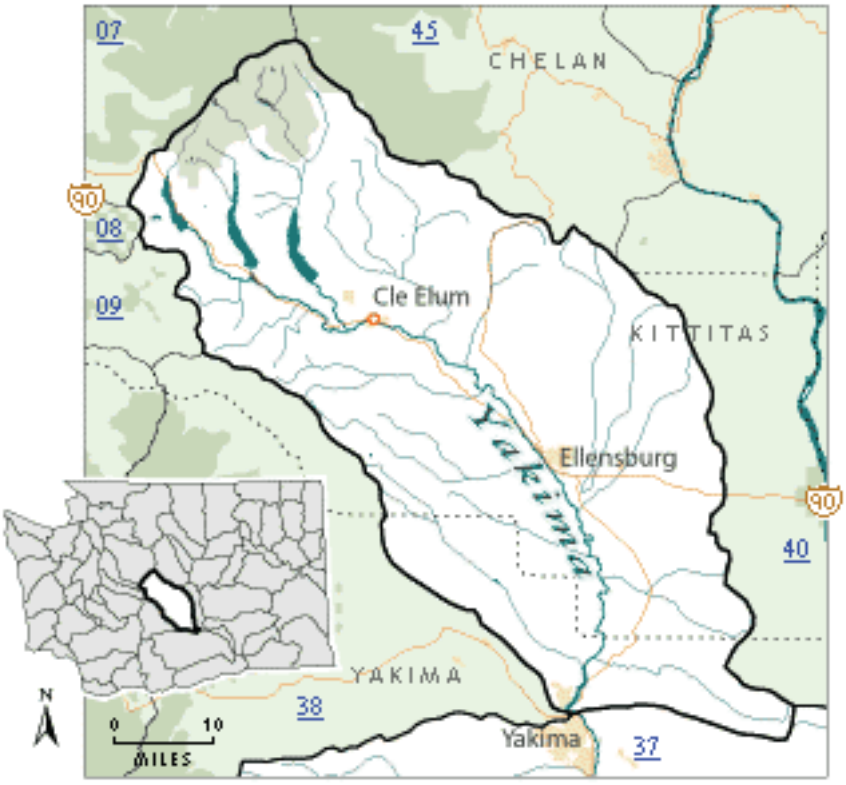
— **Shrub-steppe:** A nonforested vegetation type consisting of one or more layers of perennial bunchgrasses and a conspicuous but discontinuous layer of shrubs (see Eastside Steppe for sites with little or no shrub cover).

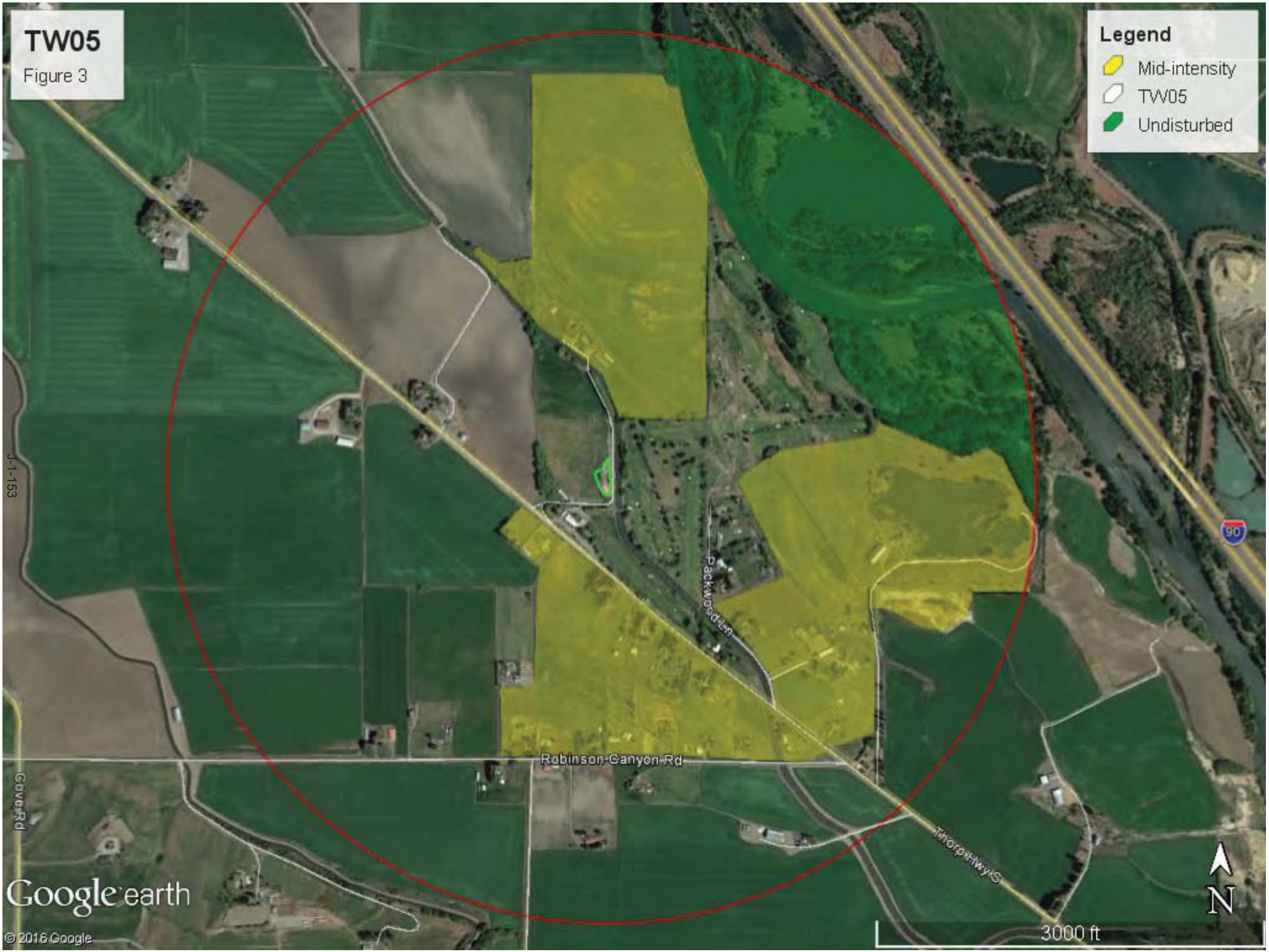
— **Eastside Steppe:** Nonforested vegetation type dominated by broadleaf herbaceous flora (i.e., forbs), perennial bunchgrasses, or a combination of both. Bluebunch wheatgrass (*Pseudoroegneria spicata*) is often the prevailing cover component along with Idaho fescue (*Festuca idahoensis*), Sandberg bluegrass (*Poa secunda*), rough fescue (*F. campestris*), or needlegrasses (*Achnatherum* spp.).

— **Juniper Savannah:** All juniper woodlands.

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list because they are addressed elsewhere.


TW05
Figure 1
Legend
Depression
Outlet/inlet
Scrub-shrub
TW05
Ungrazed (>40")
Width
Outlet/inlet
J-1-151
Google earth
© 2016 Google
N
300 ft


07
45
CHELAN
90
08
09
Cle Elum
KITTITAS
Yakima
Ellensburg
90
40
YAKIMA
38
Yakima
37
N
0
10
MILES


TW05
Figure 3
Legend
Mid-intensity
TW05
Undisturbed
J-1-153
Cover Rd
Packwood Ln
Robinson Canyon Rd
Thorp Hwy S
90
Google earth
© 2016 Google
N
3000 ft

April 25, 2017

TW05 - Figure 4



Assessed Waters/Sediment

Water
- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

Sediment
- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

Miles
0 0.125 0.25 0.5

Image courtesy of USGS Earthstar Geographics SIO © 2017 Microsoft Corporation © 2017 HERE © AND

DEPARTMENT OF ECOLOGY
State of Washington

Water Quality Improvement Projects (TMDLs)

WATER QUALITY IMPROVEMENT PROJECTS (TMDLs)

Overview of the process

Project Catalog

- by WRIA
- by County

Funding Opportunities

Project Development Priority Lists

Related Information

TMDL Contacts

RELATED ECOLOGY PROGRAMS

Water Quality

Water Quality Improvement > Water Quality Improvement Projects by WRIA > WRIA 39: Upper Yakima

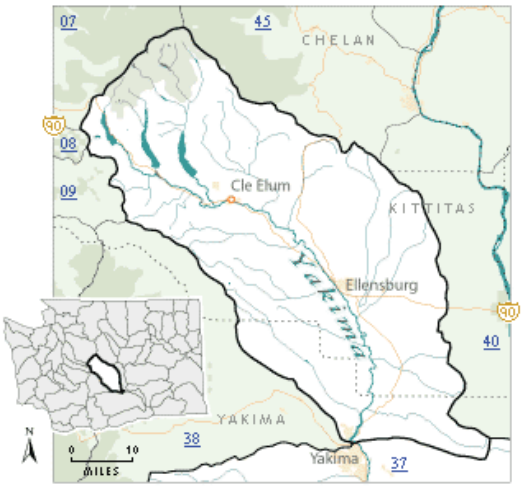
WRIA 39: Upper Yakima

The following table lists overview information and links to specific water quality improvement projects (including total maximum daily loads, or TMDLs) for this water resource inventory area (WRIA). Please use links (where available) for more information on a project.

Yakima River basin project index:
www.ecy.wa.gov/programs/wq/tmdl/yakima_wq/index.html

Counties

- Kittitas
- Yakima



Project Name	Pollutants	Status**	TMDL Lead
Crystal Creek	Ammonia-N BOD (5-day) Chlorine Fecal Coliform	EPA approved	Jane Creech 509-454-7860
Selah Ditch	Fecal Coliform Temperature	EPA approved	Greg Bohn 509-454-4174
Teanaway River segments: • Upper West Fork Teanaway River • Upper Middle Fork Teanaway River • Upper North Fork Teanaway River • Stafford Creek • Lower West Fork Teanaway River • Lower Middle Fork Teanaway River • Lower North Fork Teanaway River • Mainstem Teanaway River	Temperature	EPA approved	Jane Creech 509-454-7860
Wilson/Cooke Creek Tributaries: • Badger Creek • Bull Ditch • Caribou Creek • Cherry Creek • CID Canal • Coleman Creek • Cook Creek • EWC Canal • Johnson Drain • KRD Canal	Fecal Coliform	EPA approved Has an implementation plan Post-TMDL monitoring report	Jane Creech 509-454-7860 Greg Bohn 509-454-4174

• Mercer Creek • Naneum Creek • Parke Creek • Whiskey Creek • Wilson Creek • Wipple Wasteway			
Yakima River, Upper	Dieldrin DDT Suspended Sediments Turbidity	EPA approved	Jane Creech 509-454-7860
	Temperature	EPA approved Has an implementation plan	Jane Creech 509-454-7860
Yakima River	Toxics	Under development	Jane Creech 509-454-7860

**** Status** will be listed as one of the following: Approved by EPA, Under Development or Implementation. No status means project work has not yet started.*

For more information about WRIA 39:

- Waterbodies in WRIA 39 - using the Water Quality Assessment Query Tool
- Watershed Information for WRIA 39

* The Department of Ecology and other state resource agencies frequently use a system of 62 "Water Resource Inventory Areas" or "WRIAs" to refer to the state's major watershed basins.

Back to top of page

Last updated December 2016

Feedback?

About us
Director Maia Bellon
Tracking progress
Newsroom
Jobs
Staff only
Contact us

Publications & forms
Databases
Laws & rules
Public records disclosure
Public input & events
Environmental education
Sustainability information

中文 | Chinese
Tiếng Việt | Vietnamese
한국어 | Korean
Русский | Russian
Español | Spanish
Accessibility

Access Washington®
Welcome to the State of Washington

Copyright © Washington State Department of Ecology
Privacy Notice | Site Info | Accessibility | Contact the web team |

SHARE

APPENDIX F: KITTITAS COUNTY WETLAND BUFFER GUIDANCE

Chapter 17A.04
CRITICAL AREAS DESIGNATION AND DEVELOPMENT STANDARDS

Sections

17A.04.010 Wetlands.
17A.04.015 No net loss of wetland areas.
17A.04.020 Buffer width requirements.
17A.04.025 Wetland buffer ranges.
17A.04.030 Wetland buffer averaging.
17A.04.035 Natural condition of wetland buffer.
17A.04.040 Allowed uses.
17A.04.045 Building setback lines from wetland buffers.
17A.04.050 Wetland replacement ratios.

17A.04.010 Wetlands.
Wetlands in Kittitas County are defined in Section 17A.02.310 and classified in four categories: Category I (extreme high value), Category II (high value), Category III (average value), Category IV (less than average value). Critical area wetlands in Kittitas County are defined as Category I, Category II, Category III and Category IV wetlands as determined by the planning manager.

Category IV wetlands may be determined by the director to constitute a critical area based upon application of the criteria in this chapter. (Ord. 95-15 (part), 1995; Ord. 94-22 (part), 1994).

17A.04.015 No net loss of wetland areas.
Kittitas County shall require, to the extent practical, and except for Category IV wetlands, a zero net loss of natural wetlands functions and values together with, if reasonably possible through voluntary agreements or government incentives, a gain of wetlands in the long term. (Ord. 94-22 (part), 1994).

17A.04.020 Buffer width requirements.
Wetland buffer requirements apply to all nonexempt activities on regulated wetlands. All wetland buffers shall be measured from the wetland boundary.

Category	Size of Wetland	Required Buffer
I	any size	50 - 200 feet
II	over 2,000 sq. ft.	25 - 100 feet
III	over 10,000 sq. ft.	20 - 80 feet
IV*	43,560 sq. ft. (1 acre)	Building setbacks will be determined by the zoning lot line setbacks, but shall not exceed 25 feet.

*Includes only nonirrigation induced or enhanced Category IV wetlands. Irrigation water does influence ground water table elevations in Kittitas County.

(Ord. 96-14 (part), 1996; Ord. 95-15 (part), 1995; Ord. 94-22 (part), 1994).

17A.04.025 Wetland buffer ranges.
The wetland buffer ranges have been established to reflect the impact of certain intense land uses on wetland function and values. The director shall base the buffer size on the following criteria and shall establish the least restrictive width of buffer necessary to account for all of the following considerations:

1. The overall intensity of the proposed use;
2. The presence of threatened, endangered, or sensitive species;
3. The site's susceptibility to severe erosion;
4. The use of a buffer enhancement plan by the applicant which uses native vegetation or other measures which will enhance the functions and values of the wetland or buffer. (Ord. 94-22 (part), 1994).

17A.04.030 Wetland buffer averaging.
Wetland buffers may be modified by averaging buffer widths. Wetland buffer width averaging shall be allowed only where the applicant demonstrates that the following exists:

1. That averaging is necessary to avoid an extraordinary hardship to the applicant caused by circumstances peculiar to the property;
2. That the wetland contains variations in sensitivity due to existing physical characteristics;
3. That the proposed use would be located adjacent to areas where buffer width is reduced, and that such land uses are low in impact;
4. That width averaging will not adversely impact wetland function and values. (Ord. 9422 (part), 1994).

17A.04.035 Natural condition of wetland buffer.
Natural condition of wetland buffer. Wetland buffer areas shall be retained in their natural condition or may be improved to enhance buffer functions and values. Where buffer disturbance has occurred during construction, revegetation with native vegetation may be required. The Kittitas County noxious weed ordinance shall be adhered to. (Ord. 94-22 (part), 1994).

17A.04.040 Allowed uses.
In addition to exempt activities otherwise identified herein, the following activities are allowed to occur on wetland and wetland buffer areas: nonmotorized outdoor recreational activities including hunting and fishing; educational activities; existing and ongoing agricultural activities, silviculture and mining; and maintenance of existing facilities, structures, ditches, roads, bridges and other utility systems. Up to two acres of Class IV wetlands may be filled, drained or modified with no approval required from the planning manager. If more than two acres of Class IV wetlands are filled, drained or modified, approval of the planning manager is required. Such development activity shall provide mitigation in accordance with Section 17A.04.050 for that portion of the wetland fill or modification that exceeds two acres. Category IV wetlands may be used for secondary stormwater management facilities having no reasonable alternative on-site location, provided there is no significant adverse impact to the functions and values of those wetlands. (Ord. 95-15 (part), 1995; Ord. 94-22 (part), 1994).

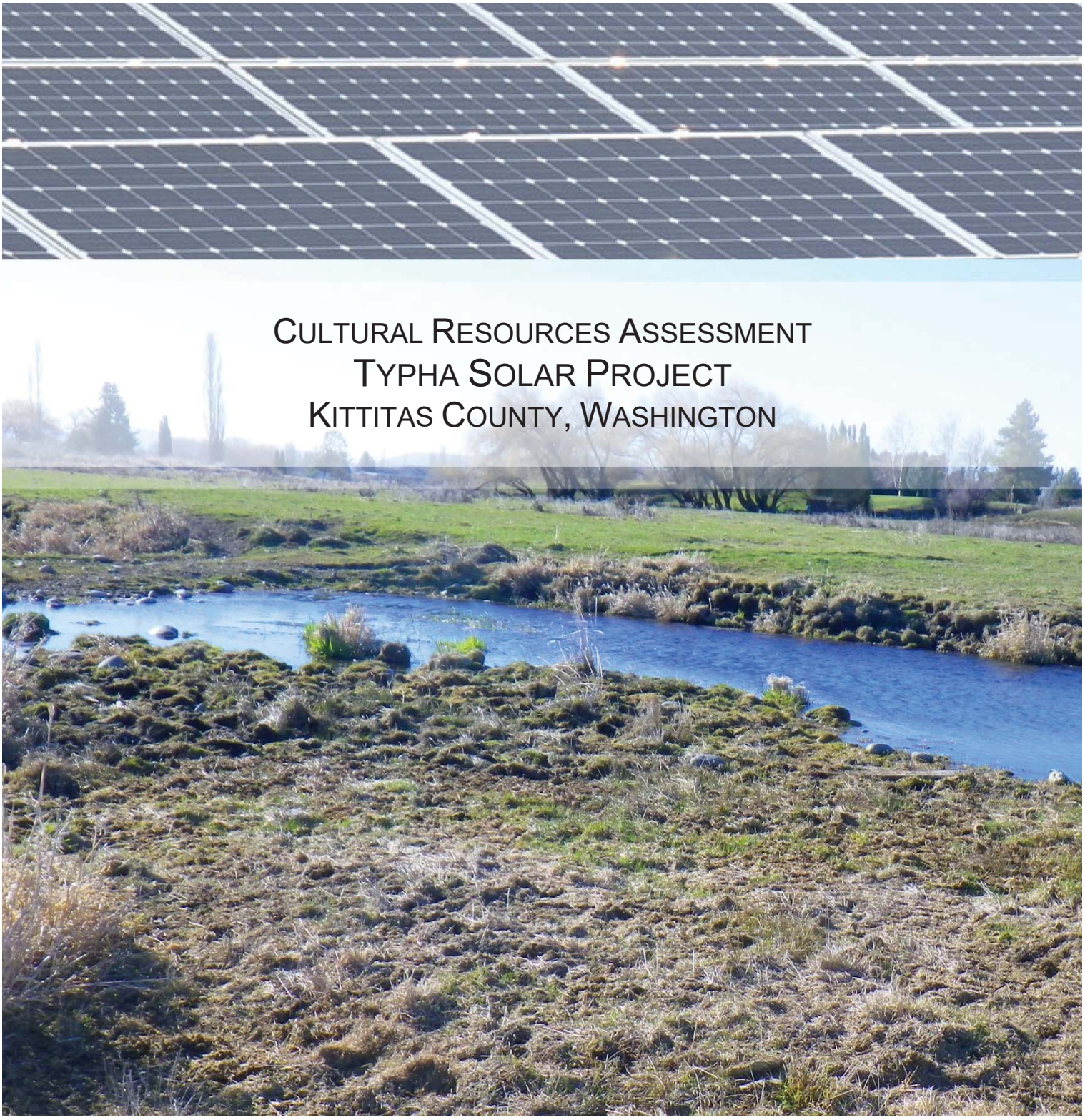
17A.04.045 Building setback lines from wetland buffers.
A building setback line equal to the side yard setback requirement of the applicable zoning district is required from the edge of any wetland buffer. Minor intrusions into the area of the building setback may be allowed if the director determines that such intrusions will not negatively impact the wetland. The setbacks shall be shown on all site plans submitted with the application. (Ord. 94-22 (part), 1994).

17A.04.050 Wetland replacement ratios.
Wetland replacement ratios are expressed in gross area required for replacement. The actual replacement, enhancement or rehabilitation of wetlands shall be determined by the director and meet all applicable standards for such. Replacement areas shall be determined according to function, acreage, type, location, time factors, ability to be self sustaining and projected success. Wetland functions and values shall be calculated using the Kittitas County critical areas policy document and the professional judgment of the director.

Category of Wetland	**Replacement Ratio**
I	3:1
II	2:1
III	1.5:1
IV	1:1 for the portion of a wetland fill or modification

(Ord. 96-14 (part), 1996; Ord. 95-15 (part), 1995; Ord. 94-22 (part), 1994).

Appendix J-2: Typha Solar Project Cultural Resources Report



CULTURAL RESOURCES ASSESSMENT
TYPHA SOLAR PROJECT
KITTITAS COUNTY, WASHINGTON

June 8, 2017

SWCA ENVIRONMENTAL CONSULTANTS
SEATTLE, WASHINGTON

This report has been redacted due to archaeological site confidentiality

Appendix J-3: Typha Permit Applications

KITTITAS COUNTY
DEPARTMENT OF PUBLIC WORKS

ACCESS AND ADDRESS APPLICATION

Application for: ☐ **Address $100.00** ☐ **Access $270.00** **Payment Method:** ☐ **Check** _____ ☐ **Cash**
☒ **Access and Address $330.00**

Owner Name Douglas Dicken
Mailing Address PO Box 1201
Ellensburg, WA 98926
Phone Number 509-859-2740
Email Address chevy@elltel.net

Permit #_____

Applicant Name TUUSSO Energy, LLC
Mailing Address 500 Yale Ave North
Seattle, WA 98109
Phone Number 206-303-0198
Email Address jason.evans@tuusso.com

DATE STAMP

Request Access and/or Address for:

☐ Approved Subdivision ☐ Pending Subdivision ☐ Agricultural Access
☐ Single Family Dwelling ☐ Commercial Access ☐ Temporary Access
☒ Other Photovoltaic Solar Project

Number of Lots to be served by the Access: 1

Assessor's Map No.: 18-18-30000-0001, 18-18-30000-0012, 18-18-30040-0001

Plat Name N/A Lot N/A

Road Name of Access Location: Thorp HWY S

Distance and Direction to Nearest Intersection or Adjacent Address:
At Ellensburg Golf, and Country Club entrance

Desired Width of Driveway: 12 FT (Minimum Width Requirement is based on length of driveway)

CALL BEFORE YOU DIG 1-800-424-5555 OR 811

Applicant is responsible for calling for underground utility locates 48 hours prior to construction.

☒ **I have attached a site map with details on the access, driveway and any buildings (existing or proposed).**
☒ **Applicant will stake along right-of-way to mark desired location of access.**
☒ **Applicant agrees to perform the work in compliance with the Kittitas County Road Standards and the requirements on the Access Permit.**
☒ **Applicant certifies that the access applied for is only for the purpose indicated.**

Applicant declares he/she is the owner or owner's agent of the real property whose access is under construction.
Applicant Signature _____ Date _____

Reviewers Notes:

NEW ADDRESS: _____

CITY: _____ ZIP: _____

☐ PRIVATE ROAD CERTIFICATION REQUIRED PRIOR TO_____

ACCESS REQUIREMENTS PRIOR TO BUILDING PERMIT:

☐ PAVED APRON REQUIRED – WSDOT DESIGN STANDARDS
☐ CULVERT REQUIRED-MUST BE BEDDED ON A MINIMUM OF 4" OF 5/8 GRAVEL OR EQUIVALENT
-Minimum Culvert Diameter: _____ Inches
-Minimum Beveled End Length: _____ Feet
-Total Culvert Length: _____ Feet
-Minimum Cover of: _____ Inches
☐ 4:1 BEVELS REQUIRED ON CULVERT ENDS
☐ CONSTRUCT APRON(FIRST 20 FEET) WITH NO MORE THAN 6% GRADE
☐ COMPACTED GRAVEL SURFACE LAYER REQUIRED
☐ 10 FOOT TURNING RADIUS ON APRON
☐ SIDE SLOPES OFF OF APRON NOT TO EXCEED A 4:1 SLOPE

☐ PERMIT EXPIRES ON: _____

DRIVEWAY REQUIREMENTS PRIOR TO OCCUPANCY PERMIT:

☐ DRIVEWAY NOT TO EXCEED 15% GRADE
☐ DRIVEWAYS LESS THAN 150 FEET IN LENGTH TO BE A MINIMUM OF 12 FEET WIDE WITH COMPACTED GRAVEL SURFACE LAYER
☐ DRIVEWAYS LONGER THAN 150 FEET IN LENGTH TO BE A MINIMUM OF 16 FEET WIDE WITH COMPACTED GRAVEL SURFACE LAYER
☐ DRIVEWAY SET BACK OF 5 FEET FROM SIDE PROPERTY BOUNDARIES
☐ SIDE SLOPE OFF DRIVEWAY SURFACE LAYER NOT TO EXCEED A 2:1 SLOPE

NOTES: _____

Reviewers Signature Title Date

411 N. Ruby St. Suite 1
Ellensburg, WA 98926
TEL (509) 962-7523
FAX (509) 962-7663

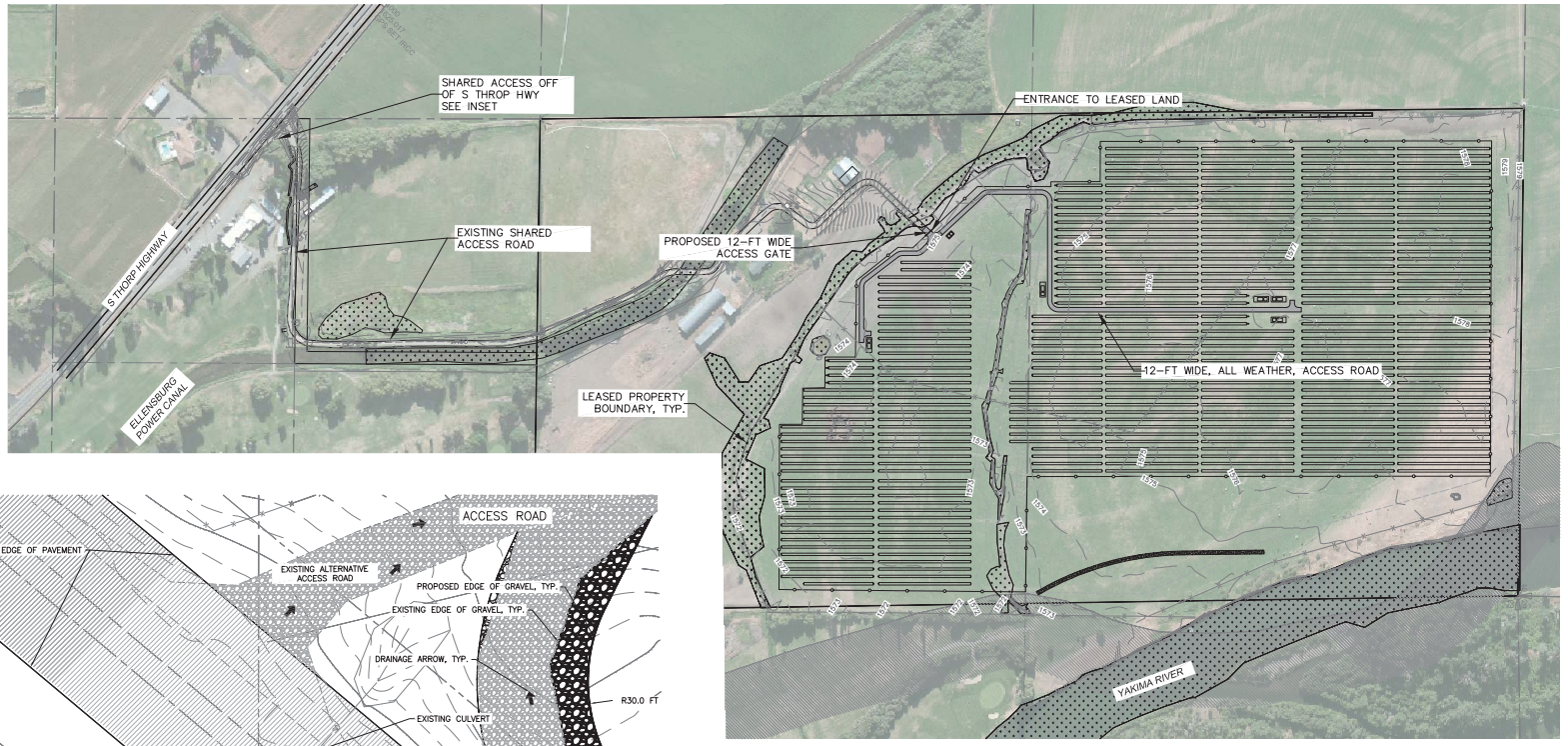
TUUSSO ENERGY - TYPHA SITE

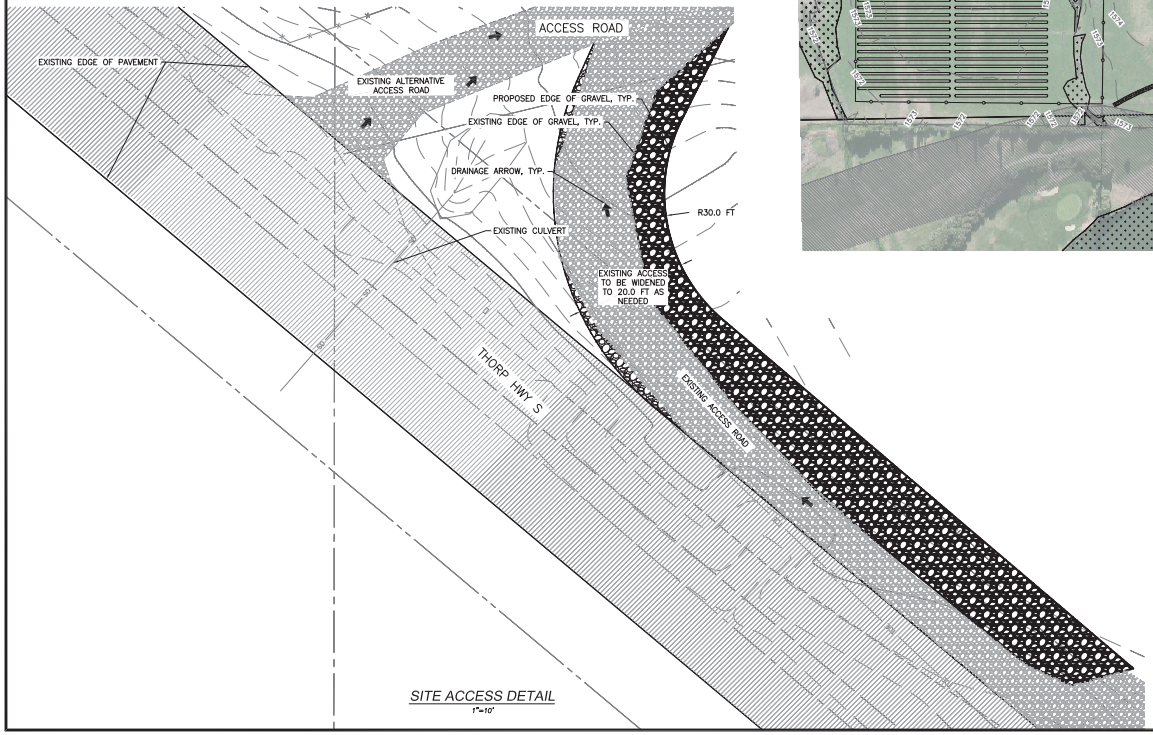
A PORTION OF THE EAST 1/2 OF THE NE 1/4 OF SECTION 30, T. 18 N., R. 18 E., W.M.
KITTITAS COUNTY, STATE OF WASHINGTON

NORTH

0 37.5 75 150

SCALE 1" = 150'





SITE ACCESS DETAIL
1"=10'

PROPERTY INFORMATION:

APPLICANT:	TUUSSO ENERGY, LLC 500 YALE AVE N SEATTLE, WA 98109
PARCEL NUMBERS:	712633, 752633, 802633
PARCEL 1 SIZE:	80.44 ACRES
TRACT 1A SIZE:	54.29 ACRES (LEASED)
TRACT 2A SIZE:	1.85 ACRES (LEASED)
TRACT 3A SIZE:	24.30 ACRES (NOT LEASED)
PARCEL 4 SIZE:	0.97 ACRES (NOT LEASED)
PROPERTY ADDRESS:	TBD, ELLENSBURG, WA 98926
ZONE:	COMMERCIAL AGRICULTURAL
IRRIGATION DISTRICT:	WEST SIDE, PACKWOOD

REVISIONS		
DESCRIPTION	BY	DATE

© THE PLANS SET FORTH ON THIS SHEET ARE AND SHALL REMAIN THE PROPERTY OF ENCOMPASS ENGINEERING & SURVEYING

NOT FOR CONSTRUCTION

TUUSSO ENERGY, LLC
TYPHA SITE
ACCESS SITE MAP

Encompass
ENGINEERING & SURVEYING
Western Washington Division
165 NE Juniper Street, Suite 201 • Issaquah, WA 98027 • Phone: (425) 392-0250 • Fax: (425) 391-3055
Eastern Washington Division
407 Trellisorte Blvd. • Ste Elum, WA 98926 • Phone: (509) 674-7433 • Fax: (509) 674-7419

JOB NO.	17019
DATE	AUGUST 2017
SCALE	AS SHOWN
DESIGNED	SF
DRAWN	SF
CHECKED	TML
APPROVED	TML
SHEET	EX-1

KITTITAS COUNTY
COMMUNITY DEVELOPMENT SERVICES
411 NORTH RUBY STREET SUITE #2 ■ ELLENSBURG, WA 98926
PHONE (509) 962-7506 ■ FAX (509) 962-7682

General Application for Construction

Assessor Map Number:	Official Use Only:
(Use http://www.co.kittitas.wa.us/assessor/property.asp if needed) Example 21-12-35000-0021 1 7 - 1 9 - 1 8 0 4 0 - ___ ___ ___ ___	**Permit #:**
Short Plat/ Subdivision: / Lot #:	**Date Applied:**
	Intake:

Site Address: 4561 No. 6 Road and 2100 Tjossem Road, Ellensburg, WA 98926			
Project Description/ Nature of Work: Camas 5-MW Solar Project		~~Square Foot~~ Total:	
Specific Use of Structure: To generate renewable electricity		No. of Bedrooms: 0	
Heating System Type & Location: N/A	Heating System Fuel Type: N/A	Fireplace Fuel Type: N/A	Hot Water Location & Fuel: N/A
☐ New Residential ☐ Residential Alteration ☐ Residential Addition ☐ Foundation	☐ New Commercial ☐ Commercial Alteration ☐ Commercial Addition ☐ Tenant Improvement	☐ Multi-Family ☐ Demolition ☐ Mobile Home ☐ Accessory Building	☐ Accessory Building Alteration ☐ Agricultural Building ■ Other New Industrial

PROPERTY OWNER:	Valley Land Company, LLC	Day Phone: 509-962-2840
Mailing Address:	1585 Tjossem Road	
City, State, ZIP:	Ellensburg, WA 98926	
E-mail:	jbrunson@fairpoint.net	Cell Phone: 509-899-2840
CONTRACTOR:		Day Phone:
Contact:		
Address, City, State, ZIP:		
E-mail:		Cell Phone:
Contractor License #:		Expiration Date:
ARCHITECT/ ENGINEER/ DESIGNER:		Day Phone:
Contact:		
Address, City, State, ZIP:		
E-mail:		Cell Phone:
Professional License No.:		Expiration Date:

APPLICANT/ AGENT:	Jason Evans	Day Phone: 206-708-6055
Company (if any):	TUUSSO Energy LLC	
Address, City, State, ZIP:	500 Yale Avenue North, Seattle, WA 98109	
E-mail:	Jason.evans@tuusso.com	Cell Phone: 206-303-0198

This Section To Be Completed For Construction Permits Only

Pursuant to RCW 19.27.095 (2)(i-ii) The requirements for a fully completed construction application shall include:

i. The name, address, and phone number of the office of the lender administering the interim construction financing, if any: OR
ii. The name and address of the firm that has issued a payment bond, if any, on behalf of the prime contractor for the protection of the owner, if the bond is for an amount not less than 50% of the total amount of the construction project.

If for any reason the information requested below is not available at the time of application, the applicant shall provide the information as soon as it can be reasonably be obtained.

☐ Lending Agency Name: Phone:

Mailing Address: City: State: ZIP:

☐ I acknowledge by checking this box that this project has no lending agency for construction financing.

☐ Bonding Agency Name: Phone:

Mailing Address: City: State: ZIP

☐ I acknowledge by checking this box that this project has no bonding agency.

If you are the Owner and Acting As Your Own Contractor, please complete the following declaration:

I acknowledge that I am applying for a construction permit through the Kittitas County Community Development Services. I also acknowledge that I *am* not a licensed contractor, specialty or general, or that I am not acting as a contractor and wish to be exempt from the requirements of the Washington State Contractor's Act, per RCW 18.27.090, and will abide by all provisions and conditions of the exemption as stated. I agree that if I use the assistance of any person(s) to provide labor and/or assistance, I will retain only contractors registered and currently licensed as required under the laws of the State of Washington.

I (print name) _____ certify under penalty of perjury under the laws of the State of Washington that the foregoing is true and correct.

Owner Signature: _____ Date: _____

1. All permits shall expire by limitation and be declared void if any one of the following apply:
   a. Work is not started within 365 days of obtaining a permit.
   b. Work is abandoned for 365 days or more after beginning work.
   c. An inspection and approval of work completed has not been performed by Kittitas County Community Development Services for 365 days.
2. The building permit card and approved construction plans shall be kept on the site of work until completion of the project.
3. It shall be the duty of the permit holder or their agent to notify the building official that such work is ready for inspection. It shall by the duty of the person requesting any inspections required by code to provide access to and means for inspection of such work. Work shall not be done beyond the point indicated in each successive inspection without first obtaining the approval of the building official. Any portion that does not comply shall be corrected and such portion shall not be covered or concealed until authorized by the building official.
4. No building or structure shall be used or occupied, and no change in the existing occupancy classification of a building or structure or portion thereof shall be made until the building official has issued a Certificate of Occupancy.
5. Work shall be installed in accordance with the approved construction documents, and any changes made during construction that are not in compliance with the approved construction documents shall be resubmitted for approval as an amended set of construction documents.

I hereby acknowledge that I have read this application and certify under penalty of perjury under the laws of the State of Washington that the above answers are true and complete to the best of my knowledge. I agree to comply with all current codes, laws, regulations and permit requirements related to this project. I hereby certify that I will pay all fees as required by law, including any applicable review fees if I do not purchase the permit. I further agree to, and hereby grant to Kittitas County Community Development Services and Department of Public Works a right to enter onto the premises as described for this permit application, for the purpose of making such inspections and tests as may be required. By signing this application, the Owner certifies that they are the legal owner of the property. All permit fees are non-refundable.

Owners Signature: (Required)		Authorized Agent Signature:	
Print Name:		Print Name:	
Date:		Date:	

Tuusso Energy: Typha Solar Project

NOI Application

September 5, 2017

SECTION 1. CONTACT INFO

Contact Information Section Help

This Notice of Intent application requires the following contact types: **Permittee, Site Owner, and Site Contact.** Please use the table below to fill in your required contacts. You may add additional contact types that are not pre-listed.

Note: Please remember you are responsible for notifying the Department of Ecology when your contact information changes.

Contact Type	First Name	Last Name	Organization Name	Action
Permittee	Jason	Evans	Tuusso Solar, LLC	Edit - Remove
Site Contact	Jason	Evans	Tuusso Solar, LLC	Edit - Remove
Site Owner	Dicken	Douglas		Edit - Remove

Your mailing address will be standardized against the postal service (USPS) mailing database when you click on the "Update" button. Verfication may be necessary.

Honorific: **Contact Type:** Permittee

First Name: Jason **Last Name:** Evans

Organization Name: Tuusso Solar, LLC Title:

Mailing Address: 500 Yale Ave N

Country: UNITED STATES

City: Seattle **State:** WA **Zip:** 98109 - 5680

Email Address: jason.evans@tuusso.com

Business Phone: 206 - 708 - 6055 Ext. Fax Number: - -

Cell Phone: 206 - 303 - 0198 UBI Number:

Your mailing address will be standardized against the postal service (USPS) mailing database when you click on the "Update" button. Verfication may be necessary.

Honorific: **Contact Type:** Site Owner

First Name: Dicken **Last Name:** Douglas

Organization Name: Title:

Mailing Address: PO Box 1201

Country: UNITED STATES

City: Ellensburg **State:** WA **Zip:** 98926 - 1902

Email Address: chevy@elltel.net

Business Phone: 509 - 859 - 2740 Ext. Fax Number: - -

Cell Phone: - - UBI Number:

Copy From... My Profile Save Contact Cancel

SECTION 2. FACILITY/SITE INFO

Facility/Site Information

Section Help

Your facility address will be standardized against the postal service (USPS) mailing database when you click on the "Select facility from map" link. Verfication may be necessary.

This Facility/Site's Ownership Type is: Private

Facility/Site Name: Typha Solar Project

Street Address:

City: Zip: 98926

Or

If the site lacks a street address, list its specific location. Example: Intersection of Highway 61 and 34.

Location Description: TBD (Near 3401 S Thorp Hwy), Ellensburg, WA 98926

Find my facility/site on a map

Please use the pop up map to complete the latitude, longitude and county information below. Use the pencil tool on the map to locate your facility at the front door or site entrance. *(The map may take a second to pop up.)*

Select facility/site from map

Latitude: 47.024099 **Longitude:** -120.628493 **County:** Kittitas

SECTION 3. SITE/PROJECT INFO

Project Information

Section Help

Type of Construction Activity: *(check all that apply)*

☐ Highway or Road (city, county, state) ☐ Residential ☐ Commercial ☐ Industrial

☐ Utilities ☑ Other *(specify):* Photovoltaic solar panel s

Project/Site Size: 56.14 acres

The total size of the project site in acres. This is all land that is owned or controlled by the permittee.

Soil Disturbance Size: 38.56 acres

Total area of soil disturbance for your site/project over the life of the project. Include grading, equipment staging, excavation, borrow pit, material storage areas, dump areas, haul roads, side-cast areas, off-site construction support areas, and all other soil disturbance acreage associated with the project. (Note: 1 acre = 43,500 ft²).

Estimated Project Start Date: 4/1/2018

Estimated Project End Date: 10/31/2018

Will 1,000 cubic yards or more of poured concrete or recycled concrete be used over the life of the project? ○ Yes ◉ No

Site Conditions

Are you aware of contaminated soils present on the site? ○ Yes ◉ No

Are you aware of groundwater contamination located within the site boundary? ○ Yes ◉ No

Other Permits

Please enter other permits issued by Water Quality for this site.

Permit Number	Action
	Add

SECTION 4. DISCHARGE LOCATION

Discharge Location/Outfall Information

Section Help

Will water discharge directly or indirectly (through a storm drain system or roadside ditch) into one or more surface waterbodies (wetlands, creeks, lakes, and all other surface waters and water courses)?

No, no discharge to surface waters (100% infiltration) ▼

If your project includes dewatering, you must include dewatering plans and discharge locations in your site Stormwater Pollution Prevention Plan.

Location of Discharge into Surface Waterbody (Outfall Location)

Select the waterbody location (outfall) on the pop up map where the site has the potential to discharge into a waterbody (enter all locations). If you have 100% infiltration, you must select where the infiltration point is as your outfall. *(The map may take a second to pop up.)*

Outfall Number	Outfall Name	Lat/Long	Action
1	Infiltratiom	47.023126/-120.624341	Edit - Remove

SECTION 5. NOI INFORMATION

Stormwater Pollution Prevention Plan (SWPPP)

You must develop a SWPPP prior to starting construction. Do **not** submit your SWPPP with your application. The exception is that Ecology may request a copy of all or part of your SWPPP if you answered yes to the questions under the Site Conditions heading on the Site/Project Info tab.

☑ I have read and agree to the information above

Best Management Practices (BMPs)

You must use the BMPs listed in the Stormwater Management Manual for Western Washington or the Stormwater Management Manual for Eastern Washington or other manuals approved by Ecology. Alternatively, you may use demonstrably equivalent BMPs on the basis of permit condition S9.C.4. If you intend to use a BMP at your site that is not included in these manuals, but that you believe meets the definition of a demostrably equivalent BMP, you must notify the appropriate regional office. (See Definitions in the Construction Stormwater General Permit).

Note that if you receive permit coverage without indicating the preference for a demostrably equivalent BMP and later decide to use one, you must provide Ecology with notice of the selection of an equivalent BMP no less than 60 days before the intended use of the equivalent BMP.

http://www.ecy.wa.gov/programs/wq/stormwater/construction/contacts.html

☑ I have read and agree to the information above

SECTION 6. DMR

Discharge Monitoring Reports (DMRs)

Permittees must submit monitoring data using Ecology's WQWebDMR program.

To sign up for WQWebDMR, or to register a new site, go to http://www.ecy.wa.gov/programs/wq/permits/paris/webdmr.html. If you are unable to submit your DMRs electronically, you may contact Ecology to request a waiver. Ecology will generally only grant waiver requests to those permittees without internet access. Only a permittee or representative, designated in writing, may request access to or a waiver from WQWebDMR. If you have questions on this process, contact Ecology's WQWebDMR staff at WQWebPortal@ecy.wa.gov or 1-800-633-6193, Option 3 (toll free).

☑ I have read and agree to the information above

SECTION 7. SEPA

State Environmental Policy Act (SEPA)

Section Help

This Notice of Intent (NOI) is incomplete and cannot be approved until the applicable SEPA requirements under Chapter 197-11 WAC are met.

Who is the SEPA lead agency on your site? Energy Facility Site Evaluation Council

Has the SEPA lead agency issued a final decision on your checklist? ○ No ○ Yes ○ Exempt

More SEPA information is available at: http://www.ecy.wa.gov/programs/sea/sepa/e-review.html

SECTION 8. PUBLIC NOTICE

Public Notice

Section Help

You must publish a public notice at least **once** a week for **two** consecutive weeks with **seven days** between publications, in at least a **single** newspaper of general circulation in the county in which the construction is to take place. Ecology cannot grant permit coverage sooner than the end of the 30-day public comment period, which begins on the date of the **second** public notice.

You may choose to use a system generated public notice and download it below. If not, you need to upload the public notice used.

- (•) I will use the system generated public notice document
- ( ) I will upload my own public notice

```
Tuusso Solar, LLC, Jason Evans, 500 Yale Ave N Seattle, WA 98109, is seeking coverage
under the Washington State Department of Ecology's Construction Stormwater NPDES and
State Waste Discharge General Permit.
The proposed project, Typha Solar Project, is located at  TBD (Near 3401 S Thorp Hwy),
Ellensburg, WA 98926 in  in Kittitas county.
This project involves 38.56 acres of soil disturbance for Other (Photovoltaic solar panel
site) construction activities.
All discharges and runoff goes to ground water.
Any persons desiring to present their views to the Washington State Department of Ecology
regarding this Application, or interested in Ecology's action on this Application, may
notify Ecology in writing no later than 30 days of the last date of publication of this
notice. Ecology reviews public comments and considers whether discharges from this
project would cause a measurable change in receiving water quality, and, if so, whether
the project is necessary and in the overriding public interest according to Tier II
antidegradation requirements under WAC 173-201A-320.

Comments can be submitted to:
Department of Ecology
Attn: Water Quality Program, Construction Stormwater
P.O. Box 47696, Olympia, WA 98504-7696
```

Clicking the text will copy it to your clipboard, if allowed. Open notice in a new window for printing.

To add a public notice to your application, select the newspaper name and enter your public notice dates, then click on the "Add" link. If you do not click the "Add" link, the public notice entry will be lost.

Note: This system does not publish your public notice in the newspaper for you. You must submit your public notice text to your selected newspaper.

Newspaper Name	First Notice	Second Notice	Action
Ellensburg - Daily Record ▼	*	**	Add

* First notice date is required.
** Second notice date is required.

SECTION 9. QUESTIONS

For Questions...

Please contact the following staff per your construction site's location.

If your construction site is located in:	Contact the following staff:
City of Seattle, Kitsap, Pierce, or Thurston County	Josh Klimek 360-407-7451 josh.klimek@ecy.wa.gov
Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Skagit, Snohomish, Spokane, Stevens, Walla Walla, Whatcom, or Whitman County	Shawn Hopkins 360-407-6442 shawn.hopkins@ecy.wa.gov
Benton, Chelan, Clallam, Clark, Cowlitz, Douglas, Grays Harbor, Jefferson, Kittitas, Klickitat, Lewis, Mason, Okanogan, Pacific, Skamania, Wahkiakum, or Yakima County	Joyce Smith 360-407-6858 joyce.smith@ecy.wa.gov
Island, King, or San Juan County	RaChelle Stane 360-407-6556 rachelle.stane@ecy.wa.gov

Tuusso Solar, LLC, Jason Evans, 500 Yale Ave N Seattle, WA 98109, is seeking coverage under the Washington State Department of Ecology's Construction Stormwater NPDES and State Waste Discharge General Permit.

The proposed project, Typha Solar Project, is located at TBD (Near 3401 S Thorp Hwy), Ellensburg, WA 98926 in in Kittitas county.

This project involves 38.56 acres of soil disturbance for Other (Solar Panel Farm) construction activities.

All discharges and runoff goes to ground water.

Any persons desiring to present their views to the Washington State Department of Ecology regarding this application, or interested in Ecology's action on this application, may notify Ecology in writing no later than 30 days of the last date of publication of this notice. Ecology reviews public comments and considers whether discharges from this project would cause a measurable change in receiving water quality, and, if so, whether the project is necessary and in the overriding public interest according to Tier II antidegradation requirements under WAC 173-201A-320.

Comments can be submitted to:

Department of Ecology

Attn: Water Quality Program, Construction Stormwater

P.O. Box 47696, Olympia, WA 98504-7696

Construction Stormwater General Permit

Stormwater Pollution Prevention Plan (SWPPP)

for

Tuusso Energy: Typha Solar Project

Prepared for:

The Washington State Department of Ecology

Central Regional Office

Permittee / Owner	Developer	Operator / Contractor
Tuusso Energy LLC	Jason Evans	TBD

TBD (Near 3401 S Thorp HW), Ellensburg, WA 98926

Certified Erosion and Sediment Control Lead (CESCL)

Name	Organization	Contact Phone Number
TBD	TBD	TBD

SWPPP Prepared By

Name	Organization	Contact Phone Number
Sarah Foster, EI	Encompass Engineering & Surveying	(509)-674-7433

SWPPP Preparation Date

July 28, 2017

Project Construction Dates

Activity / Phase	Start Date	End Date
Phase 1	4/1/2018	10/31/2018

Table of Contents

1 Project Information 4
1.1 Existing Conditions 4
1.2 Proposed Construction Activities 4
2 Construction Stormwater Best Management Practices (BMPs) 6
2.1 The 13 Elements 6
2.1.1 Element 1: Preserve Vegetation / Mark Clearing Limits 6
2.1.2 Element 2: Establish Construction Access 6
2.1.3 Element 3: Control Flow Rates 7
2.1.4 Element 4: Install Sediment Controls 7
2.1.5 Element 5: Stabilize Soils 8
2.1.6 Element 6: Protect Slopes 8
2.1.7 Element 7: Protect Drain Inlets 9
2.1.8 Element 8: Stabilize Channels and Outlets 9
2.1.9 Element 9: Control Pollutants 9
2.1.10 Element 10: Control Dewatering 11
2.1.11 Element 11: Maintain BMPs 11
2.1.12 Element 12: Manage the Project 12
2.1.13 Element 13: Protect Low Impact Development (LID) BMPs 13
3 Pollution Prevention Team 14
4 Monitoring and Sampling Requirements 15
4.1 Site Inspection 15
4.2 Stormwater Quality Sampling 15
4.2.1 Turbidity Sampling 15
4.2.2 pH Sampling 17
5 Discharges to 303(d) or Total Maximum Daily Load (TMDL) Waterbodies 18
5.1 303(d) Listed Waterbodies 18
5.2 TMDL Waterbodies 18
6 Reporting and Record Keeping 19
6.1 Record Keeping 19
6.1.1 Site Log Book 19
6.1.2 Records Retention 19
6.1.3 Updating the SWPPP 19
6.2 Reporting 19
6.2.1 Discharge Monitoring Reports 19
6.2.2 Notification of Noncompliance 20

List of Tables

Table 1 – Summary of Site Pollutant Constituents 4
Table 2 – Pollutants 9
Table 3 – pH-Modifying Sources 10
Table 4 – Dewatering BMPs 11
Table 5 – Management 12
Table 6 – BMP Implementation Schedule **Error! Bookmark not defined.**
Table 7 – Team Information 14
Table 8 – Turbidity Sampling Method 15
Table 9 – pH Sampling Method 17

List of Appendices

A. Site Map
B. BMP Details
C. Correspondence
D. Site Inspection Form
E. Construction Stormwater General Permit
F. 303(d) List Waterbodies / TMDL Waterbodies Information
G. Contaminated Site Information
H. Engineering Calculations

List of Acronyms and Abbreviations

Acronym / Abbreviation	Explanation
303(d)	Section of the Clean Water Act pertaining to Impaired Waterbodies
BFO	Bellingham Field Office of the Department of Ecology
BMP(s)	Best Management Practice(s)
CESCL	Certified Erosion and Sediment Control Lead
CO_2	Carbon Dioxide
CRO	Central Regional Office of the Department of Ecology
CSWGP	Construction Stormwater General Permit
CWA	Clean Water Act
DMR	Discharge Monitoring Report
DO	Dissolved Oxygen
Ecology	Washington State Department of Ecology
EPA	United States Environmental Protection Agency
ERO	Eastern Regional Office of the Department of Ecology
ERTS	Environmental Report Tracking System
ESC	Erosion and Sediment Control
GULD	General Use Level Designation
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Units
NWRO	Northwest Regional Office of the Department of Ecology
pH	Power of Hydrogen
RCW	Revised Code of Washington
SPCC	Spill Prevention, Control, and Countermeasure
su	Standard Units
SWMMEW	Stormwater Management Manual for Eastern Washington
SWMMWW	Stormwater Management Manual for Western Washington
SWPPP	Stormwater Pollution Prevention Plan
TESC	Temporary Erosion and Sediment Control
SWRO	Southwest Regional Office of the Department of Ecology
TMDL	Total Maximum Daily Load
VFO	Vancouver Field Office of the Department of Ecology
WAC	Washington Administrative Code
WSDOT	Washington Department of Transportation
WWHM	Western Washington Hydrology Model

1 Project Information

Project/Site Name: Typha Solar Project
Street/Location: TBD (near 3401 S Thorp HW)
City: Ellensburg State: WA Zip code: 98926
Subdivision: NA
Receiving waterbody: Existing irrigation network

1.1 Existing Conditions

Total acreage (including support activities such as off-site equipment staging yards, material storage areas, borrow areas).

Total acreage:	56.14
Disturbed acreage:	38.56
Existing structures:	0
Landscape topography:	Gently sloped range/grassland toward the southeast in the southern portion of the site and towards the east in the northern portion of the site.
Drainage patterns:	Northern portion of the site flows to the east. The southern portion of the site flows to the south into existing irrigation ditch.
Existing Vegetation:	Majority range/grassland.
Critical Areas (wetlands, streams, high erosion risk, steep or difficult to stabilize slopes):	Northern and Eastern portions of the side are within the 500-yr floodplain, with a small amount in the 100-yr floodplain. A drainage ditch runs along the southern boundary of the site, towards the east.

List of known impairments for 303(d) listed or Total Maximum Daily Load (TMDL) for the receiving waterbody: None

Table 1 includes a list of suspected and/or known contaminants associated with the construction activity.

No known contamination on site or associated with construction activity.

Table 1 – Summary of Site Pollutant Constituents

Constituent (Pollutant)	Location	Depth	Concentration
NA	NA	NA	NA

1.2 Proposed Construction Activities

Description of site development (example: subdivision):
Photovoltaic solar facility project site with all weather-access roads, inverter stations, and modular trackers with solar panels

Description of construction activities (example: site preparation, demolition, excavation):

1. Pre-construction meeting
2. Grade and install construction entrance
3. Install perimeter protection
4. Grade and stabilize construction roads
5. Install vibratory driven H piles for wide flange steel beams
6. Install electrical underground and mechanical trackers
7. Install panels
8. Perform any required site restoration

Description of site drainage including flow from and onto adjacent properties. Must be consistent with Site Map in Appendix A:
Flows from the site will flow east into an existing drainage ditch. It will eventually be outletted into an existing irrigation network.

Description of final stabilization (example: extent of revegetation, paving, landscaping):
The site will be revegetated with native vegetation.

Contaminated Site Information:
Proposed activities regarding contaminated soils or groundwater (example: on-site treatment system, authorized sanitary sewer discharge):
No contamination is known to be on site.

2 Construction Stormwater Best Management Practices (BMPs)

The SWPPP is a living document reflecting current conditions and changes throughout the life of the project. These changes may be informal (i.e., hand-written notes and deletions). Update the SWPPP when the CESCL has noted a deficiency in BMPs or deviation from original design.

2.1 The 13 Elements

2.1.1 Element 1: Preserve Vegetation / Mark Clearing Limits

List and describe BMPs:

BMP C101: Preserving Natural Vegetation

Natural vegetation will be preserved along the onsite wetlands that run through the middle of the site, as well as along the drainage ditch along the southern boundary of the site.

BMP C102: Buffer Zones

Buffer zones will be established at the limits of the proposed facility to protect existing wetlands and relieve downstream impacts. Existing vegetation will be maintained within the buffer zones throughout construction.

Installation Schedules: TBD

Inspection and Maintenance plan: TBD

Responsible Staff: TBD

2.1.2 Element 2: Establish Construction Access

List and describe BMP's:

BMP C105 – Stabilized Construction Entrance

A single, stabilized construction entrance will be provided at the end of the existing shared access road off of S Thorp HWY, where vehicles will be entering/exiting, in order to prevent tracking out from the site.

Installation Schedules: TBD

Inspection and Maintenance plan: TBD

Responsible Staff: TBD

2.1.3 Element 3: Control Flow Rates

Will you construct stormwater retention and/or detention facilities?
☐ Yes ☒ No

Will you use permanent infiltration ponds or other low impact development (example: rain gardens, bio-retention, porous pavement) to control flow during construction?
☐ Yes ☒ No

Project will not impair or alter downstream conveyance systems. Full dispersion on site will be used to account for increased flows due to proposed impervious areas. Per Chapter 2.2.6 of the SWMMEW there are exemptions for new development when flow control is not required as long as certain conditions are met. Per exemption 1, “Any project able to disperse, without discharging to surface waters, the total 25-year runoff volume for the proposed development condition” is exempt from meeting the flow control requirements. The Typha project will use full dispersion as the main way to handle increased flows due to impervious areas. As outlined in SWMMEW Chapter 6.5, BMP F6.42, full dispersion allows up to 10% of the site that is impervious to be characterized as non-effective impervious area by dispersing runoff into the native vegetation area. On the Typha site, the impervious areas may conservatively make up to 2.5% of the site while the rest of the site maintains plantings similar to existing vegetation. This is under the 10% threshold, making full dispersion a viable option.

List and describe BMPs:

BMP F6.42- Full dispersion: Runoff from impervious areas within the site will be dispersed within the site utilizing the native vegetation.

BMP C102 – Buffer Zones (See Element 1)

BMP C233 – Silt Fence will also control flow rates from the site during construction (See Element 4).

Installation Schedules: TBD

Inspection and Maintenance plan: TBD

Responsible Staff: TBD

2.1.4 Element 4: Install Sediment Controls

BMP C233- Silt Fence: Silt Fence will surround the site at all areas downslope of all disturbed areas and will be placed upslope of any existing water bodies and wetlands. The silt fence will also serve to mark the clearing limits per Element 1 above.

Installation Schedules: TBD

Inspection and Maintenance plan: TBD

Responsible Staff: TBD

2.1.5 Element 5: Stabilize Soils

The Central Basin*, East of the Cascade Mountain Crest

Season	Dates	Number of Days Soils Can be Left Exposed
During the Dry Season	July 1 – September 30	30 days
During the Wet Season	October 1 – June 30	15 days

*Note: The Central Basin is defined as the portions of Eastern Washington with mean annual precipitation of less than 12 inches.

Soils must be stabilized at the end of the shift before a holiday or weekend if needed based on the weather forecast.

Anticipated project dates: Start date: 4/1/2018 End date: 10/31/2018

Will you construct during the wet season?
☒ Yes ☐ No

BMP C123- Plastic Covering: Plastic covering will be used as necessary to protect any soil stockpiles that are produced from construction activity.

Installation Schedules: TBD

Inspection and Maintenance plan: TBD

Responsible Staff: TBD

2.1.6 Element 6: Protect Slopes

Will steep slopes be present at the site during construction?
☐ Yes ☒ No
The site is relatively flat and is not expected to require protection for slopes.

List and describe BMPs: None

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

2.1.7 Element 7: Protect Drain Inlets

There are no storm drain inlets on the site

List and describe BMPs: None

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

2.1.8 Element 8: Stabilize Channels and Outlets

Provide stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent stream banks, slopes, and downstream reaches, will be installed at the outlets of all conveyance systems.

As mentioned previously in Element 3, full dispersion will be in effect at the project site and off-site runoff will be minimal. Due to this there will be no on-site conveyance channels or outlets to account for.

List and describe BMPs: None

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

2.1.9 Element 9: Control Pollutants

The following pollutants are anticipated to be present on-site: No known pollutants

Table 2 – Pollutants

Pollutant (List pollutants and source, if applicable)
NA

List and describe BMPs: None

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

Will maintenance, fueling, and/or repair of heavy equipment and vehicles occur on-site?
☒ Yes ☐ No

Contractor is required to keep a spill kit on site and use spill prevention measures throughout the construction process, in order to address any potential fuel spills or equipment breakdowns.

List and describe BMPs: None

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

Will wheel wash or tire bath system BMPs be used during construction?
☐ Yes ☒ No

List and describe BMPs: Wheel wash is not proposed at this time; however, if construction activities are such that sediment may be tracked with tires off-site a wheel wash will be used and any wastewater generated would be disposed at a local permitted facility.

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

Will pH-modifying sources be present on-site?
☐ Yes ☒ No

Table 3 – pH-Modifying Sources

☒	None
☐	Bulk cement
☐	Cement kiln dust
☐	Fly ash
☐	Other cementitious materials
☐	New concrete washing or curing waters
☐	Waste streams generated from concrete grinding and sawing
☐	Exposed aggregate processes
☐	Dewatering concrete vaults
☐	Concrete pumping and mixer washout waters
☐	Recycled concrete
☐	Recycled concrete stockpiles
☐	Other (i.e., calcium lignosulfate) [please describe:]

List and describe BMPs: None

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

Concrete trucks must not be washed out onto the ground, or into storm drains, open ditches, streets, or streams. Excess concrete must not be dumped on-site, except in designated concrete washout areas with appropriate BMPs installed.

Will uncontaminated water from water-only based shaft drilling for construction of building, road, and bridge foundations be infiltrated provided the wastewater is managed in a way that prohibits discharge to surface waters?
☐ Yes ☒ No

List and describe BMPs: None

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

2.1.10 Element 10: Control Dewatering

No dewatering is proposed or expected to occur as part of this project.

Table 4 – Dewatering BMPs

☐	Infiltration
☐	Transport off-site in a vehicle (vacuum truck for legal disposal)
☐	Ecology-approved on-site chemical treatment or other suitable treatment technologies
☐	Sanitary or combined sewer discharge with local sewer district approval (last resort)
☐	Use of sedimentation bag with discharge to ditch or swale (small volumes of localized dewatering)

List and describe BMPs: None

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

2.1.11 Element 11: Maintain BMPs

All temporary and permanent Erosion and Sediment Control (ESC) BMPs shall be maintained and repaired as needed to ensure continued performance of their intended function.

Maintenance and repair shall be conducted in accordance with each particular BMP specification (see *Volume II of the SWMMWW or Chapter 7 of the SWMMEW*).

Visual monitoring of all BMPs installed at the site will be conducted at least once every calendar week and within 24 hours of any stormwater or non-stormwater discharge from the site. If the site becomes inactive and is temporarily stabilized, the inspection frequency may be reduced to once every calendar month.

All temporary ESC BMPs shall be removed within 30 days after final site stabilization is achieved or after the temporary BMPs are no longer needed.

Trapped sediment shall be stabilized on-site or removed. Disturbed soil resulting from removal of either BMPs or vegetation shall be permanently stabilized.

Additionally, protection must be provided for all BMPs installed for the permanent control of stormwater from sediment and compaction. BMPs that are to remain in place following completion of construction shall be examined and restored to full operating condition. If sediment enters these BMPs during construction, the sediment shall be removed and the facility shall be returned to conditions specified in the construction documents.

2.1.12 Element 12: Manage the Project

The project will be managed based on the following principles:

- Projects will be phased to the maximum extent practicable and seasonal work limitations will be taken into account.
- Inspection and monitoring:
    - Inspection, maintenance and repair of all BMPs will occur as needed to ensure performance of their intended function.
    - Site inspections and monitoring will be conducted in accordance with Special Condition S4 of the CSWGP. Sampling locations are indicated on the Site Map. Sampling station(s) are located in accordance with applicable requirements of the CSWGP.
- Maintain an updated SWPPP.
    - The SWPPP will be updated, maintained, and implemented in accordance with Special Conditions S3, S4, and S9 of the CSWGP.

As site work progresses the SWPPP will be modified routinely to reflect changing site conditions. The SWPPP will be reviewed monthly to ensure the content is current.

Table 5 – Management

☒	Design the project to fit the existing topography, soils, and drainage patterns
☒	Emphasize erosion control rather than sediment control
☒	Minimize the extent and duration of the area exposed
☒	Keep runoff velocities low
☒	Retain sediment on-site

☒	Thoroughly monitor site and maintain all ESC measures
☐	Schedule major earthwork during the dry season
☐	Other (please describe)

2.1.13 Element 13: Protect Low Impact Development (LID) BMPs

There are no existing or proposed LID facilities associated with the project site. Buffer zones will be established during construction to protect the on-site wetlands.

3 Pollution Prevention Team

Table 7 – Team Information

Title	Name(s)	Phone Number
Certified Erosion and Sediment Control Lead (CESCL)	TBD	TBD
Resident Engineer	TBD	TBD
Emergency Ecology Contact	TBD	TBD
Emergency Permittee/ Owner Contact	TBD	TBD
Non-Emergency Owner Contact	TBD	TBTD
Monitoring Personnel	TBD	TBD
Ecology Regional Office	Central Regional Office	(509)-575-2490

4 Monitoring and Sampling Requirements

Monitoring includes visual inspection, sampling for water quality parameters of concern, and documentation of the inspection and sampling findings in a site log book. A site log book will be maintained for all on-site construction activities and will include:

- A record of the implementation of the SWPPP and other permit requirements
- Site inspections
- Stormwater sampling data

File a blank form under Appendix D.

The site log book must be maintained on-site within reasonable access to the site and be made available upon request to Ecology or the local jurisdiction.

Numeric effluent limits may be required for certain discharges to 303(d) listed waterbodies. See CSWGP Special Condition S8 and Section 5 of this template.

4.1 Site Inspection

Site inspections will be conducted at least once every calendar week and within 24 hours following any discharge from the site. For sites that are temporarily stabilized and inactive, the required frequency is reduced to once per calendar month.

The discharge point(s) are indicated on the Site Map (see Appendix A) and in accordance with the applicable requirements of the CSWGP.

4.2 Stormwater Quality Sampling

4.2.1 Turbidity Sampling

Requirements include calibrated turbidity meter or transparency tube to sample site discharges for compliance with the CSWGP. Sampling will be conducted at all discharge points at least once per calendar week.

Method for sampling turbidity:

Table 8 – Turbidity Sampling Method

☒	Turbidity Meter/Turbidimeter (required for disturbances 5 acres or greater in size)
☐	Transparency Tube (option for disturbances less than 1 acre and up to 5 acres in size)

The benchmark for turbidity value is 25 nephelometric turbidity units (NTU) and a transparency less than 33 centimeters.

If the discharge's turbidity is 26 to 249 NTU **or** the transparency is less than 33 cm but equal to or greater than 6 cm, the following steps will be conducted:

1. Review the SWPPP for compliance with Special Condition S9. Make appropriate revisions within 7 days of the date the discharge exceeded the benchmark.

2. Immediately begin the process to fully implement and maintain appropriate source control and/or treatment BMPs as soon as possible. Address the problems within 10 days of the date the discharge exceeded the benchmark. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when the Permittee requests an extension within the initial 10-day response period.
3. Document BMP implementation and maintenance in the site log book.

If the turbidity exceeds 250 NTU **or** the transparency is 6 cm or less at any time, the following steps will be conducted:

1. Telephone or submit an electronic report to the applicable Ecology Region's Environmental Report Tracking System (ERTS) within 24 hours.
    - **Central Region** (Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, Yakima): (509) 575-2490 or http://www.ecy.wa.gov/programs/spills/forms/nerts_online/CRO_nerts_online.html
    - **Eastern Region** (Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman): (509) 329-3400 or http://www.ecy.wa.gov/programs/spills/forms/nerts_online/ERO_nerts_online.html
    - **Northwest Region** (King, Kitsap, Island, San Juan, Skagit, Snohomish, Whatcom): (425) 649-7000 or http://www.ecy.wa.gov/programs/spills/forms/nerts_online/NWRO_nerts_online.html
    - **Southwest Region** (Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Lewis, Mason, Pacific, Pierce, Skamania, Thurston, Wahkiakum,): (360) 407-6300 or http://www.ecy.wa.gov/programs/spills/forms/nerts_online/SWRO_nerts_online.html
2. Immediately begin the process to fully implement and maintain appropriate source control and/or treatment BMPs as soon as possible. Address the problems within 10 days of the date the discharge exceeded the benchmark. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when the Permittee requests an extension within the initial 10-day response period
3. Document BMP implementation and maintenance in the site log book.
4. Continue to sample discharges daily until one of the following is true:
    - Turbidity is 25 NTU (or lower).
    - Transparency is 33 cm (or greater).
    - Compliance with the water quality limit for turbidity is achieved.
        - 1 - 5 NTU over background turbidity, if background is less than 50 NTU
        - 1% - 10% over background turbidity, if background is 50 NTU or greater
    - The discharge stops or is eliminated.

4.2.2 pH Sampling

pH monitoring is required for “Significant concrete work” (i.e., greater than 1000 cubic yards poured concrete over the life of the project). The use of recycled concrete or engineered soils (soil amendments including but not limited to Portland cement-treated base [CTB], cement kiln dust [CKD] or fly ash) also requires pH monitoring.

For significant concrete work, pH sampling will start the first day concrete is poured and continue until it is cured, typically three (3) weeks after the last pour.

For engineered soils and recycled concrete, pH sampling begins when engineered soils or recycled concrete are first exposed to precipitation and continues until the area is fully stabilized.

If the measured pH is 8.5 or greater, the following measures will be taken:

1. Prevent high pH water from entering storm sewer systems or surface water.
2. Adjust or neutralize the high pH water to the range of 6.5 to 8.5 su using appropriate technology such as carbon dioxide (CO_2) sparging (liquid or dry ice).
3. Written approval will be obtained from Ecology prior to the use of chemical treatment other than CO_2 sparging or dry ice.

Method for sampling pH:None required

Table 9 – pH Sampling Method

☐	pH meter
☐	pH test kit
☐	Wide range pH indicator paper

5 Discharges to 303(d) or Total Maximum Daily Load (TMDL) Waterbodies

5.1 303(d) Listed Waterbodies

Is the receiving water 303(d) (Category 5) listed for turbidity, fine sediment, phosphorus, or pH?

☐ Yes ☒ No

List the impairment(s):

NA

5.2 TMDL Waterbodies

Waste Load Allocation for CWSGP discharges:

NA

List and describe BMPs:

NA

Discharges to TMDL receiving waterbodies will meet in-stream water quality criteria at the point of discharge.

The Construction Stormwater General Permit Proposed New Discharge to an Impaired Water Body form is included in Appendix F.

6 Reporting and Record Keeping

6.1 Record Keeping

6.1.1 Site Log Book

A site log book will be maintained for all on-site construction activities and will include:

- A record of the implementation of the SWPPP and other permit requirements
- Site inspections
- Sample logs

6.1.2 Records Retention

Records will be retained during the life of the project and for a minimum of three (3) years following the termination of permit coverage in accordance with Special Condition S5.C of the CSWGP.

Permit documentation to be retained on-site:

- CSWGP
- Permit Coverage Letter
- SWPPP
- Site Log Book

Permit documentation will be provided within 14 days of receipt of a written request from Ecology. A copy of the SWPPP or access to the SWPPP will be provided to the public when requested in writing in accordance with Special Condition S5.G.2.b of the CSWGP.

6.1.3 Updating the SWPPP

The SWPPP will be modified if:

- Found ineffective in eliminating or significantly minimizing pollutants in stormwater discharges from the site.
- There is a change in design, construction, operation, or maintenance at the construction site that has, or could have, a significant effect on the discharge of pollutants to waters of the State.

The SWPPP will be modified within seven (7) days if inspection(s) or investigation(s) determine additional or modified BMPs are necessary for compliance. An updated timeline for BMP implementation will be prepared.

6.2 Reporting

6.2.1 Discharge Monitoring Reports

Cumulative soil disturbance is one (1) acre or larger; therefore, Discharge Monitoring Reports (DMRs) will be submitted to Ecology monthly. If there was no discharge during a given monitoring period the DMR will be submitted as required, reporting “No Discharge”. The DMR due date is fifteen (15) days following the end of each calendar month.

DMRs will be reported online through Ecology's WQWebDMR System.

6.2.2 Notification of Noncompliance

If any of the terms and conditions of the permit is not met, and the resulting noncompliance may cause a threat to human health or the environment, the following actions will be taken:

1. Ecology will be notified within 24-hours of the failure to comply by calling the applicable Regional office ERTS phone number (Regional office numbers listed below).
2. Immediate action will be taken to prevent the discharge/pollution or otherwise stop or correct the noncompliance. If applicable, sampling and analysis of any noncompliance will be repeated immediately and the results submitted to Ecology within five (5) days of becoming aware of the violation.
3. A detailed written report describing the noncompliance will be submitted to Ecology within five (5) days, unless requested earlier by Ecology.

Anytime turbidity sampling indicates turbidity is 250 NTUs or greater, or water transparency is 6 cm or less, the Ecology Regional office will be notified by phone within 24 hours of analysis as required by Special Condition S5.A of the CSWGP.

- **Central Region** at (509) 575-2490 for Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, or Yakima County
- **Eastern Region** at (509) 329-3400 for Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, or Whitman County
- **Northwest Region** at (425) 649-7000 for Island, King, Kitsap, San Juan, Skagit, Snohomish, or Whatcom County
- **Southwest Region** at (360) 407-6300 for Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Lewis, Mason, Pacific, Pierce, Skamania, Thurston, or Wahkiakum

Include the following information:

1. Your name and / Phone number
2. Permit number
3. City / County of project
4. Sample results
5. Date / Time of call
6. Date / Time of sample
7. Project name

In accordance with Special Condition S4.D.5.b of the CSWGP, the Ecology Regional office will be notified if chemical treatment other than CO_2 sparging is planned for adjustment of high pH water.

Please see Page G-3-35 for shared SWPPP Appendices

KITTITAS COUNTY COMMUNITY DEVELOPMENT SERVICES
411 N. Ruby St., Suite 2, Ellensburg, WA 98926
CDS@CO.KITTITAS.WA.US
Office (509) 962-7506
Fax (509) 962-7682
"Building Partnerships – Building Communities"

SHORELINE PERMITTING

(For projects located within 200 feet of a body of water and/or associated floodway and wetlands under the jurisdiction of the Shoreline Master Program)

*A **preapplication conference is REQUIRED** per KCC 15A.03.020 for this permit. The more information the County has early in the development process, the easier it is to identify and work through issues and conduct an efficient review. To schedule a preapplication conference, complete and submit a Preapplication Conference Scheduling Form to CDS. Notes or summaries from preapplication conference should be included with this application.*

REQUIRED INFORMATION /ATTACHMENTS

- ❑ A scaled site plan is required showing location of all structures, driveways, well, septic, fences, etc. and proposed uses and distances from property lines, river, and Horizontal distance from OHWM. To show the Horizontal distance a profile view from the OHWM to the edge of structure/activity shall also be shown.
- ❑ Include JARPA or HPA forms *if required* for your project by a state or federal agency.

Please check the box next to the most restrictive type of shoreline permit you are requesting:

- ☐ Shoreline Substantial Development Permit (**Fee:** CDS: $2,165 + SEPA, if not exempt: $670 (CDS: $600, PW: $70))
- ☑ Shoreline Conditional Use Permit (**Fee:** CDS: $4,020 + SEPA, if not exempt: $670 (CDS: $600, PW: $70))
- ☐ Shoreline Variance (**Fee:** $4,020 + SEPA, if not exempt: $670 (CDS: $600, PW: $70))

APPLICATION FEES:

(see above)	Kittitas County Community Development Services (KCCDS)
(see above)	Kittitas County Department of Public Works
(see above)	**Total fees due for this application** (One check made payable to KCCDS)

FOR STAFF USE ONLY

Application Received By (CDS Staff Signature): _____ DATE: _____ RECEIPT # _____

DATE STAMP IN BOX

General Application Information

1. **Name, mailing address and day phone of land owner(s) of record:**
   Landowner(s) signature(s) required on application form.

   Name: Douglas Dicken

   Mailing Address: P.O. Box 1201

   City/State/ZIP: Ellensburg, WA 98926

   Day Time Phone: 509-859-2740

   Email Address: _____

2. **Name, mailing address and day phone of authorized agent, if different from landowner of record:**
   If an authorized agent is indicated, then the authorized agent's signature is required for application submittal.

   Agent Name: Jason Evans

   Mailing Address: 500 Yale Avenue North

   City/State/ZIP: Seattle, WA 98109

   Day Time Phone: 206-303-0198

   Email Address: jason.evans@tuusso.com

3. **Name, mailing address and day phone of other contact person**
   If different than land owner or authorized agent.

   Name: Timothy McMahan, Stoel Rives LLP

   Mailing Address: 760 SW Ninth Avenue, Suite 3000

   City/State/ZIP: Portland, OR 97205

   Day Time Phone: 503-294-9517

   Email Address: tim.mcmahan@stoel.com

4. **Street address of property:**

   Address: 3401 S. Thorpe Highway

   City/State/ZIP: Ellensburg, WA 98926

5. **Legal description of property: (attach additional sheets as necessary)**
   ~~See additional attachment.~~

6. **Tax parcel number(s):** 712633 and 752633

7. **Property size:** 54.29 **(acres)**

8. **Provide section, township, and range of project location:**
   ¼ Section _____ Section 30 **Township** 18 **N. Range** 18 **E., W.M.**

9. **Latitude and longitude coordinates of project location (e.g. 47.03922 N lat. / -122.89142 W long.):**
47.026053 N lat. / -120.626976 W long. **[use decimal degrees – NAD 83]**

10. **Type of Ownership: (check all that apply)**

❘■ Private ❑ Federal ❑ State ❑ Local ❑ Tribal

11. **Land Use Information:**

Zoning: Commercial Agriculture Comp Plan Land Use Designation: Commercial Agriculture

12. **Shoreline Designation: (check all that apply)**

❑ Urban Conservancy ❑ Shoreline Residential ❘■ Rural Conservancy

❑ Natural ❑ Aquatic

13. **Type of Shoreline Permit(s) requested (check all that apply):**

a. **Shoreline Substantial Development Permit will always be required unless proposal meets an exemption per WAC 173-27-040.**

❘■ Shoreline Substantial Development Permit; or
❑ Shoreline Exemption Permit (see Shoreline Exemption Permit application)

b. **Only check one or both of the boxes below if they are applicable.**

❘■ Shoreline Conditional Use Permit
**must answer question 32. a.-h. below.*
❑ Shoreline Variance
**must answer questions 33. a.-g. and 34. a.-b. (if applicable) below.*

14. **Fair Market Value of the project, including materials, labor, machine rentals, etc.** $8-10 million

15. **Anticipated start and end dates of project construction: Start** April 2018 **End** November 2018

Project Description

16. **Briefly summarize the purpose of the project:**
~~See additional attached sheet.~~

17. **What is the primary use of the project (e.g. Residential, Commercial, Public, Recreation)?**
Commercial.

18. **What is the specific use of the project (e.g. single family home, subdivision, boat launch, restoration project)?**
Solar generation facility.

Vegetation

19. **Will the project result in clearing of tree or shrub canopy? (check one)**

❑ Yes ❘■ No

If 'Yes', how much clearing will occur? N/A **(square feet and acres)**

20. Will the project result in re-vegetation of tree or shrub canopy? (check one)

❑ Yes ■ No

If 'Yes', how much re-vegetation will occur? N/A **(square feet and acres)**

Wetlands

21. Will the project result in wetland impacts? (check one)

■ Yes ❑ No

If 'Yes', how much wetland will be permanently impacted? 0.01 acre **(square feet and acres)**

22. Will the project result in wetland restoration? (check one)

❑ Yes ■ No

If 'Yes', how much wetland will be restored? N/A **(square feet and acres)**

Impervious Surfaces

23. Will the project result in creation of over 500 square feet of impervious surfaces? (check one)

■ Yes ❑ No

If 'Yes', how much impervious surface will be created? 1.40 acres **(square feet and acres)**

24. Will the project result in removal of impervious surfaces? (check one)

❑ Yes ■ No

If 'Yes', how much impervious surface will be removed? N/A **(square feet and acres)**

Shoreline Stabilization

25. Will the project result in creation of structural shoreline stabilization structures (revetment/bulkhead/riprap)?

(Check one) ❑ Yes ■ No

If 'Yes', what is the net linear feet of stabilization structures that will be created? N/A

26. Will the project result in removal of structural shoreline stabilization structures (revetment/bulkhead/riprap)?

(Check one) ❑ Yes ■ No

If 'Yes', what is the net linear feet of stabilization structures that will be removed? N/A

Levees/Dikes

27. Will the project result in creation, removal, or relocation (setting back) of levees/dikes?

(check one) ❑ Yes ■ No

If 'Yes', what is the net linear feet of levees/dikes that will be created? N/A

If 'Yes', what is the net linear feet of levees/dikes that will be permanently removed? N/A

If 'Yes', what is the linear feet of levees/dikes that will be reconstructed at a location further from the OHWM? N/A

Floodplain Development

28. Will the project result in development within the floodplain? (check one)

❑ Yes ■ No

If 'Yes', what is the net square feet of structures to be constructed in the floodplain? N/A
Note: A floodplain development is required per KCC 14.08; please contact Kittitas County Public Works

29. Will the project result in removal of existing structures within the floodplain? (check one)

❑ Yes ■ No

If 'Yes', what is the net square footage of structures to be removed from the floodplain? N/A

Overwater Structures

30. Will the project result in construction of an overwater dock, pier, or float? (check one)

❑ Yes ■ No

If 'Yes', how many overwater structures will be constructed? N/A

What is the net square footage of water-shading surfaces that will be created? N/A

31. Will the project result in removal of an overwater dock, pier, or float? (check one)

❑ Yes ■ No

If 'Yes', how many overwater structures will be removed? N/A

What is the net square footage of water-shading surfaces that will be removed? N/A

Shoreline Conditional Use Permit
(answer ONLY if requesting this permit)

Must demonstrate your proposal meets all of the following per Kittitas County Shoreline Master Program (SMP):

32. Answer the following questions on a separate sheet and attach to this application packet.

a. **That the proposed use is consistent with the policies of RCW 90.58.020 and the Master Program;**
b. **That the proposed use will not interfere with the normal public use of public shorelines;**
c. **That the proposed use of the site and design of the project is compatible with other authorized uses within the area and with uses planned for the area under the comprehensive plan and SMP;**
d. **That the proposed use will cause no significant adverse effects to the shoreline environment in which it is to be located;**
e. **That the public interest suffers no substantial detrimental effect;**
f. **That if conditional use permits were granted for other developments in the area where similar circumstances exist, the cumulative impact of such uses would remain consistent with the policies of RCW 90.58.020 and not produce substantial adverse effects to the shoreline environment.**
g. **That the proposed use has been appropriately conditioned to prevent undesirable effects of the proposed use and to assure consistency of the project with the Act and the local Master Program.**
h. **When converting from one nonconforming use to a different nonconforming use, the applicant must demonstrate that no reasonable alternative conforming use is practical and that the proposed use will be at least as consistent with the policies and provisions of the Act and the Master Program and as compatible with the uses in the area as the pre-existing use.**

Shoreline Variance

(answer ONLY if requesting this permit)

Must demonstrate with your proposal that extraordinary circumstances exist and that the public interest shall suffer no substantial detrimental effect:

33. Answer the following questions on a separate sheet and attach to this application packet. This section is for variances requested landward of the OHWM and/or landward of any wetland.

- **a. That the strict application of the bulk, dimensional or performance standards set forth in the applicable Master Program precludes, or significantly interferes with, reasonable use of the property;**
- **b. That the hardship is specifically related to the property, and is the result of unique conditions such as irregular lot shape, size, or natural features and the application of the Master Program, and not, for example, form deed restrictions or the applicant's own actions;**
- **c. That the design of the project is compatible with other authorized uses within the area and with uses planned for the area under the comprehensive plan and SMP and will not cause adverse impacts to the shoreline environment;**
- **d. That the variance will not constitute a grant of special privilege not enjoyed by the other properties in the area;**
- **e. That the variance requested is the minimum necessary to afford relief;**
- **f. That the public interest will suffer no substantial detrimental effect; and**
- **g. That the cumulative impact of additional request for variances in the area where similar circumstances exist would not produce substantial adverse effects to the shoreline environment.**

34. Answer the following questions on a separate sheet and attach to this application packet. This section is, required to be answered in addition to question 33 above, for variances requested for uses and/or development that will be located waterward of the OHWM.

- **a. That the strict application of the bulk, dimensional or performance standards set forth in the applicable Master Program precludes all reasonable use of the property; and**
- **b. That the public rights of navigation and use of the shorelines will not be adversely affected.**

Summary/Conclusion

35. Will the proposed use be consistent with the policies of RCW 90.58.020 and the Kittitas County Shoreline Master Program? (attach additional sheets if necessary)

❑ Yes ❑ No

Please explain:

~~See additional attached sheets.~~

36. Provide any additional information needed to verify the project's impacts to shoreline ecological functions: (attach additional sheets and relevant reports as necessary)

~~See attached JARPA for the Typha Solar Project.~~

Authorization

37. Application is hereby made for permit(s) to authorize the activities described herein. I certify that I am familiar with the information contained in this application, and that to the best of my knowledge and belief such information is true, complete, and accurate. I further certify that I possess the authority to undertake the proposed activities. I hereby grant to the agencies to which this application is made, the right to enter the above-described location to inspect the proposed and or completed work.

All correspondence and notices will be transmitted to the Land Owner of Record and copies sent to the authorized agent or contact person, as applicable.

Signature of Authorized Agent: **Date:**
(REQUIRED if indicated on application)

X_____ _____

Signature of Land Owner of Record **Date:**
(Required for application submittal):

X_____ _____

TUUSSO Energy Typha Solar Project
Kittitas County Shoreline Conditional Use Permit

Attachment - Answer to Question 5

5. Legal description of property:

A TRACT OF LAND SITUATED IN THE EAST HALF OF THE NORTHEAST QUARTER OF SECTION 30, TOWNSHIP 18 NORTH, RANGE 18 EAST, W.M., KITTITAS COUNTY, STATE OF WASHINGTON, WHICH IS BOUNDED BY A LINE DESCRIBED AS FOLLOWS:
COMMENCING AT THE NORTHWEST CORNER OF SAID NORTHEAST QUARTER; THENCE SOUTH 89°16'48" EAST ALONG THE NORTH BOUNDARY LINE OF SAID NORTHEAST QUARTER, 1314.14 FEET TO THE TRUE POINT OF BEGINNING OF SAID LINE;
THENCE CONTINUING SOUTH 89°16'48" EAST ALONG SAID NORTH BOUNDARY LINE, 1134.53 FEET;
THENCE SOUTH 05°04'50" EAST, 98.92 FEET;
THENCE SOUTH 14°06'00" EAST, 80.70 FEET;
THENCE SOUTH 08°58'08" EAST, 174.50 FEET;
THENCE SOUTH 19°32'43" EAST, 160.93 FEET;
THENCE SOUTH 15°40'01" EAST, 143.68 FEET;
THENCE SOUTH 20°06'14" EAST, 124.44 FEET TO A POINT ON THE EAST BOUNDARY LINE OF SAID NORTHEAST QUARTER;
THENCE SOUTH 00°52'11" EAST, ALONG THE EAST BOUNDARY LINE OF SAID NORTHEAST QUARTER, 1262.44 FEET;
THENCE SOUTH 63°35'36" WEST, 47.38 FEET;
THENCE SOUTH 69°41'30" WEST, 117.32 FEET;
THENCE SOUTH 69°54'58" WEST, 101.62 FEET;
THENCE SOUTH 83°42'43" WEST, 36.85 FEET;
THENCE NORTH 15°17'56" WEST, 24.03 FEET;
THENCE SOUTH 74°30'43" WEST, 56.36 FEET;
THENCE NORTH 74°37'20" WEST, 75.56 FEET;
THENCE NORTH 69°50'05" WEST, 53.25 FEET;
THENCE NORTH 60°06'51" WEST, 195.24 FEET;
THENCE NORTH 60°42'51" WEST, 100.56 FEET;
THENCE NORTH 55°37'02" WEST, 226.49 FEET;
THENCE NORTH 40°07'35" WEST, 65.17 FEET;
THENCE NORTH 36°07'05" WEST, 135.85 FEET;
THENCE NORTH 22°37'59" WEST, 58.56 FEET;
THENCE NORTH 51°24'40" WEST, 47.40 FEET;
THENCE NORTH 36°10'00" WEST, 75.75 FEET;
THENCE NORTH 34°20'25" WEST, 72.58 FEET;
THENCE NORTH 26°34'08" WEST, 60.13 FEET;
THENCE NORTH 04°10'07" WEST, 55.08 FEET;
THENCE NORTH 81°36'17" EAST, 30.19 FEET;
THENCE NORTH 04°17'30" EAST, 33.02 FEET;
THENCE NORTH 38°49'40" WEST, 25.43 FEET;
THENCE SOUTH 66°22'39" WEST, 53.58 FEET;
THENCE NORTH 30°46'47" WEST, 93.84 FEET;
THENCE NORTH 21°54'36" WEST, 39.86 FEET;
THENCE NORTH 14°45'26" EAST, 20.96 FEET;
THENCE SOUTH 89°23'14" WEST, 31.77 FEET TO A POINT ON THE WEST BOUNDARY LINE OF SAID EAST HALF OF SAID NORTHEAST QUARTER;
THENCE NORTH 00°36'46" WEST ALONG SAID WEST BOUNDARY LINE OF SAID EAST HALF OF SAID NORTHEAST QUARTER, TO A POINT ON THE NORTH LINE OF SAID NORTHEAST QUARTER, 1166.28 FEET TO THE TRUE POINT OF BEGINNING AND TERMINUS OF SAID LINE.
CONTAINS 54.29 ACRES.

TUUSSO Energy Typha Solar Project
Kittitas County Shoreline Conditional Use Permit

Attachment - Answers to Questions 16, 32, and 35

16. Briefly summarize the purpose of the project:

TUUSSO Energy, LLC (TUUSSO), is proposing to construct a new Typha Solar Project photovoltaic (PV) facility on approximately 54.29 acres of private agricultural land, including the construction of a switchyard with a short (0.45-mile-long) generation tie line into an existing Puget Sound Energy (PSE) distribution transmission line, located northwest of Ellensburg, in unincorporated Kittitas County, Washington. The Typha Solar Project is intended to provide up to 5 MW of solar energy to PSE for use within their service area.

32. Shoreline Conditional Use Permit Questions

Must demonstrate your proposal meets all of the following per Kittitas County Shoreline Master Program (SMP):

a. That the proposed use is consistent with the policies of RCW 90.58.020 and the Master Program.

TUUSSO proposes that the Energy Facility Site Evaluation Council (EFSEC) authorize the project pursuant to Revised Code of Washington (RCW) 80.50. KCC 17B.07.0030(I) provides that "any project with a certification from the governor pursuant to **RCW Chapter 80.50**" is exempt from shoreline permit requirements. The county's exemption is consistent with RCW 90.58.140(9).The Typha Solar Project site of the Columbia Solar Projects (Project) would be consistent with all of the policies specified in RCW 90.58.020, but is subject to EFSEC jurisdiction and authorization. Compliance with these policies is outlined below:

1. *Recognize and protect the statewide interest over local interest.*

   The proposed Project would meet the state interest of protecting the shoreline environment by minimizing adverse effects through project design, while also providing new renewable energy production to help PSE meet the clean energy requirements under Washington Administrative Code (WAC) 480-109.

2. *Preserve the natural character of the shoreline.*

   The proposed Project would overlap areas within the Shoreline of the State jurisdiction in two locations. The nearest project impact occurring within 200 feet of the Yakima River's ordinary high water mark (OHWM) would overlap this shoreline area by only 0.19 acre and would consist of fence installations located at least 144 feet from the OHWM of the Yakima River, with solar arrays proposed at least 154 feet from the OHWM of the Yakima River. The second area of overlap would be located at an existing access road crossing of wetland TW03, an associated wetland of the Yakima River that would be considered within Shoreline of the State jurisdiction, where a culvert replacement would result in approximately 0.01 acre of wetland fill. The vegetation adjacent to the Yakima River would not be altered, and the 0.19-acre area of the project within 200 feet of the Yakima River shoreline would be planted with low-growing native plant species. Therefore, the proposed Project would have minimal adverse effects on the shoreline of the Yakima River and would preserve the natural character of the shoreline.

3. *Result in long-term over short-term benefit.*

   The Kittitas County Shoreline Master Program (SMP) meets this requirement from RCW 90.58.020, and the proposed Project would meet all regulations and policies described in the Kittitas County SMP for utility generation facilities. The proposed Project would not adversely affect the long-term goals of the Kittitas County SMP or long-term land use.

4. *Protect the resources and ecology of the shoreline.*

   The proposed Project would overlap areas within the Shoreline of the State jurisdiction in two areas. The nearest project impact occurring within 200 feet of the Yakima River shoreline would overlap this shoreline area by only 0.19 acre and would consist of fence installations located at least 144 feet from the OHWM of the Yakima River and solar arrays located at least 154 feet from the OHWM of the Yakima River. The second area of overlap would be located at an existing access road crossing of wetland TW03, an associated wetland of the Yakima River that would be considered within Shoreline of the State jurisdiction, where a culvert replacement would result in approximately 0.01 acre of wetland fill. The Kittitas County SMP designates an area that overlaps approximately 6.61 acres of the proposed project area as part of the Shoreline of the State based on National Wetland Inventory (NWI) mapping; however, SWCA Environmental Consultants (SWCA) performed a professional wetland delineation throughout the entire site and found that wetlands associated with the Yakima River shoreline only occur in areas delineated as wetlands TW01, TW02, and TW03 (refer to the attached figure for exact locations). Both wetlands TW01 and TW02 would be avoided through project design, and impacts to wetland TW03 would be limited to only 0.01 acre for the proposed culvert replacement for site access. In addition, the proposed Project would plant native plant species within the project area and reduce the prevalence of non-native and invasive species. Therefore, the limited adverse effects would be minimal and would not substantially affect the ecology and resources of the Yakima River shoreline.

5. *Increase public access to publicly owned areas of the shorelines.*

   The proposed Project is located on private land that currently does not allow public access to the Yakima River shoreline. Therefore, public access to the shoreline of the Yakima River would not be affected by the proposed Project.

6. *Increase recreational opportunities for the public in the shoreline.*

   The proposed Project would not have any adverse or beneficial effects on recreational opportunities for the public along the shoreline of the Yakima River because the site currently does not allow public access to the shoreline of the Yakima River. Therefore, the proposed Project would not have any effects on the recreational opportunities for the public.

7. *Provide for any other element as defined in RCW 90.58.100 deemed appropriate or necessary.*

   The Kittitas County SMP has been approved by the Washington Department of Ecology (Ecology) and meets all of the elements defined in RCW 90.58.100. The Project would comply with the Kittitas County SMP, therefore meeting all of the elements defined in RCW 90.58.100.

The Project would be consistent with all of the policies specified in the Kittitas County SMP for utility generation facilities, which is a conditionally allowed land use in areas designated in the Kittitas County SMP as shorelines of the state, provided that the Project meets the following policies and applicable regulations in Section 6.19 of the Kittitas County SMP:

1. *New utility facilities should be located so as not to require extensive shoreline protection works.*

   The proposed Project would be located at least 144 feet from the OHWM of the Yakima River, the nearest shoreline. Less than 3% impervious surfaces would be added to the property, including less than 10 square feet (based on approximately 16 solar array footings of 6- by 8-inch cross-section) for solar array footings and less than 700 square feet for the access road fill within wetland TW03 in areas within Shoreline of the State jurisdiction. These areas and the overall project would not result in a substantial increase in runoff. No shoreline protection work is proposed nor would be necessary to stabilize the shoreline for project purposes.

2. *Utility facilities and corridors should be located so as to protect scenic views. Whenever possible, such facilities may be placed underground, or alongside or under bridges.*

   The location of the proposed Project is on private land located west of a segment of the Yakima River that is not visible from properties immediately to the west of the site. The solar arrays on the proposed site

would not exceed 8 feet in height and would not block any views of the Yakima River from adjoining properties. In addition, the associated generation tie line would be predominately located along existing power lines and would not substantially alter the current views nearby.

3. *Utility facilities and rights-of-way should be designed to preserve the natural landscape and to minimize conflicts with present and planned land uses.*

   Solar generation facilities are an allowed conditional use on lands zoned Commercial Agriculture. The Project would not negatively impact natural landscapes, and would not in any way impair the ongoing agricultural operations of adjacent and surrounding farms, nor would the Project cause or force any change in agricultural land use. The proposed Project would limit grading activities as much as possible, utilizing existing site contours with limited ground disturbance. The Project would operate under a maximum 41-year lease with the current landowner, after which the site may return to its current agricultural land use. In addition, the generation tie line would be located predominantly along existing distribution power lines and would not affect any existing land uses along its route.

4. *Section 6.19.B.12: Utility production and processing facilities shall be located outside shoreline jurisdiction unless no other feasible option exists. Where major facilities must be placed in a shoreline area, the location and design shall be chosen so as not to destroy or obstruct scenic views, and shall meet no-net-loss standards.*

   As noted above, as an EFSEC jurisdictional facility, the proposed Project is exempt from the Shoreline Management Act. While the Project will meet all provisions in the Kittitas County SMP concerning any potential impacts on the shoreline ecological environment, EFSEC will make determinations regarding the suitability of the use of this area for a solar PV generation facility. The proposed Project would require access to the property for construction and operation of the facility, which would require the replacement of an existing, non-functioning culvert at an existing access road crossing located in wetland TW03, an associated wetland of the Yakima River shoreline environment that falls under Shoreline of the State jurisdiction. The small area, 0.19 acre, of overlap between the Project site and the shoreline environment within 200 feet of the OHWM of the Yakima River would not destroy or obstruct scenic views of the Yakima River shoreline because of the private location of the property and topography of the surrounding landscape. In addition, the Project would meet the no-net-loss standards because the small areas of impact are either below the threshold for mitigation, in the case of the 0.01 acre of wetland fill, or would have a negligible impact with an improvement in vegetation quality, in case of the 0.19 acre at least 144 feet from the OHWM of the Yakima River. Therefore, the proposed Project meets the requirement for this project.

b. That the proposed use will not interfere with the normal public use of public shorelines.

The Project property does not currently provide public access to the Yakima River shoreline. In addition, no project activities would take place within 144 feet of the Yakima River shoreline. Therefore, regular public use of the Yakima River itself would not be affected by the proposed Project.

c. That the proposed use of the site and design of the project is compatible with other authorized uses within the area and with uses planned for the area under the comprehensive plan and SMP.

The proposed Project would be an allowed use under the Kittitas County Comprehensive Plan and would not affect the surrounding land uses. Surrounding land uses include commercial agriculture to the north and west, and commercial agriculture and rural residential zoning to the south, currently utilized as the Ellensburg Golf & Country Club. These surrounding land uses would not be adversely affected by the construction or operation of the Project.

d. That the proposed use will cause no significant adverse effects to the shoreline environment in which it is to be located.

The proposed Project would be located at least 144 feet from the Yakima River shoreline and would not alter the current environment, except for approximately 0.19 acre where the project area overlaps the shoreline environment within 200 feet of the OHWM of the Yakima River and 0.01 acre of fill in associated wetland TW03.

Currently, these areas of overlap are dominated by low-growing, non-native, and weedy herbaceous species and have previously been in agricultural production and are now actively grazed. The proposed Project activities in these areas would consist of fence installation, placement of solar arrays, replacement of an existing culvert, and reseeding native herbaceous species. These project actions would have minimal impacts to the shoreline environment and would not be likely to cause any long-term adverse effects on the local shoreline environment. The Project would be likely to benefit the shoreline environment within and immediately adjacent to the project area by reducing weedy species and increasing native species dominance. For these reasons, the Project would have no significant adverse effects on the shoreline environment.

e. That the public interest suffers no substantial detrimental effect.

There is currently no public access to the Yakima River through the Typha Solar Project property, and the proposed Project would not alter any of the land uses or public accessibility of the surrounding properties or along the public shoreline of the Yakima River. Therefore, the Project would have no effect on the public interest.

f. That if conditional use permits were granted for other developments in the area where similar circumstances exist, the cumulative impact of such uses would remain consistent with the policies of RCW 90.58.020 and not produce substantial adverse effects to the shoreline environment.

The proposed Project is an allowed use of the subject property and would have minimal adverse effects on the shoreline environment. The shoreline environment overlaps the project area by 0.19 acre at least 144 feet from the OHWM of the Yakima River, which would have very minimal adverse effects on the shoreline environment. The wetlands associated with the shoreline of the state would be entirely avoided through project design, except for approximately 0.01 acre of wetland fill associated with a culvert replacement for site access in wetland TW03; refer to the attached figure for exact location. The proposed Project poses minimal adverse effects on the shoreline environment. If similar projects were implemented on private land in the area with similar effects to shorelines of the state and their associated wetlands, then the cumulative effects of the projects on the shoreline environment would remain consistent with the policies of RCW 90.58.020 and would not produce substantial adverse effects to the shoreline environment.

g. That the proposed use has been appropriately conditioned to prevent undesirable effects of the proposed use and to assure consistency of the project with the Act and the local Master Program.

The proposed Project has been designed to reduce potential adverse effects on the shoreline environment to the extent possible. Overall, the Project would have no substantial adverse effects on the shoreline environment or surrounding land uses and would be consistent with the policies and regulations for conditionally permitted uses, including this project, outlined in the Shoreline Management Act and the Kittitas County SMP. See the answers to the questions above, for further explanation of the potential Project effects.

h. When converting from one nonconforming use to a different nonconforming use, the applicant must demonstrate that no reasonable alternative conforming use is practical and that the proposed use will be at least as consistent with the policies and provisions of the Act and the Master Program and as compatible with the uses in the area as the pre-existing use.

The Project site was previously in active agriculture and is currently being grazed. The current site use conforms to the Shoreline Management Act and the Kittitas SMP. Therefore, this question is not applicable to the site and the proposed Project.

Question 35. Will the proposed use be consistent with the policies of RCW 90.58.020 and the Kittitas County Shoreline Master Program?

Yes.

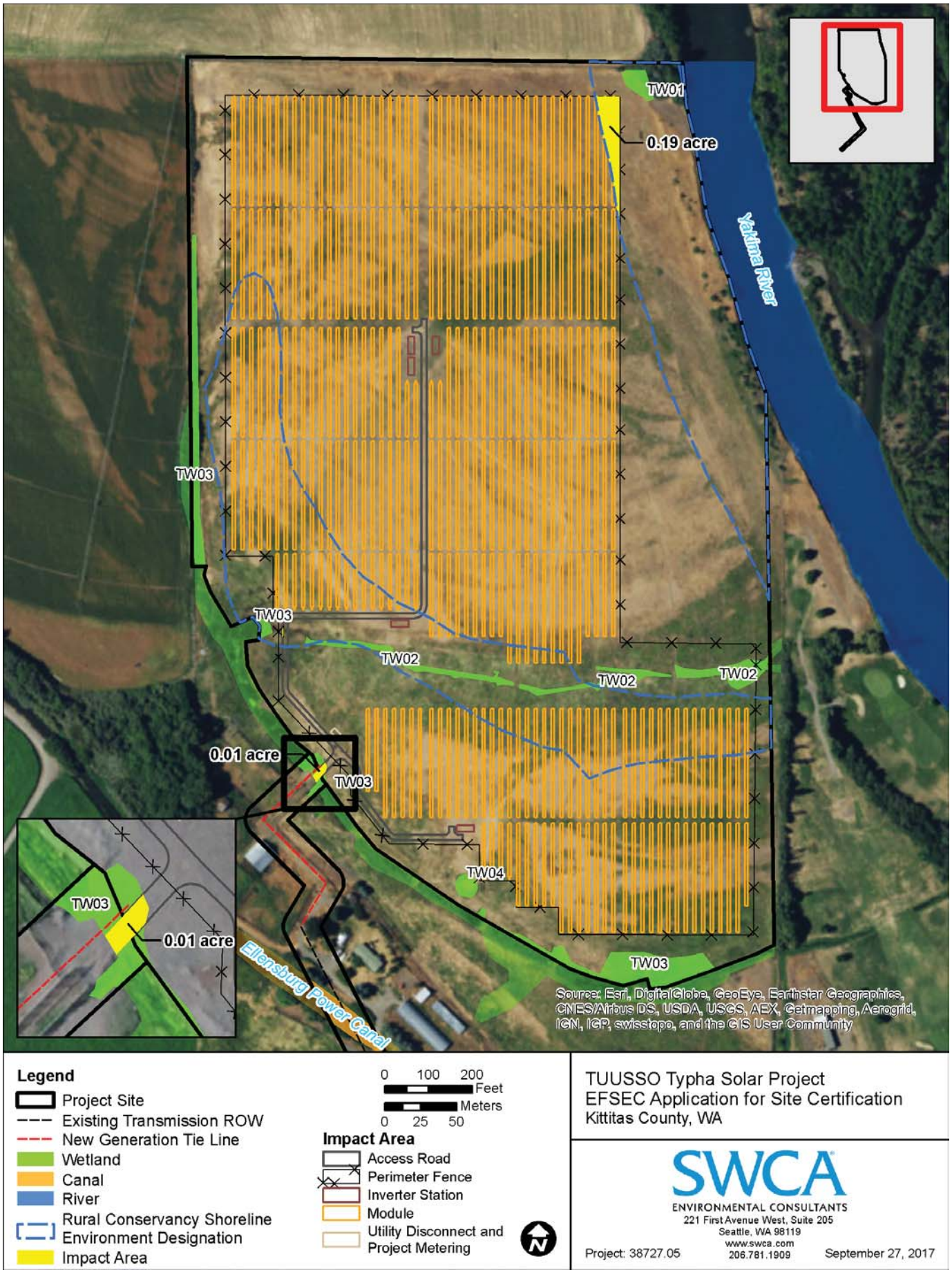
Please explain:

The Project would be consistent with all of the policies specified in RCW 90.58.020 and the Kittitas County SMP. The proposed Project would meet the state interest of protecting the shoreline environment by minimizing adverse effects through avoidance measures in project design, while also providing new renewable energy production to help PSE meet the clean energy requirements under WAC 480-109 (meets RCW 90.58.020[1]). All portions of the site within 200 feet of the OHWM of the Yakima River and within the NWI-mapped emergent wetland that extends into the southern portion of the site have a Shoreline Environment Designation (SED) of Rural Conservancy. This SED area partially overlaps wetlands TW01 and TW02, which would be avoided through project design, as well as areas delineated as uplands that would be within the Project site. The proposed Project would overlap areas within the Shoreline of the State jurisdiction in two areas. The nearest project impact occurring within 200 feet of the Yakima River shoreline would overlap this shoreline area by only 0.19 acre and would consist of fence installations located at least 144 feet from the OHWM of the Yakima River and solar arrays located at least 154 feet from the OHWM of the Yakima River. The second area of overlap would be located at an existing access road crossing of wetland TW03, an associated wetland of the Yakima River that would be considered within Shoreline of the State jurisdiction, where a culvert replacement would result in approximately 0.01 acre of wetland fill. The Kittitas County SMP designates an area that overlaps approximately 6.61 acres of the proposed project area as part of the Shoreline of the State based on NWI mapping; however, SWCA performed a professional wetland delineation throughout the entire site and found that wetlands associated with the Yakima River shoreline only occur in areas delineated as wetlands TW01, TW02, and TW03; refer to the attached figure for exact locations. Both wetlands TW01 and TW02 would be avoided through project design, and impacts to wetland TW03 would be limited to only 0.01 acre for the proposed culvert replacement for site access. In addition, the vegetation adjacent to the Yakima River would not be altered, and all of the areas of the project within 200 feet of the Yakima River shoreline would be planted with low-growing native plant species. Therefore, the proposed Project would have minimal adverse effects on the shoreline of the Yakima River and would preserve the natural character of the shoreline. In addition, any adverse effects associated with the proposed Project would be minimal and would not substantially affect the ecology and resources of the Yakima River shoreline (meets RCW 90.58.020[2–4]).

The proposed Project would be located at least 144 feet from the OHWM of the Yakima River, the nearest shoreline. Less than 3% impervious surfaces would be added to the property, including less than 10 square feet (based on approximately 16 solar array footings of 6- by 8-inch cross-section) for solar array footings and less than 700 square feet for the access road fill within wetland TW03 in areas within Shoreline of the State jurisdiction. These areas and the overall project would not result in a substantial increase in runoff. No shoreline protection work is proposed nor would be necessary to stabilize the shoreline for project purposes (meets Kittitas County SMP 6.19.A.1). The location of the proposed Typha Solar Project is on private land located west of a segment of the Yakima River that is not visible from properties immediately to the west of the site. The solar arrays on the proposed site would not exceed 8 feet in height and would not block any views of the Yakima River from adjoining properties. In addition, the associated generation tie line would be predominately located along existing power lines and would not substantially alter the current views nearby (meets Kittitas County SMP 6.19.A.2).

Solar generation facilities are an allowed conditional use on lands zoned Commercial Agriculture. As described in Section 1.16 of the Application for Site Certification, the Project would be consistent with the Kittitas County Comprehensive Plan. The proposed Project would limit grading activities as much as possible, utilizing existing site contours with limited ground disturbance. The Project would operate under a maximum 41-year lease with the current landowner, after which the site may return to its current agricultural land use. In addition, the generation tie line would be located predominantly along existing power lines and would not affect any existing land uses along its route (meets Kittitas County SMP 6.19.A.3). The proposed Typha Solar Project is located on private land that currently does not allow public access to the Yakima River shoreline. Therefore, public access to the shoreline of the Yakima River and public recreational opportunities would not be affected by the proposed Project (meets RCW 90.58.020[5–6]).

Finally, based on the project design and impacts described above, the proposed Project would not destroy or obstruct scenic views of the Yakima River shoreline because of the private location of the property and topography of the surrounding landscape. In addition, the Project would meet the no-net-loss standards because the small areas of impact are either below the threshold for mitigation, in the case of the 0.01 acre of wetland fill, or would have a negligible impact with an improvement in vegetation quality, in the case of the 0.19 acre at least 144 feet from the OHWM of the Yakima River. Therefore, the proposed Project meets the Kittitas County SMP 6.19.B.12 requirement.



Legend

- Project Site
- Existing Transmission ROW
- New Generation Tie Line
- Wetland
- Canal
- River
- Rural Conservancy Shoreline Environment Designation
- Impact Area

0 100 200 Feet

0 25 50 Meters

Impact Area

- Access Road
- Perimeter Fence
- Inverter Station
- Module
- Utility Disconnect and Project Metering

TUUSSO Typha Solar Project
EFSEC Application for Site Certification
Kittitas County, WA

SWCA
ENVIRONMENTAL CONSULTANTS
221 First Avenue West, Suite 205
Seattle, WA 98119
www.swca.com
206.781.1909

Project: 38727.05 September 27, 2017

WASHINGTON STATE
Joint Aquatic Resources Permit Application (JARPA) Form[1,2] [help]

USE BLACK OR BLUE INK TO ENTER ANSWERS IN THE WHITE SPACES BELOW.

AGENCY USE ONLY

Date received:

Agency reference #: _____

Tax Parcel #(s): _____

_____

_____

Part 1–Project Identification

1. Project Name (A name for your project that you create. Examples: Smith's Dock or Seabrook Lane Development) [help]
Typha Solar Project

Part 2–Applicant

The person and/or organization responsible for the project. [help]

2a. Name (Last, First, Middle)			
Evans, Jason			
2b. Organization (If applicable)			
TUUSSO Energy, LLC			
2c. Mailing Address (Street or PO Box)			
500 Yale Avenue North			
2d. City, State, Zip			
Seattle, WA 98109			
2e. Phone (1)	**2f.** Phone (2)	**2g.** Fax	**2h.** E-mail
(206) 303-0198			jason.evans@tuusso.com

[1]Additional forms may be required for the following permits:

- If your project may qualify for Department of the Army authorization through a Regional General Permit (RGP), contact the U.S. Army Corps of Engineers for application information (206) 764-3495.
- If your project might affect species listed under the Endangered Species Act, you will need to fill out a Specific Project Information Form (SPIF) or prepare a Biological Evaluation. Forms can be found at http://www.nws.usace.army.mil/Missions/CivilWorks/Regulatory/PermitGuidebook/EndangeredSpecies.aspx.
- Not all cities and counties accept the JARPA for their local Shoreline permits. If you need a Shoreline permit, contact the appropriate city or county government to make sure they accept the JARPA.

[2]To access an online JARPA form with [help] screens, go to http://www.epermitting.wa.gov/site/alias__resourcecenter/jarpa_jarpa_form/9984/jarpa_form.aspx.

For other help, contact the Governor's Office for Regulatory Innovation and Assistance at (800) 917-0043 or help@oria.wa.gov.

Part 3–Authorized Agent or Contact

Person authorized to represent the applicant about the project. (Note: Authorized agent(s) must sign 11b of this application.) [help]

3a. Name (Last, First, Middle)			
Dulin, Nathaniel Evan			
3b. Organization (If applicable)			
SWCA Environmental Consultants			
3c. Mailing Address (Street or PO Box)			
1220 SW Morrison St, #700			
3d. City, State, Zip			
Portland, OR 97205			
3e. Phone (1)	**3f.** Phone (2)	**3g.** Fax	**3h.** E-mail
(503) 224-0333			edulin@swca.com

Part 4–Property Owner(s)

Contact information for people or organizations owning the property(ies) where the project will occur. Consider both **upland and aquatic** ownership because the upland owners may not own the adjacent aquatic land. [help]

☐ Same as applicant. (Skip to Part 5.)

☐ Repair or maintenance activities on existing rights-of-way or easements. (Skip to Part 5.)

☐ There are multiple upland property owners. Complete the section below and fill out JARPA Attachment A for each additional property owner.

☐ Your project is on Department of Natural Resources (DNR)-managed aquatic lands. If you don't know, contact the DNR at (360) 902-1100 to determine aquatic land ownership. If yes, complete JARPA Attachment E to apply for the Aquatic Use Authorization.

4a. Name (Last, First, Middle)			
Dicken, Douglas A.			
4b. Organization (If applicable)			
4c. Mailing Address (Street or PO Box)			
P.O. Box 639			
4d. City, State, Zip			
Ellensburg, WA 98926			
4e. Phone (1)	**4f.** Phone (2)	**4g.** Fax	**4h.** E-mail

Part 5–Project Location(s)

Identifying information about the property or properties where the project will occur. [help]

☐ There are multiple project locations (e.g. linear projects). Complete the section below and use JARPA Attachment B for each additional project location.

5a. Indicate the type of ownership of the property. (Check all that apply.) [help]

☒ Private
☐ Federal
☐ Publicly owned (state, county, city, special districts like schools, ports, etc.)
☐ Tribal
☐ Department of Natural Resources (DNR) – managed aquatic lands (Complete JARPA Attachment E)

5b. Street Address (Cannot be a PO Box. If there is no address, provide other location information in 5p.) [help]

None (See 5p)

5c. City, State, Zip (If the project is not in a city or town, provide the name of the nearest city or town.) [help]

Ellensburg, WA 98926

5d. County [help]

Kittitas

5e. Provide the section, township, and range for the project location. [help]

¼ Section	Section	Township	Range
	30	18N	18E

5f. Provide the latitude and longitude of the project location. [help]

- Example: 47.03922 N lat. / -122.89142 W long. (Use decimal degrees - NAD 83)

47.024157 N lat. / -120.628488 W long

5g. List the tax parcel number(s) for the project location. [help]

- The local county assessor's office can provide this information.

712633, 752633 (partial)

5h. Contact information for all adjoining property owners. (If you need more space, use JARPA Attachment C.) [help]

Name	Mailing Address	Tax Parcel # (if known)
_pending		

5i. List all wetlands on or adjacent to the project location. [help]

TW01, TW02, TW03, TW04, TW05

5j. List all waterbodies (other than wetlands) on or adjacent to the project location. [help]

Yakima River, Ellensburg Power Canal, ditches

5k. Is any part of the project area within a 100-year floodplain? [help]

☐ Yes ☒ No ☐ Don't know

5l. Briefly describe the vegetation and habitat conditions on the property. [help]

The Typha Solar Project site primarily consists of fallow agricultural land located just west of the Yakima River and north of Thorp Highway, west of Ellensburg in unincorporated Kittitas County, Washington. Topography of the site generally slopes to the east toward the Yakima River. Surface elevation within the site and ranges from 1,570 to 1,614 feet above mean sea level, the lowest elevation being along the eastern site boundary closest to the Yakima River and the highest elevation being at the southern end of the project area near Thorp Highway.

The Typha Solar Project site consists of formerly irrigated and grazed pasture along the right bank (when facing downstream) of the Yakima River. The site is currently fallow and dominated by weeds and non-native herbaceous species in upland areas, including tall false rye grass (*Schedonorus arundinaceus*), bluegrass (*Poa* spp.), remnant planted common timothy (*Phleum pretense*), garden yellow rocket (*Barbarea vulgaris*), hairy cat's-ear (*Hypochaeris radicata*), common dandelion (*Taraxacum officinale*), and white clover (*Trifolium repens*). In addition, the site has patches of noxious weeds, including Canadian thistle (*Cirsium arvense*), Scotch thistle (*Onopordum acanthium*), yellow nutsedge (*Cyperus esculentus*), and reed canary grass (*Phalaris arundinacea*). The southern portion of the project crosses areas of rural residential use, existing driveways and access roads, and a manicured golf course, including some areas with mature grand fir (*Abies grandis*), ponderosa pine (*Pinus ponderosa*), quaking aspen (*Populus tremuloides*), and crack willow (*Salix* X *fragilis*) trees, with Nootka rose (*Rosa nutkana*) shrubs along the Ellensburg Power (EP) Canal and nearby residences.

Five wetlands were delineated within the Typha Solar Project study area. Table 1 summarizes the size, rating, and classification of wetlands found within the study area. See the figures in the attached Critical Areas Wetland and Waters Delineation Report for Typha Solar Project for the locations of the wetlands, streams, data plots, and their associated minimum protection buffers. The minimum wetland protection buffers were calculated per Kittitas County Code (KCC) guidance based on Ecology's Wetland Rating for each wetland. A detailed description of wetland TW03 is provided below. See the attached critical areas report for detailed descriptions of all other wetlands and waterbodies delineated in the project's study area.

Table 1. Wetland Size, Rating, and Classification for Wetlands within the Study Area

Wetland Name	Delineated Area within the Project (Wetland Rating Unit Size) [a] (acres)	Wetland Rating [b]	Hydrogeomorphic Classification	Cowardin Classification [c]	Dominant Species Observed within Wetland
Solar Site					
TW01	0.07 (estimated 0.33)	II	Riverine	PEM/PSS	Narrow-leaf willow, Nootka rose, red osier dogwood, common panic grass, and hairy cat's-ear
TW02	0.38 (estimated 0.68)	II	Riverine	PEM	Baltic rush, tall false rye grass, common timothy, reed canary grass, and Fuller's teasel
TW03	0.35 (estimated 8.45)	II	Riverine	PEM/PSS	Reed canary grass, common duckweed, Rocky Mountain iris, and bluegrass
TW04	0.04 (0.05)	III	Depressional	PEM	Broad-leaf cat-tail, reed canary grass, and tall false rye grass
Generation Tie Line					
TW03	0.07 (estimated 8.45)	II	Riverine	PEM/PSS	Reed canary grass, common duckweed, Rocky Mountain iris, and bluegrass
TW05	0.03 (estimated 0.47)	III	Riverine	PEM	Broad-leaf cat-tail, reed canary grass, and Baltic rush

a Wetland rating unit size is the total area of wetland delineated or estimated based on aerial photograph interpretation and field reconnaissance. Area of delineated portions of the wetlands is based on SWCA survey data.

b Wetland ratings are based on *Washington State Wetland Rating System for Eastern Washington – Revised* (Hruby 2014).

c Cowardin et al. (1979).

Wetland TW03

Wetland TW03 is a riverine wetland that surrounds a drainage that starts just outside of the western project site boundary and extends south and east along the southern study area boundary. This wetland encompasses approximately 0.35 acre of the project site study area and 0.07 acre in the generation tie line study area, which are portions of the approximately 8.45 acres total wetland unit. This wetland is fed by runoff and irrigation from the agricultural fields to the north and west of the wetland and includes areas of open water as the drainage extends south and west, eventually feeding into the Yakima River east of the study area (see Figure 5; and wetland rating Figures 1 through 5 in Appendix E of the Critical Areas Wetland and Waters Delineation Report for Typha Solar Project). Delineation data were recorded at sample plots TP05 and TP11 and is provided on datasheets in Appendix C of the Critical Areas Wetland and Waters Delineation Report for Typha Solar Project. The drainage passes through many culverts along its route east, but the culverts are partially obstructed, causing the water to flood over the higher elevation areas between the main drainage reaches; therefore, these areas are included in the wetland. The upland boundary of the wetland is defined by an obvious rise in elevation on either side of the overall drainage.

Wetland TW03 is mostly a palustrine emergent (PEM) wetland habitat type with some palustrine scrub-shrub (PSS) wetland areas off-site to the east of the project site. The wetland is dominated by reed canary grass, common duckweed (*Lemna minor*, OBL), Rocky Mountain iris (*Iris missouriensis*, FACW), bluegrass (*Poa* spp., FAC), tall false rye grass, and yellow nutsedge (FACW), with some broad-leaf cat-tail (*Typha latifolia*, OBL), Fuller's teasel, and narrow-leaf willow in the eastern portion of the wetland. The dominance of these species meets the wetland vegetation criteria. Wetland TW03 is located within two different NWI-mapped PEM1C wetland polygons, one along the western project site boundary and one in the southeastern corner of the project site that extends off-site (see Figure 2 of the Critical Areas Wetland and Waters Delineation Report for Typha Solar Project).

Soils in Wetland TW03 are mapped as Nosal ashy silt loam with 0% to 2% slopes; Mitta ashy silt loam, drained with 0% to 2% slopes; Weirman-Kayak-Zillah complex with 0% to 2% slopes; and Weirman gravelly sandy loam with 0% to 2% slopes (NRCS 2017a) (see Figure 3 of the Critical Areas Wetland and Waters Delineation Report for Typha Solar Project). The soil profile observed within 16 inches of the soil surface consists of black (2.5Y 2.5/1) silty clay loam with depletions of dark grayish brown (10YR 4/2) and redoximorphic features starting at 8 inches. The soils in Wetland TW03 meet the hydric soil indicator for Redox Dark Surface (F6). Primary indicators

of hydrology within this wetland include aquatic invertebrates. Secondary indicators of hydrology observed within the wetland include drift deposits (riverine) and drainage patterns. The presence of these indicators meets wetland hydrology criteria.

Wetland TW03 is rated as a Category II wetland in the Ecology rating system, with a high score for hydrologic function (8/9 points) and moderate scores for habitat function (6/9 points) and water quality improvement (6/9 points). Wetland TW03 has high potential to provide hydrologic functions because of its large wetland to channel width ratio and its potential to help reduce flooding issues directly downstream in the Yakima River.

5m. Describe how the property is currently used. [help]

_pending

5n. Describe how the adjacent properties are currently used. [help]

_pending

5o. Describe the structures (above and below ground) on the property, including their purpose(s) and current condition. [help]

_pending

5p. Provide driving directions from the closest highway to the project location, and attach a map. [help]

_pending

Part 6–Project Description

6a. Briefly summarize the overall project. You can provide more detail in 6b. [help]

_pending

6b. Describe the purpose of the project and why you want or need to perform it. [help]

_pending

6c. Indicate the project category. (Check all that apply) [help]

☒ Commercial ☐ Residential ☐ Institutional ☒ Transportation ☐ Recreational
☐ Maintenance ☐ Environmental Enhancement

6d. Indicate the major elements of your project. (Check all that apply) [help]

☐ Aquaculture	☒ Culvert	☐ Float	☐ Retaining Wall (upland)
☐ Bank Stabilization	☐ Dam / Weir	☐ Floating Home	☐ Road
☐ Boat House	☐ Dike / Levee / Jetty	☐ Geotechnical Survey	☐ Scientific Measurement Device
☐ Boat Launch	☐ Ditch	☐ Land Clearing	☐ Stairs
☐ Boat Lift	☐ Dock / Pier	☐ Marina / Moorage	☐ Stormwater facility
☐ Bridge	☐ Dredging	☐ Mining	☐ Swimming Pool
☐ Bulkhead	☐ Fence	☐ Outfall Structure	☐ Utility Line
☐ Buoy	☐ Ferry Terminal	☐ Piling/Dolphin	
☐ Channel Modification	☐ Fishway	☐ Raft	

☐ Other:

6e. Describe how you plan to construct each project element checked in 6d. Include specific construction methods and equipment to be used. [help]

- Identify where each element will occur in relation to the nearest waterbody.
- Indicate which activities are within the 100-year floodplain.

_pending

6f. What are the anticipated start and end dates for project construction? (Month/Year) [help]

- If the project will be constructed in phases or stages, use JARPA Attachment D to list the start and end dates of each phase or stage.

Start Date: TBD End Date: TBD ☐ See JARPA Attachment D

6g. Fair market value of the project, including materials, labor, machine rentals, etc. [help]

_pending

6h. Will any portion of the project receive federal funding? [help]

- **If yes**, list each agency providing funds.

☐ Yes ☐ No ☒ Don't know

Part 7–Wetlands: Impacts and Mitigation

☒ Check here if there are wetlands or wetland buffers on or adjacent to the project area. (If there are none, skip to Part 8.) [help]

7a. Describe how the project has been designed to avoid and minimize adverse impacts to wetlands. [help]

☐ Not applicable

_pending

7b. Will the project impact wetlands? [help]

☒ Yes ☐ No ☐ Don't know

7c. Will the project impact wetland buffers? [help]

☒ Yes ☐ No ☐ Don't know

7d. Has a wetland delineation report been prepared? [help]

- **If Yes**, submit the report, including data sheets, with the JARPA package.

☒ Yes ☐ No

7e. Have the wetlands been rated using the Western Washington or Eastern Washington Wetland Rating System? [help]

- **If Yes**, submit the wetland rating forms and figures with the JARPA package.

☒ Yes ☐ No ☐ Don't know

7f. Have you prepared a mitigation plan to compensate for any adverse impacts to wetlands? [help]

- **If Yes**, submit the plan with the JARPA package and answer 7g.
- **If No, or Not applicable**, explain below why a mitigation plan should not be required.

☐ Yes ☒ No ☐ Don't know

_pending (less than 1,000 sq. ft. of fill does not require mitigation)

7g. Summarize what the mitigation plan is meant to accomplish, and describe how a watershed approach was used to design the plan. [help]

Not Applicable.

7h. Use the table below to list the type and rating of each wetland impacted, the extent and duration of the impact, and the type and amount of mitigation proposed. Or if you are submitting a mitigation plan with a similar table, you can state (below) where we can find this information in the plan. [help]

Activity (fill, drain, excavate, flood, etc.)	Wetland Name[1]	Wetland type and rating category[2]	Impact area (sq. ft. or Acres)	Duration of impact[3]	Proposed mitigation type[4]	Wetland mitigation area (sq. ft. or acres)
Fill	TW03	PEM, Category II	TBD	Permanent	None	N/A

[1] If no official name for the wetland exists, create a unique name (such as "Wetland 1"). The name should be consistent with other project documents, such as a wetland delineation report.
[2] Ecology wetland category based on current Western Washington or Eastern Washington Wetland Rating System. Provide the wetland rating forms with the JARPA package.
[3] Indicate the days, months or years the wetland will be measurably impacted by the activity. Enter "permanent" if applicable.
[4] Creation (C), Re-establishment/Rehabilitation (R), Enhancement (E), Preservation (P), Mitigation Bank/In-lieu fee (B)

Page number(s) for similar information in the mitigation plan, if available: _____

7i. For all filling activities identified in 7h, describe the source and nature of the fill material, the amount in cubic yards that will be used, and how and where it will be placed into the wetland. [help]

_TBD

7j. For all excavating activities identified in 7h, describe the excavation method, type and amount of material in cubic yards you will remove, and where the material will be disposed. [help]

Not applicable.

Part 8–Waterbodies (other than wetlands): Impacts and Mitigation

In Part 8, "waterbodies" refers to non-wetland waterbodies. (See Part 7 for information related to wetlands.) [help]

☒ Check here if there are waterbodies on or adjacent to the project area. (If there are none, skip to Part 9.)

8a. Describe how the project is designed to avoid and minimize adverse impacts to the aquatic environment. [help]

☐ Not applicable

_pending

8b. Will your project impact a waterbody or the area around a waterbody? [help]

☐ Yes ☒ No

8c. Have you prepared a mitigation plan to compensate for the project's adverse impacts to non-wetland waterbodies? [help]

- **If Yes**, submit the plan with the JARPA package and answer 8d.
- **If No, or Not applicable,** explain below why a mitigation plan should not be required.

☐ Yes ☒ No ☐ Don't know

Not applicable. No impact proposed to waterbodies.

8d. Summarize what the mitigation plan is meant to accomplish. Describe how a watershed approach was used to design the plan.

- If you already completed 7g you do not need to restate your answer here. [help]

Not applicable.

8e. Summarize impact(s) to each waterbody in the table below. [help]

Activity (clear, dredge, fill, pile drive, etc.)	Waterbody name[1]	Impact location[2]	Duration of impact[3]	Amount of material (cubic yards) to be placed in or removed from waterbody	Area (sq. ft. or linear ft.) of waterbody directly affected

[1] If no official name for the waterbody exists, create a unique name (such as "Stream 1") The name should be consistent with other documents provided.
[2] Indicate whether the impact will occur in or adjacent to the waterbody. If adjacent, provide the distance between the impact and the waterbody and indicate whether the impact will occur within the 100-year flood plain.
[3] Indicate the days, months or years the waterbody will be measurably impacted by the work. Enter "permanent" if applicable.

8f. For all activities identified in 8e, describe the source and nature of the fill material, amount (in cubic yards) you will use, and how and where it will be placed into the waterbody. [help]

Not applicable.

8g. For all excavating or dredging activities identified in 8e, describe the method for excavating or dredging, type and amount of material you will remove, and where the material will be disposed. [help]

Not applicable.

Part 9–Additional Information

Any additional information you can provide helps the reviewer(s) understand your project. Complete as much of this section as you can. It is ok if you cannot answer a question.

9a. If you have already worked with any government agencies on this project, list them below. [help]

Agency Name	Contact Name	Phone	Most Recent Date of Contact
State of Washington Energy Facility Site Evaluation Council (EFSEC)	_pending		

9b. Are any of the wetlands or waterbodies identified in Part 7 or Part 8 of this JARPA on the Washington Department of Ecology's 303(d) List? [help]

- **If Yes,** list the parameter(s) below.
- If you don't know, use Washington Department of Ecology's Water Quality Assessment tools at: http://www.ecy.wa.gov/programs/wq/303d/.

☐ Yes ☒ No

9c. What U.S. Geological Survey Hydrological Unit Code (HUC) is the project in? [help]

- Go to http://cfpub.epa.gov/surf/locate/index.cfm to help identify the HUC.

HUC 17030001

9d. What Water Resource Inventory Area Number (WRIA #) is the project in? [help]

- Go to http://www.ecy.wa.gov/water/wria/index.html to find the WRIA #.

WRIA 39

9e. Will the in-water construction work comply with the State of Washington water quality standards for turbidity? [help]

- Go to http://www.ecy.wa.gov/programs/wq/swqs/criteria.html for the standards.

☐ Yes ☐ No ☒ Not applicable

9f. If the project is within the jurisdiction of the Shoreline Management Act, what is the local shoreline environment designation? [help]

- If you don't know, contact the local planning department.
- For more information, go to: http://www.ecy.wa.gov/programs/sea/sma/laws_rules/173-26/211_designations.html.

☐ Urban ☐ Natural ☐ Aquatic ☐ Conservancy ☒ Other: Rural Conservancy

9g. What is the Washington Department of Natural Resources Water Type? [help]

- Go to http://www.dnr.wa.gov/forest-practices-water-typing for the Forest Practices Water Typing System.

☐ Shoreline ☐ Fish ☐ Non-Fish Perennial ☐ Non-Fish Seasonal

9h. Will this project be designed to meet the Washington Department of Ecology's most current stormwater manual? [help]

- **If No**, provide the name of the manual your project is designed to meet.

☒ Yes ☐ No

Name of manual: _____

9i. Does the project site have known contaminated sediment? [help]

- **If Yes**, please describe below.

☐ Yes ☒ No

9j. If you know what the property was used for in the past, describe below. [help]

_pending

9k. Has a cultural resource (archaeological) survey been performed on the project area? [help]

- **If Yes**, attach it to your JARPA package.

☒ Yes ☐ No

9l. Name each species listed under the federal Endangered Species Act that occurs in the vicinity of the project area or might be affected by the proposed work. [help]

_pending

9m. Name each species or habitat on the Washington Department of Fish and Wildlife's Priority Habitats and Species List that might be affected by the proposed work. [help]

_pending

Part 10–SEPA Compliance and Permits

Use the resources and checklist below to identify the permits you are applying for.

- Online Project Questionnaire at http://apps.oria.wa.gov/opas/.
- Governor's Office for Regulatory Innovation and Assistance at (800) 917-0043 or help@oria.wa.gov.
- For a list of addresses to send your JARPA to, click on agency addresses for completed JARPA.

10a. Compliance with the State Environmental Policy Act (SEPA). (Check all that apply.) [help]

- For more information about SEPA, go to www.ecy.wa.gov/programs/sea/sepa/e-review.html.

☐ A copy of the SEPA determination or letter of exemption is included with this application.

☒ A SEPA determination is pending with ___TBD___ (lead agency). The expected decision date is _TBD_____.

☐ I am applying for a Fish Habitat Enhancement Exemption. (Check the box below in 10b.) [help]

☐ This project is exempt (choose type of exemption below).

☐ Categorical Exemption. Under what section of the SEPA administrative code (WAC) is it exempt?

_____

☐ Other: _____

☐ SEPA is pre-empted by federal law.

10b. Indicate the permits you are applying for. (Check all that apply.) [help]

LOCAL GOVERNMENT

Local Government Shoreline permits:

☐ Substantial Development ☐ Conditional Use ☐ Variance

☐ Shoreline Exemption Type (explain): _____

Other City/County permits:

☐ Floodplain Development Permit ☒ Critical Areas Ordinance

STATE GOVERNMENT

Washington Department of Fish and Wildlife:

☐ Hydraulic Project Approval (HPA) ☐ Fish Habitat Enhancement Exemption – Attach Exemption Form

You must submit a check for $150 to Washington Department of Fish and Wildlife, unless your project qualifies for an exemption or alternative payment method below. **Do not send cash.**

Check the appropriate boxes

☐ $150 check enclosed. Check # _____
Attach check made payable to Washington Department of Fish and Wildlife.

☒ My project is exempt from the application fee. (Check appropriate exemption):
- ☐ HPA processing is conducted by applicant funded WDFW staff.
  Agreement # _____
- ☐ Mineral prospecting and mining
- ☒ Project occurs on farm and agricultural land.
  (Attach a copy of current land use classification recorded with the county auditor, or other proof of current land use)
- ☐ Project is modification of an existing HPA originally applied for, prior to July 10, 2012.
  HPA # _____

Washington Department of Natural Resources:

☐ Aquatic Use Authorization

Complete JARPA Attachment E and submit a check for $25 payable to the Washington Department of Natural Resources. **Do not send cash.**

Washington Department of Ecology:

☐ Section 401 Water Quality Certification

FEDERAL GOVERNMENT

United States Department of the Army permits (U.S. Army Corps of Engineers):

☒ Section 404 (discharges into waters of the U.S.) ☐ Section 10 (work in navigable waters)

United States Coast Guard permits:

☐ Private Aids to Navigation (for non-bridge projects)

Part 11–Authorizing Signatures

Signatures are required before submitting the JARPA package. The JARPA package includes the JARPA form, project plans, photos, etc. [help]

11a. Applicant Signature (required) [help]

I certify that to the best of my knowledge and belief, the information provided in this application is true, complete, and accurate. I also certify that I have the authority to carry out the proposed activities, and I agree to start work only after I have received all necessary permits.

I hereby authorize the agent named in Part 3 of this application to act on my behalf in matters related to this application. _____ (initial)

By initialing here, I state that I have the authority to grant access to the property. I also give my consent to the permitting agencies entering the property where the project is located to inspect the project site or any work related to the project. _____ (initial)

Applicant Printed Name	Applicant Signature	Date

11b. Authorized Agent Signature [help]

I certify that to the best of my knowledge and belief, the information provided in this application is true, complete, and accurate. I also certify that I have the authority to carry out the proposed activities and I agree to start work only after all necessary permits have been issued.

Authorized Agent Printed Name	Authorized Agent Signature	Date

11c. Property Owner Signature (if not applicant) [help]

Not required if project is on existing rights-of-way or easements (provide copy of easement with JARPA).

I consent to the permitting agencies entering the property where the project is located to inspect the project site or any work. These inspections shall occur at reasonable times and, if practical, with prior notice to the landowner.

Property Owner Printed Name	Property Owner Signature	Date

18 U.S.C §1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly falsifies, conceals, or covers up by any trick, scheme, or device a material fact or makes any false, fictitious, or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious, or fraudulent statement or entry, shall be fined not more than $10,000 or imprisoned not more than 5 years or both.

If you require this document in another format, contact the Governor's Office for Regulatory Innovation and Assistance (ORIA) at (800) 917-0043. People with hearing loss can call 711 for Washington Relay Service. People with a speech disability can call (877) 833-6341.
ORIA publication number: ORIA-16-011 rev. 09/2016

Appendix J-4: Typha Solar Project Geotechnical Engineering Study

Geotechnical Engineering Study, Phase 1
Tyhpa Solar Array Site
3401 South Thorpe Highway
Ellensburg, Washington
Project No. 170017:GES

Site Description

The subject site comprises two adjacent tax lots, Kittitas County Tax Parcel Nos. 712633 and 752633, and is located at 3401 South Thorpe Highway in Ellensburg, Washington. The site is roughly rectangular in shape with the long axis oriented roughly north to south. The two tax lots comprise 54.29 acres. The site is currently being used to cultivate hay. Until recently, the site was being used as pasturage. The southerly portion of the site is developed with a residence, several out buildings, paddocks, and corrals. A golf-course lies to the south and east and parts of some of the fairways extend to the west to the Tyhpa property line as does the driving range. Access to the lot is across the east side of the driving range then west along the south side of the subject property. A single-family residence is located along the south margin of the subject site and a gate provides access for vehicles.

The property is irregularly shaped with the north and east site property lines being defined by the Yakima River. The site surface is irregular with an overall topography change of about 10 feet. This area appears to be ancient flood plain and old meanders and oxbows are visible across the property.

At the time of our visit, a group of archeologists were conducting a subsurface investigation. It was reported to us that no artifacts were discovered.

Proposed Site Development

It is our understanding that a series of linear solar panel racks will be constructed on the property along with access/maintenance roads and power infrastructure for distribution to the power grid. Locations for the racks have not been selected and we have not been provided with detailed plans and specifications

for installation of the solar panels nor have we been provided with a grading plan. However, based on review of similar projects, we believe that very little grading will be required to construct the solar panel racks. We understand that the solar panels are attached end to end on horizontal steel rods that are supported on driven H-beams. The solar panels are attached to the horizontal supports which are oriented north-south. The panels rotate so that they are always exposed to the sun as it moves from east to west. We assume that the maintenance roads will run between the racks, provide access to the electrical infrastructure elements, and will probably run around the perimeter of the array.

If development plans should change or if our assumptions regarding development are incorrect, Swiftwater Environmental and Geotechnical (SEG) should be contacted as soon as possible to review and/or revise the recommendations contained herein. SEG should be provided an opportunity to review final plans and specifications to confirm that these recommendations have been incorporated into the plans.

Subsurface Conditions

On April 27, 2017, SEG personnel observed the installation of two test borings using a track-mounted vibratory drilling rig – a GeoProbe 8140 LC – also known as a sonic rig. A 4-inch steel hollow-stem drill string is driven into the soil under high-frequency vibratory loading. Standard Penetration Testing (SPT) is then carried out at standard depths for this type of report. For this project, we directed the drillers to complete at least one SPT at the surface before drilling commenced to collect N-values for the surficial soils. SPTs were then variously carried out at standard depths of 2.5', 5.0', 10.0', and 15.0'. Based on hardness of drilling during advancement of the core barrel, we decided to forego some of the intermediate samples since we would be reviewing a complete sample after drilling was completed and would be able to identify unusual strata within the samples. Samples were collected from the SPT split-spoons at the appropriate depths and prepared for storage and removal from the site

One of the advantages of using the sonic drill rig is that a continuous four-inch diameter sample is collected in the hollow stem drill string as it is advanced. The continuous soil sample is then extruded into polyethylene bags and removed from the immediate area of the drill rig. The continuous sample can then be examined by cutting the bag open to expose the entire 2.4 to 4-foot sample. We were thus able to closely examine the soil profile and to identify bearing soils with unusual precision. The borings were advanced to a maximum depth of 16.5 feet below existing grade. We understand that standard H-beam penetration for this type of installation is six to eight feet below grade. Boring locations are shown on the attached Boring Location Plan (Figure 2) along with the Boring Logs on subsequent pages. Please refer to the Boring Logs for detailed descriptions of the site soils. A general description of soils and groundwater conditions is provided below.

The boring locations were selected to attempt to be representative of the entire site. Boring T-1 was completed in the south-central area of the site, and Boring T-2 was located in the northeast quadrant of the site about 100 meters west of the creek alignment as shown on the attached Boring Location Plan. The soil profiles in both borings were very consistent and we believe that based on the likely depositional environment and also on the locally flat topography, that the soil profile across the site will be similar to the profiles found in the borings.

In Boring T-1, we observed less than six inches of very dark brown highly organic sod underlain by a brown, moist medium dense gravelly SAND to sandy GRAVEL with trace to some silt and scattered fine organics

e.g. fine roots, etc. The driller reported very hard drilling below about one and a half feet with color change to gray. The surficial SPT N-Value was reported to be 40. The driller also reported cementation in the sandy gravel to gravelly sand. We observed the same material to the final depth of this boring at 16.5' below existing grade. All N-values equaled or exceeded 50. At -6.5 feet, the driller we observed a six-inch thick silty sand seam with "perched" groundwater seepage. The seepage was not continuous.

In Boring T-2, we observed a soil profile that was nearly identical to that found in T-1. Boring T-2 was terminated in the gray to dark gray silty SAND to sandy SILT unit at 16.5. Once again, we observed a six-inch silty fine sand seam at -6.0 to -6.5 feet with minor perched seepage. SPT N-values were consistent at N = 50 down to 16.5'.

In both borings, we observed that drilling was difficult with depth beginning at about one and a half to two feet below grade indicating that adequate embedment soils are present from about two feet below grade.

Groundwater

We encountered minor seepage in both borings from about six to seven feet below grade. This water was encountered in thin silty sand seams and appears to have been "perched" within the seams as additional groundwater was not noted below these depths. Additional groundwater flow may be observed during the wetter winter months and planning should be implemented accordingly.

If grading and/or construction is carried out during the winter or spring months, the contractor should anticipate that possible groundwater seepage might be present and should plan accordingly. The entire profile of the site soils is moisture sensitive and those soils will be difficult to use as structural fill during the rainy winter and spring months. The underlying partially cemented sandy gravel soils will be less moisture-sensitive, but natural variability of the fine-grained fraction (e.g. silts and clay minerals) might cause these soils to be moisture-sensitive as well. In any case, if excavated site soils are to be used as structural fill, they should be protected from moisture while stock-piled.

Geologic Setting

According to the USGS Open File Report 1127, *Late Cenozoic Deposits, Landforms, Stratigraphy, and Tectonism in Kittitas Valley, Washington*, Richard B. Waitt, Jr., 1979, the subject site and surrounding area are underlain by Qs (Quaternary Alluvium, Sidestream Facies) which is characterized as downstream aggradation deposits with their source being upstream glacial moraines located to the west and northwest areas of the Kittitas Valley. These deposits consist primarily of basaltic gravels and sands with varying amounts of silt and clay minerals. The gravel varies from fine to coarse with occasional specimens in excess of 1.5 meters. These undifferentiated sandy GRAVEL deposits are overlain by varying thicknesses of topsoil, weathered sandy gravel horizons, and loessal (wind) deposits that comprise the silty SAND and sandy SILT units that we observed from the surface down to the relatively un-weathered partially cemented gravel. The gravel deposits consistently displayed some level of cementation that is most likely caused by breakdown of the basaltic rock to silt and clay minerals and then subsequent re-lithification under normal loading. The soils we observed in our borings at the subject site are consistent with this mapping.

In Boring T-2, we encountered a fine-grained, reddish brown to tan silty clay to clayey silt unit underlying the sandy gravel deposits. We contacted Dr. Nick Zentner, Professor of Geological Sciences at Central

Washington University about this unit. Dr. Zentner indicated that it is probably an alluvial deposit that develops in slow-water areas and ox-bows proximate to streams and to the Yakima River. Dr. Zentner stated that these deposits are horizontally discontinuous and are found throughout the valley.

General Discussion and Recommendations

Based on the results of our site investigation, construction of the proposed solar panel array is feasible from a geotechnical standpoint provided that strong enough vertical H-beam supports are provided. The density of the soil matrix combined with the weight of the hammer might possibly damage the pile leading to less than satisfactory bearing capacity values. In this case, it would be prudent to complete a couple of test borings to determine if the piles can be placed with damage.

We understand that the site will be developed by constructing linear racks of structural members to which the solar panels will be attached. The racks will be oriented north to south, which support the solar panels on east to west oscillating horizontal members. Those horizontal members are in turn supported on a series of driven steel H-beams. We have reviewed plans for similar installations and it appears that there is variation in the length of the horizontal supports meaning there will be variation on the total loading for each individual H-beam. For example, some H-beams will support eight solar panels along with their mounting and support equipment while others will support six panels, etc. This means that for a design bearing capacity, pile embedment depths will vary or possibly, the H-beam sizing will need to be increased. *In either case, it is critical that final plans be reviewed by SEG to ensure that appropriate bearing capacities and embedment lengths have been incorporated into the plans and specifications.* Further, SEG should be retained to provide construction monitoring to ensure that the H-beams are installed in accordance with the plans and specifications and to document that adequate bearing capacity is developed.

Final bearing capacities and embedment lengths can be computed once the loading for the piles has been provided to us. Alternatively, we can estimate the loading for each pile if we are provided with information about the weight of the panels, supporting members and ancillary equipment. In either case, we have been informed that this information will be forthcoming and we can then complete the pile designs. We have attached a figure that shows the appropriate embedment zone for the H-beams.

We strongly recommend that once the bearing capacities and embedment lengths have been determined, a series of test piles should be driven using the same equipment that will be used during construction. The purpose of this testing is two-fold: 1) it is necessary to determine that the piles can be driven into the bearing soils to the required embedment depth without damaging the pile and, 2) it is required in order to load test the resulting piles to determine that adequate bearing capacity is being developed.

Wind Loading

The Kittitas Valley, particularly the Ellensburg area, is known for year-around windy conditions. We understand that the solar panels that will be used for this project are 32-square-foot panels mounted immediately adjacent to one another in linear "bays" of seven or eight panels. Therefore, for purposes of computing wind-loading, each bay will effectively be a single panel of 224 or 256 square feet.

We computed the maximum wind load for a 32-square-foot panel using the Uniform Building Code (UBC, 1997) formula with the preferred alternate methodology for computing wind pressure. We also used the Engineering News Record (ENR) methodology in order to check consistency across methodology. The following are wind loads for a 4-foot by 8-foot panel erected vertically that is exposed to wind that is

moving over a flat surface with few obstructions. Wind speeds were obtained from the Applied Technology Council (ATC) website wherein maximum wind speeds are obtained by location. The ASCE site-specific wind speed values are obtained from the ASCE manuals noted, but were retrieved from the ATC Windspeed by Location website. The wind speed values were then used in the UBC formula to calculate the following values for wind pressure in pounds for a single 4-foot by 8-foot solar panel.

• ASCE 7-93 Wind speed (fastest mile in mph	70 mph	593 lbs
• ASCE 7-05 Wind speed (3 second peak gust)	85 mph	878 lbs
• ASCE 7-10 100-year Mean Recurrence Interval	91 mph	1006 lbs
• ASCE 7-10 Risk Category II	110 mph	1470 lbs

The wind pressure values are the functional equivalent of lateral pressure on the H-beams. These values are maximum values. Wind pressure and equivalent lateral pressure will be less than the values shown because the solar panels are rarely, or never, in a vertical position and presumably can be rotated to a horizontal position before or during high-wind events to "spill" wind over time. Further, we believe that end to end placement of the panels will lead to an overall increase in per-panel value due to the failure of the wind to "spill" over the panel edges. Once we have received the H-beam size information, we can compute actual lateral loads based on the wind pressure values above.

Site Preparation and Earthwork

We anticipate that site preparation for the subject site will consist of installation of Temporary Erosion and Sedimentation Control (TESC) measures, installation of grade staking, establishing clearing and grading limits, site clearing and stripping, and possible stockpiling of strippings and organic material in non-structural areas. Once these activities have been completed, installation of underground utilities and final grading can occur and construction of the solar panel array can commence.

Infiltration and Temporary Erosion and Sedimentation Control (TESC)

It is important to understand and utilize Low Impact Development (LID) practices and LID Best Management Practices (BMP) in Eastern Washington to reduce or eliminate concentrated storm water runoff and erosion. BMP also help limit the introduction of pollutants/contamination into Eastern Washington's arid land soils and rangeland soils. BMP that address these issues can be found in the Washington State Department of Ecology (DOE) publication 13-10-036, *Eastern Washington Low Impact Development Guidance Manual*, June 13, 2013.

Construction of the solar array will tend to create a *variable* increase in the total *and effective* impervious area of the site that is equivalent to the area of the solar panels and associated infrastructure. The increase is variable because the panels move in accordance with the position of the sun and are tilted most of the time. There will also be an increase in less pervious area because of the proposed gravel access roads.

Based on the results of our subsurface investigation, we believe that infiltration into the upper, topsoil-like silty sand/sandy silt soils is not only feasible, but is ongoing. This site, like many others in the vicinity of Ellensburg, have been cultivated using flood irrigation methods. This consists of running a perforated PVC pipe along the upslope side of a site and simply flooding the entire area. Irrigation water percolates into the soil and is stored above the underlying relatively impervious layer found throughout the area.

Based on our observations at several of these sites and on publications and anecdotal testimonies, it is clear that these soils are quite capable of infiltrating storm water during an average year. According to the referenced DOE publication, Ellensburg is located in Climate Region 2 – Central Basin – and receives an average of about 8 inches of precipitation per year, some of it in the form of snow. Given the variable nature of the solar panel position, and relatively low precipitation in the area, combined with the natural permeability of the upper soil horizon, it is our opinion that infiltration of normal storm water amounts will occur and that normal levels of storm water will not be concentrated to a significant extent.

Based on the texture and class of the soil types that we encountered, and on a review of various documents related to storm water control in Eastern Washington, it is our opinion that it is reasonable to assume an infiltration rate of 1.02 inches/hour for the upper, silty sand unit and 0.27 inches/hour for the underlying sandy gravel. The rate for the sandy gravel unit is assumed to be low because of the presence of fine-grained silt and clay minerals in the interstitial spaces and fractures of this partially cemented unit.

Temporary construction ingress and egress should be completed prior to the start of on-going construction traffic. A temporary construction entrance should be constructed of 8-12 inches of quarry spalls. If the soils in the entrance location are soft, a layer of geotextile fabric can be laid down as a barrier prior to placement of quarry spalls. The quarry spalls will provide a stable entrance/exit to the site and will limit tracking of mud onto the road during and after wet weather. TESC measures consist of installation of silt fencing *as needed* around the site entrance, around the perimeter of the low side of the site, and at discharge points where sediment-laden surface water may enter off-site drainage features. Because the subject site is flat and slopes very gently to the south, silt fencing will probably not be required at the south perimeter unless desired by Kittitas County.

Stripping

No well-developed sod or heavily organic topsoil layer was observed at this site because of ongoing cultivation, thus stripping should not be required. If a topsoil horizon is observed in areas where maintenance roads are proposed, the topsoil should be removed down to mineral soil and replaced with crushed rock or structural fill. It is important that all deleterious material is removed prior to placement of structural fill. Topsoil strippings can be stockpiled for use in non-structural areas, as desired, but should not be allowed to mix with soils that will be used for structural fill.

Native Soils and Imported Soils

Native site soils encountered immediately below the surface contain significant fines and are very moisture sensitive. However, if moisture content is near optimum, the soil can be used as compacted structural fill. Excavated site soils should be stockpiled and covered immediately if they are to be saved and used as structural fill. If the soils are above optimum moisture content, it may be possible to aerate them to reduce moisture content. This is possible during the warmer summer months, but it is difficult to achieve uniform moisture content. It may also be possible to use Portland cement as an admixture to reduce moisture content. If the site soils cannot be adequately compacted, it may be necessary to use imported soil for structural fill. Imported soil should be a well-graded granular mineral soil with fines content below five percent (i.e. less than five percent passing the No. 200 sieve) and should be at or slightly above the optimum moisture content. If construction is scheduled to occur during periods where precipitation is expected, a contingency should be built into the project budget for imported soil/crushed rock base (CRB) and other costs associated with placement of imported structural fill.

Subgrade Preparation

Once the site has been prepared for construction of the maintenance roads and placement of the H-beams, a SEG representative should observe subgrade conditions to confirm that they are as expected and to provide additional recommendations, if necessary. If disturbed native soil is encountered in structural areas (e.g. maintenance road prism or foundations for solar panel infrastructure) the fill should re-compacted in accordance with the specifications for structural fill or should be removed and replaced with structural fill as required to reach design grade. As an alternative, CRB can be placed and compacted. SEG should observe and confirm subgrade conditions as construction progresses. The contractor should be prepared to retain a local materials testing firm to sample soils to be used as structural fill, collect samples for Proctor testing, and to provide compaction testing as structural fill is placed, as needed.

Structural Fill

Structural fill is fill that is deliberately placed in thin lifts and compacted to a design specification. Structural fill is intended to support overlying structures in a manner that produces little or no post-construction movement. It is typically used under foundations, slabs, in utility trenches, roads, behind retaining walls, and in constructed slopes. Structural fill should be placed in loose lifts that do not exceed 12 inches and compacted to a relative compaction of 95 percent of maximum dry density as determined by Modified Proctor (ASTM D1557). Compaction specifications may vary, especially in utility trenches in public or private roads as specified by the local jurisdiction. Moisture content is critical to achieving adequate densification (compaction) and the upper unit of the site soils is very moisture sensitive, e.g. a small change in moisture content can make them unusable as structural fill. *If the soils are stockpiled and not covered, precipitation will make them difficult or impossible to use as structural fill.*

Foundations

We believe that foundations for the electrical infrastructure elements of the project can be supported on undisturbed, competent, native sandy gravel soils found below the upper topsoil-like horizon, on re-compacted native soils, on structural fill, or on CRB. Where loose or unsuitable soils are encountered at design subgrade, it will be necessary to re-compact the native soils to structural fill specifications or to over-excavate down to competent native soils then place structural fill or CRB up to design subgrade.

If the subgrade is prepared as described above, the following parameters may be used for design:

- Allowable soil bearing capacity — 1,500 psf
- Passive earth pressure — 300 pcf (equivalent fluid)
- Coefficient of friction — 0.35

A one-third increase in the allowable soil bearing capacity may be assumed for short-term wind and seismic loading conditions. The passive pressure and friction values above include a factor-of-safety of at least 1.5. With anticipated structural loads, total settlement of one inch and differential settlement of one-half inch is anticipated. Most settlement should occur during construction, as dead loads are applied.

Seismic Design

The 2015 International Building Code recognizes the American Society of Civil Engineers (ASCE) for seismic site class definitions. In accordance with Table 20.3-1 of the ASCE Minimum Design Loads for Buildings and Other Structures manual, Site Class D should be used for design.

Based on our observations of the upper native silty sand soils and the underlying partially cemented sandy gravel and gravelly sands, it is our opinion that the subject site has very low susceptibility to liquefaction. Liquefaction is a phenomenon wherein loose, saturated soils suddenly lose shear strength and begin to behave as a fluid. Liquefaction typically occurs under seismic loading conditions and if structures are supported on soils that liquefy, structural damage can occur. The site groundwater and native soil conditions we observed in the test borings have allowed us to reach this conclusion.

Drainage

We did not observe any continuous seepage in the test borings, however, we did observe occasional perched groundwater present in the thin silty sand to sandy silt seams. We do not anticipate that this level of seepage will be problematic. During the rainy winter months, it is prudent to anticipate seepage in excavations and groundwater control measures should be on-site or readily available, including trash pumps, sumps and discharge ditches. Seepage may create instability in the walls of excavations – SEG should be notified if seepage is observed in excavations so that control measures may be discussed with the contractor and properly implemented. The site should be graded such that surface water is directed away from structures and slopes. Surface water must never be allowed to pond near the tops or toes of slopes. Based on the soil types observed in our test pits, it is our opinion that infiltration is not feasible at this site. Storm water discharge BMPs should be implemented to control runoff from the site. Sediment-laden surface water must be treated such that water discharged from the site meet all water quality requirements. Storm water should not be discharged over the slope to the north of the site.

Excavations/Slopes

Soils observed in the upper one and a half to two feet of the test borings would be classified as OSHA/WISHA Type C. Temporary excavations like utility excavations and foundation excavations with heights in excess of 4 feet must be sloped no steeper than 1.5H:1V. If seepage is observed in these excavations, they may need to be sloped at 2H:1V to prevent sloughing due to seepage pressure. The dense native sandy gravel soil observed below about two feet would be considered OSHA/WISHA Type B soils and can be laid back at 1H:1V.

SEG should be contacted to observe temporary slopes and utility excavations as they are constructed or excavated to assess slope stability and recommend additional measures, if necessary.

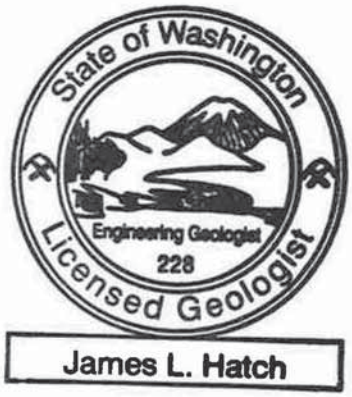
Utility Support, Trenches, and Trench Backfill

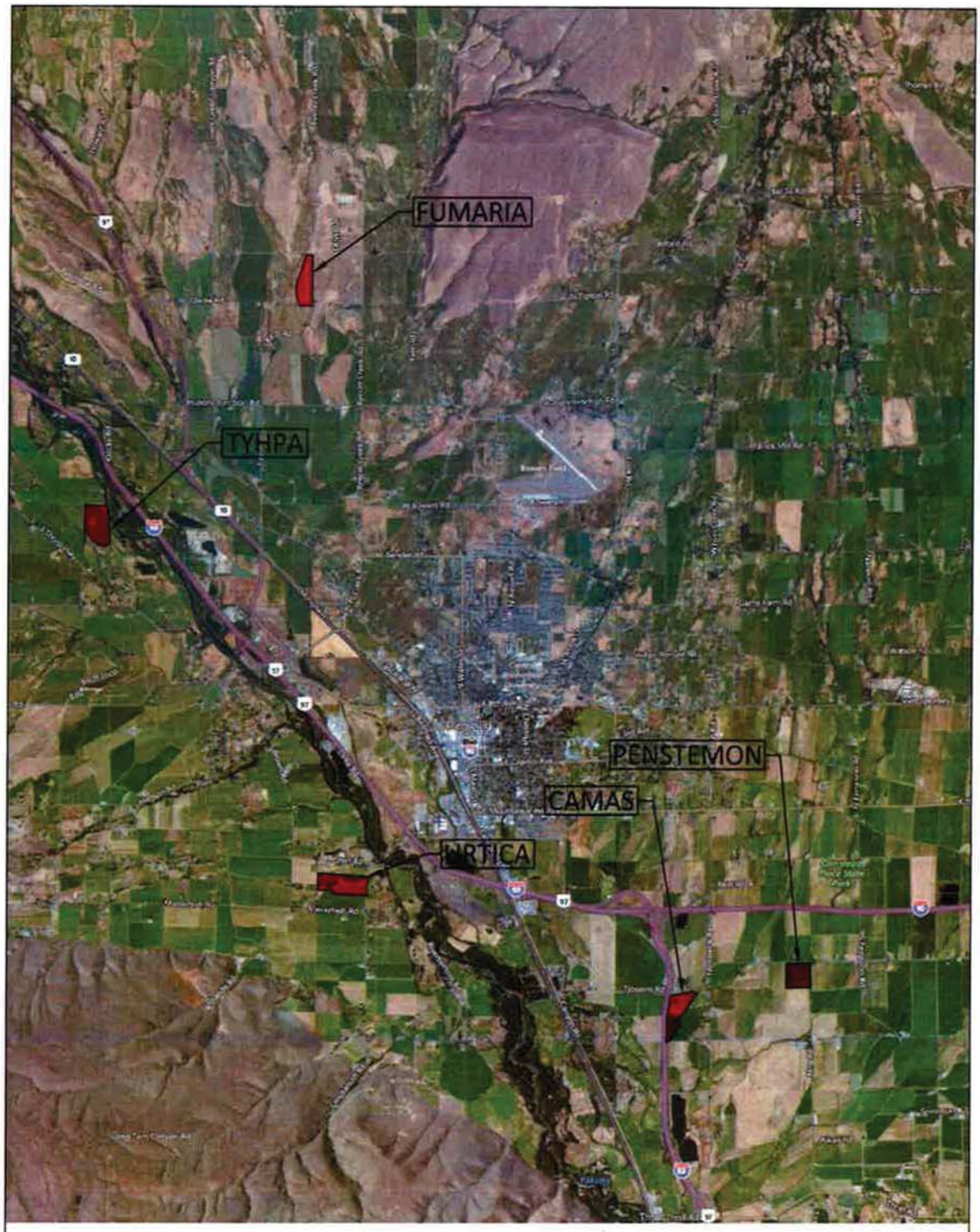
Site soils should be suitable for support of solar panel infrastructure and utilities. In shallower trenches, particularly shallower than about two feet, it may be necessary to over-excavate loose or wet soil down to suitable, stable soils, and then replace them with compacted structural fill or CRB. Groundwater seepage may be encountered in trench walls, particularly if deeper than two to three feet. Seepage may cause caving of the trench walls and temporary shoring may be required. Dewatering measures may also be needed to control seepage and SEG should be contacted to assess the need for such measures.

Site soils may be suitable for use as backfill provided the moisture content is optimal as determined in the laboratory. Trench backfill should be placed and compacted in accordance with the specifications for structural fill as described above or in accordance with specifications provided by the local jurisdiction. CRB should be placed in six to eight inch lifts and compacted with a plate compactor or other compaction device.

Limitations

This report is an instrument of service and has been prepared for the exclusive use of Tuusso Energy, LLC and their representatives and agents. The recommendations and conclusions provided in this study are professional opinions consistent with the level of care and skill that is typical of other members of the profession currently practicing in this area. A warranty is neither expressed nor implied. Variations in the soil and groundwater conditions observed in the test boring locations may exist and may not become apparent until construction commences. SEG should reevaluate the conclusions contained in this study if such variations are encountered.





TUUSO ENERGY, LLC
ELLENSBURG SOLAR PROJECTS
LOCATION MAP

Swiftwater
Environmental & Geotechnical
Western Washington Division
165 NE Juniper Street, Suite 201A • Issaquah, WA 98027 • Phone: (425) 321-0787
Eastern Washington Division
407 Swiftwater Blvd., Suite A • Cle Elum, WA 98922 • Phone: (425) 321-0787

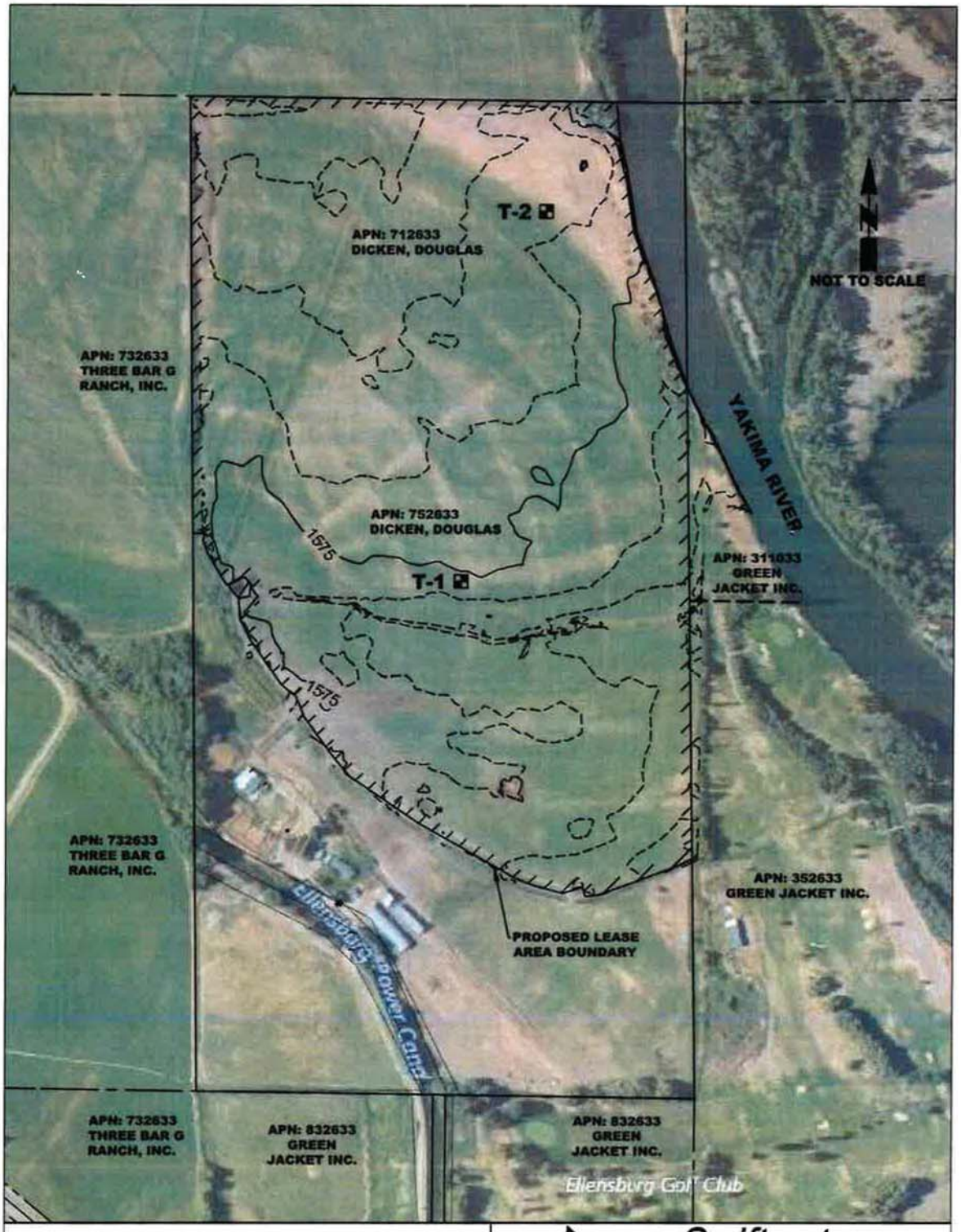


FIG. 2
TYPHA SITE
TEST BORING LOCATIONS

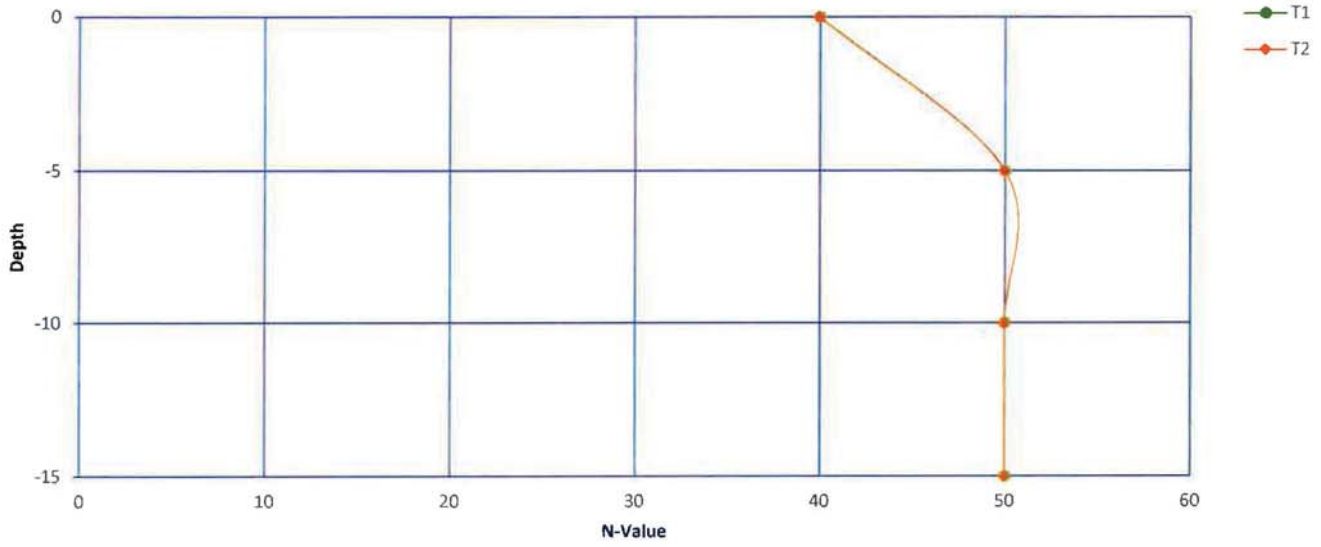
Swiftwater
Environmental & Geotechnical
Western Washington Division
165 NE Juniper Street, Suite 101A • Issaquah, WA 98027 • Phone: (425) 321-0787
Eastern Washington Division
407 Swiftwater Blvd., Suite A • Cle Elum, WA 98922 • Phone: (425) 321-0787

Swiftwater
Environmental & Geotechnical

Project:	Tuusso - Tyhpa Site	Project No. 170017:GES	Date: 6/6/2017
Location	3401 South Thorpe Highway	Surface Elevation	Groundwater N/A
Earthwork Contractor	Excavation Equip.	Logged By	
Holocene Driling	Geoprobe 8104	JH	

	T-1			T-2			
	Depth (ft)	N		Depth (ft)	N		
	0.0	40.0		0.0	40.0		
	-5.0	50.0		-5.0	50.0		
	-10.0	50.0		-10.0	50.0		
	-15.0	50.0		-15.0	50.0		

Approximate Embedment Depth



Note: Tests conducted per ASTM D1586-11 (Standard test method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils)

Swiftwater
Environmental & Geotechnical

Project:	Tuusso Energy - TYHPA Site	170017	Date: 4/27/2017
Location	3401 South Thorpe Highway	Surface Elevation	Groundwater 8.5'
Earthwork Contractor	Excavation Equip.	Logged By	
Holocene Drilling	GeoProbe 8104 LC	JH	

Depth (feet) From	Depth (feet) To	Tests	USCS Soil Class.	
0.0	4.5 +/-	N - 40	**SM**	Dark brown silty fine SAND, trace gravel, moist, loose to medium dense, (Topsoil - like.)
4.5	5.0	N - 50	**SM/GP**	Gray sandy GRAVEL to gravelly SAND, trace to some silt, moist, dense grading to very dense with depth. Partial cementation - 6 inch silty fine sand seam, perched grounwater
10.0	11.5	N - 50	**SM/GP**	Same
15.0	16.5	N - 40	**SM/GP**	Same - Test boring terminated at 16.5 feet below grade

Notes: 3-6" Topsoil / Sod @ Surface

Minor seepate noted at -8.5

TEST BORING NO.	**T-1**
Page	1 OF 1

Swiftwater
Environmental & Geotechnical

Project:	Tuusso Energy - TYHPA Site	170017	Date: 4/27/2017
Location	3401 South Thorpe Highway	Surface Elevation	Groundwater 8.5'
Earthwork Contractor	Excavation Equip.	Logged By	
Holocene Drilling	GeoProbe 8104 LC	JH	

Depth (feet) From	Depth (feet) To	Tests	USCS Soil Class.	
0.0	1.5 +/-	N - 40	SM	Dark brown silty fine SAND, trace gravel, moist, loose to medium dense, (Topsoil - like.)
1.5	5.0	N - 50	SM/GP	Gray sandy GRAVEL to gravelly SAND, trace to some silt, moist, dense grading to very dense with depth. Partial cementation
10.0	11.5	N - 50	SM/GP	Same
15.0	16.5	N - 40	SM/GP	Same - Test boring terminated at 16.5 feet below grade

Notes: 3-6" Topsoil / Sod @ Surface

Minor seepate noted at -8.5

TEST BORING NO.	T-2
Page	1 OF 1

Appendix J-5: Typha Solar Project Drainage Report

Tuusso Energy
Typha Solar Project:
DRAINAGE REPORT

Date: July 2017

Prepared by:
Encompass Engineering & Surveying
407 Swiftwater Blvd
Cle Elum, WA 98922

Table of Contents

I. INTRODUCTION 2
II. EXISTING CONDITIONS 3
a. Drainage Basins 3
b. Downstream Analysis 3
c. Soil Report 3
III. PROPOSED CONDITIONS 3
a. Solar Panel Array 4
b. Drainage Basin 4
IV. HYDROLOGIC MODELING- SANTA BARBARA URBAN HYDROGRAPH METHOD 4
a. Precipitation 4
b. Curve Number 5
c. Time of Concentration 5
d. Flow Calculations 5
V. HYDROLOGIC ANALYSIS 6
VI. COMPLIANCE WITH SWMMEW CORE ELEMENTS 7
VII. CONCLUSION 7

List of Figures

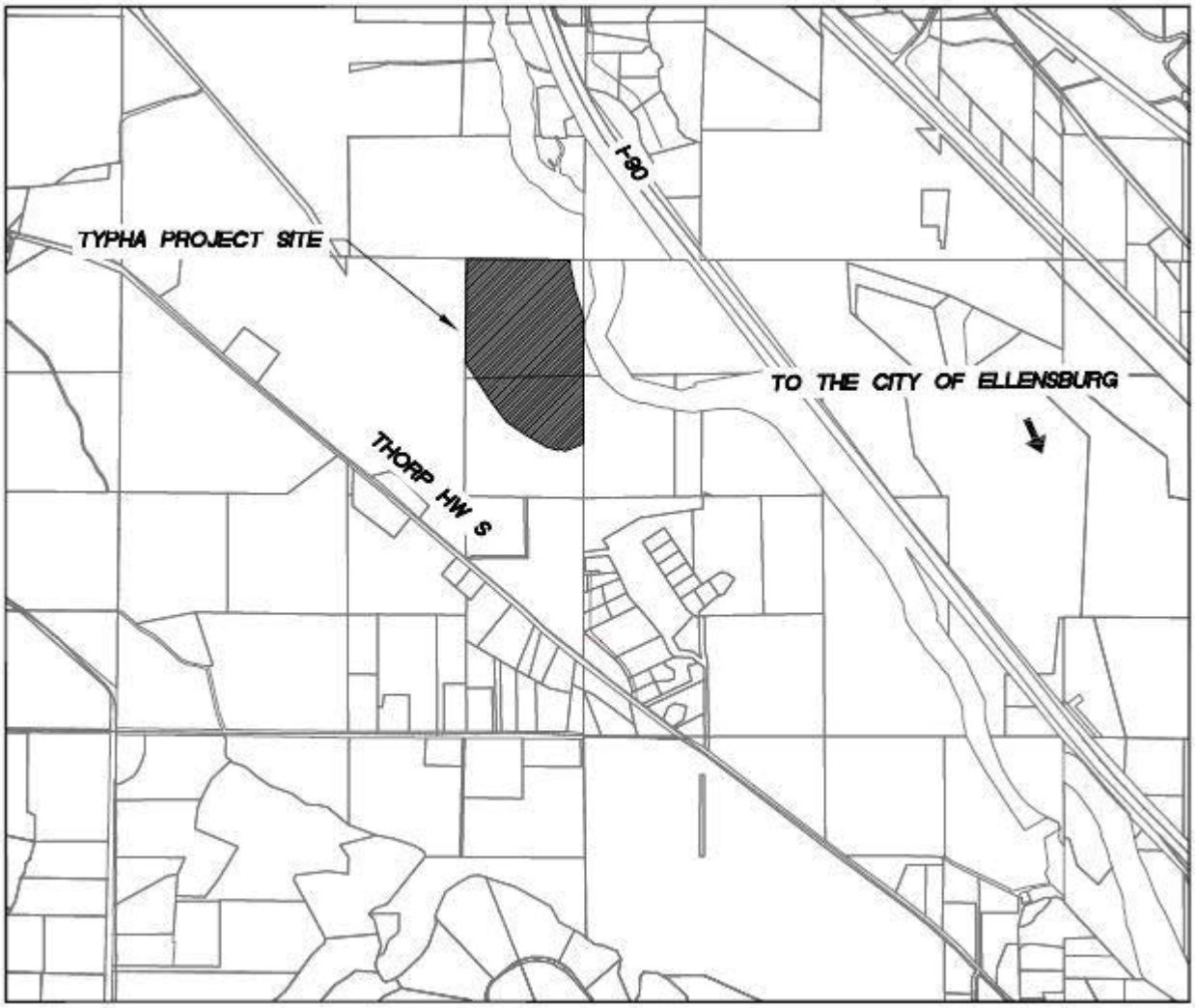
Figure 1- Existing Conditions Exhibit
Figure 2- Proposed Conditions Exhibit

Appendix

Appendix A- NRCS Web Soil Survey
Appendix B- *SWMMEW* Isopluvial Maps
Appendix C- Curve Number Calculations
Appendix D- HydroCAD Report: Existing Basin
Appendix E- HydroCAD Report: Proposed Basin

I. INTRODUCTION

Per Kittitas County assessor records the Tuusso Solar: Typha project site is comprised of portions of Tax Parcel Nos. 712633, 752633, and 802633 at 3401 S Thorp Highway, Ellensburg, WA in the E ½ of the NE ¼ of Section 30, Township 18 North, Range 18 East W.M. The project site is 56.12 acres and currently used as agricultural land to produce hay. See Vicinity Map below.



VICINITY MAP

The purpose of this project is to convert the site to a photovoltaic solar project with minimal change to the existing topography and site features. The proposed site will consist of rows of modular trackers with solar panels, an all-weather access road, and inverter stations to convert power from the solar panels. The solar panels are attached to horizontal supports that run north-south, and the panels themselves rotate east to west, in order to maximize sun exposure. Access to the site is from the south, off Thorp HWY South.

II. EXISTING CONDITIONS

The site is currently an open field used for grazing. The overall topography of the site gently slopes to the south. The surface water that does not infiltrate flows to the south. There are two narrow wetlands that run west to east through the site and capture surface runoff and slowly discharge it to the east. Existing conditions can be seen in Figure 1.

a. Drainage Basins

For the purpose of this report, the site is considered to be made up of three drainage basins, which can be seen in Figure 1. Drainage Basin 1 is made up of the northwest portion of the site. Drainage from this area flows south and into the northern wetland on the site. Drainage Basin 2 is the largest drainage basin on the site and encompasses the northeast portion of the site. Drainage from Basin 2 flows south into the existing northern wetland, which then carries the flow to the east. Drainage from Basin 3 flows south into the wetland which borders the southern portion of the site and is the more major wetland of the two on site. The runoff slowly flows to the east via the wetland. There are no structures on the existing site. The access to the site is from a gravel road that comes off Thorp HWY S. This road also serves as an access to Ellensburg Golf & Country Club as well as some existing farm structures. The road terminates at the entrance to the project site. There are no impervious surfaces within the project limits under the existing conditions.

b. Downstream Analysis

The site drains into two wetlands, both of which make their way to the east. The southern wetland becomes a more defined irrigation channel after leaving the site and continues to convey water to the east for approximately ¾ of a mile before discharging into the Yakima River. This irrigation channel is currently maintained by Kittitas Reclamation District. It is part of a larger irrigation network that serves the rural areas west of Ellensburg. As this channel is part of the irrigation facilities, the flow rate is controlled as needed. No issues have been brought up in relation to the existing irrigation infrastructure downstream of the project site.

c. Soil Report

An NRCS Web Soil Survey was performed for the site in order to obtain onsite soil types. The results of the report give descriptions of the soils found in the project area and the corresponding hydrologic soil groups. The results can be seen in APPENDIX A. The site is composed of Kayak gravelly ashy loam, Weirman gravelly sandy loam, Mitta ashy silt loam, Weirman-Kayak-Zillah complex, and Nosal ashy silt loam, all with 0-2% slopes. Weirman gravelly sandy loam belongs to Hydrologic Soil Group A and Mitta ashy silt loam belongs to Group C. Both Kayak gravelly ashy loam and Weirman-Kayak-Zillah complex have a dual B/D rating, while Nosal ashy silt loam has a dual C/D rating. These soils are classified as B or C when drained and classified as Group D when undrained. For this study, all three dually classified soils were classified as Group D, which a conservative classification.

III. PROPOSED CONDITIONS

The proposed development on this site consists of adding solar trackers, an access road, fencing, and associated electrical infrastructure. The new impervious surface will be a portion of the solar trackers

(described below), the proposed all-weather access road (which may be compacted soil or gravel) that will run north/south through the site and the electrical infrastructure that is made up of five inverters and one utility disconnect with a project metering location. Each inverter and the utility disconnect, resides on its own concrete pad. The access roads were conservatively modeled as gravel roads.

a. Solar Panel Array

A series of modular trackers will be installed throughout the site. Each tracker is essentially a long horizontal support (of various lengths), held in place by evenly spaced, driven H-beams. The trackers are oriented north-south, with solar panels attached to the entire length of the tracker. The solar panels rotate and tilt east to west to maximize sun exposure. The panels will generate runoff within the site, however, due to the way the panels tilt and that they are not continuous structures, they are not considered impervious in the proposed conditions calculations. The panels do not reduce available ground surface for infiltration. The ground below the solar panels will have native plantings, and therefore it will continue to intercept and infiltrate runoff water from the panels. The only impervious area due to the solar panels is from the posts in the ground upon which the solar panels are attached. For impervious calculations, the posts are conservatively estimated to make up 5% of the total area of the solar tracker configuration.

b. Drainage Basin

Minimal grading and ground disturbance will take place as part of this project. The access road, concrete pads for the electrical infrastructure, and solar tracker posts are the only impervious surfaces proposed for the site. The portion of the solar panel array installation that disturbs the ground is very minimal as well. Because of this, existing topography and drainage patterns will remain relatively undisturbed, and the proposed drainage basins encompass the same area as the existing drainage basins. The access road divides Basins 1 & 2. The road section will be designed to ensure the movement of flow under the road surface. Proposed conditions can be seen in Figure 2.

IV. HYDROLOGIC MODELING- SANTA BARBARA URBAN HYDROGRAPH METHOD

Hydrologic analysis for the proposed project is consistent with Title 12 of the Kittitas County Code and the 2004 *SWMMEW*. In order to properly analyze the impacts of the proposed development on the watershed, runoff modeling was done using the Santa Barbara Urban Hydrograph method (SBUH), SCS Type 1A 24-hour storm event for Region 2 per the 2004 *SWMMEW*. This was done to determine peak runoff during the 2-year, 10-year, 25-year, and 100-year storm events. Calculations were performed utilizing HydroCAD version 10.00-18, which is accepted by the Department of Ecology as a proper simulation modeling program.

a. Precipitation

The precipitation information used for the pre-development and post-development run-off calculations is based on the isopluvial maps provided in the 2004 *SWMMEW* and can be seen in APPENDIX B. The inputs for this project site west of Ellensburg are seen below:

P_{2yr} = 1.0”

P_{10yr} = 1.2”

P_{25yr} = 1.6”
P_{100yr} = 2.0”

b. Curve Number

The SCS Curve Number (CN) is a function of the soil type and ground cover. It is used to determine the portion of the precipitation depth that will be conveyed as runoff. The curve numbers are pulled from *Technical Release 55 Urban Hydrology for Small Watersheds*, and the curve numbers used can be seen in Table 1.

Table 1: Curve Numbers Used

DESCRIPTION	HYDROLOGIC SOIL GROUP			
	A	B	C	D
Meadow	30	58	71	78
Impervious areas	98	98	98	98
Gravel Roads	76	85	89	91

Using the soils report and the curve number table, a composite curve number was determined for the proposed and existing basins. A detailed curve number breakdown can be seen in APPENDIX C. Calculations can also be seen in APPENDIX D and E as part of the HydroCAD report.

c. Time of Concentration

Time of concentration is the time it takes for the runoff to get from the most hydrologically distant location to the point of collection for the basin. The flow path is broken up into three segments, with the hydrologic travel time calculated separate for each segment.

- Sheet flow- flow over plane surfaces which usually occurs at the headwaters of a catchment area. The maximum allowable length for sheet flow is 300-ft
- Shallow concentrated flow- flow in headwater areas where flow begins to concentrate in small rills or rough channels
- Channel flow- flow that is concentrated in defined channels

The time of concentration is the total of the travel times for each flow segment. Time of concentration calculations can be seen in APPENDIX D and E as part of the HydroCAD report.

d. Flow Calculations

HydroCAD uses all of the inputs described above in order to determine the peak flows for various storm events. All the inputs are combined to create an instantaneous hydrograph which is then routed through a modeled reservoir with a time delay equal to the time of concentration in order to generate the runoff hydrograph. The runoff hydrograph can be found in APPENDIX D and E as part of the HydroCAD report. The peak runoff values for the 2, 10, 25 and 100-year storms for each basin can be seen below in Table 2.

Table 2: Flow rates

Q (cfs)				
Time Span	**2-yr**	10-yr	**25-yr**	100-yr
Existing Basin 1	**0.00**	0.03	**0.10**	0.26
Existing Basin 2	**0.13**	0.17	**0.23**	0.30
Existing Basin 3	**0.00**	0.00	**0.02**	0.06
Proposed Basin 1	**0.01**	0.04	**0.12**	0.29
Proposed Basin 2	**0.13**	0.17	**0.23**	0.30
Proposed Basin 3	**0.00**	0.00	**0.03**	0.07

V. HYDROLOGIC ANALYSIS

As seen in the calculated peak flow rates, the increased runoff due to proposed site development is minimal. Post-development flows match pre-development flows in Basin 2. For Basin 1, the 2-yr peak flow is increased by 0.01 cfs and the 25-yr peak flow is increased by 0.02 cfs. For Basin 3, the 2-yr peak flow remains at 0 cfs and the 25-yr peak flow is increased by 0.01 cfs. Typically, *SWMMEW* requires developments to release runoff at or below one half of the existing 2-yr peak flow and at or below the existing 25-yr peak flow, as well as for that runoff to be treated.

Per Chapter 2.2.6 of the *SWMMEW* there are exemptions for new development when flow control is not required as long as certain conditions are met. Per chapter 2.6.6 exemption 1, "Any project able to disperse, without discharging to surface waters, the total 25-year runoff volume for the proposed development condition" is exempt from meeting the flow control requirements. The Typha project will use full dispersion, as the main way to handle increased flows due to impervious areas. As outlined in *SWMMEW* Chapter 6.5, BMP F6.42, full dispersion allows up to 10% of the site that is impervious to be characterized as non-effective impervious area by dispersing runoff into the native vegetation area. On the Typha site, the impervious areas may conservatively make up to 2.5% of the site while the rest of the site maintains plantings similar to existing vegetation. This is under the 10% threshold, making full dispersion a viable option.

Chapter 2.2.5 of the *SWMMEW* summarizes the requirements for treating storm water runoff to reduce pollutant loads and concentrations. Runoff treatment is required for all projects creating 5,000 square feet or more of pollutant-generating impervious surfaces (PGIS). The Typha site is not classified as a high use site and all of the proposed impervious surfaces are considered Non-Pollutant Generating Impervious Surfaces (NPGIS). Infrequently used maintenance access roads are classified as NPGIS, and thus are exempt from basic treatment requirements. The solar panels are detached impervious surfaces which the water flows off of and into natural vegetation below. The inverter pads are concrete pads, which the inverters and transformers sit on. The inverters contain no fluids. The transformers may be "dry", meaning they contain no fluids, or they may contain fluids, that has not been finalized yet. If they do contain fluid, it would be Envirotemp or a similar biodegradable vegetable based coolant. Therefore, the inverter pads will be considered NPGIS as well, however if that classification is challenged, they make up no more than 3,600 square feet, which is below the 5,000 square feet threshold. The Typha site meets the exemption requirement, therefore no treatment measures will be necessary or put in place.

VI. COMPLIANCE WITH *SWMMEW* CORE ELEMENTS

All new development projects must comply with the 8 Core Elements outlined in Chapter 2 in the *SWMMEW* when applicable. Exemptions exist for each Core Element and vary depending on requirements that must be met. The Core Elements are listed below in relation to the proposed development of the Tuusso Solar: Typha project, and exemptions are noted when applicable.

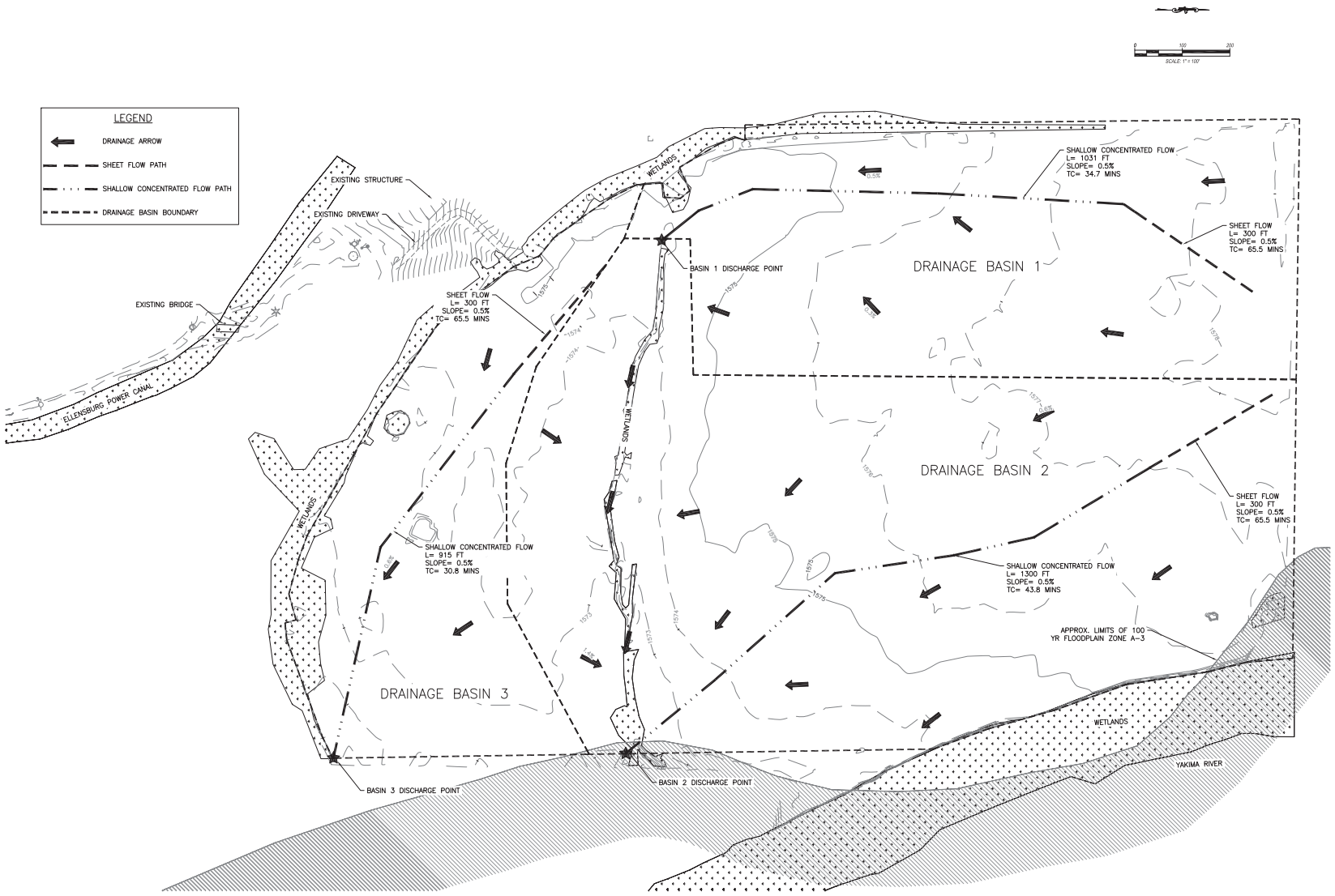
1. Preparation of a Stormwater Site Plan:
    - This can be seen in Figure 2- Proposed Drainage Basin Map, and will be included in the civil plans.
2. Construction Stormwater Pollution Prevention:
    - This will be included as part of the SWPPP submittal.
3. Source Control Pollution
    - The only potential fluid on the site is a biodegradable vegetable based coolant, which is not classified as a pollutant. Therefore, no point source pollutants are on the site.
4. Preservation of Natural Drainage Systems
    - Minimal grading will occur on site and natural drainage patterns will be maintained.
5. Runoff Treatment
    - The site satisfies the requirement for full dispersion and is not a high use site, making it exempt from runoff treatment.
6. Flow Control
    - Per Exemption 1 in chapter 2.6.6 of *SWMMEW*, the site will use full dispersion to control the 2 and 25-yr flows.
7. Operation and Maintenance
    - No on-site maintenance is required for full dispersion.
8. Local Requirements
    - There are no local ordinances above and beyond what is outlined in *SWMMEW*

VII. CONCLUSION

The Tuusso Energy: Typha Solar Project involves transforming 56.12 acres of an existing fallow agriculture field, into a solar project. The project consists of adding an array of solar panels, an access road, and the associated electrical infrastructure. Existing topography will be preserved to the maximum extent possible and native plantings will be made throughout the site. From a stormwater and drainage standpoint, the biggest impacts of the project will be from converting 1.42 acres into impervious surfaces in the form of an all-weather access road, electrical infrastructure, and posts for the solar trackers. 1.42 acres is an overestimate of impervious area, as it maxes out the percentage of impervious to pervious surfaces based on the design of the solar panel trackers. All site and location factors were taken into account in order to perform the SBUH hydrologic modelling method. The calculations from the modelling showed that the runoff generated from the 2-yr storm increased from 0.00 cfs to 0.01 cfs for Basin 1, and remained the same for Basins 2 and 3. Runoff generated from the 25-yr storm increased from 0.10 cfs to 0.12 cfs for Basin 1 and from 0.02 cfs to 0.03 cfs for Basin 3, while Basin 2 remained unchanged. This increased runoff can be handled by full dispersion throughout the site, due to maintaining a majority of the existing pervious area with minimal grading.

TUUSSO ENERGY - TYPHA SITE

A PORTION OF THE EAST 1/2 OF THE NE 1/4 OF SECTION 30, T. 18 N., R. 18 E., W.M.
KITTITAS COUNTY, STATE OF WASHINGTON



J-5-9

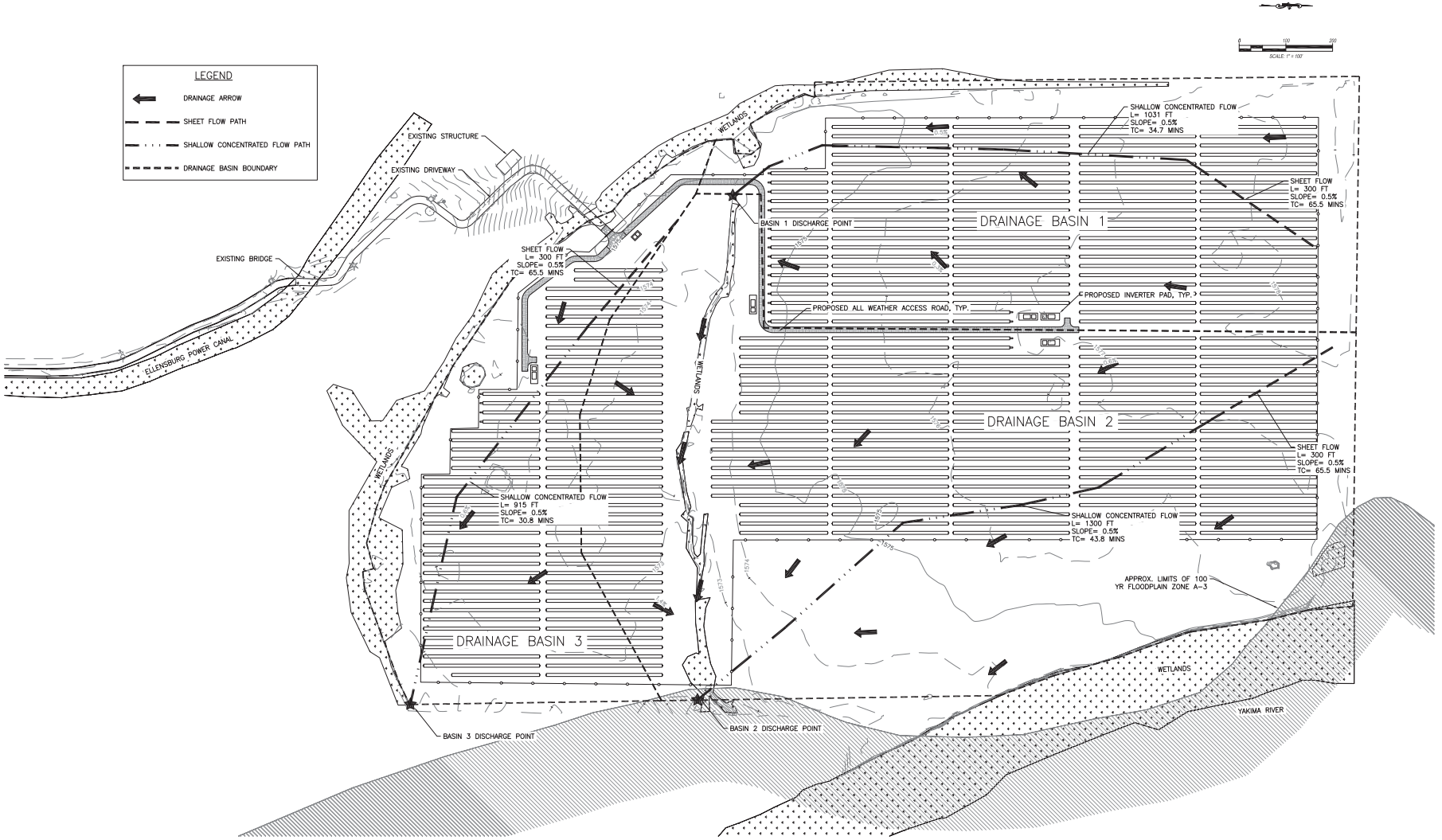
TUUSSO ENERGY, LLC
TYPHA SITE
EXISTING DRAINAGE CONDITIONS

Encompass
ENGINEERING & SURVEYING
165 NE Juniper Street, Suite 201 • Issaquah, WA 98027 • Phone: (425) 392-0250 • Fax: (425) 391-3055
Eastern Washington Division
409 Stadium Blvd. • Ste Elum, WA 98922 • Phone: (509) 674-7433 • Fax: (509) 674-7419

JOB NO.	17016
DATE	July, 2017
SCALE	AS SHOWN
DESIGNED	SF
DRAWN	SF
CHECKED	TML
APPROVED	TML
SHEET	FIG-1

TUUSSO ENERGY - TYPHA SITE

A PORTION OF THE EAST 1/2 OF THE NE 1/4 OF SECTION 30, T. 18 N., R. 18 E., W.M.
KITTITAS COUNTY, STATE OF WASHINGTON



J-5-10

TUUSSO ENERGY, LLC
TYPHA SITE
PROPOSED DRAINAGE CONDITIONS

Encompass
ENGINEERING & SURVEYING
165 NE Juniper Street, Suite 201 • Issaquah, WA 98027 • Phone: (425) 392-0250 • Fax: (425) 391-3055
Eastern Washington Division
409 Southwest Blvd. • Kennewick, WA 99336 • Phone: (509) 572-7433 • Fax: (509) 674-7419

JOB NO.	17016
DATE	July, 2017
SCALE	AS SHOWN
DESIGNED	SF
DRAWN	SF
CHECKED	TML
APPROVED	TML
SHEET	FIG-2

Appendix A:

NRCS WEB SOIL SURVEY

Hydrologic Soil Group—Kittitas County Area, Washington
(Typha Soil Report)



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Soil Rating Lines

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Soil Rating Points

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Water Features

Streams and Canals

Transportation

Rails
Interstate Highways
US Routes
Major Roads
Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Kittitas County Area, Washington
Survey Area Data: Version 9, Sep 9, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 25, 2010—Oct 17, 2010

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

J-5-13

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Kittitas County Area, Washington (WA637)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
621	Mitta ashy silt loam, flooded, 0 to 2 percent slopes	C	5.7	7.0%
622	Manastash loam, 0 to 2 percent slopes	D	0.2	0.2%
706	Kayak gravelly ashy loam, 0 to 2 percent slopes	B/D	0.2	0.3%
715	Weirman gravelly sandy loam, 0 to 2 percent slopes	A	19.1	23.5%
791	Mitta ashy silt loam, drained, 0 to 2 percent slopes	C	7.4	9.0%
809	Weirman-Kayak-Zillah complex, 0 to 2 percent slopes	B/D	30.1	37.0%
838	Nosal ashy silt loam, 0 to 2 percent slopes	C/D	8.1	9.9%
839	Vanderbilt ashy loam, 0 to 2 percent slopes	C	9.0	11.1%
W	Water		1.5	1.9%
Totals for Area of Interest			**81.4**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

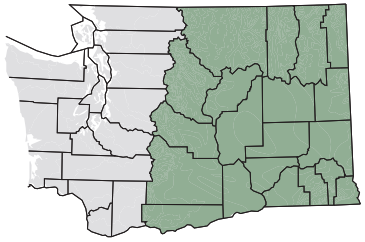
Tie-break Rule: Higher

Appendix B:

SWMMEW ISOPLUVIAL MAPS



Eastern Washington Stormwater Manual



2-Year 24-Hour Isopluvials

Source: NOAA Atlas 2, Volume IX, 1973
Precipitation in inches

- County(2003, 1:24,000)
- City(2003, 1:24,000)
- Latitude/Longitude(1/10 degree)
- Isopluvial(1973, 1:2,000,000)
- NOAA/NWS Station(1931-1998)

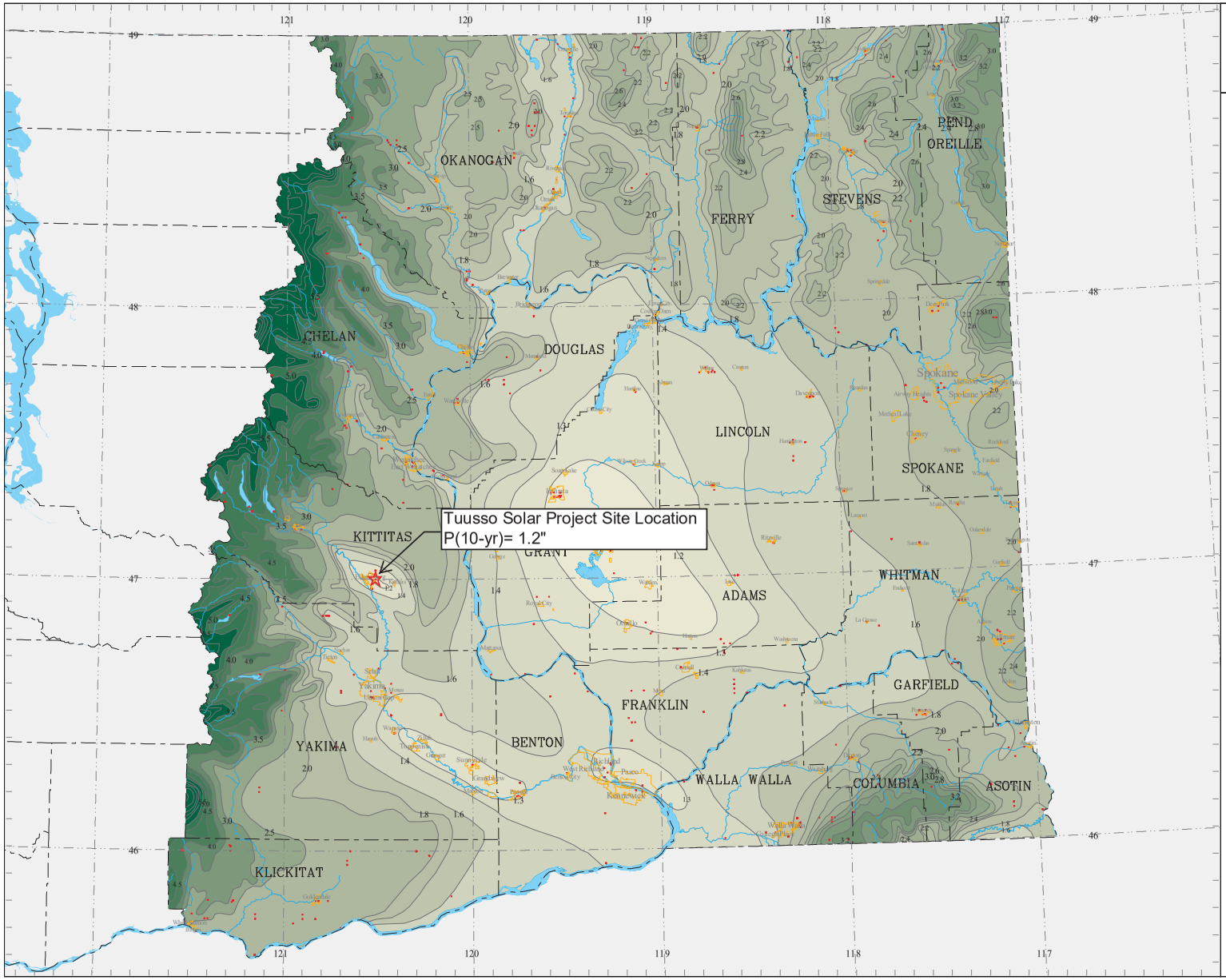
N

Scale 1:1,600,000
Miles
0 16.5 33

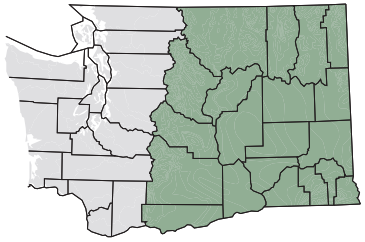
Water Quality Program

WASHINGTON STATE DEPARTMENT OF ECOLOGY

GIS Technical Services
02/25/04
Figure_4.3.3



Eastern Washington Stormwater Manual



10-Year 24-Hour Isopluvials

Source: NOAA Atlas 2, Volume IX, 1973
Precipitation in inches

- County(2003, 1:24,000)
- City(2003, 1:24,000)
- Latitude/Longitude(1/10 degree)
- Isopluvial(1973, 1:2,000,000)
- NOAA/NWS Station(1931-1998)

N

Scale 1:1,600,000
Miles
0 16.5 33

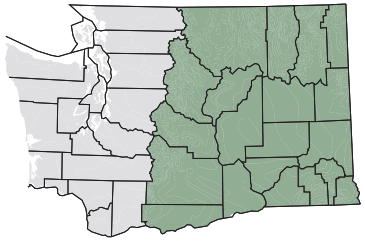
Water Quality Program

WASHINGTON STATE DEPARTMENT OF ECOLOGY

GIS Technical Services
02/25/04
Figure_4.3.4



Eastern Washington Stormwater Manual



25-Year 24-Hour Isopluvials
Source: NOAA Atlas 2, Volume IX, 1973
Precipitation in inches

County(2003, 1:24,000)
City(2003, 1:24,000)
Latitude/Longitude(1/10 degree)
Isopluvial(1973, 1:2,000,000)
NOAA/NWS Station(1931-1998)

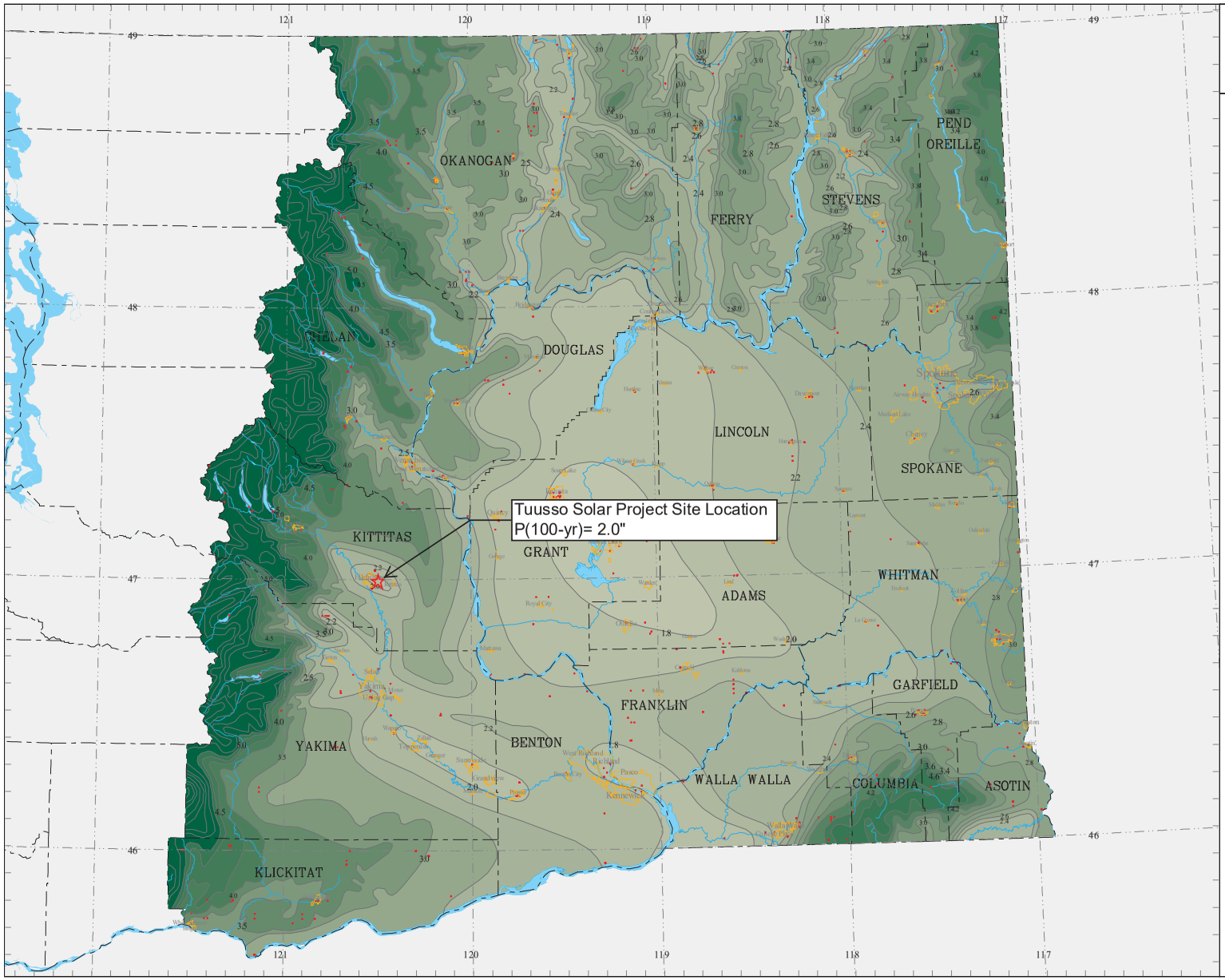
N

Scale 1:1,600,000
Miles
0 16.5 33

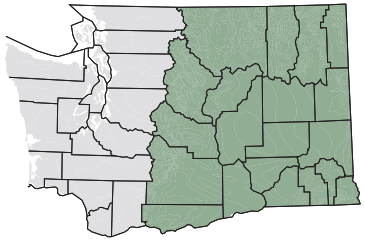
Water Quality Program

WASHINGTON STATE DEPARTMENT OF ECOLOGY

GIS Technical Services
02/25/04
Figure_4.3.5



Eastern Washington Stormwater Manual



100-Year 24-Hour Isopluvials

Source: NOAA Atlas 2, Volume IX, 1973
Precipitation in inches

County(2003, 1:24,000)
City(2003, 1:24,000)
Latitude/Longitude(1/10 degree)
Isopluvial(1973, 1:2,000,000)
NOAA/NWS Station(1931-1998)

Scale 1:1,600,000
Miles
0 16.5 33

Water Quality Program

WASHINGTON STATE DEPARTMENT OF ECOLOGY

GIS Technical Services
02/25/04
Figure_4.3.7

Appendix C:

CURVE NUMBER CALCULATIONS

Predevelopment Conditions																			
Basin Name	Total Area (sf)	Total Area (ac)	Meadow (sf)	Meadow (ac)	HSG	CN	Meadow (sf)	Meadow (ac)	HSG	CN	Meadow (sf)	Meadow (ac)	HSG	CN	Water (sf)	Water (ac)	HSG	CN	**Composite CN**
Exisiting Basin 1	691461.17	15.87	143748	3.30	A	30	8712.00	0.20	C	71	540144.00	12.40	D	78	0.00	0.00	-	-	**68**
Existing Basin 2	1334260.1	30.63	535788	12.30	A	30	4356.00	0.10	C	71	727452.00	16.70	D	78	65340.00	1.50	-	98	**60**
Existing Basin 3	418890.07	9.62	143748	3.30	A	30	74052.00	1.70	C	71	204732.00	4.70	D	78	0.00	0.00	-	-	**61**

Postdevelopment Conditions																							
Basin Name	Total Area (sf)	Total Area (ac)	Impervious Area (sf)	Impervious Area (ac)	HSG	CN	Meadow (sf)	Meadow (ac)	HSG	CN	Meadow (sf)	Meadow (ac)	HSG	CN	Meadow (sf)	Meadow (ac)	HSG	CN	Water (sf)	Water (ac)	HSG	CN	**Composite CN**
Proposed Basin 1	691461.17	15.87	21338.775	0.49	D	94	138413.31	3.18	A	30	8712.00	0.20	C	71	524139.92	12.03	D	78	0.00	0.00	-	-	**69**
Proposed Basin 2	1334260.1	30.63	21041.95	0.48	D	95	525267.03	12.06	A	30	4356.00	0.10	C	71	716931.03	16.46	D	78	65340.00	1.50	-	98	**60**
Proposed Basin 3	418890.07	9.62	18712.5	0.430	D	93	134391.75	3.085	A	30	74052.00	1.700	C	71	191733.82	4.402	D	78	0.00	0.00	-	-	**62**

Impervious Area Break Down									
	Basin 1			Basin 2			Basin 3		
Lot or Tract	Area (sf)	CN classification	CN	Area (sf)	CN classification	CN	Area (sf)	CN classification	CN
Road	12460	Gravel	91	9700	Gravel	91	13320	Gravel	91
Inverters	1200	Impervious	98	1200	Impervious	98	1200	Impervious	98
Post	7679	Impervious	98	10142	Impervious	98	4193	Impervious	98
	Composite CN		94		Composite CN	95		Composite CN	93

Basin 1 Post Area

Solar Trackers	Length	Width	#	area (sf)
72 ft trackers	248	6.5	86	138632
52 ft trackers	188	6.5	0	0
36 ft traclers	121	6.5	19	14943.5
			Total	153575.5
			assumed % impervious (posts)	5%
			impervious area	7678.775

Basin 2 Post Area

Solar Trackers	Length	Width	#	area (sf)
72 ft trackers	248	6.5	115	185380
52 ft trackers	188	6.5	13	15886
36 ft traclers	121	6.5	2	1573
			Total	202839
			assumed % impervious (posts)	5%
			impervious area	10141.95

Basin 3 Post Area

Solar Trackers	Length	Width	#	area (sf)
72 ft trackers	248	6.5	44	70928
52 ft trackers	188	6.5	8	9776
36 ft traclers	121	6.5	4	3146
			Total	83850
			assumed % impervious	5%
			impervious area	4192.5

Appendix D:

HydroCAD REPORT:
EXISTING BASINS

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
3.300	30	HSG A Meadow (1S)
0.200	71	HSG C Meadow (1S)
12.400	78	HSG D Meadow (1S)
15.900	**68**	**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
3.300	0.000	0.200	12.400	0.000	15.900		1S
3.300	**0.000**	**0.200**	**12.400**	**0.000**	**15.900**	**TOTAL AREA**	

Summary for Subcatchment 1S: Existing Basin 1

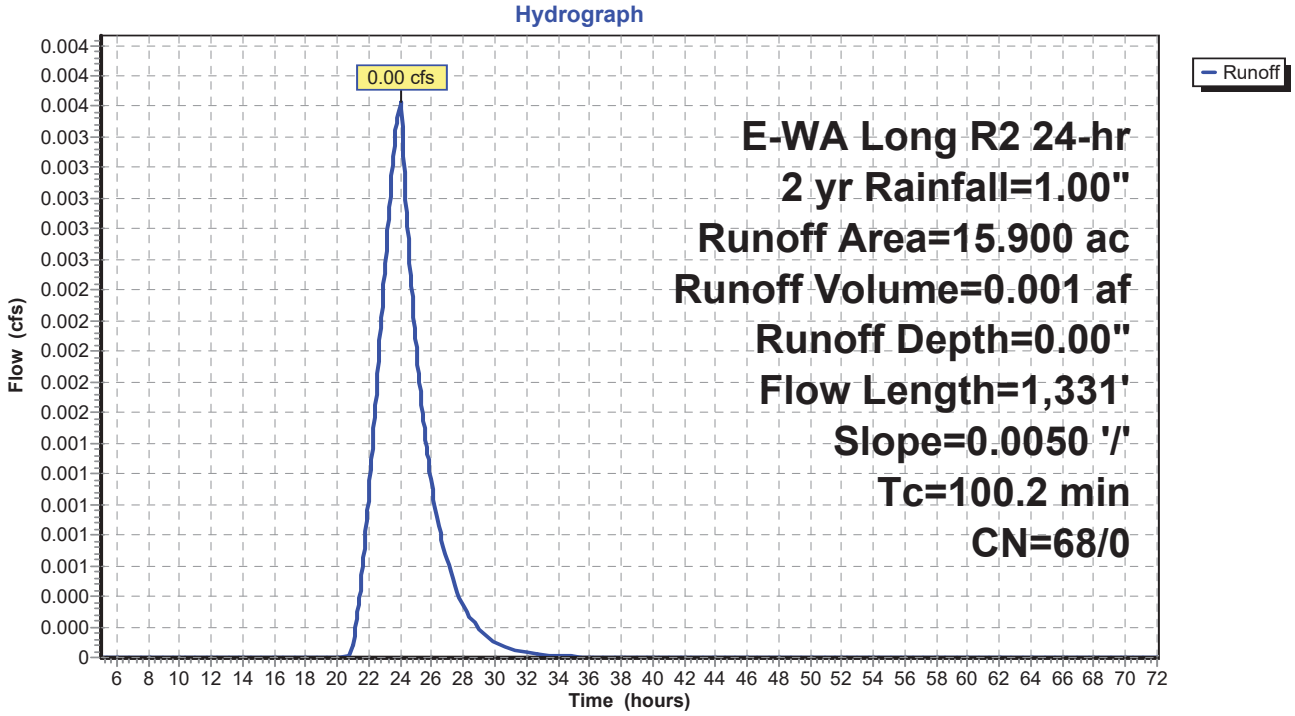
Runoff = 0.00 cfs @ 23.99 hrs, Volume= 0.001 af, Depth= 0.00"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 2 yr Rainfall=1.00"

	Area (ac)	CN	Description
*	3.300	30	HSG A Meadow
*	0.200	71	HSG C Meadow
*	12.400	78	HSG D Meadow
	15.900	68	Weighted Average
	15.900	68	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
65.5	300	0.0050	0.08		**Sheet Flow,** Range n= 0.130 P2= 1.00"
34.7	1,031	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
100.2	1,331	Total			

Subcatchment 1S: Existing Basin 1



Summary for Subcatchment 1S: Existing Basin 1

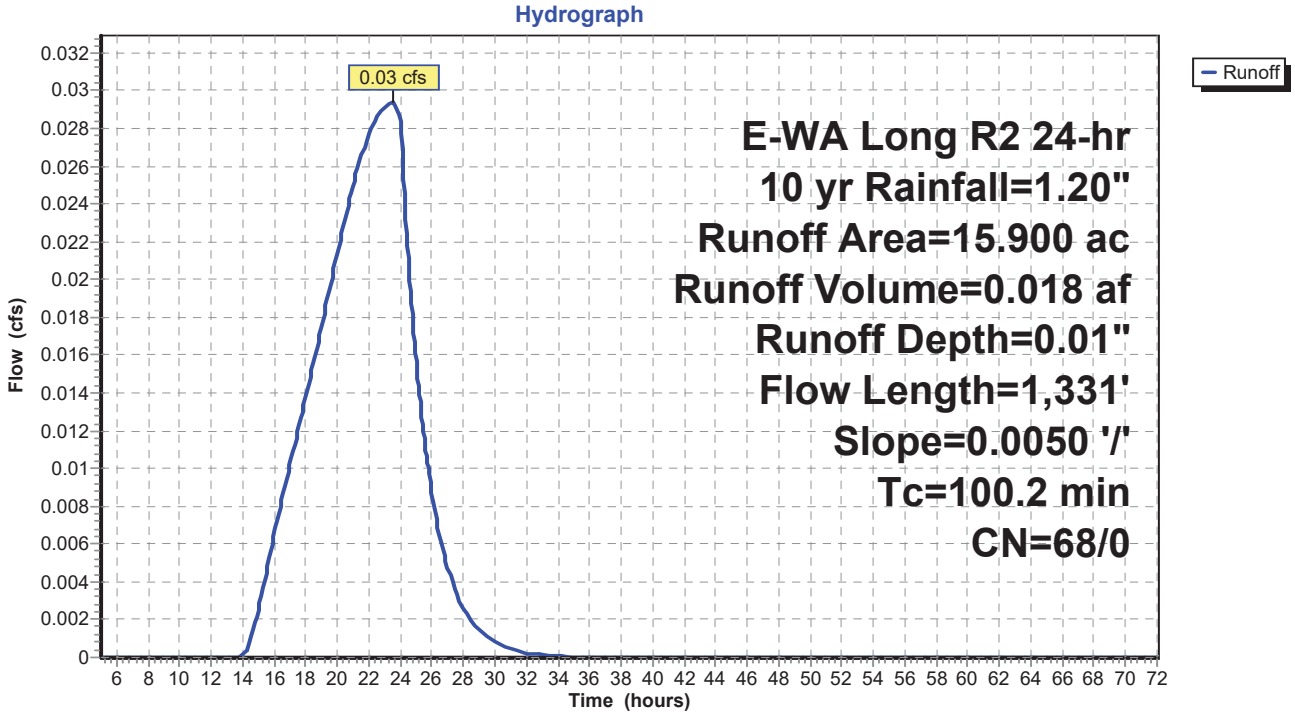
Runoff = 0.03 cfs @ 23.53 hrs, Volume= 0.018 af, Depth= 0.01"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 10 yr Rainfall=1.20"

	Area (ac)	CN	Description
*	3.300	30	HSG A Meadow
*	0.200	71	HSG C Meadow
*	12.400	78	HSG D Meadow
	15.900	68	Weighted Average
	15.900	68	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
65.5	300	0.0050	0.08		**Sheet Flow,** Range n= 0.130 P2= 1.00"
34.7	1,031	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
100.2	1,331	Total			

Subcatchment 1S: Existing Basin 1



Summary for Subcatchment 1S: Existing Basin 1

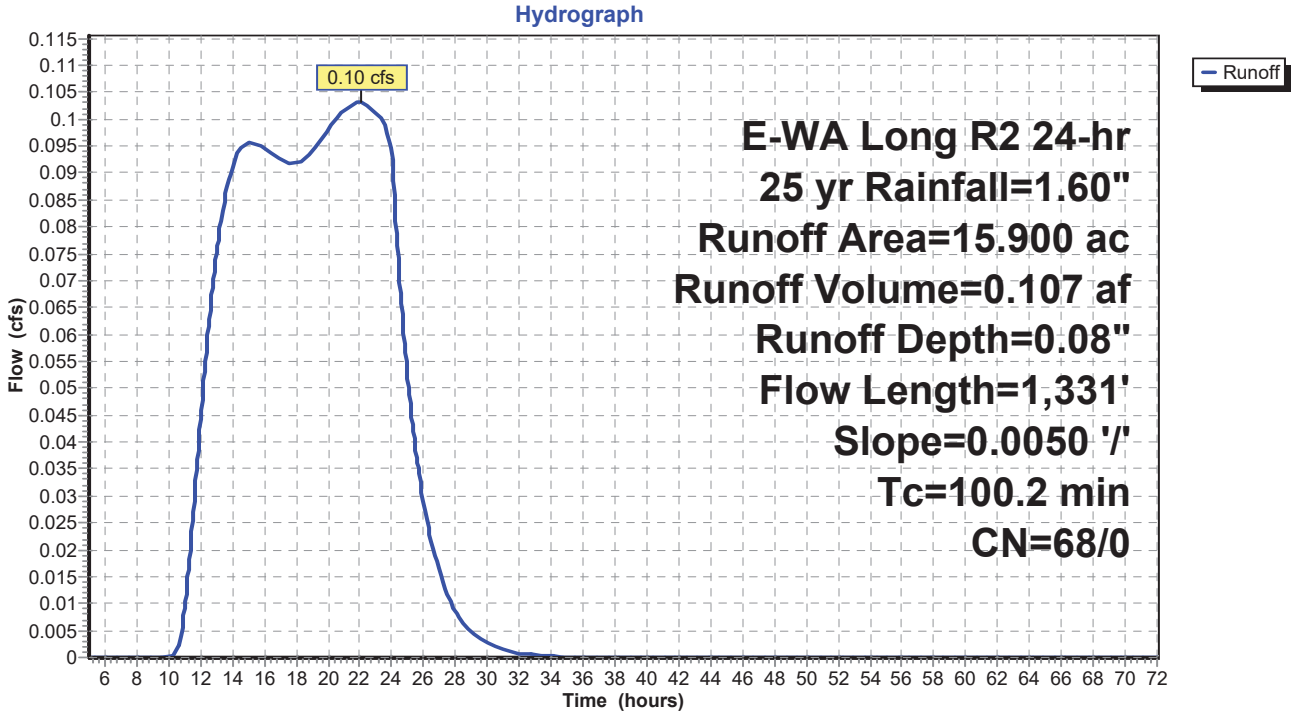
Runoff = 0.10 cfs @ 22.01 hrs, Volume= 0.107 af, Depth= 0.08"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 25 yr Rainfall=1.60"

	Area (ac)	CN	Description
*	3.300	30	HSG A Meadow
*	0.200	71	HSG C Meadow
*	12.400	78	HSG D Meadow
	15.900	68	Weighted Average
	15.900	68	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
65.5	300	0.0050	0.08		**Sheet Flow,** Range n= 0.130 P2= 1.00"
34.7	1,031	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
100.2	1,331	Total			

Subcatchment 1S: Existing Basin 1



Summary for Subcatchment 1S: Existing Basin 1

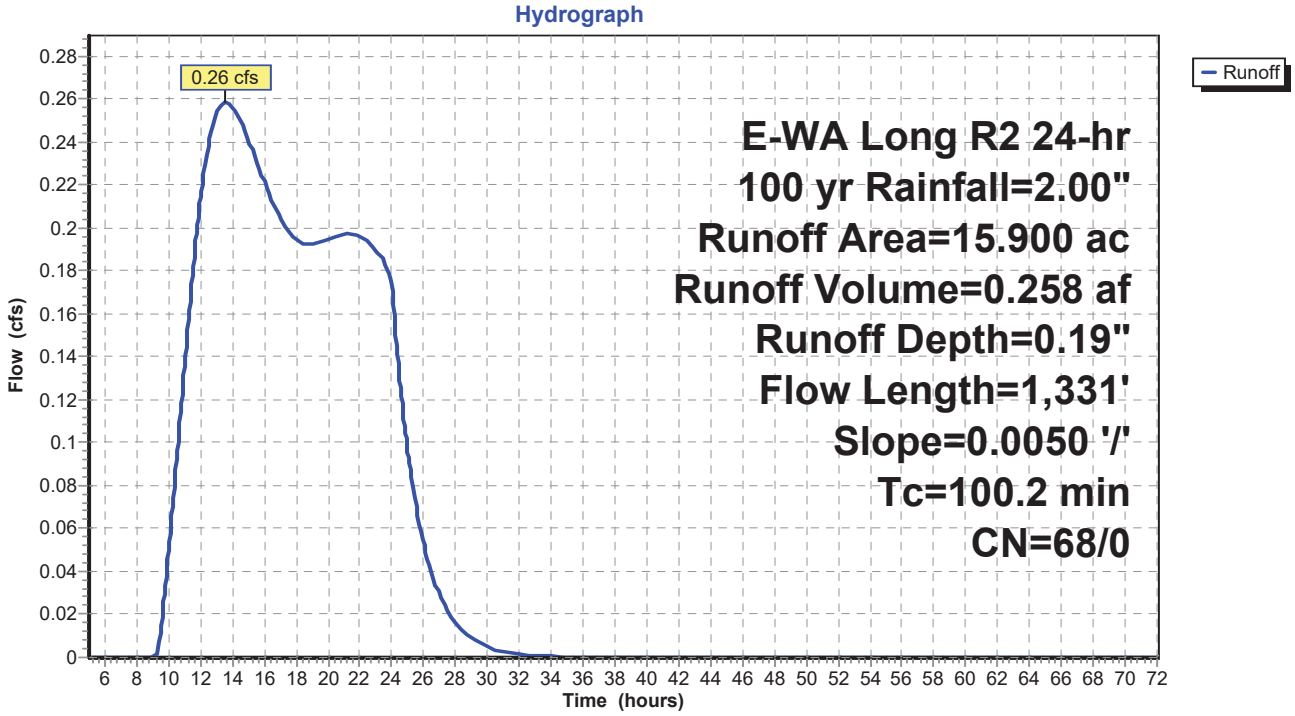
Runoff = 0.26 cfs @ 13.59 hrs, Volume= 0.258 af, Depth= 0.19"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 100 yr Rainfall=2.00"

	Area (ac)	CN	Description
*	3.300	30	HSG A Meadow
*	0.200	71	HSG C Meadow
*	12.400	78	HSG D Meadow
	15.900	68	Weighted Average
	15.900	68	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
65.5	300	0.0050	0.08		**Sheet Flow,** Range n= 0.130 P2= 1.00"
34.7	1,031	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
100.2	1,331	Total			

Subcatchment 1S: Existing Basin 1



Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
12.300	30	HSG A Meadow (2S)
0.100	71	HSG C Meadow (2S)
16.700	78	HSG D Meadow (2S)
1.500	98	Water (2S)
30.600	**60**	**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
12.300	0.000	0.100	16.700	0.000	29.100		2S
0.000	0.000	0.000	0.000	1.500	1.500	Water	2S
12.300	**0.000**	**0.100**	**16.700**	**1.500**	**30.600**	**TOTAL AREA**	

Summary for Subcatchment 2S: Existing Basin 2

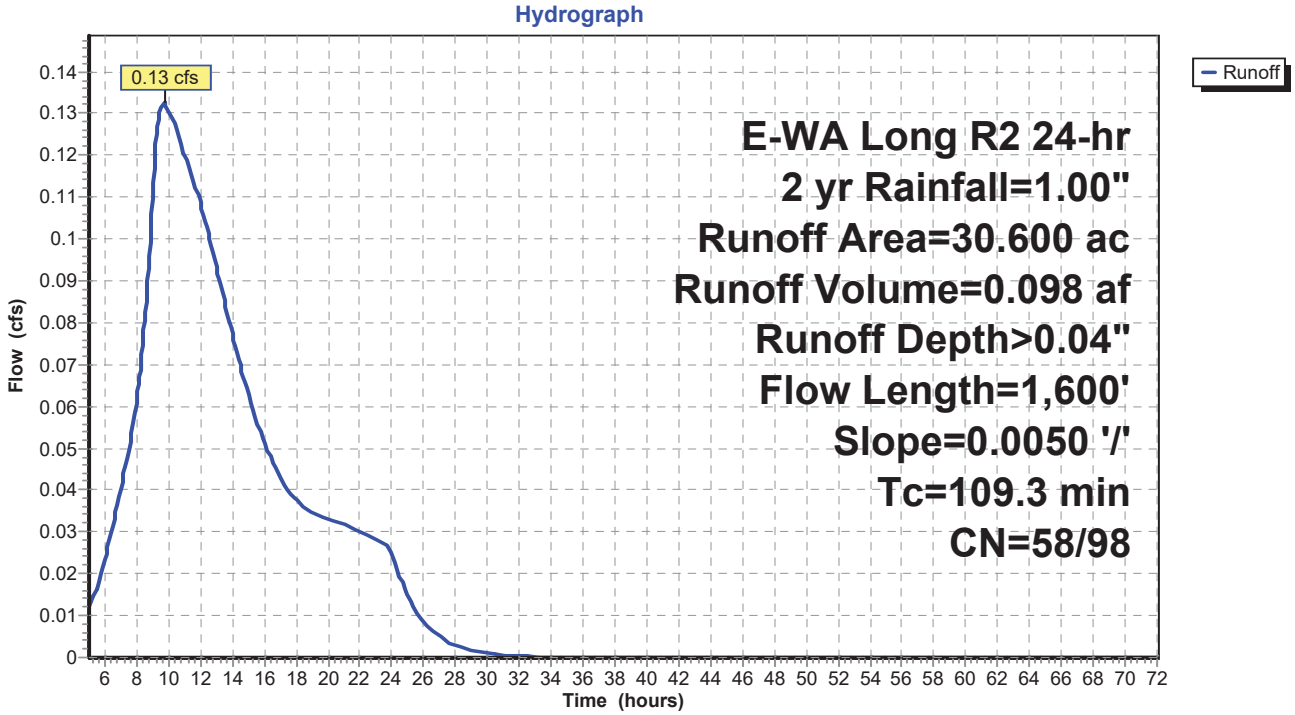
Runoff = 0.13 cfs @ 9.72 hrs, Volume= 0.098 af, Depth> 0.04"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 2 yr Rainfall=1.00"

	Area (ac)	CN	Description
*	12.300	30	HSG A Meadow
*	0.100	71	HSG C Meadow
*	16.700	78	HSG D Meadow
*	1.500	98	Water
	30.600	60	Weighted Average
	29.100	58	95.10% Pervious Area
	1.500	98	4.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
65.5	300	0.0050	0.08		**Sheet Flow,** Range n= 0.130 P2= 1.00"
43.8	1,300	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
109.3	1,600	Total			

Subcatchment 2S: Existing Basin 2



Summary for Subcatchment 2S: Existing Basin 2

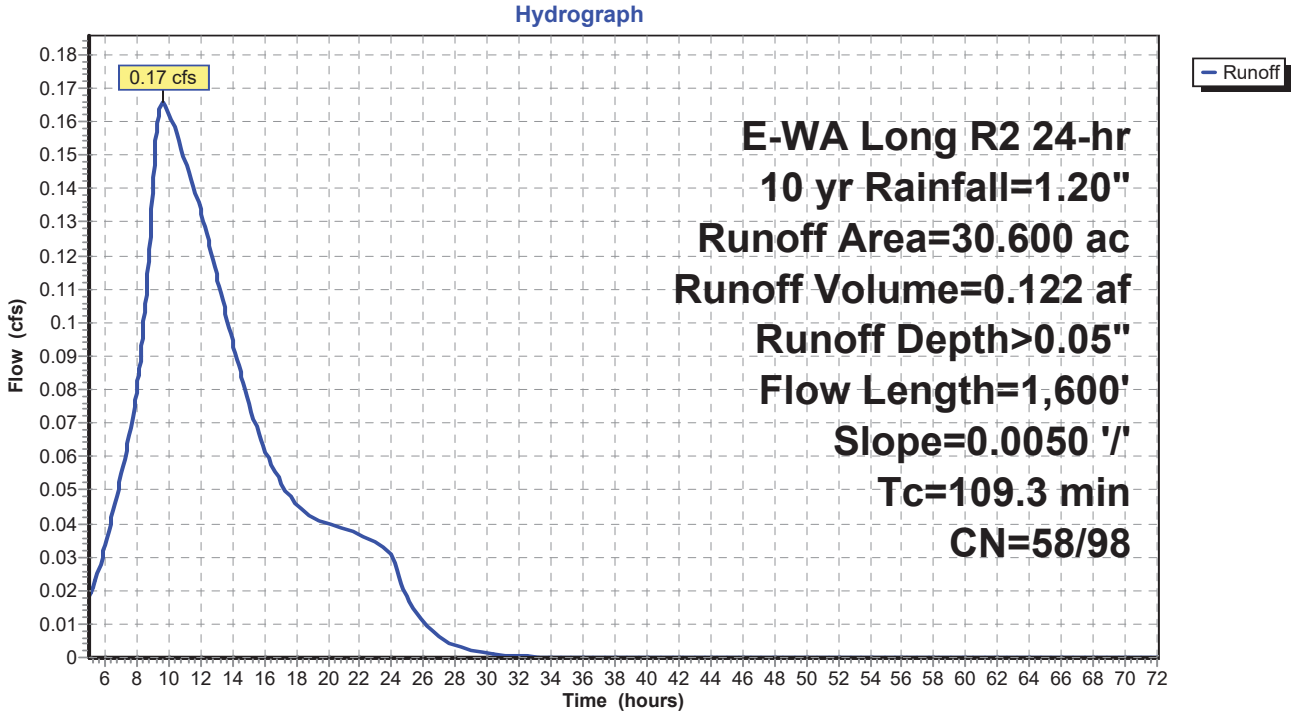
Runoff = 0.17 cfs @ 9.69 hrs, Volume= 0.122 af, Depth> 0.05"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 10 yr Rainfall=1.20"

	Area (ac)	CN	Description
*	12.300	30	HSG A Meadow
*	0.100	71	HSG C Meadow
*	16.700	78	HSG D Meadow
*	1.500	98	Water
	30.600	60	Weighted Average
	29.100	58	95.10% Pervious Area
	1.500	98	4.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
65.5	300	0.0050	0.08		**Sheet Flow,** Range n= 0.130 P2= 1.00"
43.8	1,300	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
109.3	1,600	Total			

Subcatchment 2S: Existing Basin 2



Summary for Subcatchment 2S: Existing Basin 2

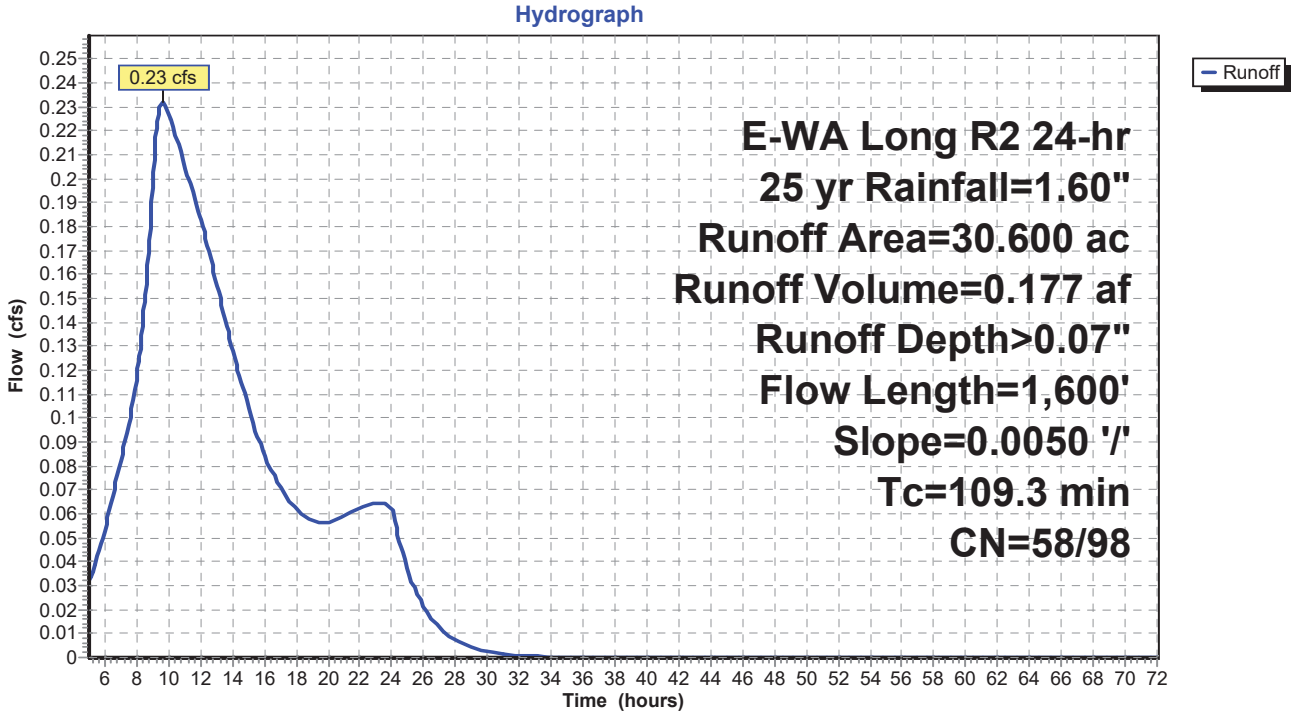
Runoff = 0.23 cfs @ 9.64 hrs, Volume= 0.177 af, Depth> 0.07"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 25 yr Rainfall=1.60"

	Area (ac)	CN	Description
*	12.300	30	HSG A Meadow
*	0.100	71	HSG C Meadow
*	16.700	78	HSG D Meadow
*	1.500	98	Water
	30.600	60	Weighted Average
	29.100	58	95.10% Pervious Area
	1.500	98	4.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
65.5	300	0.0050	0.08		**Sheet Flow,** Range n= 0.130 P2= 1.00"
43.8	1,300	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
109.3	1,600	Total			

Subcatchment 2S: Existing Basin 2



Summary for Subcatchment 2S: Existing Basin 2

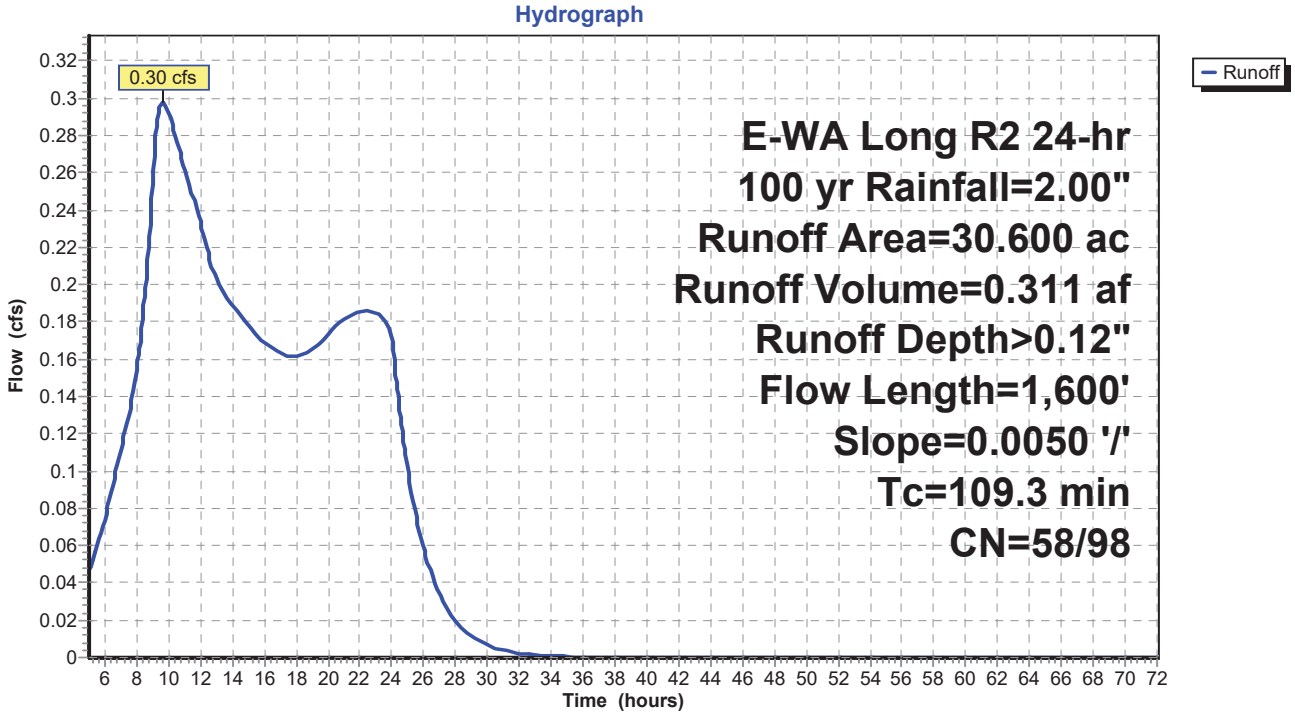
Runoff = 0.30 cfs @ 9.62 hrs, Volume= 0.311 af, Depth> 0.12"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 100 yr Rainfall=2.00"

	Area (ac)	CN	Description
*	12.300	30	HSG A Meadow
*	0.100	71	HSG C Meadow
*	16.700	78	HSG D Meadow
*	1.500	98	Water
	30.600	60	Weighted Average
	29.100	58	95.10% Pervious Area
	1.500	98	4.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
65.5	300	0.0050	0.08		**Sheet Flow,** Range n= 0.130 P2= 1.00"
43.8	1,300	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
109.3	1,600	Total			

Subcatchment 2S: Existing Basin 2



Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
3.300	30	Meadow HSG A (5S)
1.700	71	Meadow HSG C (5S)
4.700	78	Meadow HSG D (5S)
9.700	**60**	**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
3.300	0.000	1.700	4.700	0.000	9.700	Meadow	5S
3.300	**0.000**	**1.700**	**4.700**	**0.000**	**9.700**	**TOTAL AREA**	

Summary for Subcatchment 5S: Existing Basin 3

[45] Hint: Runoff=Zero

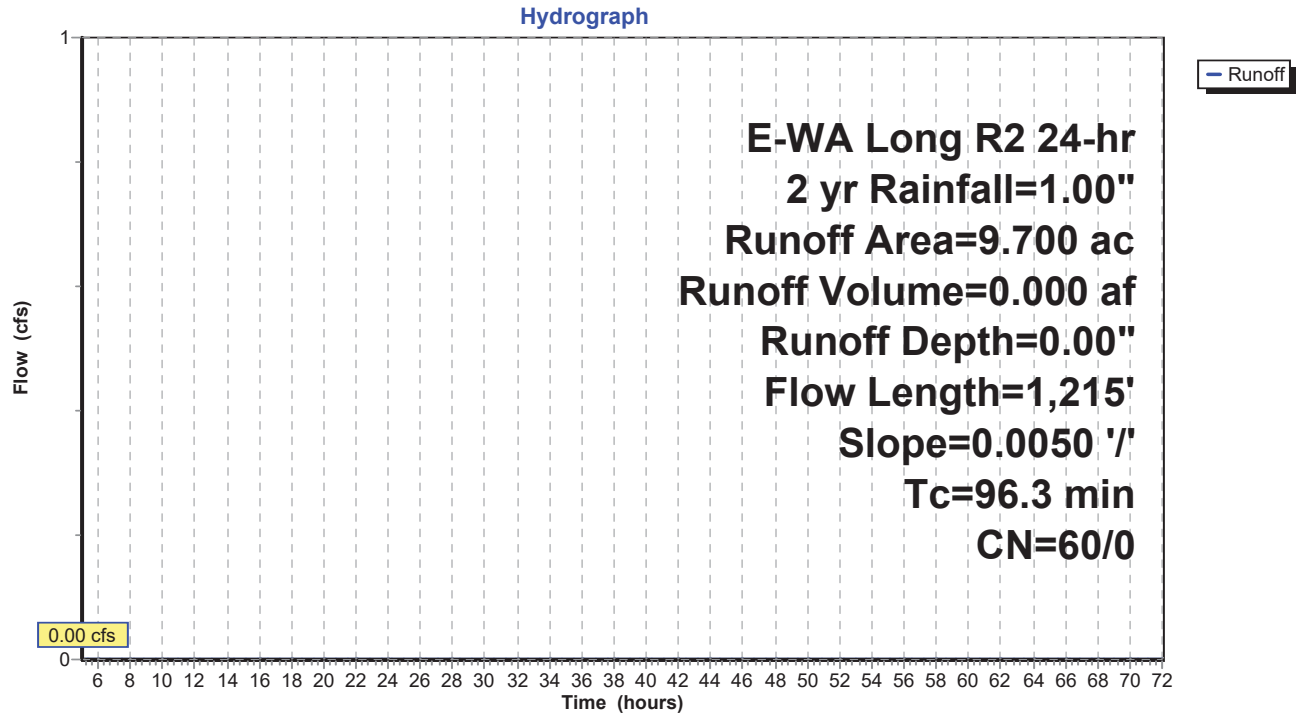
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 2 yr Rainfall=1.00"

	Area (ac)	CN	Description
*	3.300	30	Meadow HSG A
*	1.700	71	Meadow HSG C
*	4.700	78	Meadow HSG D
	9.700	60	Weighted Average
	9.700	60	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
65.5	300	0.0050	0.08		**Sheet Flow,** Range n= 0.130 P2= 1.00"
30.8	915	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
96.3	1,215	Total			

Subcatchment 5S: Existing Basin 3



Summary for Subcatchment 5S: Existing Basin 3

[45] Hint: Runoff=Zero

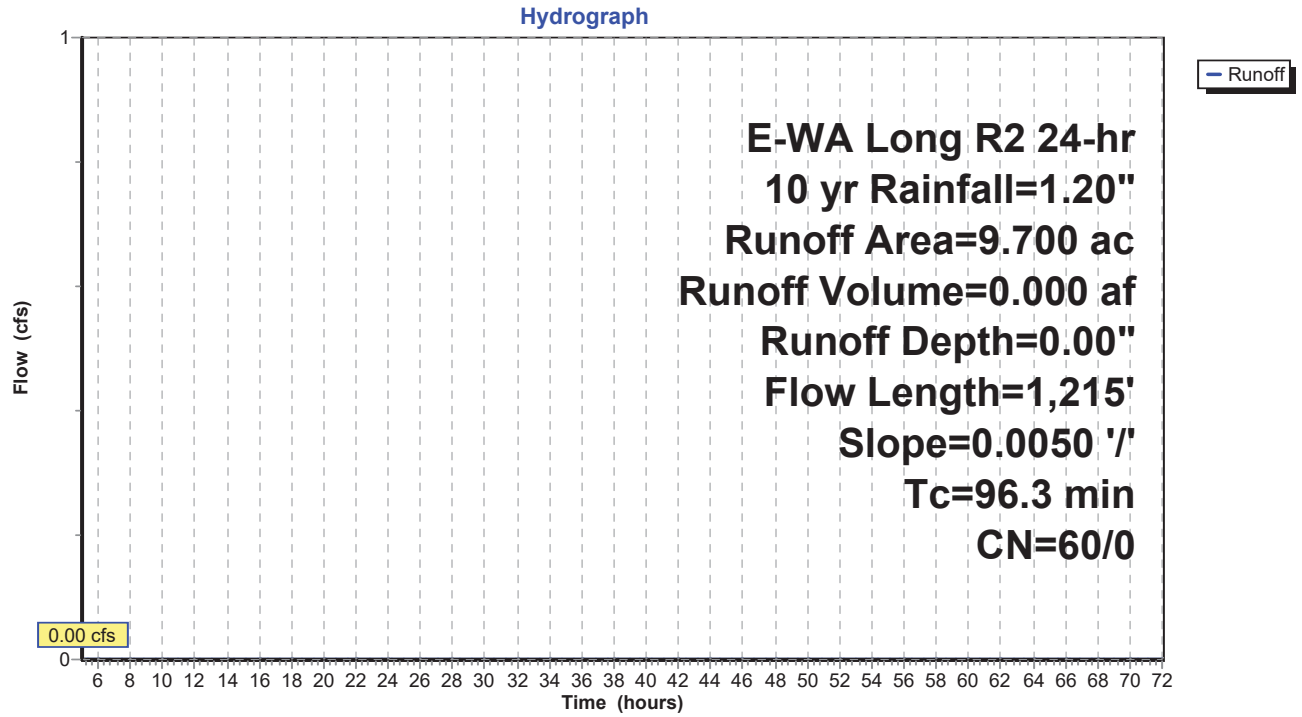
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 10 yr Rainfall=1.20"

	Area (ac)	CN	Description
*	3.300	30	Meadow HSG A
*	1.700	71	Meadow HSG C
*	4.700	78	Meadow HSG D
	9.700	60	Weighted Average
	9.700	60	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
65.5	300	0.0050	0.08		**Sheet Flow,** Range n= 0.130 P2= 1.00"
30.8	915	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
96.3	1,215	Total			

Subcatchment 5S: Existing Basin 3



Summary for Subcatchment 5S: Existing Basin 3

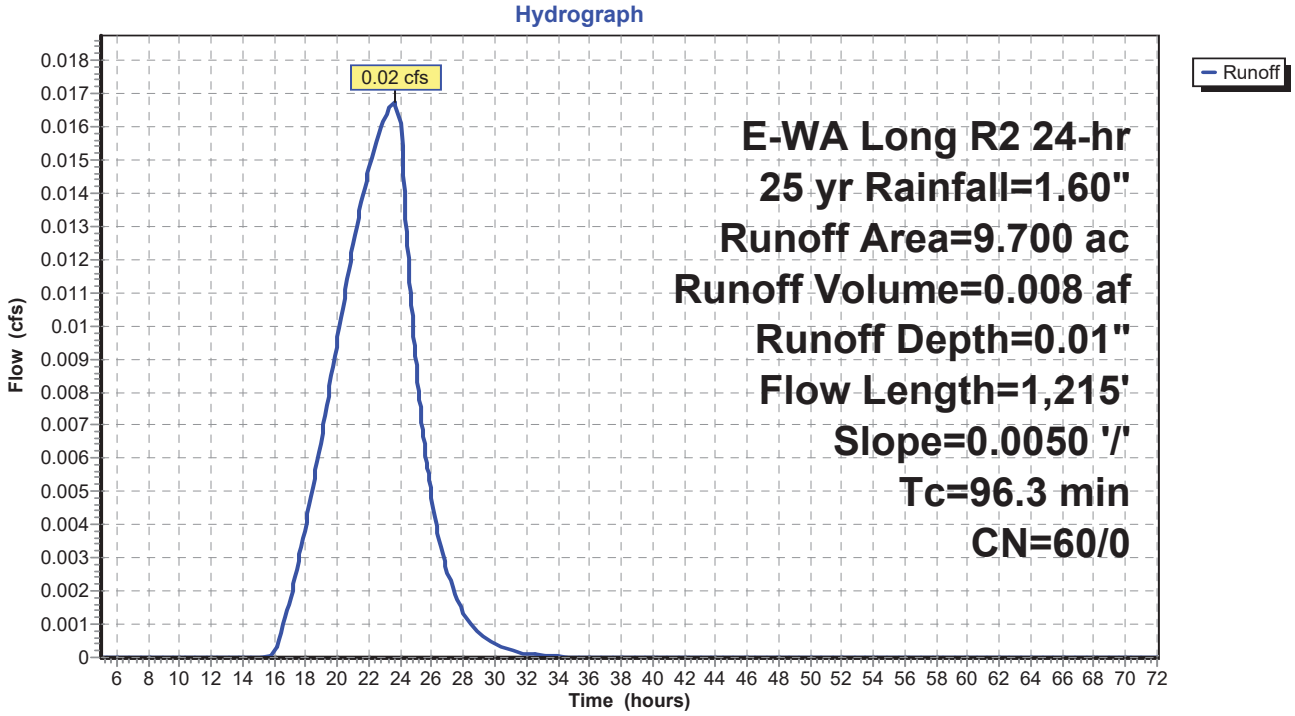
Runoff = 0.02 cfs @ 23.62 hrs, Volume= 0.008 af, Depth= 0.01"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 25 yr Rainfall=1.60"

	Area (ac)	CN	Description
*	3.300	30	Meadow HSG A
*	1.700	71	Meadow HSG C
*	4.700	78	Meadow HSG D
	9.700	60	Weighted Average
	9.700	60	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
65.5	300	0.0050	0.08		**Sheet Flow,** Range n= 0.130 P2= 1.00"
30.8	915	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
96.3	1,215	Total			

Subcatchment 5S: Existing Basin 3



Summary for Subcatchment 5S: Existing Basin 3

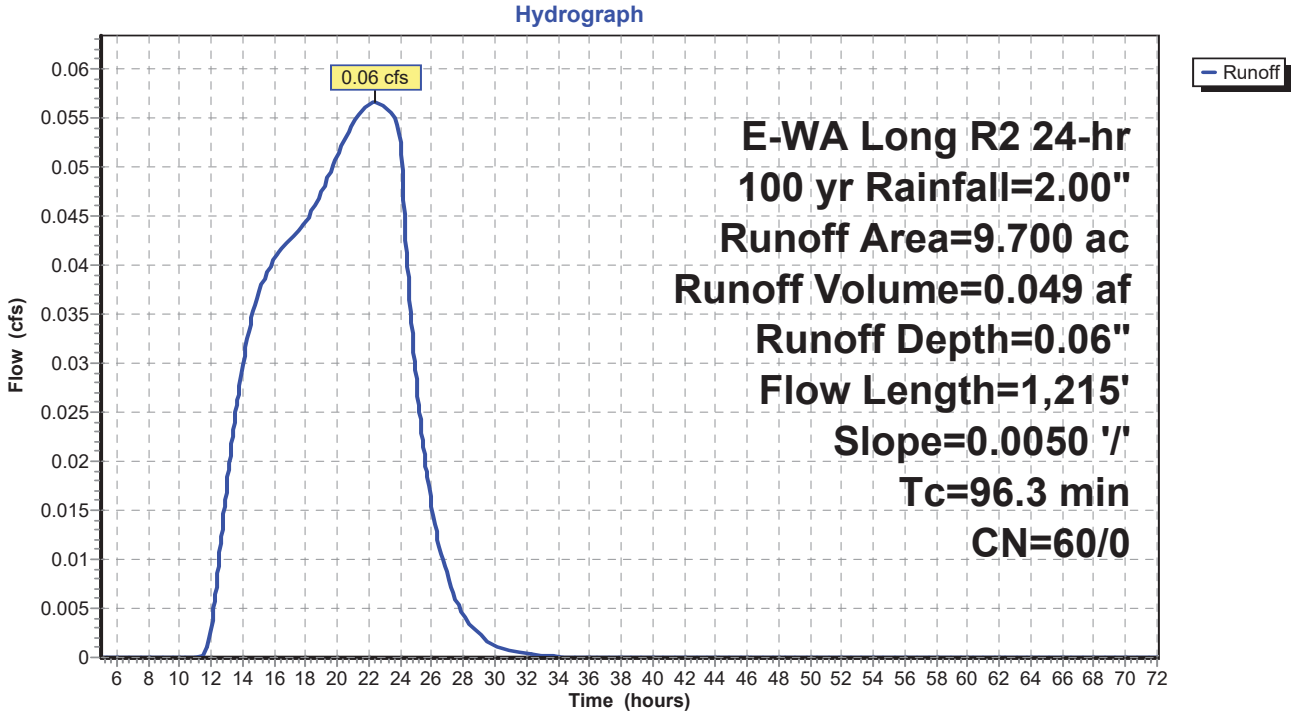
Runoff = 0.06 cfs @ 22.34 hrs, Volume= 0.049 af, Depth= 0.06"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 100 yr Rainfall=2.00"

	Area (ac)	CN	Description
*	3.300	30	Meadow HSG A
*	1.700	71	Meadow HSG C
*	4.700	78	Meadow HSG D
	9.700	60	Weighted Average
	9.700	60	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
65.5	300	0.0050	0.08		**Sheet Flow,** Range n= 0.130 P2= 1.00"
30.8	915	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
96.3	1,215	Total			

Subcatchment 5S: Existing Basin 3



Appendix E:

HydroCAD REPORT: PROPOSED BASINS

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
3.180	30	HSG A Meadow (7S)
0.200	71	HSG C Meadow (7S)
12.030	78	HSG D Meadow (7S)
0.490	94	Impervious (7S)
15.900	**69**	**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
3.180	0.000	0.200	12.030	0.000	15.410		7S
0.000	0.000	0.000	0.000	0.490	0.490	Impervious	7S
3.180	**0.000**	**0.200**	**12.030**	**0.490**	**15.900**	**TOTAL AREA**	

Summary for Subcatchment 7S: Proposed Basin 1

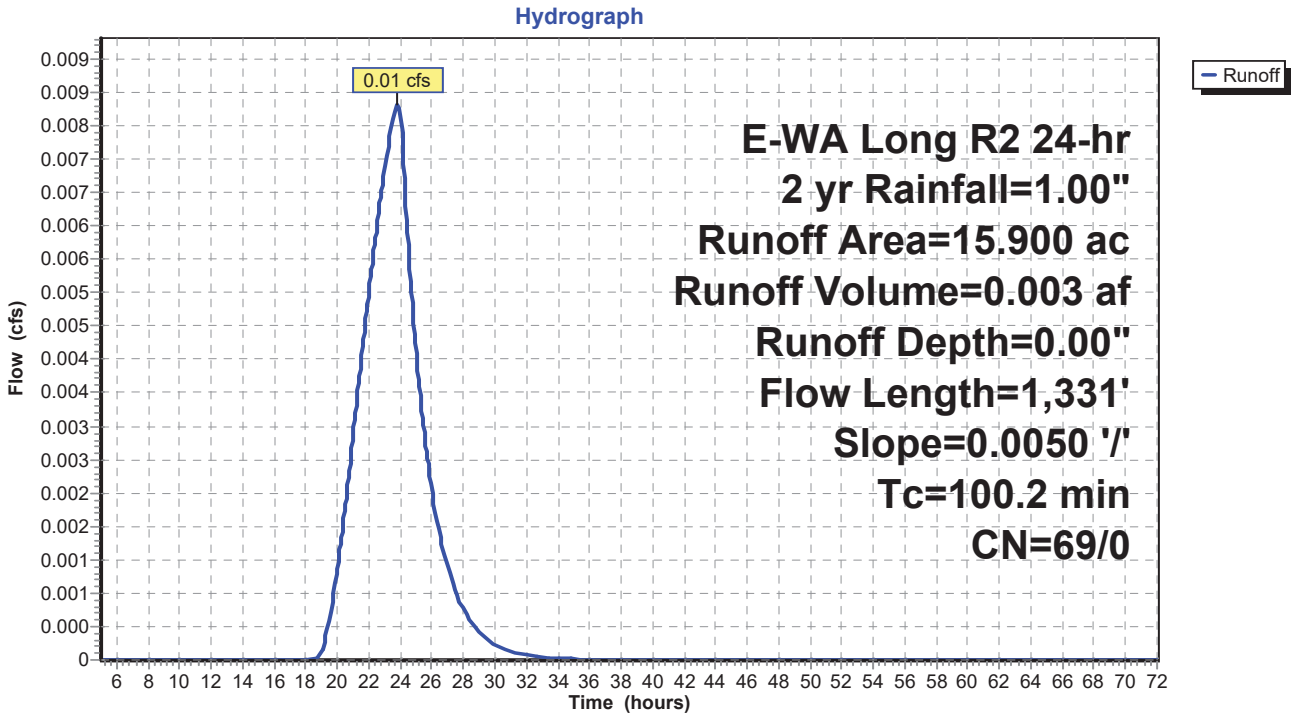
Runoff = 0.01 cfs @ 23.84 hrs, Volume= 0.003 af, Depth= 0.00"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 2 yr Rainfall=1.00"

	Area (ac)	CN	Description
*	3.180	30	HSG A Meadow
*	0.200	71	HSG C Meadow
*	12.030	78	HSG D Meadow
*	0.490	94	Impervious
	15.900	69	Weighted Average
	15.900	69	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
65.5	300	0.0050	0.08		**Sheet Flow,** Range n= 0.130 P2= 1.00"
34.7	1,031	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
100.2	1,331	Total			

Subcatchment 7S: Proposed Basin 1



Summary for Subcatchment 7S: Proposed Basin 1

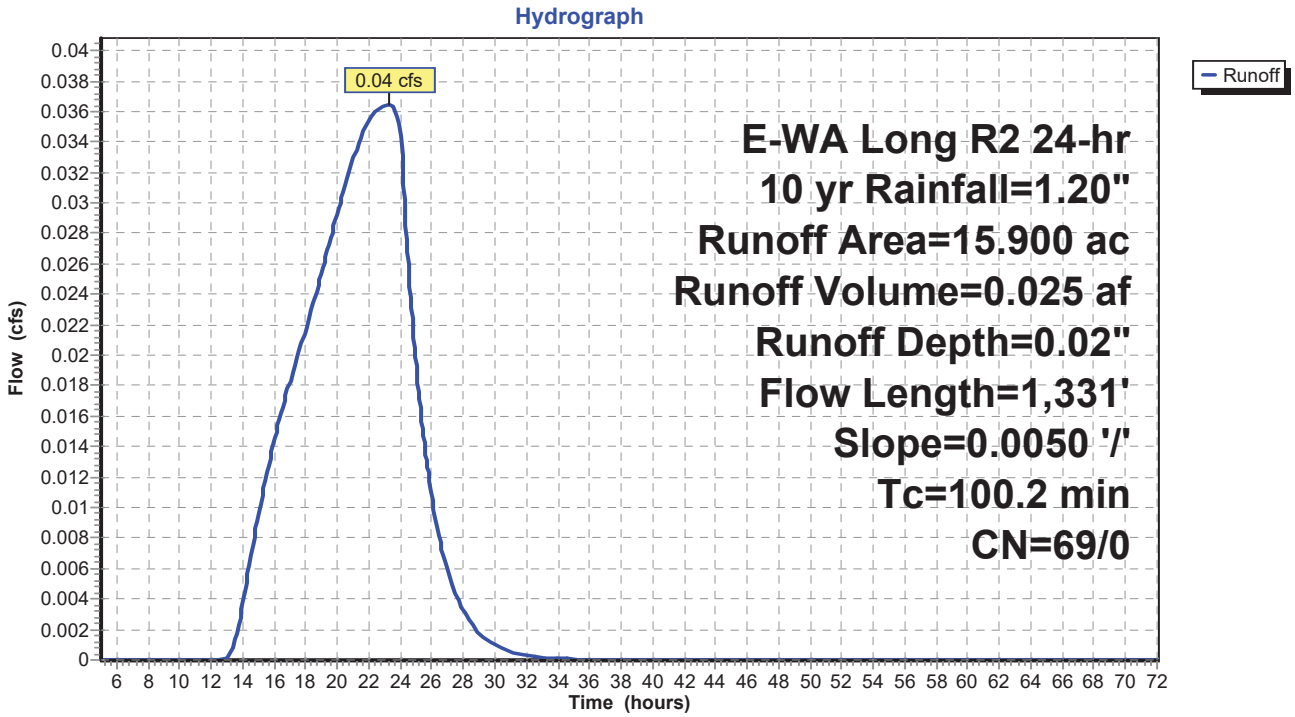
Runoff = 0.04 cfs @ 23.25 hrs, Volume= 0.025 af, Depth= 0.02"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 10 yr Rainfall=1.20"

	Area (ac)	CN	Description
*	3.180	30	HSG A Meadow
*	0.200	71	HSG C Meadow
*	12.030	78	HSG D Meadow
*	0.490	94	Impervious
	15.900	69	Weighted Average
	15.900	69	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
65.5	300	0.0050	0.08		**Sheet Flow,** Range n= 0.130 P2= 1.00"
34.7	1,031	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
100.2	1,331	Total			

Subcatchment 7S: Proposed Basin 1



Summary for Subcatchment 7S: Proposed Basin 1

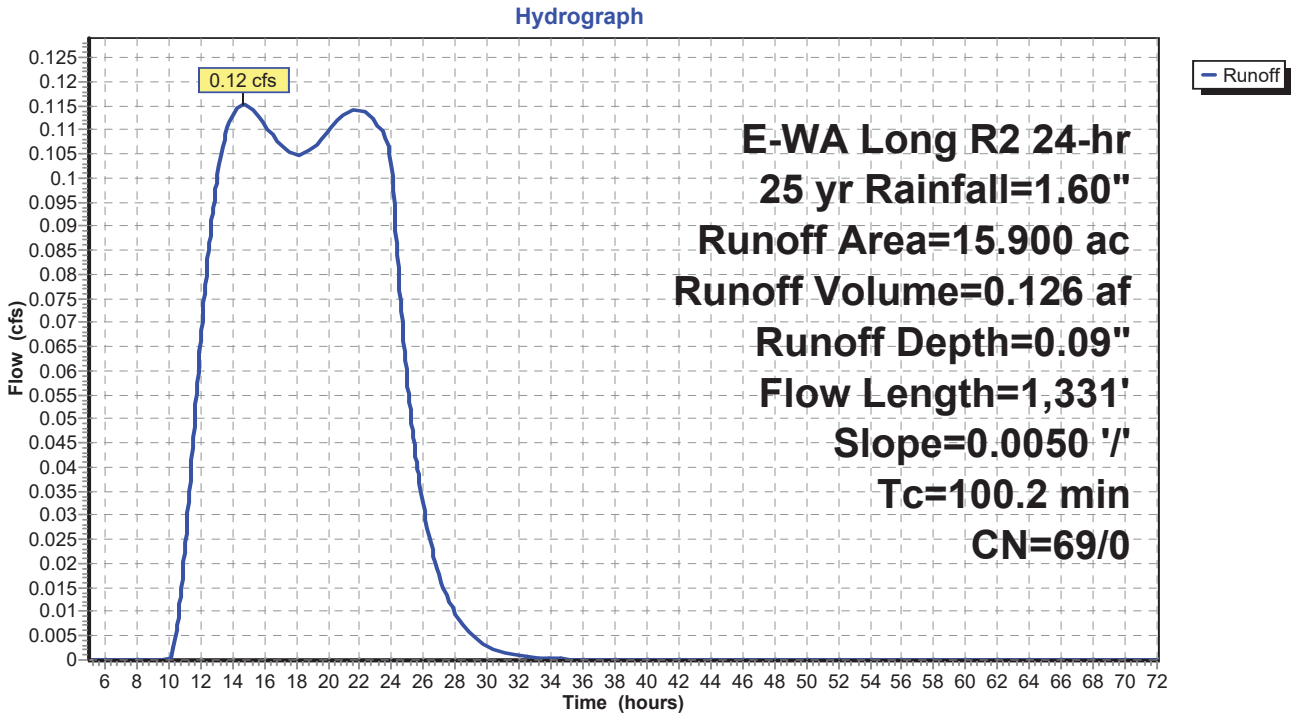
Runoff = 0.12 cfs @ 14.64 hrs, Volume= 0.126 af, Depth= 0.09"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 25 yr Rainfall=1.60"

	Area (ac)	CN	Description
*	3.180	30	HSG A Meadow
*	0.200	71	HSG C Meadow
*	12.030	78	HSG D Meadow
*	0.490	94	Impervious
	15.900	69	Weighted Average
	15.900	69	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
65.5	300	0.0050	0.08		**Sheet Flow,** Range n= 0.130 P2= 1.00"
34.7	1,031	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
100.2	1,331	Total			

Subcatchment 7S: Proposed Basin 1



Summary for Subcatchment 7S: Proposed Basin 1

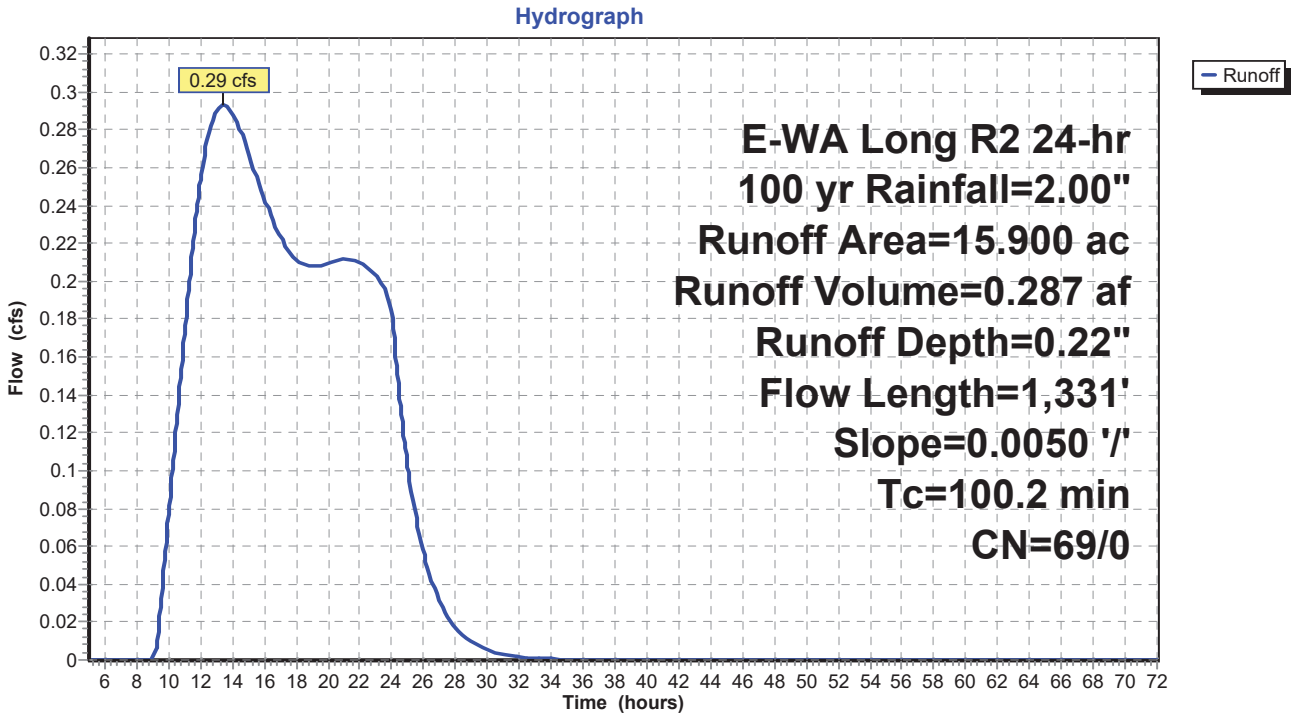
Runoff = 0.29 cfs @ 13.41 hrs, Volume= 0.287 af, Depth= 0.22"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 100 yr Rainfall=2.00"

	Area (ac)	CN	Description
*	3.180	30	HSG A Meadow
*	0.200	71	HSG C Meadow
*	12.030	78	HSG D Meadow
*	0.490	94	Impervious
	15.900	69	Weighted Average
	15.900	69	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
65.5	300	0.0050	0.08		**Sheet Flow,** Range n= 0.130 P2= 1.00"
34.7	1,031	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
100.2	1,331	Total			

Subcatchment 7S: Proposed Basin 1



Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
12.060	30	HSG A Meadow (8S)
0.100	71	HSG C Meadow (8S)
16.460	78	HSG D Meadow (8S)
0.480	95	Impervious (8S)
1.500	98	Water (8S)
30.600	**60**	**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
12.060	0.000	0.100	16.460	0.000	28.620		8S
0.000	0.000	0.000	0.000	0.480	0.480	Impervious	8S
0.000	0.000	0.000	0.000	1.500	1.500	Water	8S
12.060	**0.000**	**0.100**	**16.460**	**1.980**	**30.600**	**TOTAL AREA**	

Summary for Subcatchment 8S: Proposed Basin 2

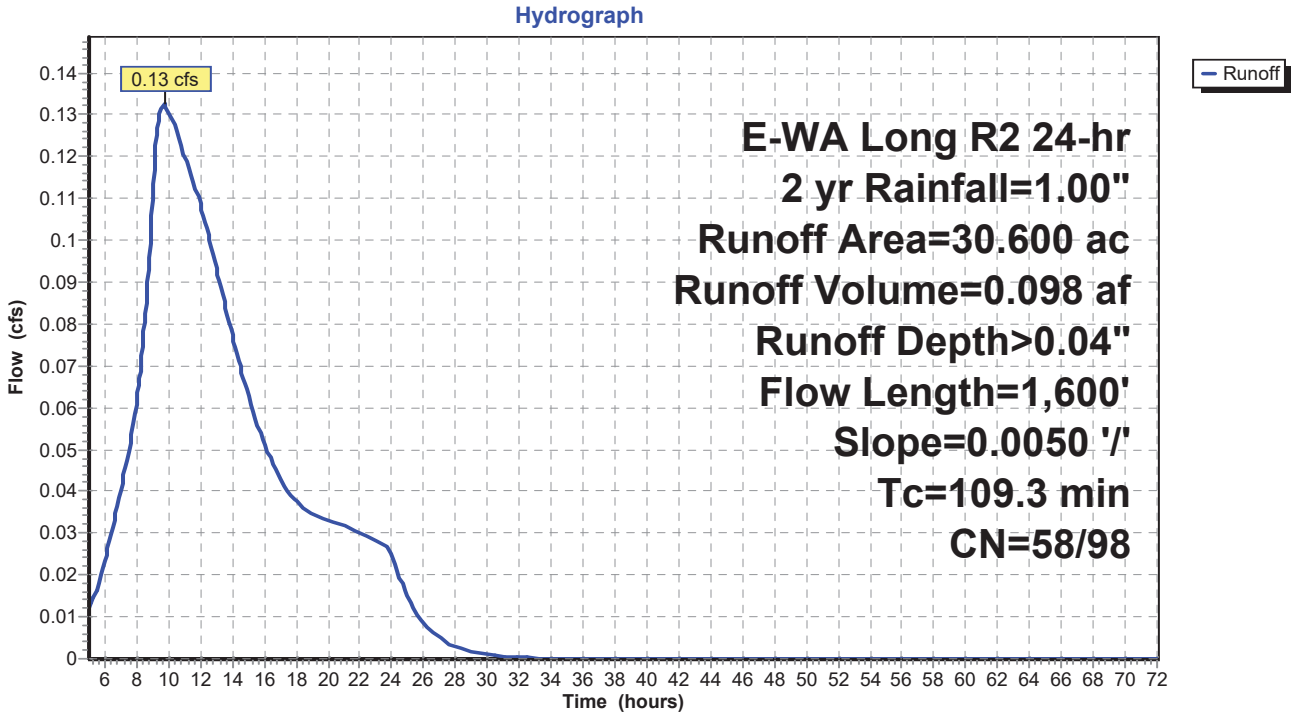
Runoff = 0.13 cfs @ 9.72 hrs, Volume= 0.098 af, Depth> 0.04"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 2 yr Rainfall=1.00"

	Area (ac)	CN	Description
*	12.060	30	HSG A Meadow
*	0.100	71	HSG C Meadow
*	16.460	78	HSG D Meadow
*	1.500	98	Water
*	0.480	95	Impervious
	30.600	60	Weighted Average
	29.100	58	95.10% Pervious Area
	1.500	98	4.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
65.5	300	0.0050	0.08		**Sheet Flow,** Range n= 0.130 P2= 1.00"
43.8	1,300	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
109.3	1,600	Total			

Subcatchment 8S: Proposed Basin 2



Summary for Subcatchment 8S: Proposed Basin 2

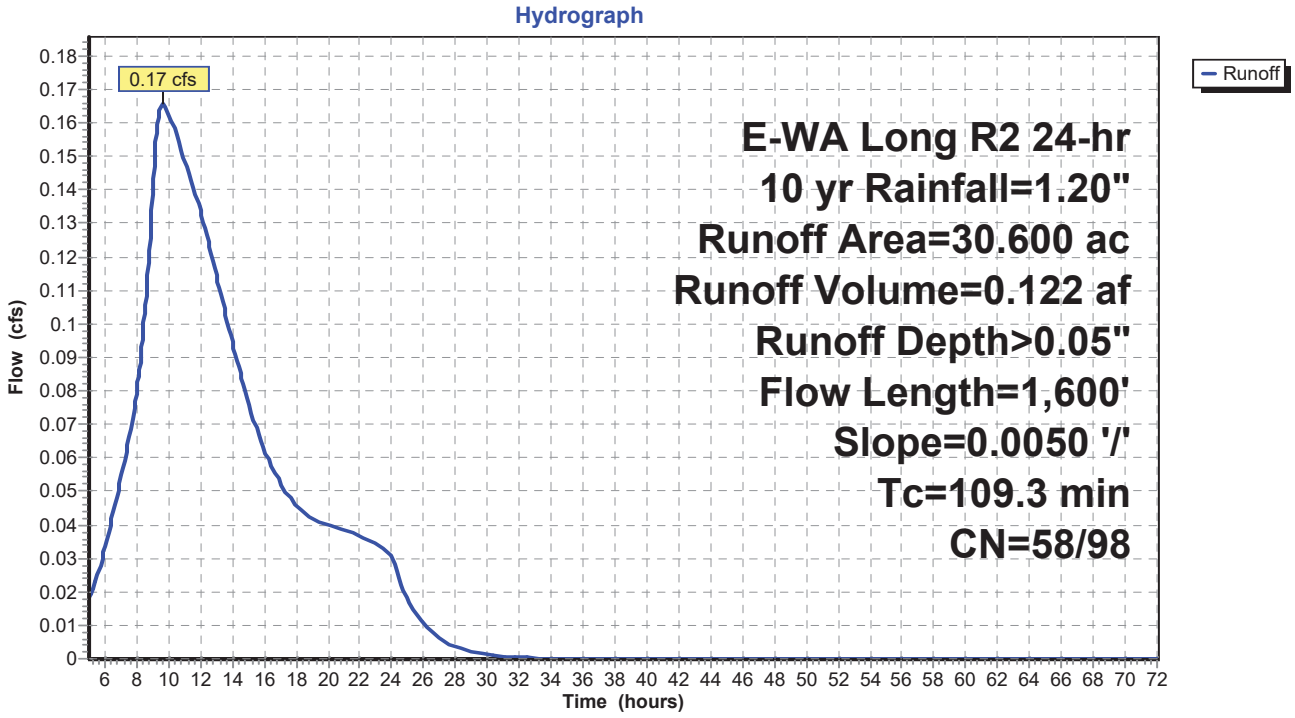
Runoff = 0.17 cfs @ 9.69 hrs, Volume= 0.122 af, Depth> 0.05"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 10 yr Rainfall=1.20"

	Area (ac)	CN	Description
*	12.060	30	HSG A Meadow
*	0.100	71	HSG C Meadow
*	16.460	78	HSG D Meadow
*	1.500	98	Water
*	0.480	95	Impervious
	30.600	60	Weighted Average
	29.100	58	95.10% Pervious Area
	1.500	98	4.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
65.5	300	0.0050	0.08		**Sheet Flow,** Range n= 0.130 P2= 1.00"
43.8	1,300	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
109.3	1,600	Total			

Subcatchment 8S: Proposed Basin 2



Summary for Subcatchment 8S: Proposed Basin 2

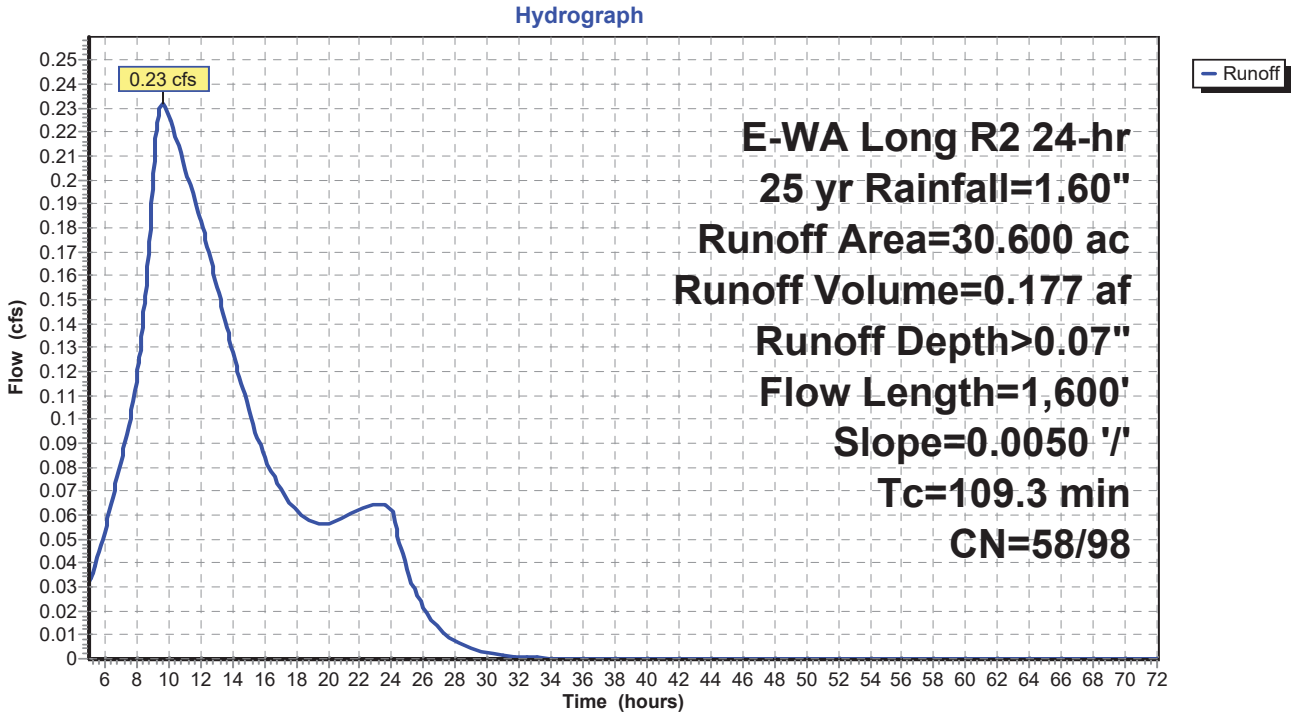
Runoff = 0.23 cfs @ 9.64 hrs, Volume= 0.177 af, Depth> 0.07"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 25 yr Rainfall=1.60"

	Area (ac)	CN	Description
*	12.060	30	HSG A Meadow
*	0.100	71	HSG C Meadow
*	16.460	78	HSG D Meadow
*	1.500	98	Water
*	0.480	95	Impervious
	30.600	60	Weighted Average
	29.100	58	95.10% Pervious Area
	1.500	98	4.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
65.5	300	0.0050	0.08		**Sheet Flow,** Range n= 0.130 P2= 1.00"
43.8	1,300	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
109.3	1,600	Total			

Subcatchment 8S: Proposed Basin 2



Summary for Subcatchment 8S: Proposed Basin 2

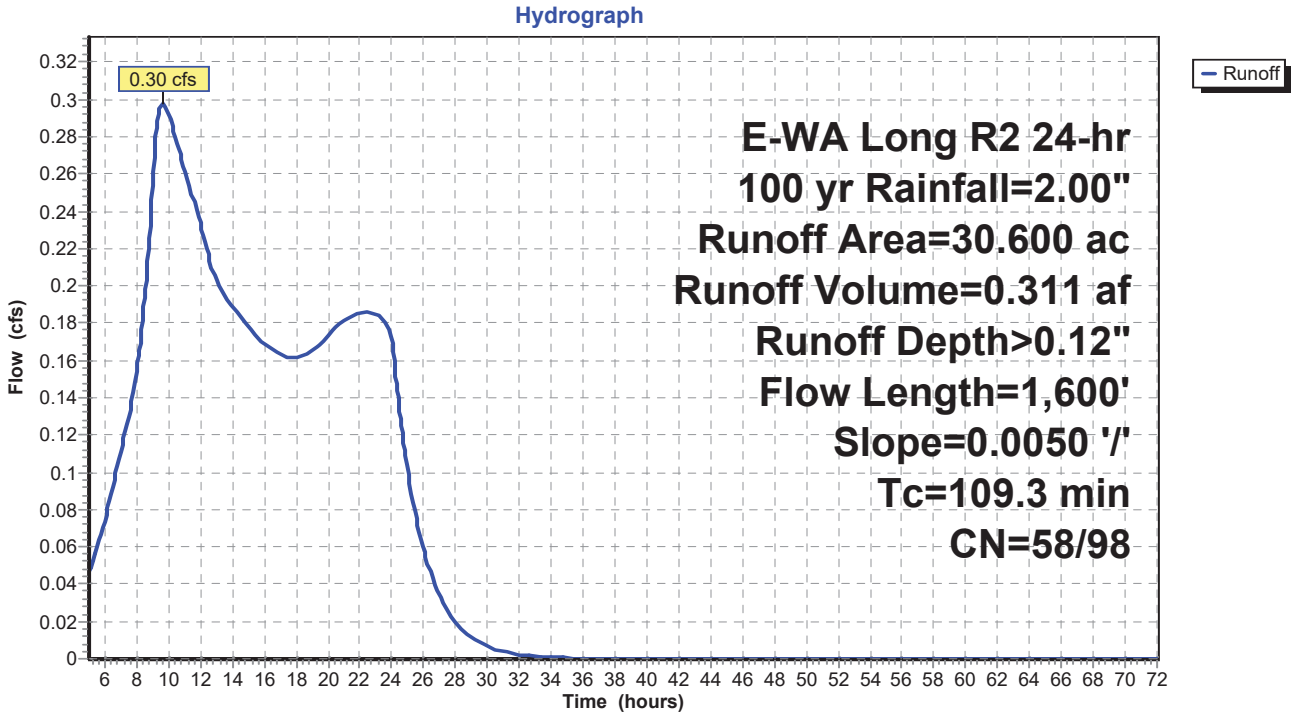
Runoff = 0.30 cfs @ 9.62 hrs, Volume= 0.311 af, Depth> 0.12"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 100 yr Rainfall=2.00"

	Area (ac)	CN	Description
*	12.060	30	HSG A Meadow
*	0.100	71	HSG C Meadow
*	16.460	78	HSG D Meadow
*	1.500	98	Water
*	0.480	95	Impervious
	30.600	60	Weighted Average
	29.100	58	95.10% Pervious Area
	1.500	98	4.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
65.5	300	0.0050	0.08		**Sheet Flow,** Range n= 0.130 P2= 1.00"
43.8	1,300	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
109.3	1,600	Total			

Subcatchment 8S: Proposed Basin 2



Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.430	93	Impervious (9S)
3.085	30	Meadow HSG A (9S)
1.700	71	Meadow HSG C (9S)
4.402	78	Meadow HSG D (9S)
9.617	**62**	**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.000	0.430	0.430	Impervious	9S
3.085	0.000	1.700	4.402	0.000	9.187	Meadow	9S
3.085	**0.000**	**1.700**	**4.402**	**0.430**	**9.617**	**TOTAL AREA**	

Summary for Subcatchment 9S: Proposed Basin 3

[45] Hint: Runoff=Zero

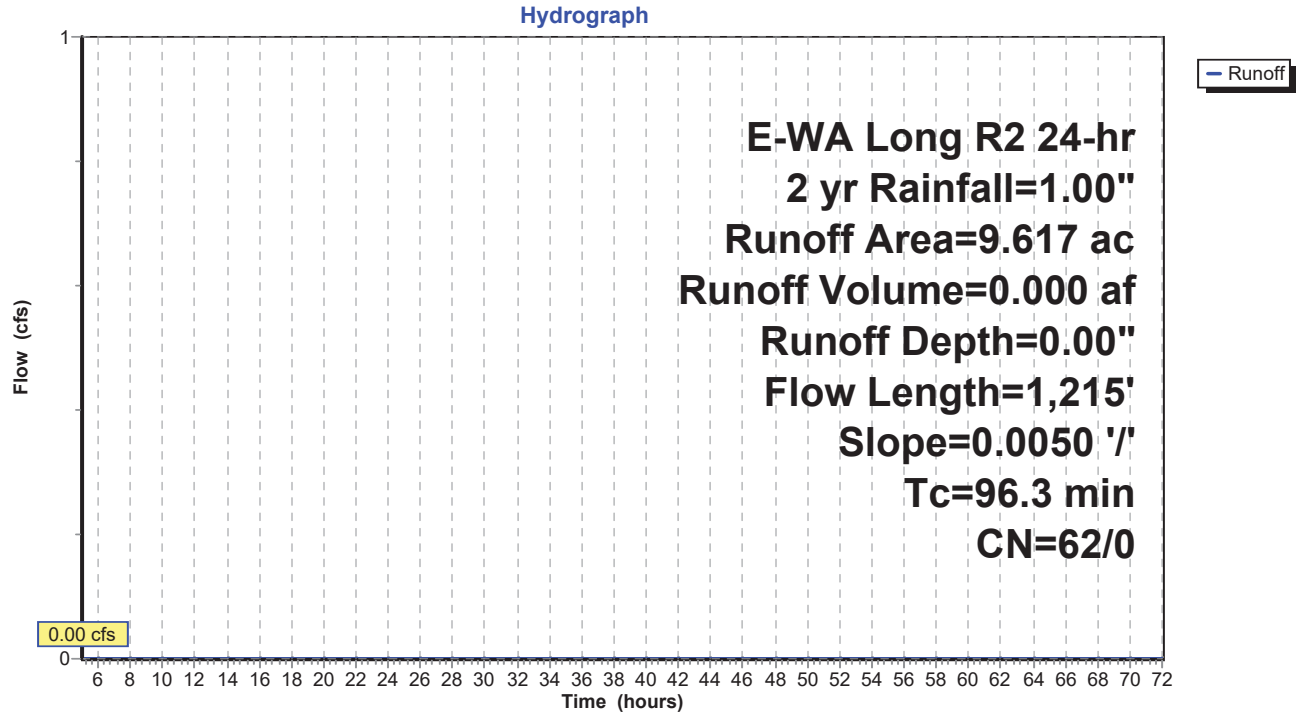
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 2 yr Rainfall=1.00"

	Area (ac)	CN	Description
*	3.085	30	Meadow HSG A
*	1.700	71	Meadow HSG C
*	4.402	78	Meadow HSG D
*	0.430	93	Impervious
	9.617	62	Weighted Average
	9.617	62	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
65.5	300	0.0050	0.08		**Sheet Flow,** Range n= 0.130 P2= 1.00"
30.8	915	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
96.3	1,215	Total			

Subcatchment 9S: Proposed Basin 3



Summary for Subcatchment 9S: Proposed Basin 3

[45] Hint: Runoff=Zero

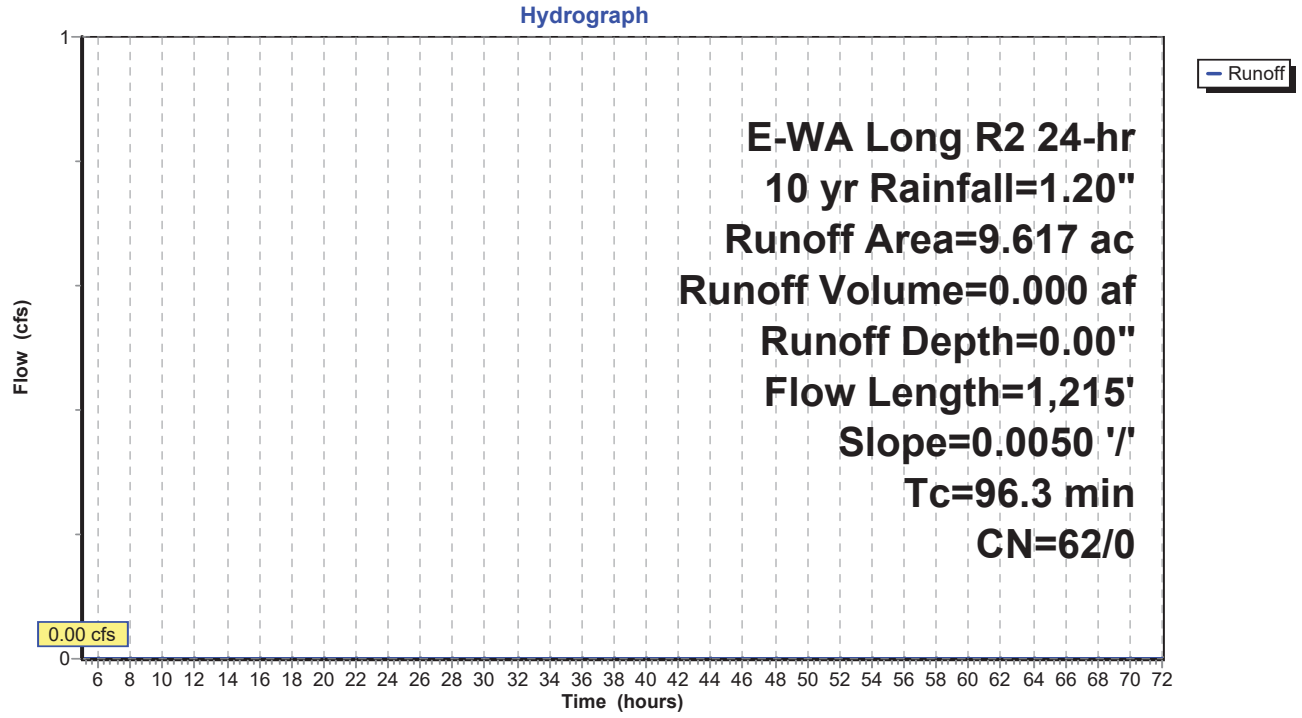
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 10 yr Rainfall=1.20"

	Area (ac)	CN	Description
*	3.085	30	Meadow HSG A
*	1.700	71	Meadow HSG C
*	4.402	78	Meadow HSG D
*	0.430	93	Impervious
	9.617	62	Weighted Average
	9.617	62	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
65.5	300	0.0050	0.08		**Sheet Flow,** Range n= 0.130 P2= 1.00"
30.8	915	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
96.3	1,215	Total			

Subcatchment 9S: Proposed Basin 3



Summary for Subcatchment 9S: Proposed Basin 3

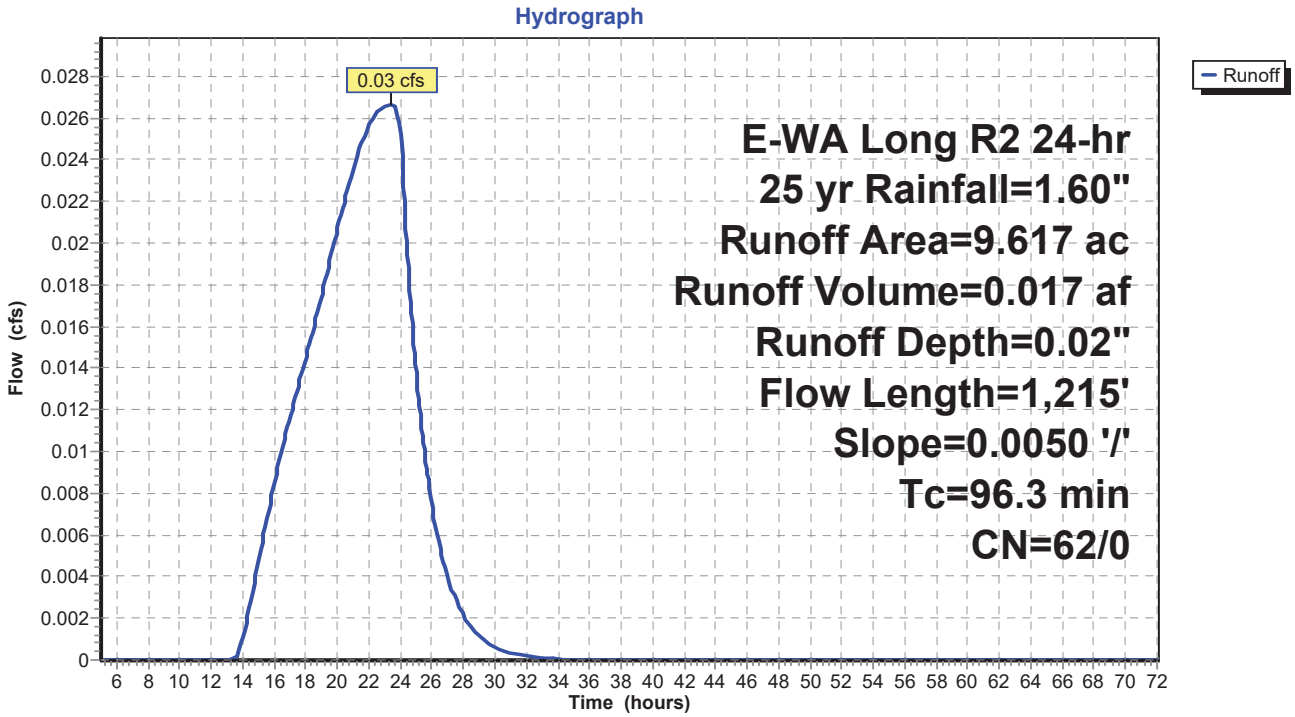
Runoff = 0.03 cfs @ 23.40 hrs, Volume= 0.017 af, Depth= 0.02"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 25 yr Rainfall=1.60"

	Area (ac)	CN	Description
*	3.085	30	Meadow HSG A
*	1.700	71	Meadow HSG C
*	4.402	78	Meadow HSG D
*	0.430	93	Impervious
	9.617	62	Weighted Average
	9.617	62	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
65.5	300	0.0050	0.08		**Sheet Flow,** Range n= 0.130 P2= 1.00"
30.8	915	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
96.3	1,215	Total			

Subcatchment 9S: Proposed Basin 3



Summary for Subcatchment 9S: Proposed Basin 3

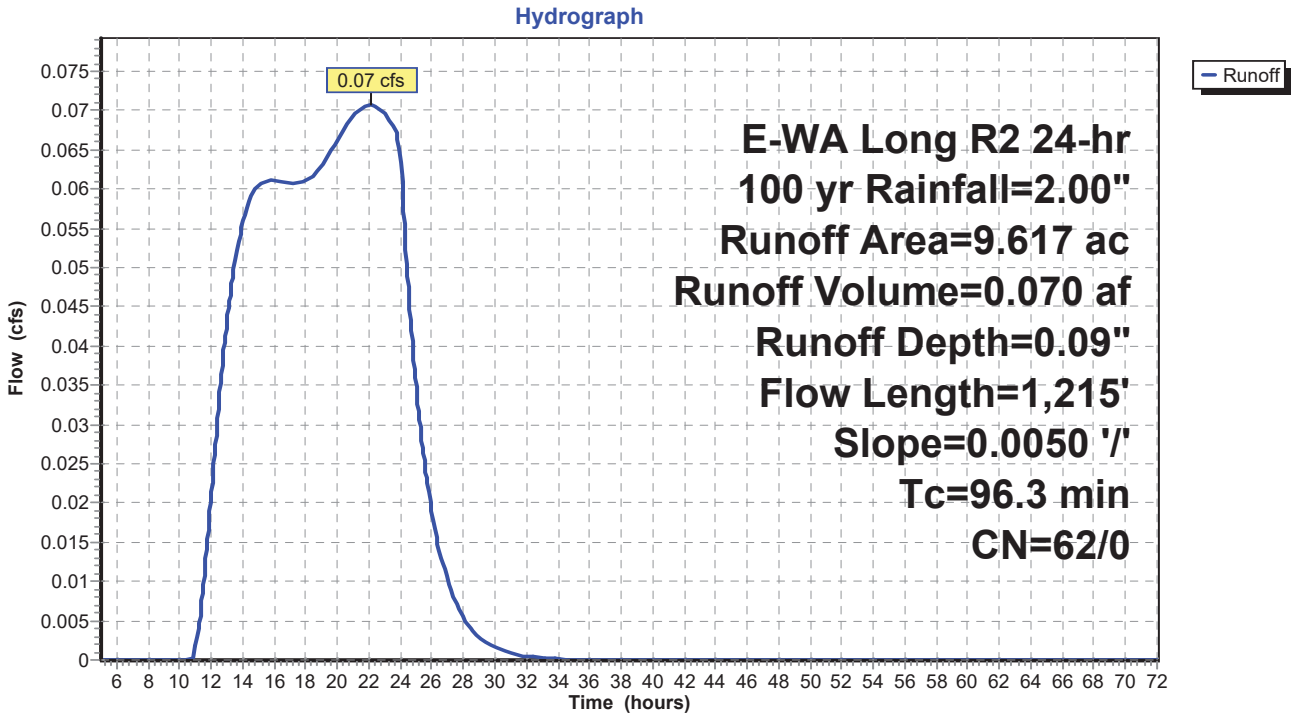
Runoff = 0.07 cfs @ 22.10 hrs, Volume= 0.070 af, Depth= 0.09"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 100 yr Rainfall=2.00"

	Area (ac)	CN	Description
*	3.085	30	Meadow HSG A
*	1.700	71	Meadow HSG C
*	4.402	78	Meadow HSG D
*	0.430	93	Impervious
	9.617	62	Weighted Average
	9.617	62	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
65.5	300	0.0050	0.08		**Sheet Flow,** Range n= 0.130 P2= 1.00"
30.8	915	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
96.3	1,215	Total			

Subcatchment 9S: Proposed Basin 3



Appendix K: Urtica Solar Project Site Reports and Permit Applications

K-1: Urtica Solar Project Critical Areas Report

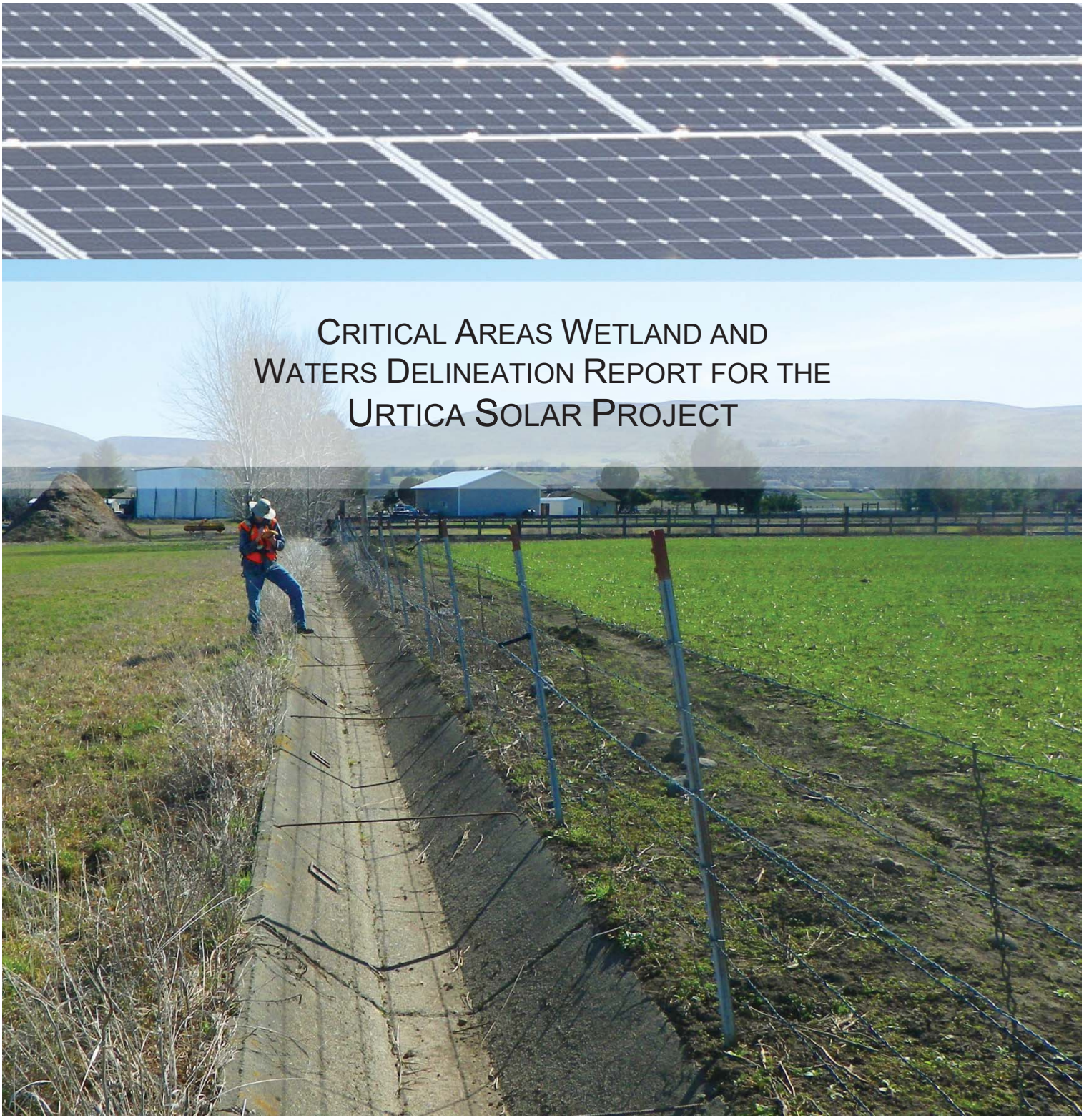
K-2: Urtica Solar Project Cultural Resources Report

K-3: Urtica Solar Project Permit Applications

K-4: Urtica Solar Project Geotechnical Engineering Study

K-5: Urtica Solar Project Drainage Report

Appendix K-1: Urtica Solar Project Critical Areas Report



CRITICAL AREAS WETLAND AND WATERS DELINEATION REPORT FOR THE URTICA SOLAR PROJECT

July 10, 2017

SWCA ENVIRONMENTAL CONSULTANTS
SEATTLE, WASHINGTON

CRITICAL AREAS WETLAND AND WATERS DELINEATION REPORT FOR THE URTICA SOLAR PROJECT KITTITAS COUNTY, WASHINGTON

Section 10, Township 17 North, Range 18 East
Parcel Numbers 808533, 869436, 879436, 889436, 950243, 950244, 950245, 950246, 950247, and 950248

Report Prepared for

TUUSSO Energy, LLC

By
Evan Dulin

July 10, 2017

Project Number 38727.05

SWCA Environmental Consultants
221 1st Ave W, Suite 205
Seattle, Washington 98119

TABLE OF CONTENTS

1 INTRODUCTION 1
1.1 Background 1
1.2 Project Setting 1
2 METHODS 1
2.1 Study Area 1
2.2 Review of Existing Information 1
2.3 Field Investigation 3
2.3.1 Wetlands 6
2.3.2 Riparian Habitats 10
3 RESULTS AND DISCUSSION 10
3.1 Wetlands 11
3.1.1 Wetland UW01 12
3.1.2 Wetland UW02 13
3.1.3 Wetland UW03 13
3.2 Frequently Flooded Areas 14
3.3 Geologically Hazardous Areas 14
3.4 Habitats 14
3.4.1 Riparian Habitat 14
3.4.2 Priority Habitats and Species 15
3.5 Aquifer Recharge Areas 15
4 CONCLUSIONS AND RECOMMENDATIONS 16
5 DISCLAIMER 17
6 LITERATURE CITED AND REVIEWED 17
APPENDIX A: WETLAND DELINEATION METHODOLOGY A-1
APPENDIX B: VEGETATION LIST B-1
APPENDIX C: WETLAND DATA SHEETS C-1
APPENDIX D: WETLAND AND STREAM PHOTOGRAPHS D-1
APPENDIX E: ECOLOGY RATING FORMS E-1
APPENDIX F: KITTITAS COUNTY WETLAND BUFFER GUIDANCE F-1

LIST OF TABLES

Table 1. Precipitation for 3 Months Prior to Site Visits (in inches) 6
Table 2. Precipitation 2 Weeks Prior to Site Visits (in inches) 6
Table 3. Washington State Department of Ecology Wetland Rating System 7
Table 4. Summary of the Water Typing System 10
Table 5. Soil Mapping within the Study Area 11
Table 6. Wetland Size, Rating, and Classification for Wetlands within the Study Area 12
Table 7. Summary of Streams in the Study Area and within 200 Feet 15
Table 8. Wetland and Waters Summary 16

LIST OF FIGURES

Figure 1. Project vicinity map. 2
Figure 2. NWI, NHD, and floodplain mapping. 4
Figure 3. Soils and PHS mapping. 5
Figure 4. Wetland and waters delineation map, west portion. 8
Figure 5. Wetland and waters delineation map, east portion. 9

1 INTRODUCTION

This report describes the methods and findings of wetland, stream, and other critical areas delineation for the proposed Urtica Solar Project. The report was prepared by SWCA Environmental Consultants (SWCA), and is intended to address permitting requirements under Energy Facility Site Evaluation Council (EFSEC) Washington Administrative Code (WAC) 463-60-322, -332, and -333, and to show compliance of the proposed project with Kittitas County's Code for Critical Areas Ordinance (KCC Chapter 17A).

1.1 Background

TUUSSO Energy, LLC (TUUSSO), is proposing to construct a new photovoltaic solar facility installation on approximately 51.1 acres of private agricultural land, which would connect into the existing Puget Sound Energy (PSE) distribution transmission line along Umptanum Road, located southwest of Ellensburg, Kittitas County, Washington. The Urtica Solar Project is intended to provide up to 5 MW of solar energy to PSE for use within their service area.

1.2 Project Setting

The Urtica Solar Project site primarily consists of active agricultural land located on the west side of Umptanum Road and approximately 0.2 mile southwest of the Yakima River, with McCarl Creek flowing through the study area from west to east, southwest of Ellensburg in unincorporated Kittitas County, Washington. The project would be located approximately 0.2 mile north of the intersection of Umptanum Road and Manastash Road, in Section 10 of Township 17 North, Range 18 East, Willamette Meridian (Figure 1). The project site totals approximately 51.1 acres. Topography of the site generally slopes to the east toward Umptanum Road and toward McCarl Creek, which flows through the study area. Surface elevation within the study area ranges from 1,539 to 1,575 feet above mean sea level, the lowest elevation being within the eastern portion of the McCarl Creek channel along Umptanum Road and the highest elevation being along the western site boundary.

2 METHODS

2.1 Study Area

The Urtica Solar Project site is approximately 51.1 acres in size (Figure 1). Wetlands and streams outside of the project site but that occur within 200 feet of the project site boundary and had the potential to have buffers extend into the project site were included in the study area. Wetlands and streams outside of the project site and within the study area were visually inspected but not formally delineated.

2.2 Review of Existing Information

Prior to conducting fieldwork, background materials were reviewed to determine the potential for wetlands, floodplains, habitats, and other critical areas and their buffers that may occur within the study area. Materials referenced during the desktop study are listed below. The following checklist follows the KCC Critical Areas required checklist outlined in KCC Chapter 17A.03.035.

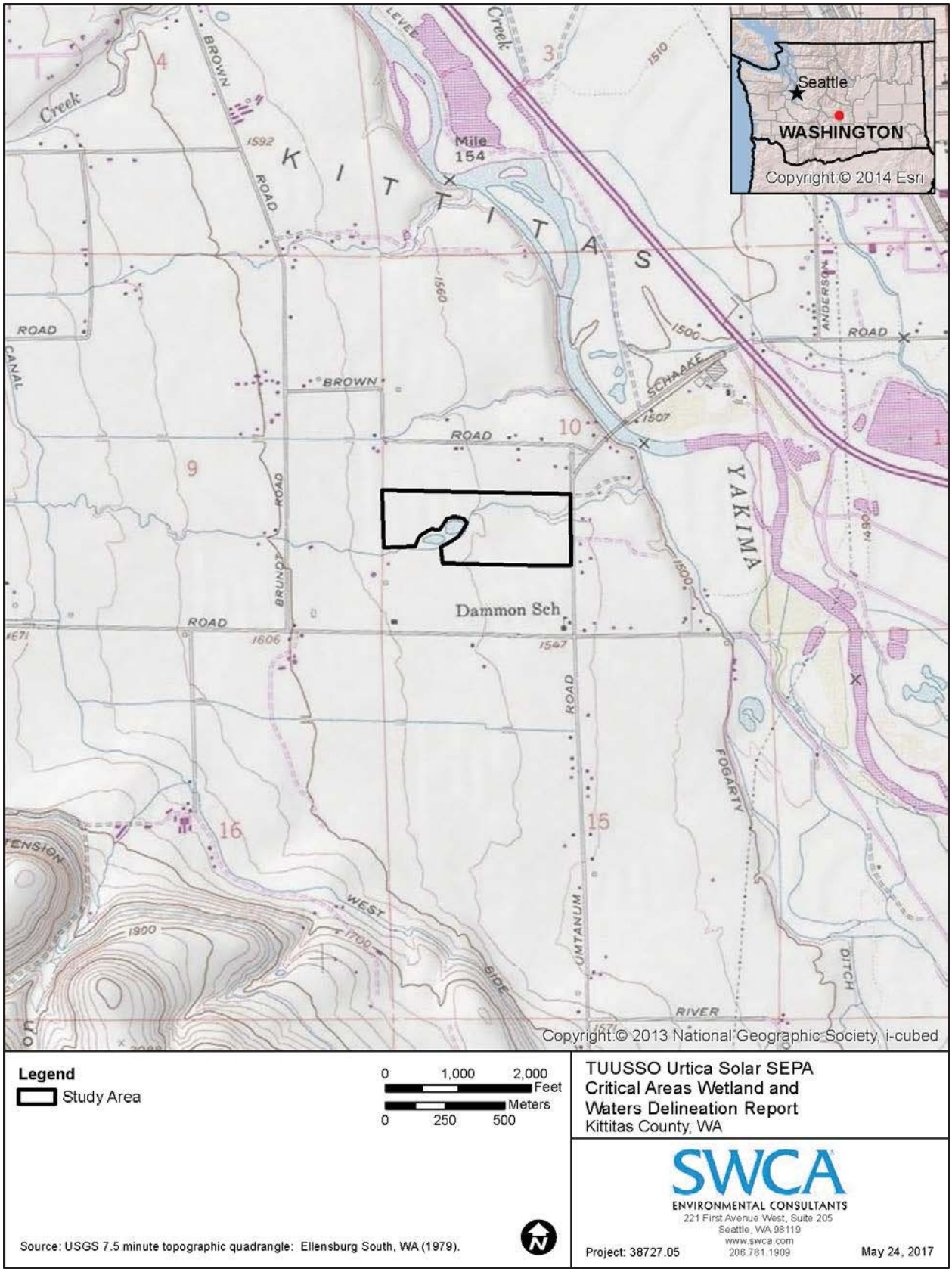


Figure 1. Project vicinity map.

Wetlands (KCC Chapter 17A.04)

- Historical Google Earth aerial photography (2000–2016).
- U.S. Department of Agriculture (USDA) historical imagery (USDA 1954).
- U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle map for Ellensburg South, Washington, included in Figure 1.
- U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) data and USGS National Hydrography Dataset (NHD), included in Figure 2.
- Natural Resources Conversation Service (NRCS) Soil Survey of Kittitas County Area, Washington and NRCS Web Soil Survey map of the study area, included in Figure 3.

Frequently flooded areas (KCC Chapter 17A.05)

- Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Panel 5300950552C (as cited by Kittitas County 2017 and modified by Encompass Engineering & Surveying), included in Figure 2.

Geologically hazardous areas (KCC Chapter 17A.06)

- Includes erosion, landslide, mine, and seismic hazard areas.
- Kittitas County COMPAS mapping tool.

Habitats (KCC Chapter 17A.07)

- Includes riparian habitats and streams and rivers.
- Washington State Department of Fish and Wildlife (WDFW) SalmonScape online mapper.
- WDFW Priority Habitats and Species (PHS) online mapper, included in Figure 3.

Aquifer recharge areas (KCC Chapter 17A.08)

- No critical aquifer recharge locations have been identified in Kittitas County.

Spatial data obtained during the review of existing information were incorporated into the Urtica Solar Project base maps (Figures 1–3).

2.3 Field Investigation

Following the desktop review of existing information, a team of two biologists conducted site visits on April 6 and 7, 2017, to assess the study area for the presence of wetland and waterbody features and to record data relevant to the Washington State Department of Ecology's (Ecology's) most recently approved version of the *Washington State Wetland Rating System for Eastern Washington, 2014 Update* (Hruby 2014). Visual observations were recorded within 200 feet of the project site, and included wildlife and habitat data.

Precipitation data were obtained from the closest wetlands climate analysis (WETS) climate station, the Ellensburg National Weather Service (NWS) station (ELBW1), approximately 1.5 miles to the east of the project site in southern Ellensburg, Washington. Historical (1971–2000) average annual rainfall is listed as 8.96 inches. Table 1 shows the monthly precipitation at the Ellensburg NWS weather station for the 3 months prior to the April 6 and 7, 2017, site visits. Table 2 shows the rainfall received 2 weeks prior to the site visits, and the water-year-to-date (WYTD) rainfall. Rainfall recorded 3 months prior to fieldwork was wetter than normal.

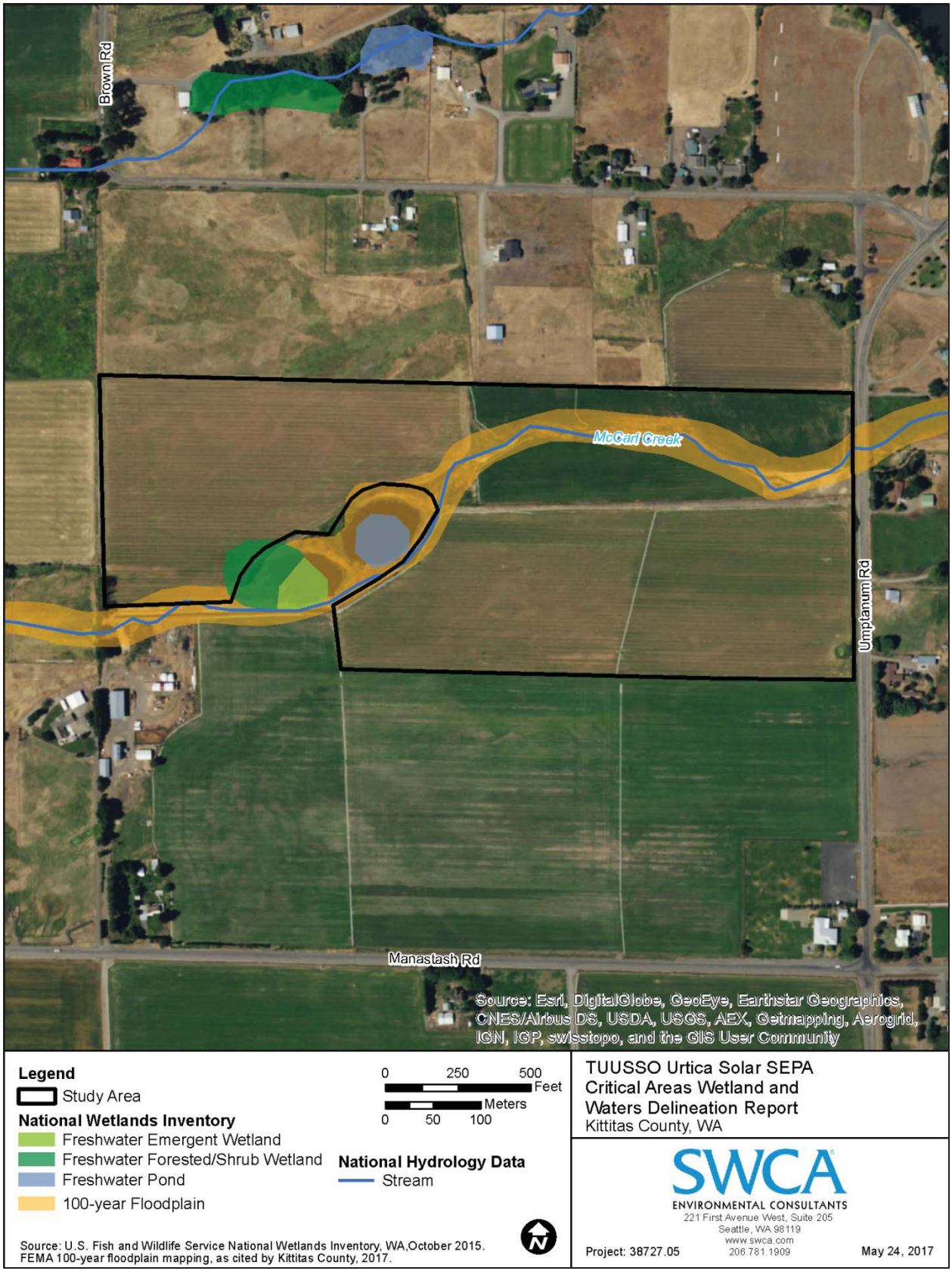


Figure 2. NWI, NHD, and floodplain mapping.

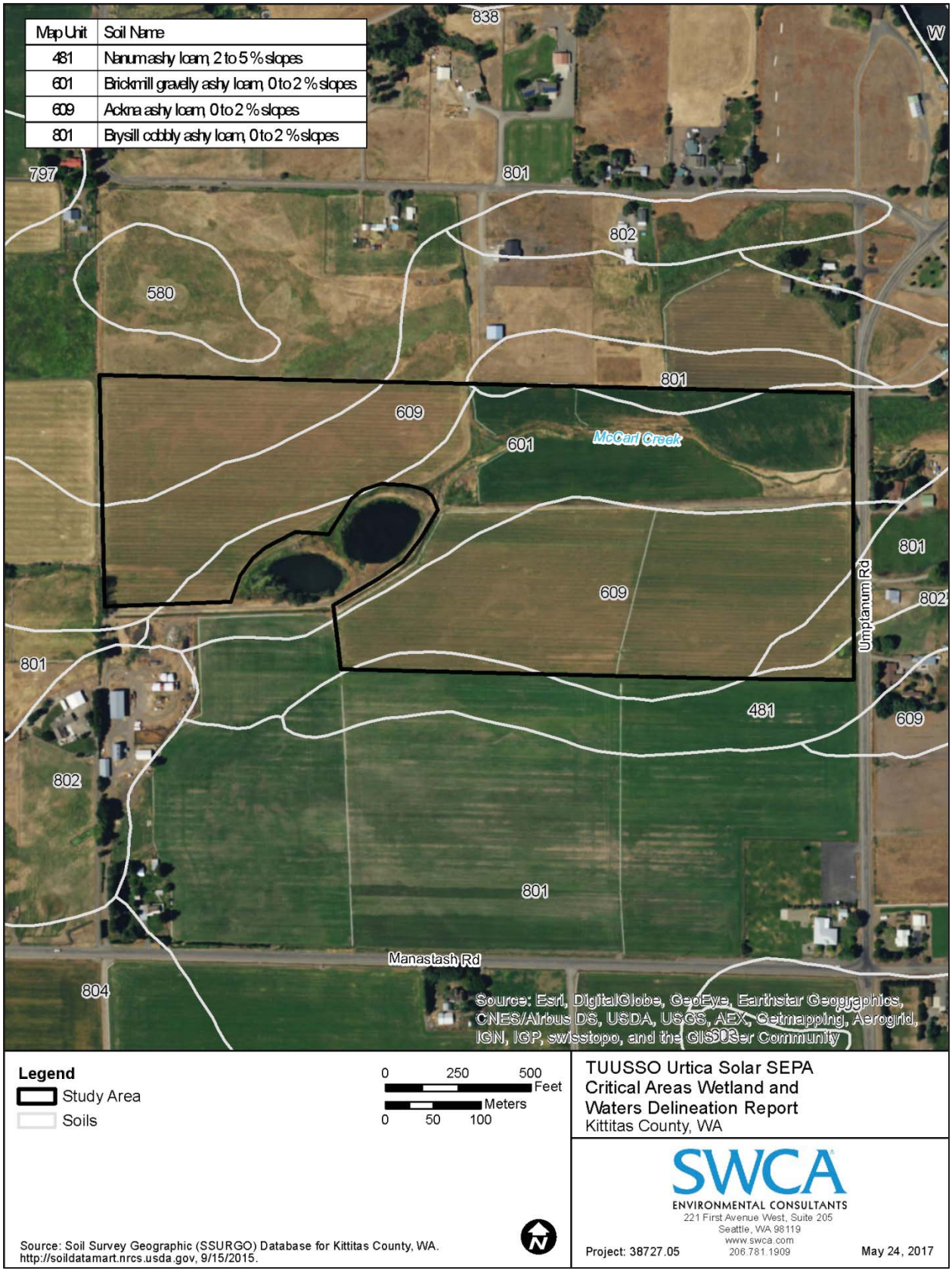


Figure 3. Soils and PHS mapping.

Table 1. Precipitation for 3 Months Prior to Site Visits (in inches)

Month	Average	30% Chance Will Have		Observed Precipitation	Within Normal Range?
		Less Than	More Than		
March	0.76	0.36	0.93	1.49	Above
February	0.91	0.59	1.10	2.04	Above
January	1.19	0.65	1.45	1.54	Above

Source: NRCS 2017b.

Table 2. Precipitation 2 Weeks Prior to Site Visits (in inches)

Field Study	Precipitation 2 Weeks Prior	WYTD	Inches Above or Below Normal WYTD*
April 5–March 23, 2017	0.48	8.93	2.74 above
April 6–March 24, 2017	0.60	9.06	3.85 above

*Based on average precipitation from 1981 to 2010.
Source: NRCS 2017b.

2.3.1 Wetlands

The study area was investigated for wetlands in accordance with the current methodology of the U.S. Army Corps of Engineers' (USACE's) 2008 *Arid West Regional Supplement (Version 2)* and the *Wetlands Delineation Manual* (Environmental Laboratory 1987). A detailed description of the field methods used in this study is provided in Appendix A.

A Trimble Geo XT global positioning system (GPS) unit was used by the field team to assist in identifying the project site boundaries and to record site spatial data. This device is capable of submeter accuracy. The full extent of the study area was covered by the team of biologists. Photographs were collected and vegetation, soil, and hydrology characteristics were documented. The boundaries for wetlands located outside of the project site but within the study area were approximated using field observations and aerial imagery to determine the extent of on-site wetland buffers.

Geographic information system (GIS) software were used to analyze data and to produce the report figures (Figures 4 and 5). Per WAC 463-60-333 and KCC Chapter 17A, wetlands were rated using the *Washington State Wetland Rating System for Eastern Washington, 2014 Update*. Per KCC 17A.04.020, the resulting wetland ratings were used to determine the County-prescribed range of wetland buffers for each wetland. Table 3 lists Ecology's wetland rating criteria. Kittitas County's definition of a wetland is based on the Revised Code of Washington (RCW) 36.70A.030, which states:

> *(21) "Wetland" or "wetlands" means areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Wetlands do not include those artificial wetlands intentionally created from nonwetland sites, including, but not limited to, irrigation and drainage ditches, grass-lined swales, canals, detention facilities, wastewater treatment facilities, farm ponds, and landscape amenities, or those wetlands created after July 1, 1990, that were unintentionally created as a result of the construction of a road, street, or highway. Wetlands may include those artificial wetlands intentionally created from nonwetland areas created to mitigate conversion of wetlands.*

Table 3. Washington State Department of Ecology Wetland Rating System

Category			
I	**II**	**III**	**IV**
Category I wetlands: Represent a unique or rare wetland type; are more sensitive to disturbance than most wetlands; are relatively undisturbed and contain ecological attributes that are impossible to replace within a human lifetime; or provide a high level of functions. Specific wetlands that meet the Category I criteria include: 1. alkali wetlands, characterized by the presence of shallow saline water with a high pH; 2. natural heritage wetlands, specifically, wetlands identified by the Washington Natural Heritage Program/DNR as high quality relatively undisturbed wetlands; and wetlands that support state-listed threatened or endangered plants; 3. bogs and calcareous fens; 4. mature and old-growth forested wetlands with slow growing trees that are over 0.25 acre in size; and 5. wetlands that perform many functions very well, as indicated by a score of 22 or more points out of 27 on the wetland rating form.	Category II wetlands: Wetlands that are difficult, though not impossible, to replace, and provide high levels of some functions. Specific wetlands that meet the Category II criteria include: 1. forested wetlands in the floodplains of rivers; 2. mature and old-growth forested wetlands with fast growing trees that are over 0.25 acre in size; 3. vernal pool that are located in a landscape with other wetlands and that are relatively undisturbed during the early spring; and 4. wetlands scoring between 19 and 21 points, out of 27, on the wetland rating form.	Category III wetlands: Wetlands that provide a moderate level of functions. Specific wetlands that meet the Category III criteria include: 1. wetlands scoring between 16 and 18 points, out of 27, on the wetland rating form.	Category IV wetlands: Wetlands that have the lowest levels of functions and are heavily disturbed. Specific wetlands that meet the Category IV criteria include: 1. wetlands scoring less than 16 points out of 27 on the wetland rating form.

Source: Hruby (2014).
Kittitas County wetland category definitions defer to Washington Administrative Code for guidance.
Appendix F includes the County-issued guidance.

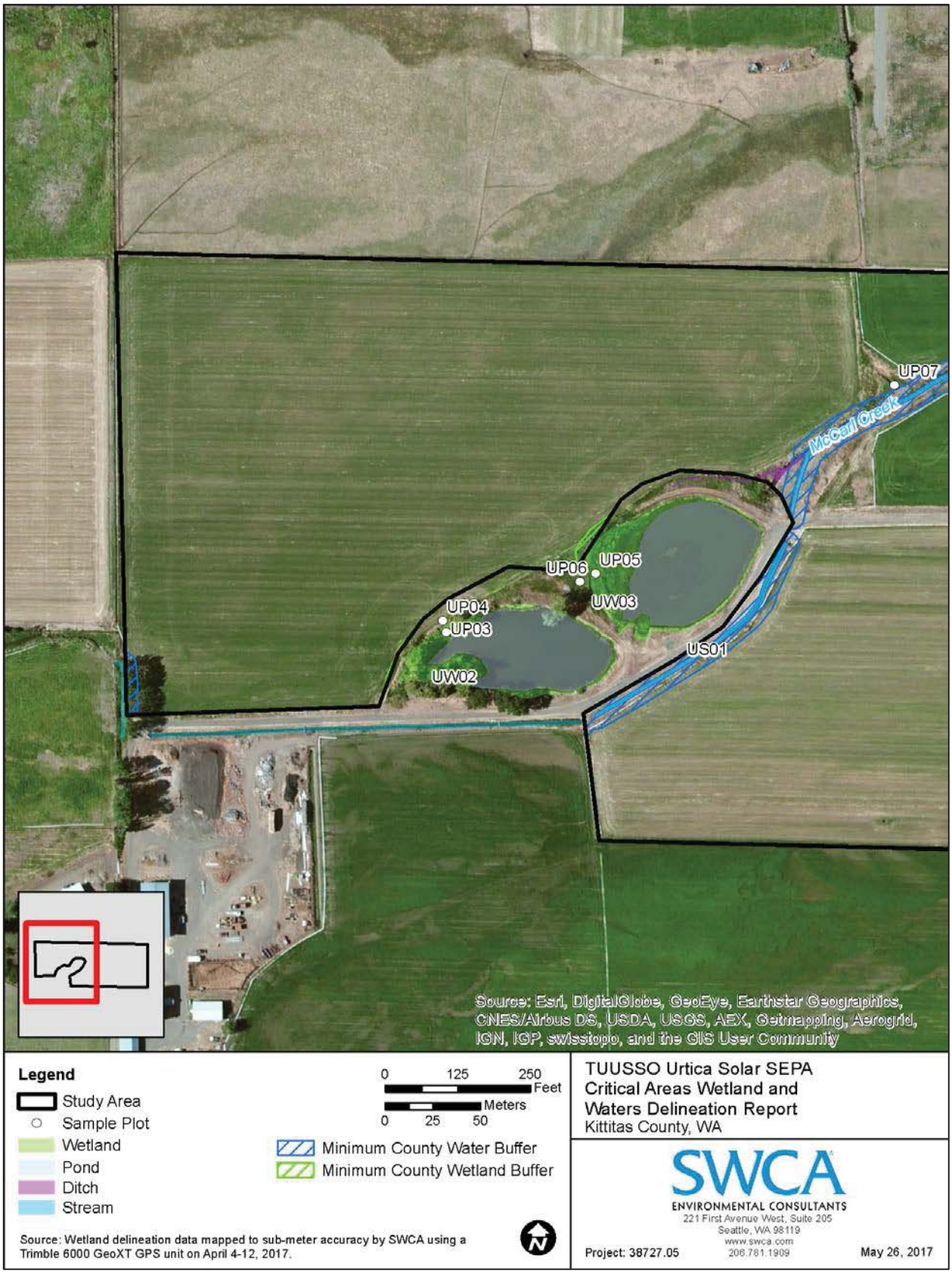


Figure 4. Wetland and waters delineation map, west portion.

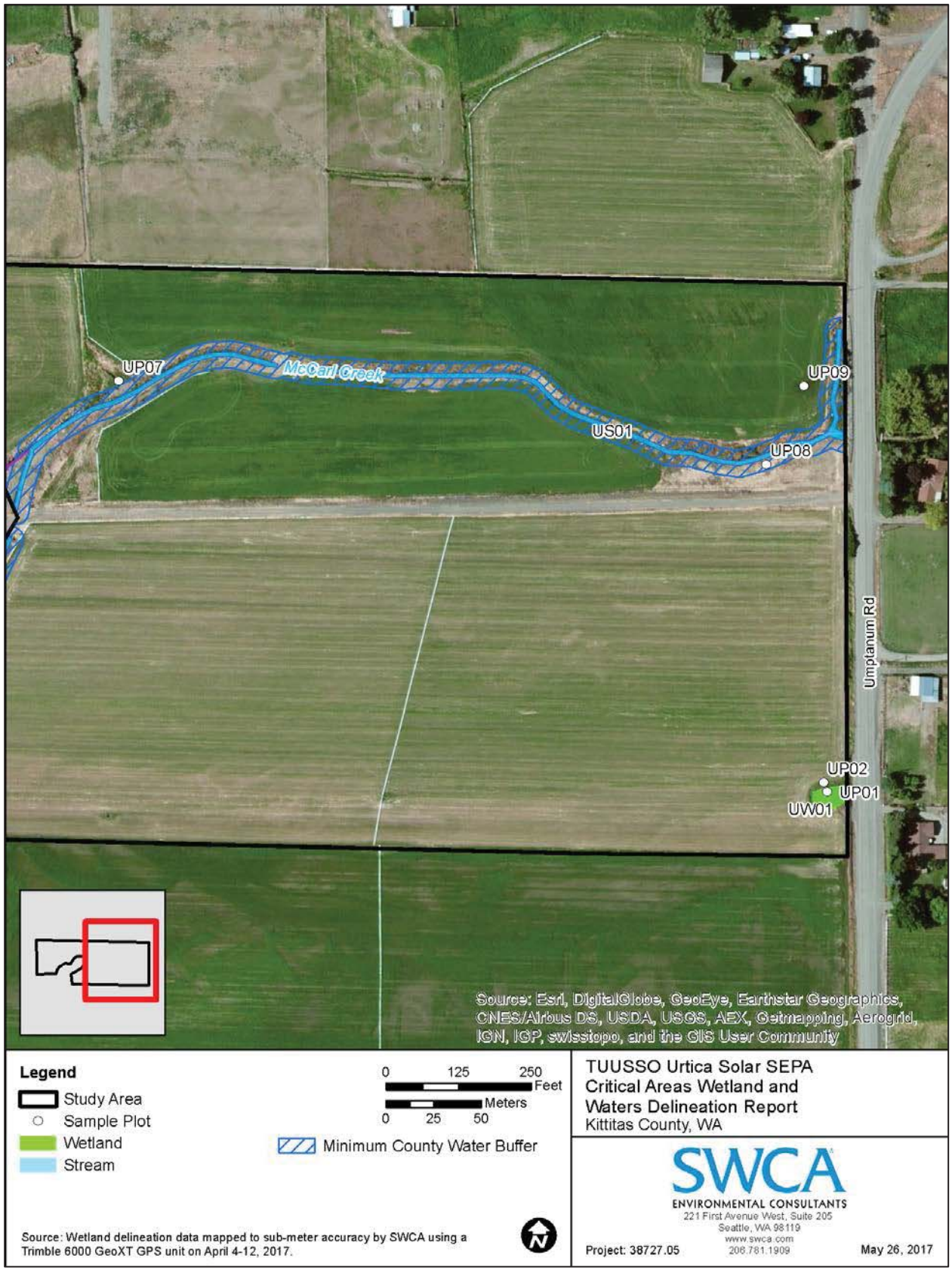


Figure 5. Wetland and waters delineation map, east portion.

A detailed analysis of wetland functions is not included in this report; however, a brief description of wetland functions is provided as part of the general description for each wetland.

2.3.2 Riparian Habitats

Biologists also investigated the study area for the presence of waterbodies and used a GPS device to delineate the ordinary high water marks (OHWMs) of streams per the definitions in WAC 173-22-030 (Figure 5). The OHWMs of streams and rivers outside of the project site but within the study area were approximated using field observations and aerial imagery to determine the extent of on-site stream buffers.

Streams identified in the study areas were classified according to the WAC stream typing system (WAC 222-16-030). Criteria for this typing system are described in Table 4. The stream types described in this report are based on the stream reaches within the study area; downstream reaches may be rated higher.

Table 4. Summary of the Water Typing System

Stream Type	Definition [a]
S	All waters, within their bankfull width, as inventoried as "shorelines of the state" under Chapter 90.58 RCW and the rules promulgated pursuant to Chapter 90.58 RCW including periodically inundated areas of their associated wetlands.
F	All segments of natural waters that are not Type S waters, and that contain fish or fish habitat, including: 1) waters diverted for domestic use by more than 10 residential or camping units or by a public accommodation facility; 2) waters diverted for use by a federal, state, or Tribal fish hatchery from the point of diversion for 1,500 feet or the entire tributary if the tributary is highly significant for protection of downstream water quality; 3) waters that are within a federal, state, local, or private campground having more than 10 camping units; or 4) riverine ponds, wall-based channels, and other channel features that are used by fish for off-channel habitat.
Np	All segments of natural waters within the bankfull width of defined channels that are perennial non–fish habitat streams. Perennial streams are flowing waters that do not go dry any time of a year of normal rainfall and include the intermittent dry portions of the perennial channel below the uppermost point of perennial flow.
Ns	All segments of natural waters within the bankfull width of the defined channels that are not Type S, F, or Np waters. These are seasonal, non–fish habitat streams in which surface flow is not present for at least some portion of a year of normal rainfall and the stream is not located downstream from any stream reach that is a Type Np water. Ns waters must be physically connected by an above-ground channel system to Type S, F, or Np waters.

[a] Definitions are summarized from WAC 222-16-030. Kittitas County stream type definitions defer to WAC for guidance.

3 RESULTS AND DISCUSSION

The Urtica Solar Project site primarily consists of actively managed agriculture for growing common timothy (*Phleum pratense*) hay with a highly manipulated stream (formerly called McCarl Creek) that flows south of two ponds in the western portion of the site (outside of the project site) and through the northeastern quarter of the project site. In addition, a farm road bisects the project site, crossing the site from east to west and passing over McCarl Creek just east of the ponds. Some species of weeds and non-native herbaceous species occur around the edges of the agricultural land, along the sides of the farm road, and in the interspace between planted timothy, including tall false rye grass (*Schedonorus arundinaceus*), bluegrass (*Poa* spp.), creeping wild rye (*Elymus repens*), colonial bent grass (*Agrostis capillaris*), white clover (*Trifolium repens*), hairy cat's-ear (*Hypochaeris radicata*), and common dandelion (*Taraxacum officinale*). In addition, there are areas adjacent to McCarl Creek in the northeastern quarter of the project site that do not meet wetland criteria but are dominated by wetland species and could be partially influenced by McCarl Creek. These areas would be within the county-required minimum buffer of McCarl Creek and are dominated by reed canary grass (*Phalaris arundinacea*). Refer to Appendix B for a complete list of vegetation observed within the study area.

The proposed Urtica Solar Project site is situated between Umptanum Road and Brondt Road to the east and west and between Brown Road and Manastash Road to the north and south. The project site is approximately 0.2 mile from the Yakima River and is surrounded by active agricultural land and rural residences in all directions. Access to the proposed project is on the west side of Umptanum Road via the farm road that bisects the project site.

According to NRCS, the study area encompasses four different soil map units (Table 5). These soil map units range from somewhat poorly drained to well drained soils that occur on terraces, piedmont slopes, valleys, and alluvial fans. None of the soil units within the study area are on the National Hydric Soils list (NRCS 2015), which is a list of soils that can be indicative of saturated, flooded, or ponded areas that could meet the definition of a hydric soil.

Table 5. Soil Mapping within the Study Area

Map Unit Symbol	Map Unit Name	Hydric
481	Nanum ashy loam, 2% to 5% slopes	No
601	Brickmill gravelly ashy loam, 0% to 2% slopes	No
609	Ackna ashy loam, 0% to 2% slopes	No
801	Brysill cobbly ashy loam, 0% to 2% slopes	No

Source: NRCS 2015 and 2017b.

3.1 Wetlands

Only one wetland (UW01) was delineated within the study area, but two more wetlands (UW02 and UW03) were delineated outside of the study area that would have protection buffers that extend into the study area. Wetlands were distinguished from adjoining uplands by the presence or absence of indicators for wetland hydrology, hydric soils, and hydrophytic vegetation. Wetland delineation data sheets are provided in Appendix C, photographs are provided in Appendix D, and wetland rating forms are provided in Appendix E.

Table 6 summarizes the size, rating, and classification of wetlands found within and adjacent to the study area. All delineated wetlands would fall under the jurisdiction of the USACE, Ecology, and Kittitas County. Figures 4 and 5 show the locations of the wetlands, streams, data plots, and their associated minimum protection buffers. The minimum wetland protection buffers were calculated per KCC guidance based on Ecology's Wetland Rating for each wetland. Detailed descriptions of each wetland are provided in the following sections.

Table 6. Wetland Size, Rating, and Classification for Wetlands within the Study Area

Wetland Name	Delineated Area within Project Site (Wetland Rating Unit Size) [a] (acres)	Wetland Rating [b]	Hydrogeomorphic Classification	Cowardin Classification [c]	Dominant Species Observed within Wetland
UW01	0.05 (0.05)	III	Depressional	PEM	Reed canary grass, broad-leaf cat-tail, common duckweed
UW02	0.00 (0.97)	III	Depressional	PEM	Reed canary grass, curly dock, lamp rush, broad-leaf cat-tail
UW03	0.00 (1.19)	III	Depressional	PEM	Reed canary grass, broad-leaf cat-tail, colonial bent grass, curly dock, lamp rush

a Wetland rating unit size is the total area of wetland delineated or estimated based on aerial photograph interpretation and field reconnaissance. Area of delineated portions of the wetlands is based on SWCA survey data.

b Wetland ratings are based on *Washington State Wetland Rating System for Eastern Washington – Revised* (Hruby 2014).

c Cowardin et al. (1979).

3.1.1 Wetland UW01

Palustrine emergent
Category III
0.05 acre within the project site and in total

Wetland UW01 is a small depressional wetland located near the southeastern corner of the project site (see Figure 5; and wetland rating Figures 1 through 5 in Appendix E). Delineation data were recorded at sample plots UP01 and TP02, provided on datasheets in Appendix C. The wetland does not extend off-site and is fed by overflow from the roadside ditch along Umptanum Road and from overland flow from the adjacent uplands to the west. The upland boundary is defined by an obvious rise in elevation and change in the plant community in every direction.

Wetland UW01 is a palustrine emergent (PEM) wetland habitat type (Cowardin et al. 1979). Refer to Table A-1 in Appendix A for definitions of wetland indictor statuses listed in this section (i.e., FAC, FACW, and OBL). The wetland is dominated by reed canary grass (FACW) and broad-leaf cat-tail (*Typha latifolia*, OBL), except for about a quarter of the wetland that was sparsely vegetated from recent standing water with dead common duckweed (*Lemna minor*, OBL).

Soils in Wetland UW01 are mapped as Nanum ashy loam with 2% to 5% slopes and Brysill cobbly ashy loam with 0% to 2% slopes (NRCS 2017a) (see Figure 3). The typical soil profile observed within 16 inches of the soil surface consists of very dark grayish brown (10YR 3/2) silt loam with redoximorphic features starting at 2 inches, with a thin layer of sand at 2 inches, over a very dark gray (2.5Y 3/1) silt loam layer starting at 8 inches with more prominent redoximorphic features (Munsell Color 2009). The soils in Wetland UW01 meet the hydric soil indicator for Redox Dark Surface (F6).

Primary indicators of hydrology within the wetland include saturation from 0 to 8 inches from recent surface water ponding, surface soil cracks, inundation visible on aerial imagery, and aquatic invertebrates. The presence of these indicators meets wetland hydrology criteria.

Wetland UW01 is rated as a Category III wetland in the Ecology rating system (see Table 3), with a moderately high score for hydrologic function (8/9 points), a moderate score for water quality improvement (6/9), and a low score for habitat function (4/9 points). Wetland UW01 has a moderately high potential to provide hydrologic function because it does not have a surface water outlet, has high storage during seasonal ponding, and receives stormwater from the adjacent roadside ditch.

3.1.2 Wetland UW02

Palustrine emergent
Category III
0.00 acre within the project site, 0.97 acre in total

Wetland UW02 is a depressional wetland fringe around a 0.69-acre open water pond, which is included in the total wetland unit acreage, and is fed by impounded water diverted from McCarl Creek and overland flow from surrounding uplands (see Figure 4; and wetland rating Figures 1 through 5 in Appendix E). Delineation data were recorded at sample plots UP03 and UP04 and is provided on datasheets in Appendix C. The upland boundary is defined by an obvious rise in elevation in every direction associated with the original grading of the western pond and observations of primary and secondary hydrology.

Wetland UW02 is a PEM wetland habitat type (Cowardin et al. 1979). The wetland is dominated by reed canary grass, with some other wetland plant species scattered around the edges that include curly dock (*Rumex crispus*, FAC), lamp rush (*Juncus effusus*, FACW), and broad-leaf cat-tail. The dominance of these species meets the wetland vegetation criteria. Wetland UW02 partially overlaps two NWI-mapped wetland types: palustrine forested, broad-leaved deciduous, temporarily flooded (PFO1A) wetland; and palustrine emergent, persistent, unconsolidated bottom, semi-permanently flooded, excavated (PEM1/UBFx) wetland (see Figure 2).

Soils in Wetland UW02 are mapped as Brickmill gravelly ashy loam with 0% to 2% slopes (NRCS 2017a) (see Figure 3). The typical soil profile observed within 16 inches of the soil surface consists of very dark grayish brown (10YR 3/2) silty clay loam over very dark gray (10YR 3/1) silty clay loam with redoximorphic features starting at 7 inches (Munsell Color 2009). The soils in Wetland UW02 meet the hydric soil indicator for Redox Dark Surface (F6).

Primary indicators of hydrology within the wetland include a high water table and saturation within the upper 12 inches. The presence of these indicators meets wetland hydrology criteria.

Wetland UW02 is rated as a Category III wetland in the Ecology rating system, with a moderately high score for hydrologic function (7/9 points) and moderately low scores for water quality improvement and habitat function (5/9 points). Wetland UW02 has a moderately high potential to provide hydrologic functions because of its high storage during seasonal ponding and highly constricted outlet feeding into the eastern pond.

3.1.3 Wetland UW03

Palustrine emergent
Category III
0.00 acre within the project site, 1.19 acres in total

Wetland UW03 is a depressional wetland fringe around a 0.83-acre open water pond, which is included in the total wetland unit acreage, and is fed by impounded water diverted from McCarl Creek that passes through the western pond and overland flow from surrounding uplands (see Figure 4; and wetland rating Figures 1 through 5 in Appendix E). Delineation data were recorded at sample plots UP05 and UP06 and is provided on datasheets in Appendix C. The upland boundary is defined by an obvious rise in elevation in every direction associated with the original grading of the eastern pond and observations of primary and secondary hydrology.

Wetland UW03 is a PEM wetland habitat type (Cowardin et al. 1979). The wetland is dominated by reed canary grass, broad-leaf cat-tail, and colonial bent grass (FAC), with some other wetland plant species scattered around the edges that include curly dock and lamp rush. The dominance of these species meets the wetland vegetation criteria. Wetland UW03 partially overlaps an NWI-mapped palustrine, unconsolidated bottom, permanently flooded, excavated (PUBHx) wetland (see Figure 2).

Soils in Wetland UW03 are mapped as Brickmill gravelly ashy loam with 0% to 2% slopes (NRCS 2017a) (see Figure 3). The typical soil profile observed within 16 inches of the soil surface consists of very dark gray (10YR 3/1) silty clay loam over very dark gray (7.5YR 3/1) silt loam with redoximorphic features starting at 5 inches (Munsell Color 2009). The soils in Wetland UW02 meet the hydric soil indicator for Redox Dark Surface (F6).

No primary indicators of hydrology were observed within the wetland plot (UP05); however, secondary indicators of saturation visible on aerial imagery and the FAC-neutral test were satisfied by field and desktop observations. The presence of these indicators meets wetland hydrology criteria.

Wetland UW03 is rated as a Category III wetland in the Ecology rating system, with a moderately high score for hydrologic function (7/9 points) and moderately low scores for water quality improvement and habitat function (5/9 points). Wetland UW02 has a moderately high potential to provide hydrologic functions because of its high storage during seasonal ponding and highly constricted outlet feeding into the McCarl Creek.

3.2 Frequently Flooded Areas

FEMA floodplain mapping depicts the 100-year floodplain along McCarl Creek and incorporates the two ponds (see Figure 2). This area overlaps most of Wetlands UW02 and UW03 and McCarl Creek, with a total area of 5.56 acres within the project site, and will likely be avoided during project design. Development within the 100-year floodplain will be avoided; therefore, no net loss of floodplain storage will be achieved.

3.3 Geologically Hazardous Areas

The Urtica Solar Project site is not within any mapped geologically hazardous areas. No erosion/landslide geologic hazard areas, snow avalanche hazards, or mine hazard areas are mapped on any of the parcels that encompass the project site (Kittitas County 2017). The Urtica Solar Project will not require specialized engineering to ascertain that the property is suitable for development.

3.4 Habitats

Based on the criteria provided in KCC Chapter 17A.07, the study area only includes riparian habitat. The Urtica Solar Project is not located on federal land or land owned or leased by the WDFW, and therefore is not considered big game winter range.

3.4.1 Riparian Habitat

Two ponds and one intermittent stream (McCarl Creek) and ephemeral ditch are located in the study area. Based on the field observations, McCarl Creek would be considered a jurisdictional water for the USACE, Ecology, and Kittitas County because it satisfies the definition of “waters of the United States” under the Clean Water Rule 40 CFR 230.3. The ponds are fed by water diverted from McCarl Creek and feed back into McCarl Creek through an ephemeral ditch. Because the ponds and ditch are hydrologically connected to McCarl Creek, they would likely be considered jurisdictional. Table 7

summarizes the size, rating, and classification of the streams found in the study area (see Figures 4 and 5). Photographs of these features are provided in Appendix D.

Table 7. Summary of Streams in the Study Area

Stream Name	Tributary to	Stream Type [a]	USACE Jurisdiction [b]	Average Width in Study Area (feet) [c]	Approximate Length in Project Site (feet) [c]
McCarl Creek (US01)	Yakima River	F	RPW	7	2108
Unnamed Ephemeral Ditch	McCarl Creek	N/A	NRPW	3	269

[a] F = fish-bearing stream (WAC 222-16-030), N/A = not applicable, due to ditches and canals being excluded from the WAC typing system.

[b] RPW = relatively permanent water; NPRW = non-relatively permanent water.

[c] Average widths and approximate lengths were determined based on SWCA survey data and field observations.

3.4.1.1 McCarl Creek

McCarl Creek is an intermittent, potentially fish bearing tributary of the Yakima River. Fish presence was not observed in the field and the culvert under Umptanum Road is likely acting as a barrier to fish passage; however, if that barrier were to be replaced, then fish could utilize this stream for a portion of the year. The majority of the on-site portion of this stream has been heavily manipulated and ditched, with a portion of the water flow being diverted through the two ponds that are located north of McCarl Creek and outside of the project site. Diverted water from McCarl Creek feeds the two ponds and their surrounding wetlands (UW02 and UW03), as well as the ephemeral ditch north of the eastern pond that is fed from a hole on the north side of the pond. The ephemeral ditch runs along the north side of the eastern pond and collects water from an outfall pipe from the eastern pond, just before feeding back into McCarl Creek. McCarl Creek flows through the northeastern quarter of the study area for approximately 2,108 feet before leaving the study area through a culvert under Umptanum Road in the northeastern corner of the study area.

The riparian area around McCarl Creek consists primarily of herbaceous species, including reed canary grass, tall scouring-rush (*Equisetum hyemale*), creeping wild rye, prickly lettuce (*Lactuca serriola*), garden yellow-rocket (*Barbarea vulgaris*), curly dock, tall annual willowherb (*Epilobium brachycarpum*), creeping buttercup (*Ranunculus repens*), broad-leaf cat-tail, stinging nettle (*Urtica dioica*), and Fuller's teasel (*Dipsacus fullonum*). Based on the Washington Water Typing Criteria (WAC 222-16-030) and communication with WDFW, McCarl Creek is designated as a Type F water because of its potential to support fish species if downstream barriers were removed.

3.4.2 Priority Habitats and Species

Upon review of the PHS mapper, no PHS-listed species or habitats occur within the study area (WDFW 2017a). The nearest PHS-mapped species are located approximately 0.2 mile northeast of the study area in the Yakima River. In addition, no PHS-mapped areas or their protection buffers occur within the study area; therefore, no additional designation will be required under KCC 17A.07.020.

3.5 Aquifer Recharge Areas

As described in KCC 17A.08.010, no critical aquifer recharge locations have been identified in Kittitas County. Additionally, the Urtica Solar Project will not involve any hazardous materials or disposal of on-site sewage. No well-heads have been identified within the study area.

4 CONCLUSIONS AND RECOMMENDATIONS

EFSEC will provide permitting requirements for the Urtica Solar Project, but this report evaluates and shows compliance with County requirements. A review of the study area determined that the following Kittitas County defined critical areas have the potential to be affected by the Urtica Solar Project:

- Wetlands
- Frequently Flooded Areas
- Habitats:
    - Riparian Habitat

A summary of all wetlands, waters, and critical area buffers documented within the study area is provided in Table 8. The wetland and non-wetland waters identified in this study will likely be determined jurisdictional by Ecology and the USACE, including the delineated ditch. Although EFSEC will provide permitting requirements for the proposed project, to show compliance with County requirements, KCC guidance (Chapter 17A.07.010) defines a minimum 20-foot protection buffer for Type F waters, such as McCarl Creek. However, up to a 100-foot protection buffer could be requested once Kittitas County has had the opportunity to review the results of this study, and has had discussions with TUUSSO (see Figures 4 and 5). KCC guidance does not define protection buffers for the ephemeral ditch because it does not qualify as a stream.

To show compliance with County requirements, the minimum and maximum wetland protection buffers defined by the KCC (Chapter 17A.04.020) are listed in Appendix F, and are provided for these wetlands in Table 8, but only the minimum protection buffers are depicted on Figures 4 and 5.

Table 8. Wetland and Waters Summary

Critical Area	Wetland Rating/Water Typing [a]	Kittitas County Minimum/Maximum Buffer Distances (feet) [b]	Total Size of Feature Within the Project Site (acres) [c]
Wetlands			
Wetland UW01	III	0 / 0 [d]	0.05
Wetland UW02	III	20 / 80	0.00
Wetland UW03	III	20 / 80	0.00
Frequently Flooded Areas			
100-year flood zone	N/A	N/A	5.56
Riparian Habitat			
McCarl Creek (US01)	F	20 / 100	0.32
Ditch	N/A	None	0.01

[a] III = Category III (Hruby 2014); F = fish bearing water (WAC 22-16-030);
[b] Only minimum buffer distances are depicted on maps;
[c] Does not include buffer areas;
[d] No Kittitas County buffer is defined because the wetland area is below the minimum size threshold for protection; however, building setbacks may be required based on zoning lot line setbacks, but would not exceed 25 feet.

Design plans are incomplete for the proposed Urtica Solar Project; however, TUUSSO will attempt to design the project to avoid, reduce, or eliminate impacts to wetlands, waters, and their buffers. Following the finalization of the design footprint, all removal-fill activities proposed within jurisdictional features would require a Joint Aquatic Resources Permit Application (JARPA) submitted for USACE and Ecology review.

There is no minimum threshold to implement mitigation sequencing for potential impacts to wetland and water features. Where possible, the Urtica Solar Project should demonstrate avoidance of jurisdictional features and then minimization of impacts. Avoidance and minimization could be achieved by making minor design alterations around delineated feature boundaries.

Where impact avoidance is not possible, mitigation measures should be implemented to minimize temporary construction disturbance and other permanent alterations to the features. Mitigation would include the implementation of construction best management practices. Where permanent alterations to wetland and waters features are unavoidable, wetland mitigation measures to achieve “no net loss” would be required. Desktop research shows that there are no approved mitigation banks or in-lieu fee programs in Kittitas County; therefore, any mitigation that would be required must be conducted as an Advance Permittee-Responsible Mitigation. Under KCC guidance (Chapter 17A.04.050), the mitigation ratio for a Category III wetland is 1:1.

5 DISCLAIMER

This report documents the investigation, best professional judgment, and conclusions of the investigators. This should be considered a Preliminary Jurisdictional Determination of wetlands and other waters and is not a final determination.

6 LITERATURE CITED AND REVIEWED

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. FWS/OBS-79/31. Washington, D.C.: U.S. Fish and Wildlife Service. Available at: http://www.fws.gov/wetlands/Documents/Classification-of-Wetlands-and-Deepwater-Habitats-of-the-United-States.pdf.

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual*. Technical Report Y-87-1. Online edition. Vicksburg, Mississippi: U.S. Army Engineer Waterways Experiment Station. Available at: http://el.erdc.usace.army.mil/wetlands/pdfs/wlman87.pdf.

Hruby, T. 2014. *Washington State Wetland Rating System for Eastern Washington – Revised.* Washington State Department of Ecology Publication No. 14-06-030. Olympia, Washington: Department of Ecology. Available at: https://fortress.wa.gov/ecy/publications/SummaryPages/1406030.html. Accessed March 10, 2017.

Kittitas County Code (KCC). 2017. Kittitas County, Washington, Ordinances and Resolutions. Available at: http://co.kittitas.wa.us/boc/countycode/. Accessed March 13, 2017.

Kittitas County. 2017. COMPAS Mapping Tool Parcel Report. Available at: https://gis.co.kittitas.wa.us/compas/default.aspx. Accessed May 15, 2017.

Lichvar, R.W., D.L. Banks, W.N. Kirchner, and N.C. Melvin. 2016. *The National Wetland Plant List: 2016 Wetland Ratings.* Phytoneuron 2016-30:1–17. Available at: http://www.phytoneuron.net/ and http://rsgisias.crrel.usace.army.mil/NWPL/. Accessed May 3, 2016.

Munsell Color. 2009. Munsell Soil-Color Charts. Revised Edition. Grand Rapids, Michigan: Munsell Color.

Natural Resources Conservation Service (NRCS). 2008. *Hydrogeomorphic Wetland Classification System: An Overview and Modification to Better Meet the Needs of the Natural Resources Conservation Service*. Technical Note No. 190-8-79. Available at: http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs143_010784.pdf.

———. 2015. List of Hydric Soils. December 2015. Available at: http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/use/hydric/. Accessed March 9, 2016.

———. 2017a. Web soil survey. Available at: http://websoilsurvey.nrcs.usda.gov/app/. Accessed March 10, 2017.

———. 2017b. WETS and precipitation data for Ellensburg, Washington. Available at: http://agacis.rcc-acis.org/. Accessed May 2, 2017.

Olson, P., and E. Stockdale. 2010. *Determining the Ordinary High Water Mark on Streams in Washington State*. Second Review Draft. Ecology Publication No. 08-06-001. Lacey, Washington: Washington State Department of Ecology, Shorelands and Environmental Assistance Program.

U.S. Army Corps of Engineers (USACE). 2008. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0)*, edited by J.S. Wakeley, R.W. Lichvar, and C.V. Noble. ERDC/EL TR-08-28. Vicksburg, Mississippi: U.S. Army Engineer Research and Development Center.

U. S. Department of Agriculture (USDA). 1954. Kittitas County. Central Washington Historical Aerial Photograph Project. Central Washington University, Department of Geography. Available at: http://www.gis.cwu.edu/geog/historical_airphotos/. Accessed on June 23, 2017.

U. S. Fish and Wildlife Service (USFWS). 2017. National Wetland Inventory. Wetlands Online Mapper. Available at: http://wetlandsfws.er.usgs.gov/wtlnds/launch.html. Accessed March 10, 2017.

Washington State Department of Ecology (Ecology). 1997. Washington State Wetland Identification and Delineation Manual. Publication No. 96-94. Olympia, Washington: Washington State Department of Ecology.

Washington State Department of Fish and Wildlife (WDFW). 2017a. Priority Habitats and Species on the Web. Available at: http://wdfw.wa.gov/mapping/phs/. Accessed March 10, 2017.

———. 2017b. SalmonScape. Available at: http://wdfw.wa.gov/mapping/salmonscape. Accessed March 10, 2017.

APPENDIX A: WETLAND DELINEATION METHODOLOGY

Wetlands are defined as areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and which under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. The methods used to delineate wetlands within the study area conform to guidance in the *Washington State Wetland Identification and Delineation Manual* (Ecology 1997), the *Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987), and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0)* (USACE 2008).

To be considered a wetland by the U.S. Army Corps of Engineers (USACE), an area must express hydrophytic vegetation, hydric soils, and wetland hydrology. SWCA Environmental Consultants (SWCA) staff documented site conditions for these parameters in areas representative of the project site and in areas most likely to exhibit wetland features. Staff collected additional data in associated uplands, as needed, to confirm wetland boundaries. Wetland boundaries, stream boundaries, and wetland data plot locations in the study area were recorded with a Trimble Geo XT global positioning system (GPS) unit. All delineated wetlands and streams were processed and projected onto existing base maps using ArcGIS software.

Vegetation

The dominant and sub-dominant plants were identified and recorded at each sample plot location. These plants were evaluated based on their wetland indicator status to determine if the vegetation was hydrophytic. SWCA biologists utilized the 50/20 rule per USACE recommendations to determine which plants were dominant at each sample plot. Under this guidance, absolute cover estimates were made for each species found rooted within the sample plot radius for each vegetative strata found in the habitat (tree, sapling/shrub, herb, and woody vine). Refer to the USACE regional supplement for exact applications of this method of determining dominance (USACE 2008).

Sample plot radii varied in size depending on site topography and habitat complexity. When documenting vegetation in smaller or oddly-shaped wetlands or habitat features, vegetation strata radii may be adjusted to more accurately depict vegetation rooted within the wetland or habitat feature being delineated.

Hydrophytic vegetation is defined as vegetation adapted to wetland conditions, such as inundation or prolonged saturation. To meet the hydrophytic vegetation criterion, more than 50% of the total dominant plants across all stratums must have a wetland indicator status of Facultative (FAC), Facultative Wetland (FACW), or Obligate (OBL). The wetland indicator status is assigned to plant species that have the potential to occur in wetlands by the USACE (Lichvar et al. 2016). Table A-1 lists the definitions for each wetland indicator status.

Table A-1. Definitions for Each Wetland Plant Indicator Status

Wetland Indicator Status	Symbol	Definition
Obligate Wetland Plants	OBL	Plants that almost always (> 99% of the time) occur in wetlands, but which may rarely (< 1% of the time) occur in non-wetlands.
Facultative Wetland Plants	FACW	Plants that often (67 to 99% of the time) occurs in wetlands, but sometimes (1 to 33% of the time) occur in non-wetlands.
Facultative Plants	FAC	Plants with a similar likelihood (34 to 66% of the time) of occurring in both wetlands and non-wetlands.
Facultative Upland Plants	FACU	Plants that sometimes (1 to 33% of the time) occur in wetlands, but occur more often (67 to 99% of the time) in non-wetlands.
Upland Plants	UPL	Plants that rarely (< 1% of the time) occur in wetlands, and almost always (> 99% of the time) occur in non-wetlands.

Source: Lichvar et al. (2016).

SWCA biologists identified plants found in the field to species whenever possible, when adequate vegetative or flowering characteristics were available. Scientific and common plant names were reported with the currently accepted nomenclature.

Soils

An area typically must contain hydric soils to be considered a wetland, except when problematic site conditions occur. Hydric soils typically form under an area that experiences durations of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper portion of the soil profile. Chemical and biological processes in saturated soil result in reduced oxygen concentrations and promote anaerobic metabolism in microorganisms. These prolonged anaerobic conditions often create mottling and other distinct patterns in the soil, which are used as indicators of hydric soils. The hue, value, and chroma and relative percentage of mottling are recorded in the field at each data plot location. Other important hydric soil indicators include organic matter accumulations in the surface horizon, reduced sulfur odors, and organic matter staining in the soil profile (Natural Resource Conservation Service [NRCS] 2017a).

SWCA staff examined soil profiles at each data plot location by excavating sample pits to a depth of 16 to 20 inches to observe the soil profile, colors, and textures. In some cases, a shallower soil pit was used due to shovel refusal from obstructions in the soil profile, such as gravel, bedrock, thick roots, or clay hardpan. Munsell color charts (Munsell Color 2009) were used to determine soil colors in the field.

Hydrology

SWCA staff investigated the entire project site for evidence of wetland hydrology. Where data plot locations were taken, additional notes were recorded to fully document the presence of primary and secondary wetland hydrology indicators at the sample location. According to the USACE, wetland hydrology criteria were considered to be satisfied if the soil was seasonally inundated or saturated to the surface for a consecutive number of days greater than or equal to 12.5% of the growing season. The growing season for the area was determined based on the period in which temperatures are above 28 degrees Fahrenheit 5 out of 10 years (Ecology 1997) using the long-term climatological data collected by the NRCS (2017). Using the wetlands climate analysis (WETS) table for the nearest station (Ellensburg, Washington), the growing season was approximated as typically between April 20 and October 10, or a total of 173 days (NRCS 17b).

However, often times multiple site visits to determine the duration of seasonal inundation or saturation are not possible. Therefore, field indicators are used in an attempt to determine an area's hydro-period through field observations. Wetland hydrology indicators are divided into two categories: primary and secondary indicators (USACE 2008). Primary indicators of hydrology include, but are not limited to, surface inundation and high water table and saturated soils within 12 inches of the soil surface. The presence of one primary indicator is sufficient to conclude that wetland hydrology is present. Secondary hydrology indicators are also recorded and may substitute in the case of a lack of any primary indicators if multiple secondary indicators are observed. Secondary indicators of hydrology include, but are not limited to, drainage patterns, crayfish burrows, and dry-season water table (USACE 2008). If no primary indicators, and fewer than two secondary indicators, are observed within the sample area, then it is likely that the area is not considered a wetland, unless problematic conditions exist on-site. Aerial and historic imagery are often reviewed before and after site visits to ensure all possible hydrology indicators are taken into account.

References

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual*. Technical Report Y-87-1. Online edition. Vicksburg, MSMississippi: U.S. Army Engineer Waterways Experiment Station. Available at: http://el.erdc.usace.army.mil/wetlands/pdfs/wlman87.pdf.

Lichvar, R.W., D.L. Banks, W.N. Kirchner, and N.C. Melvin. 2016. *The National Wetland Plant List: 2016 Wwetland Rratings.* Phytoneuron 2016-30:1–17. Available at: http://www.phytoneuron.net/ and http://rsgisias.crrel.usace.army.mil/NWPL/. Accessed May 3, 2016.

Munsell Color. 2009. Munsell Soil-Color Charts. Revised Edition. Grand Rapids, MichiganI: Munsell Color.

Natural Resources Conservation Service (NRCS). 2017a. *Field Indicators of Hydric Soils in the United States, a Guide for Identifying and Delineating Hydric Soils, Version 8.1*. Edited by L.M. Vasilas, G.W. Hurt, and J.F. Berkowitz. Available at: https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_053171.pdf. Accessed March 10, 2017.

———. 2017b. WETS and precipitation data for Ellensburg, Washington. Available at: http://agacis.rcc-acis.org/. Accessed May 2, 2017.

U.S. Army Corps of Engineers (USACE). 2008. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0)*, edited by. J.S. Wakeley, R.W. Lichvar, and C.V. Noble. ERDC/EL TR-08-28. Vicksburg, MississippiS: U.S. Army Engineer Research and Development Center.

Washington State Department of Ecology (Ecology). 1997. Washington State Wetland Identification and Delineation Manual. Publication No. #96-94. Olympia, Washington: Washington State Department of Ecology.

APPENDIX B: VEGETATION LIST

Urtica Solar Project
Vegetation Table
April 6-7, 2017

Common Name	Scientific Name	Wetland Indicator Status[1]	Native / Introduced and Invasive / Noxious
Colonial Bent	*Agrostis capillaris*	FAC	non-native
Garden Yellow-Rocket	*Barbarea vulgaris*	FAC	non-native
Devil's-Pitchfork	*Bidens frondosa*	FACW	native
Shepherd's-Purse	*Capsella bursa-pastoris*	FACU	non-native
sedge	*Carex species*	OBL to FACU	-
spotted knapweed	*Centaurea stoebe*	NOL	noxious
Canadian Thistle	*Cirsium arvense*	FACU	invasive, noxious
Orchard Grass	*Dactylis glomerata*	FACU	non-native
Queen Anne's-Lace	*Daucus carota*	UPL	non-native, noxious
Fuller's Teasel	*Dipsacus fullonum*	FAC	invasive, noxious
common viper's bugloss	*Echium vulgare*	NOL	non-native
Creeping Wild Rye	*Elymus repens*	FAC	non-native
tall annual willowherb	*Epilobium brachycarpum*	NOL	native
Tall Scouring-Rush	*Equisetum hyemale*	FACW	native
Hairy Cat's-Ear	*Hypochaeris radicata*	FACU	non-native, noxious
Baltic Rush	*Juncus balticus*	FACW	native
Lamp Rush	*Juncus effusus*	FACW	native
Prickly Lettuce	*Lactuca serriola*	FACU	non-native
Common Duckweed	*Lemna minor*	OBL	native
Spearmint	*Mentha spicata*	FACW	non-native
True Forget-Me-Not	*Myosotis scorpioides*	FACW	non-native
scotch thistle	*Onopordum acanthium*	NOL	noxious
Reed Canary Grass	*Phalaris arundinacea*	FACW	invasive, noxious
Common Timothy	*Phleum pratense*	FACU	non-native
English Plantain	*Plantago lanceolata*	FAC	non-native
bluegrass	*Poa species*	FAC ?	-
Quaking Aspen	*Populus tremuloides*	FACU	native
Creeping Buttercup	*Ranunculus repens*	FAC	non-native
Black Locust	*Robinia pseudoacacia*	FACU	non-native
Curly Dock	*Rumex crispus*	FAC	non-native
crack willow	*Salix X fragilis*	FAC	non-native
Common Dandelion	*Taraxacum officinale*	FACU	non-native
yellow salsify	*Tragopogon dubius*	NOL	non-native
White Clover	*Trifolium repens*	FACU	non-native
Broad-Leaf Cat-Tail	*Typha latifolia*	OBL	native
Stinging Nettle	*Urtica dioica*	FAC	native
Great Mullein	*Verbascum thapsus*	FACU	non-native

[1]Wetland Indicator Status (WIS) from the NWPL AW Region - see below.

A question mark (?) preceded by a space indicates our default assumption that the plant is FAC.

Wetland Indicator Status (WIS) and taxonomy for the AW Region per the National Wetland Plant List 2016v3.3:
(common names are capitalized) http://wetland-plants.usace.army.mil/ Accessed January 10, 2017
WIS for non-wetland plants and taxonomy from Reed 1988 and Reed et al. 1993, and the USDA PLANTS database:
(common names are not capitalized) http://plants.usda.gov/ Accessed multiple dates

Native per Hitchcock & Cronquist 1973 and http://plants.usda.gov/
Noxious per Washington State NWCB 2017 http://www.nwcb.wa.gov/

WETLAND INDICATOR STATUS - Arid West Region	
OBL	**Obligate Wetland** – Almost always is a hydrophyte, rarely in uplands. Examples: broad-leaf cat-tail, yellow-skunk-cabbage
FACW	**Facultative Wetland** - Usually is a hydrophyte but occasionally found in uplands. Examples: Oregon ash, red osier
FAC	**Facultative** – Commonly occurs as either a hydrophyte or non-hydrophyte. Examples: red alder, salmon raspberry
FACU	**Facultative Upland** - Occasionally is a hydrophyte but usually occurs in uplands. Examples: big-leaf maple, Himalayan blackberry
UPL	**Upland** - Rarely is a hydrophyte, almost always in uplands. These plants have been removed from the NWPL WMVC Region.
NOL	**Not Listed** - Not on the list; assumed to be UPL.

APPENDIX C: WETLAND DATA SHEETS

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Urtica Solar Project City/County: - / Kittitas Sampling Date: 4/6/2017

Applicant/Owner: TUUSSO Energy, LLC State: WA Sampling Point: **UP01**

Investigator(s): Evan Dulin, Jamie Young Section, Township, Range: Section 10, T17N, R18E

Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope (%): 3

Subregion (LRR): B, Columbia/Snake River Plateau Lat: 46.972973 Long: -120.570319 Datum: NAD 1983

Soil Map Unit Name: Nanum ashy loam, 2 to 5 percent slopes (481) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X* (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____		
Hydric Soil Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?**	**Yes X No ____**
Wetland Hydrology Present?	Yes X	No ____		

Precipitation prior to fieldwork: 0.48" two weeks prior, 2.28" above normal for CYTD, 2.74" above normal for WYTD. *Wetter than normal.

Remarks:

UW01. Wetland is in a depression that is fed by diverted water from a roadside ditch uphill to the east and runoff from the fields to the west..

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1.			
2.			
3.			
4.			
5.			
	0% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Phalaris arundinacea*	55%	Yes	FACW
2. *Typha latifolia*	20%	Yes	OBL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	75% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 25%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species 20	x 1 =	20
FACW species 55	x 2 =	110
FAC species 0	x 3 =	0
FACU species 0	x 4 =	0
UPL species 0	x 5 =	0
Column Totals: 75 (A)		130 (B)

Prevalence Index = B/A = 1.73

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ____ 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes X No ____**

Remarks:

25% bare ground where previously ponded and dominated by *Lemna minor*.

Entered by: KL/ED QC by: TJD

SOIL

Sampling Point: **UP01**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 3/2	95	7.5YR 4/6	5	C	PL	SiL	
2	10YR 4/2	100					Sand	very thin layer
2-8	10YR 3/2	95	7.5YR 4/6	5	C	PL	SiL	
8-13+	2.5Y 3/1	80	7.5YR 4/6	15	C	PL	SiL	
			7.5YR 3/4	5	C	PL		

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distrubed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): N/A

Hydric Soil Present? Yes X No ___

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)
2" thick mat of organic matter extends above soil surface.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- X Surface Soil Cracks (B6)
- X Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- X Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes	___	No	X	Depth (inches): N/A
Water Table Present?	Yes	___	No	X	Depth (inches): >13
Saturation Present? (includes capillary fringe)	Yes	X	No	___	Depth (inches): 0-8

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Entered by: KL/ED QC by: TJD

Living snails were observed in area of previously open water that recently dried up. Surface saturation from recent ponding, surface water driven.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Urtica Solar Project City/County: - / Kittitas Sampling Date: 4/6/2017

Applicant/Owner: TUUSSO Energy, LLC State: WA Sampling Point: **UP02**

Investigator(s): Evan Dulin, Jamie Young Section, Township, Range: Section 10, T17N, R18E

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): Convex Slope (%): 1

Subregion (LRR): B, Columbia/Snake River Plateau Lat: 46.973019 Long: -120.570343 Datum: NAD 1983

Soil Map Unit Name: Brysill cobbly ashy loam, 0 to 2 percent slopes (801) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X* (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No **X**	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** **X**
Hydric Soil Present?	Yes ____	No **X**		
Wetland Hydrology Present?	Yes ____	No **X**		

Precipitation prior to fieldwork: 0.48" two weeks prior, 2.28" above normal for CYTD, 2.74" above normal for WYTD. *Wetter than normal.

Remarks:
Sample plot is approximately 4' higher in elevation than UP01 in planted timothy field.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1.			
2.			
3.			
4.			
5.			
	0% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Phleum pratense*	90%	Yes	FACU
2. *Cirsium arvense*	5%	No	FACU
3. *Phalaris arundinacea*	5%	No	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	100% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 0%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species 0	x 1 =	0
FACW species 5	x 2 =	10
FAC species 0	x 3 =	0
FACU species 95	x 4 =	380
UPL species 0	x 5 =	0
Column Totals: 100 (A)		390 (B)

Prevalence Index = B/A = 3.90

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- ____ 2 - Dominance Test is >50%
- ____ 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Remarks:
Planted timothy.

Entered by: KL/ED QC by: TJD

SOIL

Sampling Point: **UP02**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-9	10YR 3/2	100					SiCL	
9-14	10YR 3/1	98	7.5YR 3/4	2	C	M	SiCL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distrubed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): N/A

Hydric Soil Present? Yes ___ **No X**

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)
Redox features below 9" could possibly be relic redox.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches):	N/A
Water Table Present?	Yes ___	No X	Depth (inches):	>14
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches):	>14

Wetland Hydrology Present?

Yes ___ **No X**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Entered by: KL/ED QC by: TJD

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Urtica Solar Project City/County: - / Kittitas Sampling Date: 4/7/2017

Applicant/Owner: TUUSSO Energy, LLC State: WA Sampling Point: **UP03**

Investigator(s): Evan Dulin, Jamie Young Section, Township, Range: Section 10, T17N, R18E

Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope (%): 1

Subregion (LRR): B, Columbia/Snake River Plateau Lat: 46.973920 Long: -120.578257 Datum: NAD 1983

Soil Map Unit Name: Brickmill gravelly ashy loam, 0 to 2 percent slopes (601) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X* (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?**	**Yes X No ____**
Hydric Soil Present?	Yes X	No ____		
Wetland Hydrology Present?	Yes X	No ____		

Precipitation prior to fieldwork: 0.60" two weeks prior, 2.39" above normal for CYTD, 2.85" above normal for WYTD. *Wetter than normal.

Remarks:

UW02. Wetland on fringes of the permanent open water area of the western pond.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1.			
2.			
3.			
4.			
5.			
	0% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Phalaris arundinacea*	95%	Yes	FACW
2. *Rumex crispus*	5%	No	FAC
3. *Epilobium brachycarpum*	3%	No	NOL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	103% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 0%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species 0	x 1 =	0
FACW species 95	x 2 =	190
FAC species 5	x 3 =	15
FACU species 0	x 4 =	0
UPL species 3	x 5 =	15
Column Totals: 103 (A)		220 (B)

Prevalence Index = B/A = 2.14

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ____ 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

Entered by: KL/ED QC by: TJD

SOIL

Sampling Point: **UP03**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-7	10YR 3/2	100					SiCL	
7-14	10YR 3/1	98	7.5YR 3/3	2	C	PL	SiCL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distrubed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): N/A

Hydric Soil Present? Yes X No ___

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes	___	No	X	Depth (inches): N/A
Water Table Present?	Yes	X	No	___	Depth (inches): 8
Saturation Present? (includes capillary fringe)	Yes	X	No	___	Depth (inches): 5

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
About 6' from the pond's OHWM.

Entered by: KL/ED QC by: TJD

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Urtica Solar Project City/County: - / Kittitas Sampling Date: 4/7/2017

Applicant/Owner: TUUSSO Energy, LLC State: WA Sampling Point: **UP04**

Investigator(s): Evan Dulin, Jamie Young Section, Township, Range: Section 10, T17N, R18E

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): Convex Slope (%): 4

Subregion (LRR): B, Columbia/Snake River Plateau Lat: 46.973974 Long: -120.578279 Datum: NAD 1983

Soil Map Unit Name: Brickmill gravelly ashy loam, 0 to 2 percent slopes (601) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X* (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No **X**	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** **X**
Hydric Soil Present?	Yes ____	No **X**		
Wetland Hydrology Present?	Yes ____	No **X**		

Precipitation prior to fieldwork: 0.60" two weeks prior, 2.39" above normal for CYTD, 2.85" above normal for WYTD. *Wetter than normal.

Remarks:
Sample plot located on edge of planted timothy field.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1.			
2.			
3.			
4.			
5.			
	0% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Phleum pratense*	90%	Yes	FACU
2. *Phalaris arundinacea*	10%	No	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	100% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 0%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species 0	x 1 =	0
FACW species 10	x 2 =	20
FAC species 0	x 3 =	0
FACU species 90	x 4 =	360
UPL species 0	x 5 =	0
Column Totals: 100 (A)		380 (B)

Prevalence Index = B/A = 3.80

Hydrophytic Vegetation Indicators:

____ 1 - Rapid Test for Hydrophytic Vegetation

____ 2 - Dominance Test is >50%

____ 3 - Prevalence Index is ≤3.0[1]

____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

____ 5 - Wetland Non-Vascular Plants[1]

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Remarks:
Planted timothy.

Entered by: KL/ED QC by: TJD

SOIL

Sampling Point: **UP04**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-7	10YR 3/1	100					SiCL	
7-11+	10YR 3/1	99	7.5YR 3/2	1	C	PL	SiCL	faint redox

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distrubed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): N/A

Hydric Soil Present? Yes ___ **No X**

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)
Shovel refusal 11" due to rocks.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches):	N/A
Water Table Present?	Yes ___	No X	Depth (inches):	>12
Saturation Present? (includes capillary fringe)	Yes X	No X	Depth (inches):	0-3

Wetland Hydrology Present? Yes ___ **No X**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
0-3" of saturation at surface from recent rainfall.

Entered by: KL/ED QC by: TJD

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Urtica Solar Project City/County: - / Kittitas Sampling Date: 4/7/2017

Applicant/Owner: TUUSSO Energy, LLC State: WA Sampling Point: **UP05**

Investigator(s): Evan Dulin, Jamie Young Section, Township, Range: Section 10, T17N, R18E

Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope (%): 1

Subregion (LRR): B, Columbia/Snake River Plateau Lat: 46.974175 Long: -120.577216 Datum: NAD 1983

Soil Map Unit Name: Brickmill gravelly ashy loam, 0 to 2 percent slopes (601) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X* (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?**	**Yes X No ____**
Hydric Soil Present?	Yes X	No ____		
Wetland Hydrology Present?	Yes X	No ____		

Precipitation prior to fieldwork: 0.60" two weeks prior, 2.39" above normal for CYTD, 2.85" above normal for WYTD. *Wetter than normal.

Remarks:

UW03. Wetland on fringes of the permanent open water area of the eastern pond.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1.			
2.			
3.			
4.			
5.			
	0% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Phalaris arundinacea*	40%	Yes	FACW
2. *Typha latifolia*	20%	Yes	OBL
3. *Agrostis capillaris*	20%	Yes	FAC
4. *Juncus effusus*	10%	No	FACW
5. *Carex species*	10%	No	FAC ?
6.			
7.			
8.			
9.			
10.			
11.			
	100% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 0%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

	Total % Cover of:	Multiply by:	
OBL species	20	x 1 =	20
FACW species	50	x 2 =	100
FAC species	30	x 3 =	90
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	100 (A)		210 (B)

Prevalence Index = B/A = 2.10

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ____ 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? Yes X No ____

Remarks: Entered by: KL/ED QC by: TJD

SOIL

Sampling Point: **UP05**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 3/1	100					SiCL	
5-14	7.5YR 3/1	93	7.5YR 3/4	7	C	M, PL	SiL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distrubed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): N/A

Hydric Soil Present? Yes X No ___

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)
Small streaks of black Mn concentrations from 7-14".

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- X Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches):	N/A	
Water Table Present?	Yes ___	No X	Depth (inches):	>14	**Wetland Hydrology Present?**
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches):	>14	**Yes X No ___**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Entered by: KL/ED QC by: TJD

About 9' from the pond's OHWM, appears to be fed by overland flooding from pond (does not appear to be fed by groundwater from the pond). Saturation visible on aerial imagery.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Urtica Solar Project City/County: - / Kittitas Sampling Date: 4/7/2017

Applicant/Owner: TUUSSO Energy, LLC State: WA Sampling Point: **UP06**

Investigator(s): Evan Dulin, Jamie Young Section, Township, Range: Section 10, T17N, R18E

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): Convex Slope (%): 4

Subregion (LRR): B, Columbia/Snake River Plateau Lat: 46.974139 Long: -120.577325 Datum: NAD 1983

Soil Map Unit Name: Brickmill gravelly ashy loam, 0 to 2 percent slopes (601) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X* (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No **X**	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** **X**
Hydric Soil Present?	Yes ____	No **X**		
Wetland Hydrology Present?	Yes ____	No **X**		

Precipitation prior to fieldwork: 0.60" two weeks prior, 2.39" above normal for CYTD, 2.85" above normal for WYTD. *Wetter than normal.

Remarks:
Sample plot located on edge of planted timothy field.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1.			
2.			
3.			
4.			
5.			
	0% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Phleum pratense*	95%	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	95% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 5%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

	Total % Cover of:	Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	95	x 4 =	380
UPL species	0	x 5 =	0
Column Totals:	95 (A)		380 (B)

Prevalence Index = B/A = 4.00

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- ____ 2 - Dominance Test is >50%
- ____ 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Remarks:
Planted timothy.

Entered by: KL/ED QC by: TJD

SOIL

Sampling Point: **UP06**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-10	10YR 3/2	100					SiL	
10-14	10YR 3/2	97	10YR 3/3	3	C	M	SiL	faint redox

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distrubed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): N/A

Hydric Soil Present? Yes ___ **No X**

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches):	N/A
Water Table Present?	Yes ___	No X	Depth (inches):	>14
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches):	>14

Wetland Hydrology Present?

Yes ___ **No X**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Entered by: KL/ED QC by: TJD

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Urtica Solar Project City/County: - / Kittitas Sampling Date: 4/7/2017

Applicant/Owner: TUUSSO Energy, LLC State: WA Sampling Point: **UP07**

Investigator(s): Evan Dulin, Jamie Young Section, Township, Range: Section 10, T17N, R18E

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Concave Slope (%): 1

Subregion (LRR): B, Columbia/Snake River Plateau Lat: 46.975018 Long: -120.575117 Datum: NAD 1983

Soil Map Unit Name: Brickmill gravelly ashy loam, 0 to 2 percent slopes (601) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X* (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____		
Hydric Soil Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____	No X		

Precipitation prior to fieldwork: 0.60" two weeks prior, 2.39" above normal for CYTD, 2.85" above normal for WYTD. *Wetter than normal.

Remarks:
Sample plot located about 20' north of US01.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1.			
2.			
3.			
4.			
5.			
	0% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Phalaris arundinacea*	100%	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	100% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 0%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species 0	x 1 =	0
FACW species 100	x 2 =	200
FAC species 0	x 3 =	0
FACU species 0	x 4 =	0
UPL species 0	x 5 =	0
Column Totals: 100 (A)		200 (B)

Prevalence Index = B/A = 2.00

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ____ 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: Entered by: KL/ED QC by: TJD

SOIL

Sampling Point: **UP07**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-10	10YR 3/2	100					SiCL	
10-14+	10YR 3/1	98	7.5YR 3/4	2	C	M	SiCL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distrubed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): N/A

Hydric Soil Present? Yes ___ **No X**

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches):	N/A
Water Table Present?	Yes ___	No X	Depth (inches):	>14
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches):	>14

Wetland Hydrology Present?

Yes ___ **No X**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Entered by: KL/ED QC by: TJD

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Urtica Solar Project City/County: - / Kittitas Sampling Date: 4/7/2017

Applicant/Owner: TUUSSO Energy, LLC State: WA Sampling Point: **UP08**

Investigator(s): Evan Dulin, Jamie Young Section, Township, Range: Section 10, T17N, R18E

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Convex Slope (%): 2

Subregion (LRR): B, Columbia/Snake River Plateau Lat: 46.974528 Long: -120.570668 Datum: NAD 1983

Soil Map Unit Name: Brickmill gravelly ashy loam, 0 to 2 percent slopes (601) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X* (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____		
Hydric Soil Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?**	**Yes** ____ **No** X
Wetland Hydrology Present?	Yes ____	No X		

Precipitation prior to fieldwork: 0.60" two weeks prior, 2.39" above normal for CYTD, 2.85" above normal for WYTD. *Wetter than normal.

Remarks:

Sample plot is located on low stream terrace overgrown by *Phalaris arundinacea* adjacent to US01. Does not meet wetland criteria.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1.			
2.			
3.			
4.			
5.			
	0% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Phalaris arundinacea*	100%	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	100% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 0%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species 0	x 1 =	0
FACW species 100	x 2 =	200
FAC species 0	x 3 =	0
FACU species 0	x 4 =	0
UPL species 0	x 5 =	0
Column Totals: 100 (A)		200 (B)

Prevalence Index = B/A = 2.00

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ____ 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: Entered by: KL/ED QC by: TJD

SOIL

Sampling Point: **UP08**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 3/2	100					SiCL	
8-15	10YR 3/1	89	10YR 3/3	1	C	M	SiCL	mixed matrix
	10YR 3/2	10					SiCL	mixing from top

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distrubed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): N/A

Hydric Soil Present? Yes ___ **No** X

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)
Large roots present throughout.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches):	N/A
Water Table Present?	Yes ___	No X	Depth (inches):	>15
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches):	>15

Wetland Hydrology Present?

Yes ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Entered by: KL/ED QC by: TJD

Plot is located about 8' from the stream's OHWM, approximately 3' in elevation above the current stream level (stream is nearly full). Area Could have previously been a floodplain for US01 prior to ditching of the stream. Does not meet wetland criteria.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Urtica Solar Project City/County: - / Kittitas Sampling Date: 4/7/2017

Applicant/Owner: TUUSSO Energy, LLC State: WA Sampling Point: **UP09**

Investigator(s): Evan Dulin, Jamie Young Section, Township, Range: Section 10, T17N, R18E

Landform (hillslope, terrace, etc.): Terrace Local relief (concave, convex, none): Convex Slope (%): 1

Subregion (LRR): B, Columbia/Snake River Plateau Lat: 46.974892 Long: -120.570391 Datum: NAD 1983

Soil Map Unit Name: Brickmill gravelly ashy loam, 0 to 2 percent slopes (601) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X* (If no, explain in Remarks)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?**	**Yes ____ No X**
Hydric Soil Present?	Yes X	No ____		
Wetland Hydrology Present?	Yes ____	No X		

Precipitation prior to fieldwork: 0.60" two weeks prior, 2.39" above normal for CYTD, 2.85" above normal for WYTD. *Wetter than normal.

Remarks:
Sample plot is located in a low spot at the bottom of the field, approximately 40' west of the stream's OHWM.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1.			
2.			
3.			
4.			
5.			
	0% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Poa species*	40%	Yes	FAC ?
2. *Juncus balticus*	30%	Yes	FACW
3. *Rumex crispus*	10%	No	FAC
4. *Taraxacum officinale*	10%	No	FACU
5. *Trifolium repens*	5%	No	FACU
6.			
7.			
8.			
9.			
10.			
11.			
	95% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 5%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species 0	x 1 =	0
FACW species 30	x 2 =	60
FAC species 50	x 3 =	150
FACU species 15	x 4 =	60
UPL species 0	x 5 =	0
Column Totals: 95 (A)		270 (B)

Prevalence Index = B/A = 2.84

Hydrophytic Vegetation Indicators:

- ____ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ____ 3 - Prevalence Index is ≤3.0[1]
- ____ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ 5 - Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present.

Hydrophytic Vegetation Present? **Yes X No ____**

Remarks: Entered by: KL/ED QC by: TJD

SOIL

Sampling Point: **UP09**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 3/2	100					SiCL	
5-15	10YR 3/1	80	7.5YR 2.5/3	18	C	M, PL	SiL	
			2.5Y 5/4	2	D	M		

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless distrubed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): N/A

Hydric Soil Present? Yes X No ___

Remarks: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)
Large rocks present throughout soil.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches):	N/A
Water Table Present?	Yes ___	No X	Depth (inches):	>15
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches):	>15

Wetland Hydrology Present?

Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Entered by: KL/ED QC by: TJD

APPENDIX D: WETLAND AND STREAM PHOTOGRAPHS



Photo A. View south of Wetland UW01 (UP02).



Photo B. View down of living snails in Wetland UW01.



Photo C. View southeast of off-site roadside ditch and drain east of Wetland UW01.



Photo D. View west of McCarl Creek (US01) in the southwest corner, off-site.



Photo E. View east of McCarl Creek where water is siphoned to the western pond.



Photo F. View southwest of confluence of McCarl Creek (left) with pond side ditch.



Photo G. View northeast of the middle portion of McCarl Creek.



Photo H. View south of McCarl Creek along eastern site boundary.



Photo I. View northeast of McCarl Creek flowing off-site through a culvert.



Photo J. View northeast of off-site pond fringe Wetland UW02 (UP03).



Photo K. View south of off-site pond fringe Wetland UW03 (UP05).



Photo L. View south of side seep from eastern pond feeding into drainage ditch.



Photo M. View east of side seep drainage ditch.



Photo N. View west of upland stream terrace near the middle of the site (UP07).



Photo O. View east of upland stream terrace in the eastern portion of the site (UP08).



Photo P. View east of upland in slight depression just west of McCarl Creek (UP09).

APPENDIX E: ECOLOGY RATING FORMS

Wetland name or number UW01

RATING SUMMARY – Eastern Washington

Name of wetland (or ID #): UW01 Date of site visit: 4/6/17

Rated by N. Evan Dulin Trained by Ecology? ✓ Yes ___ No Date of training 3/24/17

HGM Class used for rating Depressional Wetland has multiple HGM classes? ___ Y ✓ N

NOTE: Form is not complete without the figures requested (*figures can be combined*).
Source of base aerial photo/map Google Earth

OVERALL WETLAND CATEGORY III (based on functions ✓ or special characteristics ___)

1. Category of wetland based on FUNCTIONS

___ **Category I** – Total score = 22-27
___ **Category II** – Total score = 19-21
✓ **Category III** – Total score = 16-18
___ **Category IV** – Total score = 9-15

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
	Circle the appropriate ratings			
Site Potential	H (M) L	(H) M L	H (M) L	
Landscape Potential	(H) M L	(H) M L	H M (L)	
Value	H M (L)	H (M) L	H M (L)	TOTAL
Score Based on Ratings	6	8	4	18

Score for each function based on three ratings *(order of ratings is not important)*

9 = H,H,H
8 = H,H,M
7 = H,H,L
7 = H,M,M
6 = H,M,L
6 = M,M,M
5 = H,L,L
5 = M,M,L
4 = M,L,L
3 = L,L,L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	CATEGORY *Circle the appropriate category*
Vernal Pools	II III
Alkali	I
Wetland of High Conservation Value	I
Bog and Calcareous Fens	I
Old Growth or Mature Forest – slow growing	I
Aspen Forest	I
Old Growth or Mature Forest – fast growing	II
Floodplain forest	II
None of the above	✓

Wetland name or number UW01

Maps and figures required to answer questions correctly for Eastern Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	D 1.3, H 1.1, H 1.5	1
Hydroperiods (including area of open water for H 1.3)	D 1.4, H 1.2, H 1.3	1
Location of outlet (*can be added to map of hydroperiods)*	D 1.1, D 4.1	N/A – No outlet
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	1
Map of the contributing basin	D 5.3	2
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	3
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	4
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	D 3.3	5

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	R 2.4	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of wetland vs. width of stream *(can be added to another figure)*	R 4.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	R 3.2, R 3.3	

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	L 1.1, L 4.1, H 1.1, H 1.5	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants *(can be added to figure above)*	S 4.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	S 3.3	

Wetland name or number UW01

HGM Classification of Wetland in Eastern Washington

For questions 1-4, the criteria described must apply to the entire unit being rated.

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-4 apply, and go to Question 5.

1. Does the entire unit **meet both** of the following criteria?
   ___The vegetated part of the wetland is on the water side of the Ordinary High Water Mark of a body of permanent open water (without any plants on the surface) that is at least 20 ac (8 ha) in size
   ___At least 30% of the open water area is deeper than 10 ft (3 m)

   NO – go to 2 **YES –** The wetland class is **Lake Fringe** (Lacustrine Fringe)

2. Does the entire wetland unit **meet all** of the following criteria?
   ___The wetland is on a slope (*slope can be very gradual*),
   ___The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks;
   ___The water leaves the wetland **without being impounded.**

   NO - go to 3 YES – The wetland class is **Slope**
   NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 foot deep).

3. Does the entire wetland unit **meet all** of the following criteria?
   ___ The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river;
   ___ The overbank flooding occurs at least once every 10 years.

   NO - go to 4 YES – The wetland class is **Riverine**
   NOTE: The Riverine wetland can contain depressions that are filled with water when the river is not flooding.

4. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year. *This means that any outlet, if present, is higher than the interior of the wetland.*

   NO – go to 5 YES – The wetland class is **Depressional**

5. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-4 APPLY TO DIFFERENT AREAS IN THE WETLAND UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

Wetland name or number UWo 1

NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the wetland unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM Class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine (the riverine portion is within the boundary of depression)	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine

If you are still unable to determine which of the above criteria apply to your wetland, or if you have ***more than 2 HGM classes*** *within a wetland boundary, classify the wetland as Depressional for the rating.*

Wetland name or number UW01

DEPRESSIONAL WETLANDS **Water Quality Functions** - Indicators that the site functions to improve water quality	Points (only 1 score per box)
D 1.0. Does the site have the potential to improve water quality?	
D 1.1. Characteristics of surface water outflows from the wetland: — Wetland has no surface water outlet — points = 5 Wetland has an intermittently flowing outlet — points = 3 Wetland has a highly constricted permanently flowing outlet — points = 3 Wetland has a permanently flowing, unconstricted, surface outlet — points = 1	5
D 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic *(use NRCS definitions of soils)* YES = 3 (NO = 0)	0
D 1.3. Characteristics of persistent vegetation (Emergent, Scrub-shrub, and/or Forested Cowardin classes) — Wetland has persistent, ungrazed, vegetation for > 2/3 of area (100% ungrazed) — points = 5 Wetland has persistent, ungrazed, vegetation from 1/3 to 2/3 of area — points = 3 Wetland has persistent, ungrazed vegetation from 1/10 to < 1/3 of area — points = 1 Wetland has persistent, ungrazed vegetation < 1/10 of area — points = 0	5
D 1.4. Characteristics of seasonal ponding or inundation: *This is the area of ponding that fluctuates every year. Do not count the area that is permanently ponded.* Area seasonally ponded is > ½ total area of wetland — points = 3 — Area seasonally ponded is ¼ - ½ total area of wetland (27%) — points = 1 Area seasonally ponded is < ¼ total area of wetland — points = 0	1
Total for D 1 — Add the points in the boxes above	11

Rating of Site Potential If score is: ___ **12- 16 = H** ✓ **6- 11 = M** ___ **0- 5 = L** *Record the rating on the first page*

D 2.0. Does the landscape have the potential to support the water quality function of the site?	
D 2.1. Does the wetland receive stormwater discharges? (fed by roadside ditch) (Yes = 1) No = 0	1
D 2.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate pollutants? (Yes = 1) No = 0	1
D 2.3. Are there septic systems within 250 ft of the wetland? (potentially) (Yes = 1) No = 0	1
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1- D 2.3? Source_____ Yes = 1 (No = 0)	0
Total for D 2 — Add the points in the boxes above	3

Rating of Landscape Potential If score is: ✓ **3 or 4 = H** ___ **1 or 2 = M** ___ **0 = L** *Record the rating on the first page*

D 3.0. Is the water quality improvement provided by the site valuable to society?	
D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, or lake that is on the 303(d) list? Yes = 1 (No = 0)	0
D 3.2. Is the wetland in a basin or sub-basin where water quality is an issue in some aquatic resource [303(d) list, eutrophic lakes, problems with nuisance and toxic algae]? Yes = 1 (No = 0)	0
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality (*answer YES if there is a TMDL for the drainage or basin in which the wetland is found*)? Yes = 2 (No = 0)	0
Total for D 3 — Add the points in the boxes above	0

Rating of Value If score is: ___ **2-4 = H** ___ **1 = M** ✓ **0 = L** *Record the rating on the first page*

Wetland name or number UW61

DEPRESSIONAL WETLANDS **Hydrologic Functions** - Indicators that the site functions to reduce flooding and erosion.	Points (only 1 score per box)
D 4.0. Does the site have the potential to reduce flooding and erosion?	
D 4.1. Characteristics of surface water outflows from the wetland: — Wetland has no surface water outlet — points = 8 Wetland has an intermittently flowing outlet — points = 4 Wetland has a highly constricted permanently flowing outlet — points = 4 Wetland has a permanently flowing unconstricted surface outlet — points = 0 *(If outlet is a ditch and not permanently flowing treat wetland as "intermittently flowing")*	8
D 4.2. Depth of storage during wet periods: *Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or deepest part (if dry).* Seasonal ponding: > 3 ft above the lowest point in wetland or the surface of permanent ponding — points = 8 — Seasonal ponding: 2 ft - < 3 ft above the lowest point in wetland or the surface of permanent ponding — points = 6 The wetland is a headwater wetland — points = 4 Seasonal ponding: 1 ft - < 2 ft — points = 4 Seasonal ponding: 6 in - < 1 ft — points = 2 Seasonal ponding: < 6 in or wetland has only saturated soils — points = 0	6
Total for D 4 — Add the points in the boxes above	14

Rating of Site Potential If score is: ✓ **12-16 = H** ___ **6-11 = M** ___ **0-5 = L** *Record the rating on the first page*

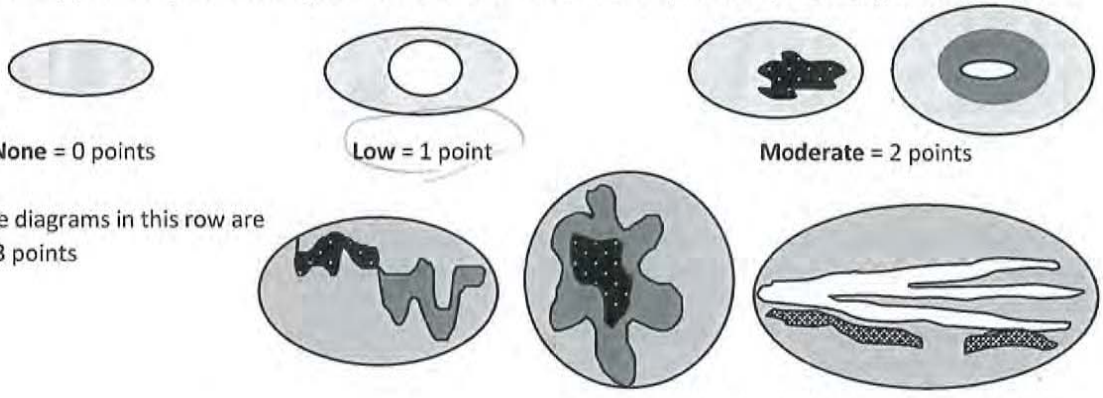
D 5.0. Does the landscape have the potential to support the hydrologic functions of the site?	
D 5.1. Does the wetland receive stormwater discharges? fed by roadside ditch (Yes = 1) No = 0	1
D 5.2. Is > 10% of the area within 150 ft of the wetland in a land use that generates runoff? 16% (Yes = 1) No = 0	1
D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land uses? (Yes = 1) No = 0	1
Total for D 5 — Add the points in the boxes above	3

Rating of Landscape Potential If score is: ✓ **3 = H** ___ **1 or 2 = M** ___ **0 = L** *Record the rating on the first page*

D 6.0. Are the hydrologic functions provided by the site valuable to society?	
D 6.1. The wetland is in a landscape that has flooding problems. Choose the description that best matches conditions around the wetland being rated. *Do not add points. Choose the highest score if more than one condition is met.* The wetland captures surface water that would otherwise flow down-gradient into areas where flooding has damaged human or natural resources (e.g., houses or salmon redds), AND Flooding occurs in sub-basin that is immediately down-gradient of wetland — points = 2 — Surface flooding problems are in a sub-basin farther down-gradient Yakima River — points = 1 The existing or potential outflow from the wetland is so constrained by human or natural conditions that the water stored by the wetland cannot reach areas that flood. *Explain why* _____ — points = 0 There are no problems with flooding downstream of the wetland — points = 0	1
D 6.2. Has the site has been identified as important for flood storage or flood conveyance in a regional flood control plan? Yes = 2 (No = 0)	0
Total for D 6 — Add the points in the boxes above	1

Rating of Value If score is: ___ **2-4 = H** ✓ **1 = M** ___ **0 = L** *Record the rating on the first page*

Wetland name or number UW01

These questions apply to wetlands of all HGM classes. **HABITAT FUNCTIONS** - Indicators that site functions to provide important habitat	(only 1 score per box)
H 1.0. Does the wetland have the potential to provide habitat for many species?	
H 1.1. Structure of the plant community: *Check the Cowardin vegetation classes present and categories of emergent plants. Size threshold for each category is >= ¼ ac or >= 10% of the wetland if wetland is < 2.5 ac.* ✓ Aquatic bed 27% ___ Emergent plants 0-12 in (0-30 cm) high are the highest layer and have > 30% cover ___ Emergent plants >12-40 in (>30-100 cm) high are the highest layer with >30% cover ✓ Emergent plants > 40 in (> 100 cm) high are the highest layer with >30% cover the rest (73%) ___ Scrub-shrub (areas where shrubs have >30% cover) ___ Forested (areas where trees have >30% cover) 4 or more checks: points = 3 3 checks: points = 2 2 checks: points = 1 1 check: points = 0	1
H 1.2. Is one of the vegetation types Aquatic Bed? (Yes = 1) No = 0	1
H 1.3. Surface water H 1.3.1. Does the wetland have areas of open water (without emergent or shrub plants) over at least ¼ ac **OR** 10% of its area during the March to early June **OR** in August to the end of September? *Answer YES for Lake Fringe wetlands.* 27% (Yes = 3 points & go to H 1.4) No = go to H 1.3.2 H 1.3.2. Does the wetland have an intermittent or permanent, and unvegetated stream within its boundaries, or along one side, over at least ¼ ac or 10% of its area? *Answer yes only if H 1.3.1 is No.* Yes = 3 No = 0	3
H 1.4. Richness of plant species Count the number of plant species in the wetland that cover at least 10 ft^2. *Different patches of the same species can be combined to meet the size threshold. You do not have to name the species.* *Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Russian olive, Phragmites, Canadian thistle, yellow-flag iris, and saltcedar (Tamarisk)* # of species 2 Scoring: > 9 species: points = 2 4-9 species: points = 1 < 4 species: points = 0	0
H 1.5. Interspersion of habitats Decide from the diagrams below whether interspersion among types of plant structures (described in H 1.1), and unvegetated areas (open water or mudflats) is high, moderate, low, or none. *Use map of Cowardin and emergent plant classes prepared for questions H 1.1 and map of open water from H 1.3. If you have four or more plant classes or three classes and open water, the rating is always high.*  **None** = 0 points **Low** = 1 point **Moderate** = 2 points All three diagrams in this row are **High** = 3 points Riparian braided channels with 2 classes	Figure__ 1

Wetland name or number UW01

H 1.6. Special habitat features *Check the habitat features that are present in the wetland. The number of checks is the number of points.* ____Loose rocks larger than 4 in OR large, downed, woody debris (> 4 in diameter) within the area of surface ponding or in stream. ✓ Cattails or bulrushes are present within the wetland. ____Standing snags (diameter at the bottom > 4 in) in the wetland or within 30 m (100 ft) of the edge. ____Emergent or shrub vegetation in areas that are permanently inundated/ponded. ____Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 45 degree slope) OR signs of recent beaver activity ____ Invasive species cover less than 20% in each stratum of vegetation *(canopy, sub-canopy, shrubs, herbaceous, moss/ground cover)*	1
Total for H 1 — Add the points in the boxes above	7

Rating of Site Potential If score is: ___**15-18 = H** ✓**7-14 = M** ___**0-6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support habitat functions of the site?	
H 2.1. Accessible habitat (only area of habitat abutting wetland). If total accessible habitat is: *Calculate:* % undisturbed habitat 0 + [(% moderate and low intensity land uses)/2] 0 = 0 % > 1/3 (33.3%) of 1 km Polygon — points = 3 20-33% of 1km Polygon — points = 2 10-19% of 1km Polygon — points = 1 ✓ <10% of 1km Polygon — points = 0	0
H 2.2. Undisturbed habitat in 1 km Polygon around wetland. (5+ patches) *Calculate:* % undisturbed habitat 13 + [(% moderate and low intensity land uses)/2] 15.5 = 28.5 % Undisturbed habitat > 50% of Polygon — points = 3 Undisturbed habitat 10 - 50% and in 1-3 patches — points = 2 — Undisturbed habitat 10 - 50% and > 3 patches — points = 1 Undisturbed habitat < 10% of Polygon — points = 0 undis 100/790 ac = 13%; 248/790 ac = 31%	1
H 2.3. Land use intensity in 1 km Polygon: > 50% of Polygon is high intensity land use 56% — points = (- 2) Does not meet criterion above — points = 0	-2
H 2.4. The wetland is in an area where annual rainfall is less than 12 in, and its water regime is not influenced by irrigation practices, dams, or water control structures. *Generally, this means outside boundaries of reclamation areas, irrigation districts, or reservoirs* — Yes = 3 (No = 0)	0
Total for H 2 — Add the points in the boxes above	-1

Rating of Landscape Potential If score is: ___**4-9 = H** ___**1-3 = M** ✓**< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose the highest score that applies to the wetland being rated* Site meets ANY of the following criteria: — points = 2 — It has 3 or more priority habitats within 100 m (see Appendix B) — It provides habitat for Threatened or Endangered species (any plant or animal on state or federal lists) — It is mapped as a location for an individual WDFW species — It is a Wetland of High Conservation Value as determined by the Department of Natural Resources — It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan Site has 1 or 2 priority habitats within 100 m (see Appendix B) — points = 1 — Site does not meet any of the criteria above — points = 0	0

Rating of Value If score is: ___**2 = H** ___**1 = M** ✓**0 = L** *Record the rating on the first page*

Appendix B: WDFW Priority Habitats in Eastern Washington

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp. http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here: http://wdfw.wa.gov/conservation/phs/list/)

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland: ***NOTE:*** *This question is independent of the land use between the wetland and the priority habitat.*

— **Aspen Stands:** Pure or mixed stands of aspen greater than 1 ac (0.4 ha).

— **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).

— **Old-growth/Mature forests:** Old-growth east of Cascade crest – Stands are highly variable in tree species composition and structural characteristics due to the influence of fire, climate, and soils. In general, stands will be >150 years of age, with 10 trees/ac (25 trees/ha) that are > 21 in (53 cm) dbh, and 1-3 snags/ac (2.5-7.5 snags/ha) that are > 12-14 in (30-35 cm) diameter. Downed logs may vary from abundant to absent. Canopies may be single or multi-layered. Evidence of human-caused alterations to the stand will be absent or so slight as to not affect the ecosystem's essential structures and functions. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west and 80-160 years old east of the Cascade crest.

— **Oregon White Oak:** Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).

— **Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

— **Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.

— **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

— **Cliffs:** Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.

— **Talus:** Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

— **Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 12 in (30 cm)in eastern Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

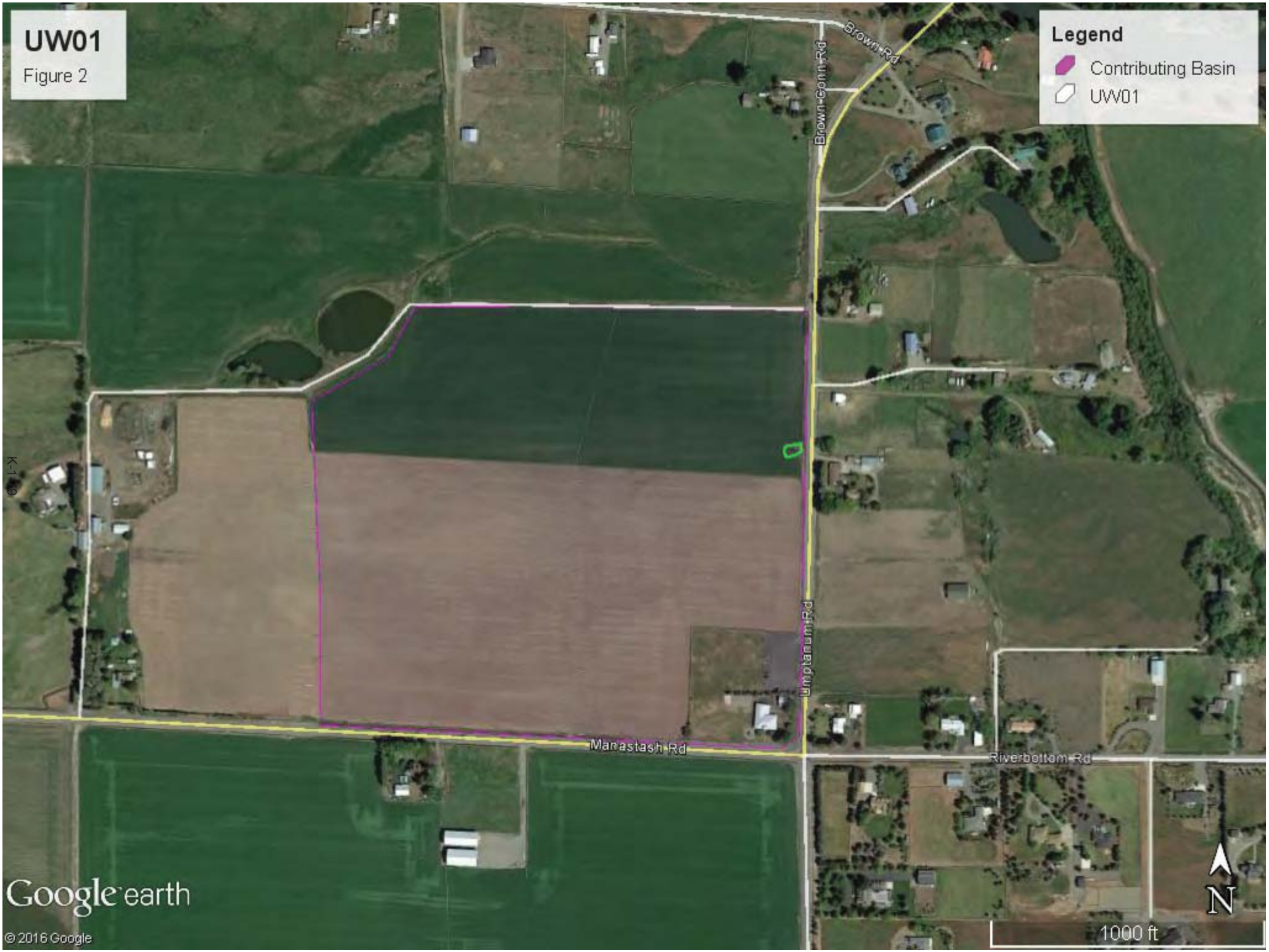
— **Shrub-steppe:** A nonforested vegetation type consisting of one or more layers of perennial bunchgrasses and a conspicuous but discontinuous layer of shrubs (see Eastside Steppe for sites with little or no shrub cover).

— **Eastside Steppe:** Nonforested vegetation type dominated by broadleaf herbaceous flora (i.e., forbs), perennial bunchgrasses, or a combination of both. Bluebunch wheatgrass (*Pseudoroegneria spicata*) is often the prevailing cover component along with Idaho fescue (*Festuca idahoensis*), Sandberg bluegrass (*Poa secunda*), rough fescue (*F. campestris*), or needlegrasses (*Achnatherum* spp.).

— **Juniper Savannah:** All juniper woodlands.

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list because they are addressed elsewhere.

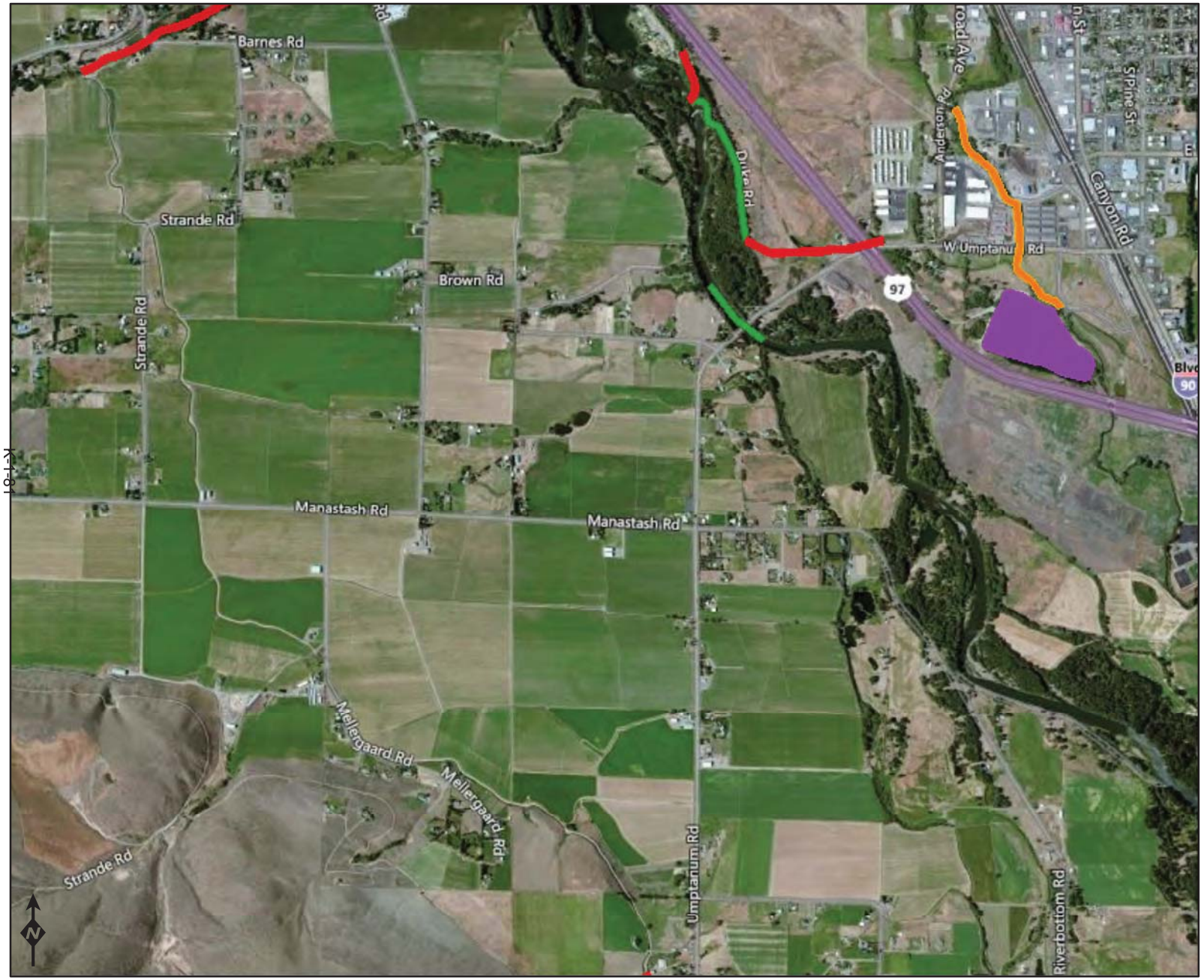

UW01
Figure 1
Legend
Seasonally ponded / Aquatic bed
UW01
K-1-78
Google earth
© 2016 Google
N
200 ft


UW01
Figure 2
Legend
Contributing Basin
UW01
Brown Rd
Brown-Conn Rd
Improvement Rd
Manastash Rd
Riverbottom Rd
K-1 Rd
N
1000 ft
Google earth
© 2016 Google


UW01
Figure 3
Legend
Mid-intensity
UW01
Undisturbed
Roadrunner Ln
Brown Rd
Umptanum Rd
Manastash Rd
Riverbottom Rd
Anderson Rd
Brondi Rd
K-1-80
97
Google earth
© 2016 Google
N
3000 ft

April 27, 2017

UW01 - Figure 4



Assessed Waters/Sediment

Water
- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

Sediment
- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

Miles
0 0.25 0.5 1

Image courtesy of USGS Earthstar Geographics SIO © 2017 Microsoft Corporation © 2010 NAVTEQ © AND

DEPARTMENT OF ECOLOGY
State of Washington

Water Quality Improvement Projects (TMDLs)

WATER QUALITY IMPROVEMENT PROJECTS (TMDLs)

Overview of the process

Project Catalog

- by WRIA
- by County

Funding Opportunities

Project Development Priority Lists

Related Information

TMDL Contacts

RELATED ECOLOGY PROGRAMS

Water Quality

Water Quality Improvement > Water Quality Improvement Projects by WRIA > WRIA 39: Upper Yakima

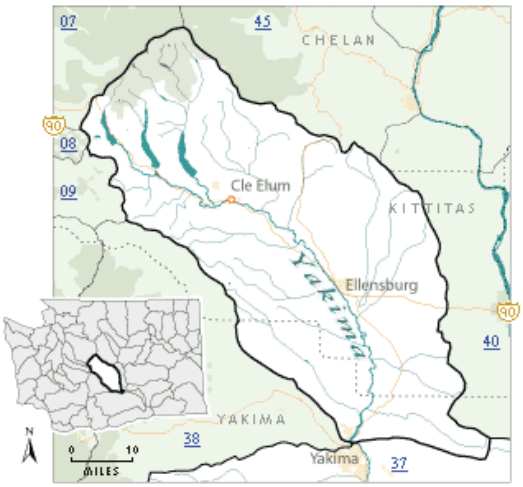
WRIA 39: Upper Yakima

The following table lists overview information and links to specific water quality improvement projects (including total maximum daily loads, or TMDLs) for this water resource inventory area (WRIA). Please use links (where available) for more information on a project.

Yakima River basin project index:
www.ecy.wa.gov/programs/wq/tmdl/yakima_wq/index.html

Counties

- Kittitas
- Yakima



Project Name	Pollutants	Status**	TMDL Lead
Crystal Creek	Ammonia-N BOD (5-day) Chlorine Fecal Coliform	EPA approved	Jane Creech 509-454-7860
Selah Ditch	Fecal Coliform Temperature	EPA approved	Greg Bohn 509-454-4174
Teanaway River segments: • Upper West Fork Teanaway River • Upper Middle Fork Teanaway River • Upper North Fork Teanaway River • Stafford Creek • Lower West Fork Teanaway River • Lower Middle Fork Teanaway River • Lower North Fork Teanaway River • Mainstem Teanaway River	Temperature	EPA approved	Jane Creech 509-454-7860
Wilson/Cooke Creek Tributaries: • Badger Creek • Bull Ditch • Caribou Creek • Cherry Creek • CID Canal • Coleman Creek • Cook Creek • EWC Canal • Johnson Drain • KRD Canal	Fecal Coliform	EPA approved Has an implementation plan Post-TMDL monitoring report	Jane Creech 509-454-7860 Greg Bohn 509-454-4174

• Mercer Creek • Naneum Creek • Parke Creek • Whiskey Creek • Wilson Creek • Wipple Wasteway			
Yakima River, Upper	Dieldrin DDT Suspended Sediments Turbidity	EPA approved	Jane Creech 509-454-7860
	Temperature	EPA approved Has an implementation plan	Jane Creech 509-454-7860
Yakima River	Toxics	Under development	Jane Creech 509-454-7860

**** Status** will be listed as one of the following: Approved by EPA, Under Development or Implementation. No status means project work has not yet started.*

For more information about WRIA 39:

- Waterbodies in WRIA 39 - using the Water Quality Assessment Query Tool
- Watershed Information for WRIA 39

* The Department of Ecology and other state resource agencies frequently use a system of 62 "Water Resource Inventory Areas" or "WRIAs" to refer to the state's major watershed basins.

Back to top of page

Last updated December 2016

Feedback?

About us
Director Maia Bellon
Tracking progress
Newsroom
Jobs
Staff only
Contact us

Publications & forms
Databases
Laws & rules
Public records disclosure
Public input & events
Environmental education
Sustainability information

中文 | Chinese
Tiếng Việt | Vietnamese
한국어 | Korean
Русский | Russian
Español | Spanish
Accessibility

Access Washington®
Welcome to the State of Washington

Copyright © Washington State Department of Ecology
Privacy Notice | Site Info | Accessibility | Contact the web team |

SHARE

Wetland name or number UW02

RATING SUMMARY – Eastern Washington

Name of wetland (or ID #): UW02 Date of site visit: 4/7/17

Rated by N. Evan Dulin Trained by Ecology? ✓ Yes ___ No Date of training 3/24/17

HGM Class used for rating Depressional Wetland has multiple HGM classes? ___Y ✓N

NOTE: Form is not complete without the figures requested (*figures can be combined*).

Source of base aerial photo/map Google Earth

OVERALL WETLAND CATEGORY III (based on functions ✓ or special characteristics ___)

1. Category of wetland based on FUNCTIONS

___**Category I** – Total score = 22-27

___**Category II** – Total score = 19-21

✓ **Category III** – Total score = 16-18

___**Category IV** – Total score = 9-15

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
	Circle the appropriate ratings			
Site Potential	H M (L)	(H) M L	H (M) L	
Landscape Potential	H (M) L	H (M) L	H M (L)	
Value	H (M) L	H (M) L	H (M) L	TOTAL
Score Based on Ratings	5	7	5	17

Score for each function based on three ratings *(order of ratings is not important)*

9 = H,H,H
8 = H,H,M
7 = H,H,L
7 = H,M,M
6 = H,M,L
6 = M,M,M
5 = H,L,L
5 = M,M,L
4 = M,L,L
3 = L,L,L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	CATEGORY *Circle the appropriate category*
Vernal Pools	II III
Alkali	I
Wetland of High Conservation Value	I
Bog and Calcareous Fens	I
Old Growth or Mature Forest – slow growing	I
Aspen Forest	I
Old Growth or Mature Forest – fast growing	II
Floodplain forest	II
None of the above	✓

Wetland name or number UW02

Maps and figures required to answer questions correctly for Eastern Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	D 1.3, H 1.1, H 1.5	1
Hydroperiods (including area of open water for H 1.3)	D 1.4, H 1.2, H 1.3	1
Location of outlet (*can be added to map of hydroperiods)*	D 1.1, D 4.1	1
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	1
Map of the contributing basin	D 5.3	2
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	3
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	4
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	D 3.3	5

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	R 2.4	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of wetland vs. width of stream *(can be added to another figure)*	R 4.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	R 3.2, R 3.3	

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	L 1.1, L 4.1, H 1.1, H 1.5	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants *(can be added to figure above)*	S 4.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	S 3.3	

Wetland name or number UW02

HGM Classification of Wetland in Eastern Washington

For questions 1-4, the criteria described must apply to the entire unit being rated.

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-4 apply, and go to Question 5.

1. Does the entire unit **meet both** of the following criteria?
   ___The vegetated part of the wetland is on the water side of the Ordinary High Water Mark of a body of permanent open water (without any plants on the surface) that is at least 20 ac (8 ha) in size
   ✓ At least 30% of the open water area is deeper than 10 ft (3 m)

   NO – go to 2 **YES –** The wetland class is **Lake Fringe** (Lacustrine Fringe)

2. Does the entire wetland unit **meet all** of the following criteria?
   ___The wetland is on a slope (*slope can be very gradual*),
   ___The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks;
   ___The water leaves the wetland **without being impounded**.

   NO - go to 3 YES – The wetland class is **Slope**
   NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 foot deep).

3. Does the entire wetland unit **meet all** of the following criteria?
   ___ The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river;
   ___ The overbank flooding occurs at least once every 10 years.

   NO - go to 4 YES – The wetland class is **Riverine**
   NOTE: The Riverine wetland can contain depressions that are filled with water when the river is not flooding.

4. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year. *This means that any outlet, if present, is higher than the interior of the wetland.*

   NO – go to 5 YES – The wetland class is **Depressional**

5. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-4 APPLY TO DIFFERENT AREAS IN THE WETLAND UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

Wetland name or number UW02

NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the wetland unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM Class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine (the riverine portion is within the boundary of depression)	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine

If you are still unable to determine which of the above criteria apply to your wetland, or if you have ***more than 2 HGM classes*** *within a wetland boundary, classify the wetland as Depressional for the rating.*

Wetland name or number UW02

DEPRESSIONAL WETLANDS **Water Quality Functions** - Indicators that the site functions to improve water quality	Points (only 1 score per box)
D 1.0. Does the site have the potential to improve water quality?	
D 1.1. Characteristics of surface water outflows from the wetland: Wetland has no surface water outlet — points = 5 Wetland has an intermittently flowing outlet — points = 3 Wetland has a highly constricted permanently flowing outlet — points = 3 Wetland has a permanently flowing, unconstricted, surface outlet — points = 1	3
D 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic *(use NRCS definitions of soils)* YES = 3 (NO = 0)	0
D 1.3. Characteristics of persistent vegetation (Emergent, Scrub-shrub, and/or Forested Cowardin classes) Wetland has persistent, ungrazed, vegetation for > $^2/_3$ of area — points = 5 Wetland has persistent, ungrazed, vegetation from $^1/_3$ to $^2/_3$ of area — points = 3 Wetland has persistent, ungrazed vegetation from $^1/_{10}$ to < $^1/_3$ of area — points = 1 (1%) Wetland has persistent, ungrazed vegetation < $^1/_{10}$ of area — points = 0	1
D 1.4. Characteristics of seasonal ponding or inundation: *This is the area of ponding that fluctuates every year. Do not count the area that is permanently ponded.* Area seasonally ponded is > ½ total area of wetland — points = 3 Area seasonally ponded is ¼ - ½ total area of wetland — points = 1 Area seasonally ponded is < ¼ total area of wetland (10%) — points = 0	0
Total for D 1 — Add the points in the boxes above	4

Rating of Site Potential If score is: ___ **12- 16 = H** ___ **6- 11 = M** ✓ **0- 5 = L** *Record the rating on the first page*

D 2.0. Does the landscape have the potential to support the water quality function of the site?	
D 2.1. Does the wetland receive stormwater discharges? Yes = 1 (No = 0)	0
D 2.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate pollutants? (Yes = 1) No = 0	1
D 2.3. Are there septic systems within 250 ft of the wetland? Yes = 1 (No = 0)	0
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1- D 2.3? Source_____ Yes = 1 (No = 0)	0
Total for D 2 — Add the points in the boxes above	1

Rating of Landscape Potential If score is: ___ **3 or 4 = H** ✓ **1 or 2 = M** ___ **0 = L** *Record the rating on the first page*

D 3.0. Is the water quality improvement provided by the site valuable to society?	
D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, or lake that is on the 303(d) list? Yakima River within 1 mile (Yes = 1) No = 0	1
D 3.2. Is the wetland in a basin or sub-basin where water quality is an issue in some aquatic resource [303(d) list, eutrophic lakes, problems with nuisance and toxic algae]? Yes = 1 (No = 0)	0
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality (*answer YES if there is a TMDL for the drainage or basin in which the wetland is found*)? Yes = 2 (No = 0)	0
Total for D 3 — Add the points in the boxes above	1

Rating of Value If score is: ___ **2-4 = H** ✓ **1 = M** ___ **0 = L** *Record the rating on the first page*

Wetland name or number GW02

DEPRESSIONAL WETLANDS **Hydrologic Functions** - Indicators that the site functions to reduce flooding and erosion.	Points (only 1 score per box)
D 4.0. Does the site have the potential to reduce flooding and erosion?	
D 4.1. Characteristics of surface water outflows from the wetland: Wetland has no surface water outlet — points = 8 Wetland has an intermittently flowing outlet — points = 4 — Wetland has a highly constricted permanently flowing outlet — points = 4 Wetland has a permanently flowing unconstricted surface outlet — points = 0 *(If outlet is a ditch and not permanently flowing treat wetland as "intermittently flowing")*	4
D 4.2. Depth of storage during wet periods: *Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or deepest part (if dry).* — Seasonal ponding: > 3 ft above the lowest point in wetland or the surface of permanent ponding — points = 8 Seasonal ponding: 2 ft - < 3 ft above the lowest point in wetland or the surface of permanent ponding — points = 6 The wetland is a headwater wetland — points = 4 Seasonal ponding: 1 ft - < 2 ft — points = 4 Seasonal ponding: 6 in - < 1 ft — points = 2 Seasonal ponding: < 6 in or wetland has only saturated soils — points = 0	8
Total for D 4 — Add the points in the boxes above	12

Rating of Site Potential If score is: ✓ **12-16 = H** ___ **6-11 = M** ___ **0-5 = L** *Record the rating on the first page*

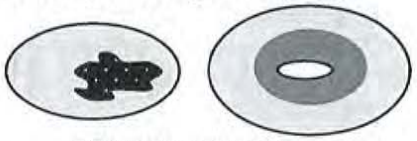
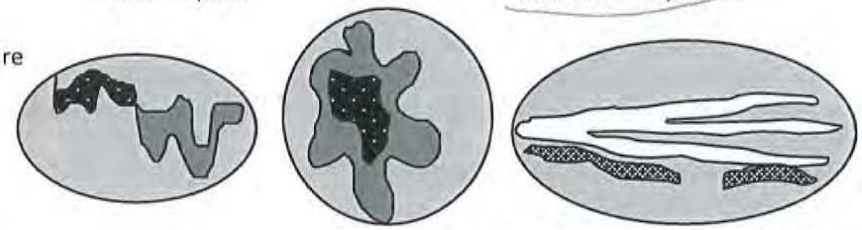
D 5.0. Does the landscape have the potential to support the hydrologic functions of the site?	
D 5.1. Does the wetland receive stormwater discharges? Yes = 1 (No = 0)	0
D 5.2. Is > 10% of the area within 150 ft of the wetland in a land use that generates runoff? Yes = 1 (No = 0)	0
D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land uses? (Yes = 1) No = 0	1
Total for D 5 — Add the points in the boxes above	1

Rating of Landscape Potential If score is: ___ **3 = H** ✓ **1 or 2 = M** ___ **0 = L** *Record the rating on the first page*

D 6.0. Are the hydrologic functions provided by the site valuable to society?	
D 6.1. The wetland is in a landscape that has flooding problems. Choose the description that best matches conditions around the wetland being rated. *Do not add points. Choose the highest score if more than one condition is met.* The wetland captures surface water that would otherwise flow down-gradient into areas where flooding has damaged human or natural resources (e.g., houses or salmon redds), AND Flooding occurs in sub-basin that is immediately down-gradient of wetland — points = 2 — Surface flooding problems are in a sub-basin farther down-gradient — points = 1 The existing or potential outflow from the wetland is so constrained by human or natural conditions that the water stored by the wetland cannot reach areas that flood. *Explain why* _____ — points = 0 There are no problems with flooding downstream of the wetland — points = 0	1
D 6.2. Has the site has been identified as important for flood storage or flood conveyance in a regional flood control plan? Yes = 2 (No = 0)	0
Total for D 6 — Add the points in the boxes above	1

Rating of Value If score is: ___ **2-4 = H** ✓ **1 = M** ___ **0 = L** *Record the rating on the first page*

Wetland name or number UW02

These questions apply to wetlands of all HGM classes. **HABITAT FUNCTIONS** - Indicators that site functions to provide important habitat	(only 1 score per box)
H 1.0. Does the wetland have the potential to provide habitat for many species?	
H 1.1. Structure of the plant community: *Check the Cowardin vegetation classes present and categories of emergent plants. Size threshold for each category is >= ¼ ac or >= 10% of the wetland if wetland is < 2.5 ac.* ✓ Aquatic bed ~ 10% ___ Emergent plants 0-12 in (0-30 cm) high are the highest layer and have > 30% cover ___ Emergent plants >12-40 in (>30-100 cm) high are the highest layer with >30% cover 5% ✓ Emergent plants > 40 in (> 100 cm) high are the highest layer with >30% cover ~10 % ___ Scrub-shrub (areas where shrubs have >30% cover) ___ Forested (areas where trees have >30% cover) 6% 4 or more checks: points = 3 3 checks: points = 2 2 checks: points = 1 1 check: points = 0	1
H 1.2. Is one of the vegetation types Aquatic Bed? Yes = 1 No = 0	1
H 1.3. Surface water H 1.3.1. Does the wetland have areas of open water (without emergent or shrub plants) over at least ¼ ac **OR** 10% of its area during the March to early June **OR** in August to the end of September? *Answer YES for Lake Fringe wetlands.* Yes = 3 points & go to H 1.4 No = go to H 1.3.2 H 1.3.2. Does the wetland have an intermittent or permanent, and unvegetated stream within its boundaries, or along one side, over at least ¼ ac or 10% of its area? *Answer yes only if H 1.3.1 is No.* Yes = 3 No = 0	3
H 1.4. Richness of plant species Count the number of plant species in the wetland that cover at least 10 ft^2. *Different patches of the same species can be combined to meet the size threshold. You do not have to name the species.* *Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Russian olive, Phragmites, Canadian thistle, yellow-flag iris, and saltcedar (Tamarisk)* # of species ____ RCG, RHAMCA, TYPLAT, ~3 ind, + trees Scoring: > 9 species: points = 2 4-9 species: points = 1 < 4 species: points = 0	1
H 1.5. Interspersion of habitats Decide from the diagrams below whether interspersion among types of plant structures (described in H 1.1), and unvegetated areas (open water or mudflats) is high, moderate, low, or none. *Use map of Cowardin and emergent plant classes prepared for questions H 1.1 and map of open water from H 1.3. If you have four or more plant classes or three classes and open water, the rating is always high.*  **None** = 0 points  **Low** = 1 point  **Moderate** = 2 points All three diagrams in this row are **High** = 3 points  Riparian braided channels with 2 classes	Figure 2

Wetland name or number UW02

H 1.6. Special habitat features *Check the habitat features that are present in the wetland. The number of checks is the number of points.* ✓ Loose rocks larger than 4 in OR large, downed, woody debris (> 4 in diameter) within the area of surface ponding or in stream. ✓ Cattails or bulrushes are present within the wetland. ___ Standing snags (diameter at the bottom > 4 in) in the wetland or within 30 m (100 ft) of the edge. ✓ Emergent or shrub vegetation in areas that are permanently inundated/ponded. ✓ Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 45 degree slope) OR signs of recent beaver activity ___ Invasive species cover less than 20% in each stratum of vegetation *(canopy, sub-canopy, shrubs, herbaceous, moss/ground cover)*	4
Total for H 1 — Add the points in the boxes above	12

Rating of Site Potential If score is: ___ **15-18 = H** ✓ **7-14 = M** ___ **0-6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support habitat functions of the site?	
H 2.1. Accessible habitat (only area of habitat abutting wetland). If total accessible habitat is: *Calculate:* % undisturbed habitat 0 + [(% moderate and low intensity land uses)/2] 0 = 0 % > 1/3 (33.3%) of 1 km Polygon — points = 3 20-33% of 1km Polygon — points = 2 10-19% of 1km Polygon — points = 1 — <10% of 1km Polygon — points = 0	0
H 2.2. Undisturbed habitat in 1 km Polygon around wetland. (5+ patches) *Calculate:* % undisturbed habitat 3 + [(% moderate and low intensity land uses)/2] 15.5 = 18.5 % Undisturbed habitat > 50% of Polygon — points = 3 Undisturbed habitat 10 - 50% and in 1-3 patches — points = 2 — Undisturbed habitat 10 - 50% and > 3 patches — points = 1 Undisturbed habitat < 10% of Polygon — points = 0 undis 26/850 ac = 3%; mod 267/850 ac = 31%	1
H 2.3. Land use intensity in 1 km Polygon: > 50% of Polygon is high intensity land use 66% — points = (- 2) Does not meet criterion above — points = 0	-2
H 2.4. The wetland is in an area where annual rainfall is less than 12 in, and its water regime is not influenced by irrigation practices, dams, or water control structures. *Generally, this means outside boundaries of reclamation areas, irrigation districts, or reservoirs* — Yes = 3 (No = 0)	0
Total for H 2 — Add the points in the boxes above	-1

Rating of Landscape Potential If score is: ___ **4-9 = H** ___ **1-3 = M** ✓ **< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose the highest score that applies to the wetland being rated* Site meets ANY of the following criteria: — points = 2 — It has 3 or more priority habitats within 100 m (see Appendix B) — It provides habitat for Threatened or Endangered species (any plant or animal on state or federal lists) — It is mapped as a location for an individual WDFW species — It is a Wetland of High Conservation Value as determined by the Department of Natural Resources — It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan — Site has 1 or 2 priority habitats within 100 m (see Appendix B) — points = 1 Site does not meet any of the criteria above — points = 0	1

Rating of Value If score is: ___ **2 = H** ✓ **1 = M** ___ **0 = L** *Record the rating on the first page*

Appendix B: WDFW Priority Habitats in Eastern Washington

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp. http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here: http://wdfw.wa.gov/conservation/phs/list/)

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland: ***NOTE:*** *This question is independent of the land use between the wetland and the priority habitat.*

— **Aspen Stands:** Pure or mixed stands of aspen greater than 1 ac (0.4 ha).

— **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).

— **Old-growth/Mature forests:** Old-growth east of Cascade crest – Stands are highly variable in tree species composition and structural characteristics due to the influence of fire, climate, and soils. In general, stands will be >150 years of age, with 10 trees/ac (25 trees/ha) that are > 21 in (53 cm) dbh, and 1-3 snags/ac (2.5-7.5 snags/ha) that are > 12-14 in (30-35 cm) diameter. Downed logs may vary from abundant to absent. Canopies may be single or multi-layered. Evidence of human-caused alterations to the stand will be absent or so slight as to not affect the ecosystem's essential structures and functions. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west and 80-160 years old east of the Cascade crest.

— **Oregon White Oak:** Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).

✓ — **Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

✓ — **Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.

— **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

— **Cliffs:** Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.

— **Talus:** Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

— **Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 12 in (30 cm)in eastern Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

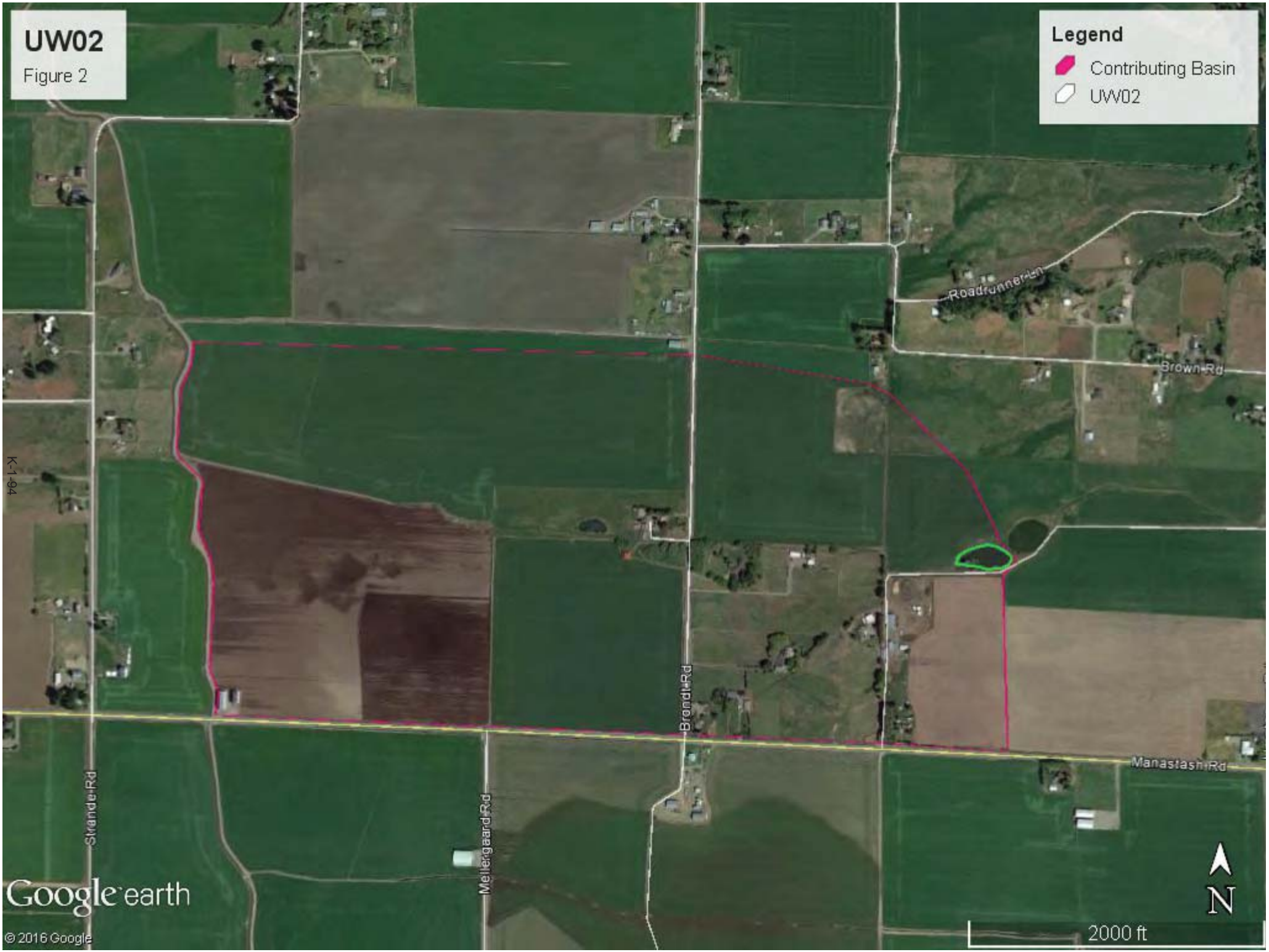
— **Shrub-steppe:** A nonforested vegetation type consisting of one or more layers of perennial bunchgrasses and a conspicuous but discontinuous layer of shrubs (see Eastside Steppe for sites with little or no shrub cover).

— **Eastside Steppe:** Nonforested vegetation type dominated by broadleaf herbaceous flora (i.e., forbs), perennial bunchgrasses, or a combination of both. Bluebunch wheatgrass (*Pseudoroegneria spicata*) is often the prevailing cover component along with Idaho fescue (*Festuca idahoensis*), Sandberg bluegrass (*Poa secunda*), rough fescue (*F. campestris*), or needlegrasses (*Achnatherum* spp.).

— **Juniper Savannah:** All juniper woodlands.

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list because they are addressed elsewhere.


UW02
Figure 1
Legend
Emergent (12-40")
Emergent (>40")
Forested
Outlet
Permanently ponded
Seasonally Ponded/Aquatic Bed
UW02
Outlet
K-1-93
Google earth
© 2016 Google
N
200 ft


UW02
Figure 2
Legend
Contributing Basin
UW02
Roadrunner Ln
Brown Rd
K-1-94
Brondi Rd
Manastash Rd
Strande Rd
Mellergaard Rd
Google earth
© 2016 Google
N
2000 ft


UW02
Figure 3
Legend
Mid-intensity
UW02
Undisturbed
Roadrunner Ln
Brown Rd
Brondi Rd
Umptanum Rd
Manastash Rd
Mellergaard Rd
K-1-95
90
Google earth
© 2016 Google
N
3000 ft

April 27, 2017

UW02 - Figure 4



Assessed Waters/Sediment

Water
- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

Sediment
- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

Miles
0 0.25 0.5 1

Image courtesy of USGS Earthstar Geographics SIO © 2017 Microsoft Corporation © 2017 HERE © AND

DEPARTMENT OF ECOLOGY
State of Washington

Water Quality Improvement Projects (TMDLs)

WATER QUALITY IMPROVEMENT PROJECTS (TMDLs)

Overview of the process

Project Catalog

- by WRIA
- by County

Funding Opportunities

Project Development Priority Lists

Related Information

TMDL Contacts

RELATED ECOLOGY PROGRAMS

Water Quality

Water Quality Improvement > Water Quality Improvement Projects by WRIA > WRIA 39: Upper Yakima

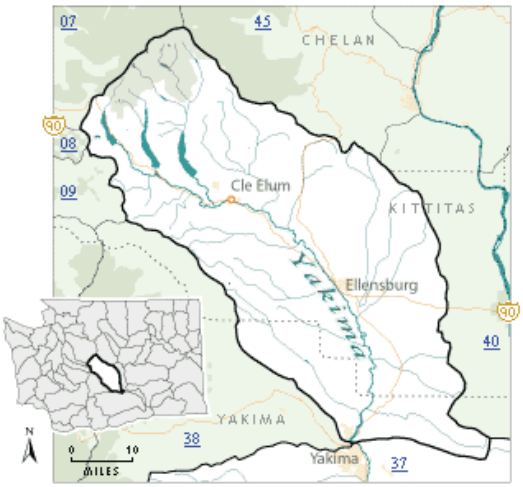
WRIA 39: Upper Yakima

The following table lists overview information and links to specific water quality improvement projects (including total maximum daily loads, or TMDLs) for this water resource inventory area (WRIA). Please use links (where available) for more information on a project.

Yakima River basin project index:
www.ecy.wa.gov/programs/wq/tmdl/yakima_wq/index.html

Counties

- Kittitas
- Yakima



Project Name	Pollutants	Status**	TMDL Lead
Crystal Creek	Ammonia-N BOD (5-day) Chlorine Fecal Coliform	EPA approved	Jane Creech 509-454-7860
Selah Ditch	Fecal Coliform Temperature	EPA approved	Greg Bohn 509-454-4174
Teanaway River segments: • Upper West Fork Teanaway River • Upper Middle Fork Teanaway River • Upper North Fork Teanaway River • Stafford Creek • Lower West Fork Teanaway River • Lower Middle Fork Teanaway River • Lower North Fork Teanaway River • Mainstem Teanaway River	Temperature	EPA approved	Jane Creech 509-454-7860
Wilson/Cooke Creek Tributaries: • Badger Creek • Bull Ditch • Caribou Creek • Cherry Creek • CID Canal • Coleman Creek • Cook Creek • EWC Canal • Johnson Drain • KRD Canal	Fecal Coliform	EPA approved Has an implementation plan Post-TMDL monitoring report	Jane Creech 509-454-7860 Greg Bohn 509-454-4174

• Mercer Creek • Naneum Creek • Parke Creek • Whiskey Creek • Wilson Creek • Wipple Wasteway			
Yakima River, Upper	Dieldrin DDT Suspended Sediments Turbidity	EPA approved	Jane Creech 509-454-7860
	Temperature	EPA approved Has an implementation plan	Jane Creech 509-454-7860
Yakima River	Toxics	Under development	Jane Creech 509-454-7860

**** Status** will be listed as one of the following: Approved by EPA, Under Development or Implementation. No status means project work has not yet started.*

For more information about WRIA 39:

- Waterbodies in WRIA 39 - using the Water Quality Assessment Query Tool
- Watershed Information for WRIA 39

* The Department of Ecology and other state resource agencies frequently use a system of 62 "Water Resource Inventory Areas" or "WRIAs" to refer to the state's major watershed basins.

Back to top of page

Last updated December 2016

Feedback?

About us
Director Maia Bellon
Tracking progress
Newsroom
Jobs
Staff only
Contact us

Publications & forms
Databases
Laws & rules
Public records disclosure
Public input & events
Environmental education
Sustainability information

中文 | Chinese
Tiếng Việt | Vietnamese
한국어 | Korean
Русский | Russian
Español | Spanish
Accessibility

Access Washington®
Welcome to the State of Washington

Copyright © Washington State Department of Ecology
Privacy Notice | Site Info | Accessibility | Contact the web team |

SHARE

Wetland name or number UW03

RATING SUMMARY – Eastern Washington

Name of wetland (or ID #): UW03 Date of site visit: 4/7/17

Rated by N. Evan Dulin Trained by Ecology? ✓ Yes ___ No Date of training 3/24/17

HGM Class used for rating Depressional Wetland has multiple HGM classes? ___Y ✓N

NOTE: Form is not complete without the figures requested (*figures can be combined*).
Source of base aerial photo/map Google Earth

OVERALL WETLAND CATEGORY III (based on functions ✓ or special characteristics ___)

1. Category of wetland based on FUNCTIONS

___**Category I** – Total score = 22-27

___**Category II** – Total score = 19-21

✓ **Category III** – Total score = 16-18

___**Category IV** – Total score = 9-15

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
	Circle the appropriate ratings			
Site Potential	H M (L)	(H) M L	H (M) L	
Landscape Potential	H (M) L	H (M) L	H M (L)	
Value	H (M) L	H (M) L	H (M) L	TOTAL
Score Based on Ratings	5	7	5	17

Score for each function based on three ratings *(order of ratings is not important)*

9 = H,H,H
8 = H,H,M
7 = H,H,L
7 = H,M,M
6 = H,M,L
6 = M,M,M
5 = H,L,L
5 = M,M,L
4 = M,L,L
3 = L,L,L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	CATEGORY *Circle the appropriate category*
Vernal Pools	II III
Alkali	I
Wetland of High Conservation Value	I
Bog and Calcareous Fens	I
Old Growth or Mature Forest – slow growing	I
Aspen Forest	I
Old Growth or Mature Forest – fast growing	II
Floodplain forest	II
None of the above	✓

Wetland name or number 1W03

Maps and figures required to answer questions correctly for Eastern Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	D 1.3, H 1.1, H 1.5	1
Hydroperiods (including area of open water for H 1.3)	D 1.4, H 1.2, H 1.3	1
Location of outlet (*can be added to map of hydroperiods)*	D 1.1, D 4.1	1
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	1
Map of the contributing basin	D 5.3	2
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	3
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	4
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	D 3.3	5

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	R 2.4	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of wetland vs. width of stream *(can be added to another figure)*	R 4.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	R 3.2, R 3.3	

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	L 1.1, L 4.1, H 1.1, H 1.5	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants *(can be added to figure above)*	S 4.1	
Boundary of area within 150 ft of the wetland (*can be added to another figure*)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	S 3.3	

Wetland name or number UW03

HGM Classification of Wetland in Eastern Washington

For questions 1-4, the criteria described must apply to the entire unit being rated.

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-4 apply, and go to Question 5.

1. Does the entire unit **meet both** of the following criteria?
   ___The vegetated part of the wetland is on the water side of the Ordinary High Water Mark of a body of permanent open water (without any plants on the surface) that is at least 20 ac (8 ha) in size
   ___At least 30% of the open water area is deeper than 10 ft (3 m)

   NO – go to 2 **YES –** The wetland class is **Lake Fringe** (Lacustrine Fringe)

2. Does the entire wetland unit **meet all** of the following criteria?
   ___The wetland is on a slope (*slope can be very gradual*),
   ___The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks;
   ___The water leaves the wetland **without being impounded**.

   NO - go to 3 YES – The wetland class is **Slope**
   NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 foot deep).

3. Does the entire wetland unit **meet all** of the following criteria?
   ___ The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river;
   ___ The overbank flooding occurs at least once every 10 years.

   NO - go to 4 YES – The wetland class is **Riverine**
   NOTE: The Riverine wetland can contain depressions that are filled with water when the river is not flooding.

4. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year. *This means that any outlet, if present, is higher than the interior of the wetland.*

   NO – go to 5 YES – The wetland class is **Depressional**

5. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-4 APPLY TO DIFFERENT AREAS IN THE WETLAND UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

Wetland name or number UW03

NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the wetland unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM Class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine (the riverine portion is within the boundary of depression)	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine

If you are still unable to determine which of the above criteria apply to your wetland, or if you have ***more than 2 HGM classes*** *within a wetland boundary, classify the wetland as Depressional for the rating.*

Wetland name or number UWo3

DEPRESSIONAL WETLANDS **Water Quality Functions** - Indicators that the site functions to improve water quality	Points (only 1 score per box)
D 1.0. Does the site have the potential to improve water quality?	
D 1.1. Characteristics of surface water outflows from the wetland: Wetland has no surface water outlet — points = 5 Wetland has an intermittently flowing outlet — points = 3 — Wetland has a highly constricted permanently flowing outlet — points = 3 Wetland has a permanently flowing, unconstricted, surface outlet — points = 1	3
D 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic *(use NRCS definitions of soils)* YES = 3 (NO = 0)	0
D 1.3. Characteristics of persistent vegetation (Emergent, Scrub-shrub, and/or Forested Cowardin classes) Wetland has persistent, ungrazed, vegetation for > $^2/_3$ of area — points = 5 Wetland has persistent, ungrazed, vegetation from $^1/_3$ to $^2/_3$ of area — points = 3 — Wetland has persistent, ungrazed vegetation from $^1/_{10}$ to < $^1/_3$ of area 14% — points = 1 Wetland has persistent, ungrazed vegetation < $^1/_{10}$ of area — points = 0	1
D 1.4. Characteristics of seasonal ponding or inundation: *This is the area of ponding that fluctuates every year. Do not count the area that is permanently ponded.* Area seasonally ponded is > ½ total area of wetland — points = 3 Area seasonally ponded is ¼ - ½ total area of wetland — points = 1 — Area seasonally ponded is < ¼ total area of wetland 18% — points = 0	0
Total for D 1 — Add the points in the boxes above	4

Rating of Site Potential If score is: ___ **12- 16 = H** ___ **6- 11 = M** ✓ **0- 5 = L** *Record the rating on the first page*

D 2.0. Does the landscape have the potential to support the water quality function of the site?	
D 2.1. Does the wetland receive stormwater discharges? Yes = 1 (No = 0)	0
D 2.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate pollutants? (Yes = 1) No = 0	1
D 2.3. Are there septic systems within 250 ft of the wetland? Yes = 1 (No = 0)	0
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1- D 2.3? Source_____ Yes = 1 (No = 0)	0
Total for D 2 — Add the points in the boxes above	1

Rating of Landscape Potential If score is: ___ **3 or 4 = H** ✓ **1 or 2 = M** ___ **0 = L** *Record the rating on the first page*

D 3.0. Is the water quality improvement provided by the site valuable to society?	
D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, or lake that is on the 303(d) list? Yakima River within 1 mile (Yes = 1) No = 0	1
D 3.2. Is the wetland in a basin or sub-basin where water quality is an issue in some aquatic resource [303(d) list, eutrophic lakes, problems with nuisance and toxic algae]? Yes = 1 (No = 0)	0
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality (*answer YES if there is a TMDL for the drainage or basin in which the wetland is found*)? Yes = 2 (No = 0)	0
Total for D 3 — Add the points in the boxes above	1

Rating of Value If score is: ___ **2-4 = H** ✓ **1 = M** ___ **0 = L** *Record the rating on the first page*

Wetland name or number UW03

DEPRESSIONAL WETLANDS **Hydrologic Functions** - Indicators that the site functions to reduce flooding and erosion.	Points (only 1 score per box)
D 4.0. Does the site have the potential to reduce flooding and erosion?	
D 4.1. Characteristics of surface water outflows from the wetland: Wetland has no surface water outlet — points = 8 Wetland has an intermittently flowing outlet — points = 4 —Wetland has a highly constricted permanently flowing outlet — points = 4 Wetland has a permanently flowing unconstricted surface outlet — points = 0 *(If outlet is a ditch and not permanently flowing treat wetland as "intermittently flowing")*	4
D 4.2. Depth of storage during wet periods: *Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or deepest part (if dry).* — Seasonal ponding: > 3 ft above the lowest point in wetland or the surface of permanent ponding — points = 8 Seasonal ponding: 2 ft - < 3 ft above the lowest point in wetland or the surface of permanent ponding — points = 6 The wetland is a headwater wetland — points = 4 Seasonal ponding: 1 ft - < 2 ft — points = 4 Seasonal ponding: 6 in - < 1 ft — points = 2 Seasonal ponding: < 6 in or wetland has only saturated soils — points = 0	8
Total for D 4 — Add the points in the boxes above	12

Rating of Site Potential If score is: ✓ **12-16 = H** ___ **6-11 = M** ___ **0-5 = L** *Record the rating on the first page*

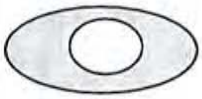
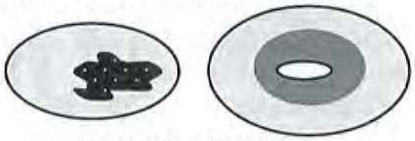
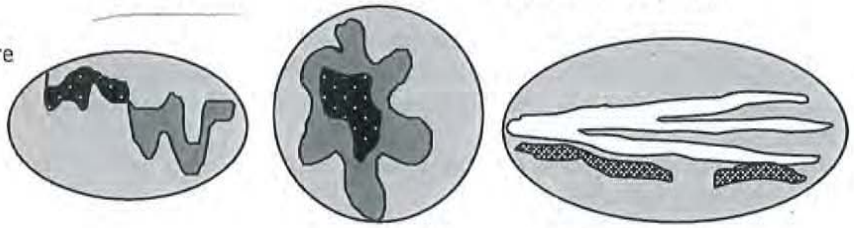
D 5.0. Does the landscape have the potential to support the hydrologic functions of the site?		
D 5.1. Does the wetland receive stormwater discharges?	Yes = 1 (No = 0)	0
D 5.2. Is > 10% of the area within 150 ft of the wetland in a land use that generates runoff?	Yes = 1 (No = 0)	0
D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land uses?	(Yes = 1) No = 0	1
Total for D 5	Add the points in the boxes above	1

Rating of Landscape Potential If score is: ___ **3 = H** ✓ **1 or 2 = M** ___ **0 = L** *Record the rating on the first page*

D 6.0. Are the hydrologic functions provided by the site valuable to society?		
D 6.1. The wetland is in a landscape that has flooding problems. Choose the description that best matches conditions around the wetland being rated. *Do not add points. Choose the highest score if more than one condition is met.* The wetland captures surface water that would otherwise flow down-gradient into areas where flooding has damaged human or natural resources (e.g., houses or salmon redds), AND Flooding occurs in sub-basin that is immediately down-gradient of wetland — points = 2 — Surface flooding problems are in a sub-basin farther down-gradient — points = 1 The existing or potential outflow from the wetland is so constrained by human or natural conditions that the water stored by the wetland cannot reach areas that flood. *Explain why* _____ — points = 0 There are no problems with flooding downstream of the wetland — points = 0		1
D 6.2. Has the site has been identified as important for flood storage or flood conveyance in a regional flood control plan?	Yes = 2 (No = 0)	0
Total for D 6	Add the points in the boxes above	1

Rating of Value If score is: ___ **2-4 = H** ✓ **1 = M** ___ **0 = L** *Record the rating on the first page*

Wetland name or number UW03

These questions apply to wetlands of all HGM classes. **HABITAT FUNCTIONS** - Indicators that site functions to provide important habitat	(only 1 score per box)
H 1.0. Does the wetland have the potential to provide habitat for many species?	
H 1.1. Structure of the plant community: *Check the Cowardin vegetation classes present and categories of emergent plants. Size threshold for each category is >= ¼ ac or >= 10% of the wetland if wetland is < 2.5 ac.* ✓ Aquatic bed 18% ___ Emergent plants 0-12 in (0-30 cm) high are the highest layer and have > 30% cover ___ Emergent plants >12-40 in (>30-100 cm) high are the highest layer with >30% cover 5% ✓ Emergent plants > 40 in (> 100 cm) high are the highest layer with >30% cover ~10% ___ Scrub-shrub (areas where shrubs have >30% cover) 4 or more checks: points = 3 ___ Forested (areas where trees have >30% cover) 3 checks: points = 2 2 checks: points = 1 1 check: points = 0	1
H 1.2. Is one of the vegetation types Aquatic Bed? (Yes = 1) No = 0	1
H 1.3. Surface water H 1.3.1. Does the wetland have areas of open water (without emergent or shrub plants) over at least ¼ ac **OR** 10% of its area during the March to early June **OR** in August to the end of September? *Answer YES for Lake Fringe wetlands.* Yes = 3 points & go to H 1.4 No = go to H 1.3.2 H 1.3.2. Does the wetland have an intermittent or permanent, and unvegetated stream within its boundaries, or along one side, over at least ¼ ac or 10% of its area? *Answer yes only if H 1.3.1 is No.* Yes = 3 No = 0	3
H 1.4. Richness of plant species Count the number of plant species in the wetland that cover at least 10 ft^2. *Different patches of the same species can be combined to meet the size threshold. You do not have to name the species.* *Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Russian olive, Phragmites, Canadian thistle, yellow-flag iris, and saltcedar (Tamarisk)* # of species ____ Scoring: > 9 species: points = 2 4-9 species: points = 1 < 4 species: points = 0	1
H 1.5. Interspersion of habitats Decide from the diagrams below whether interspersion among types of plant structures (described in H 1.1), and unvegetated areas (open water or mudflats) is high, moderate, low, or none. *Use map of Cowardin and emergent plant classes prepared for questions H 1.1 and map of open water from H 1.3. If you have four or more plant classes or three classes and open water, the rating is always high.*  **None** = 0 points  **Low** = 1 point  **Moderate** = 2 points All three diagrams in this row are **High** = 3 points  Riparian braided channels with 2 classes	Figure__ 1

Wetland name or number UW03

H 1.6. Special habitat features *Check the habitat features that are present in the wetland. The number of checks is the number of points.* ✓ Loose rocks larger than 4 in OR large, downed, woody debris (> 4 in diameter) within the area of surface ponding or in stream. ✓ Cattails or bulrushes are present within the wetland. ___ Standing snags (diameter at the bottom > 4 in) in the wetland or within 30 m (100 ft) of the edge. ✓ Emergent or shrub vegetation in areas that are permanently inundated/ponded. ✓ Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 45 degree slope) OR signs of recent beaver activity ___ Invasive species cover less than 20% in each stratum of vegetation *(canopy, sub-canopy, shrubs, herbaceous, moss/ground cover)*	4
Total for H 1 — Add the points in the boxes above	11

Rating of Site Potential If score is: ___ **15-18 = H** ✓ **7-14 = M** ___ **0-6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support habitat functions of the site?	
H 2.1. Accessible habitat (only area of habitat abutting wetland). If total accessible habitat is: *Calculate:* % undisturbed habitat 0 + [(% moderate and low intensity land uses)/2] 0 = 0 % ≥ 1/3 (33.3%) of **1** km Polygon — points = 3 20-33% of 1km Polygon — points = 2 10-19% of 1km Polygon — points = 1 — <10% of 1km Polygon — points = 0	0
H 2.2. Undisturbed habitat in 1 km Polygon around wetland. (5+ patches) *Calculate:* % undisturbed habitat 5 + [(% moderate and low intensity land uses)/2] 16 = 21 % Undisturbed habitat > 50% of Polygon — points = 3 Undisturbed habitat 10 - 50% and in 1-3 patches — points = 2 — Undisturbed habitat 10 - 50% and > 3 patches — points = 1 Undisturbed habitat < 10% of Polygon — points = 0 undis 41/840 ac = 5%; mid 272/840 ac = 32%	1
H 2.3. Land use intensity in 1 km Polygon: > 50% of Polygon is high intensity land use 63% — points = (- 2) Does not meet criterion above — points = 0	-2
H 2.4. The wetland is in an area where annual rainfall is less than 12 in, and its water regime is not influenced by irrigation practices, dams, or water control structures. *Generally, this means outside boundaries of reclamation areas, irrigation districts, or reservoirs* — Yes = 3 (No = 0)	0
Total for H 2 — Add the points in the boxes above	-1

Rating of Landscape Potential If score is: ___ **4-9 = H** ___ **1-3 = M** ✓ **< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose the highest score that applies to the wetland being rated* Site meets ANY of the following criteria: — points = 2 — It has 3 or more priority habitats within 100 m (see Appendix B) — It provides habitat for Threatened or Endangered species (any plant or animal on state or federal lists) — It is mapped as a location for an individual WDFW species — It is a Wetland of High Conservation Value as determined by the Department of Natural Resources — It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan — Site has 1 or 2 priority habitats within 100 m (see Appendix B) — points = 1 Site does not meet any of the criteria above — points = 0	1

Rating of Value If score is: ___ **2 = H** ✓ **1 = M** ___ **0 = L** *Record the rating on the first page*

Appendix B: WDFW Priority Habitats in Eastern Washington

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp. http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here: http://wdfw.wa.gov/conservation/phs/list/)

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland: ***NOTE:*** *This question is independent of the land use between the wetland and the priority habitat.*

— **Aspen Stands:** Pure or mixed stands of aspen greater than 1 ac (0.4 ha).

— **Biodiversity Areas and Corridors:** Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).

— **Old-growth/Mature forests:** Old-growth east of Cascade crest – Stands are highly variable in tree species composition and structural characteristics due to the influence of fire, climate, and soils. In general, stands will be >150 years of age, with 10 trees/ac (25 trees/ha) that are > 21 in (53 cm) dbh, and 1-3 snags/ac (2.5-7.5 snags/ha) that are > 12-14 in (30-35 cm) diameter. Downed logs may vary from abundant to absent. Canopies may be single or multi-layered. Evidence of human-caused alterations to the stand will be absent or so slight as to not affect the ecosystem's essential structures and functions. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west and 80-160 years old east of the Cascade crest.

— **Oregon White Oak:** Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).

✓ — **Riparian:** The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

✓ — **Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.

— **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

— **Cliffs:** Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.

— **Talus:** Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

— **Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 12 in (30 cm)in eastern Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

— **Shrub-steppe:** A nonforested vegetation type consisting of one or more layers of perennial bunchgrasses and a conspicuous but discontinuous layer of shrubs (see Eastside Steppe for sites with little or no shrub cover).

— **Eastside Steppe:** Nonforested vegetation type dominated by broadleaf herbaceous flora (i.e., forbs), perennial bunchgrasses, or a combination of both. Bluebunch wheatgrass (*Pseudoroegneria spicata*) is often the prevailing cover component along with Idaho fescue (*Festuca idahoensis*), Sandberg bluegrass (*Poa secunda*), rough fescue (*F. campestris*), or needlegrasses (*Achnatherum* spp.).

— **Juniper Savannah:** All juniper woodlands.

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list because they are addressed elsewhere.


UW03
Figure 1
Legend
Emergent (12-40")
Emergent (>40")
Outlet
Permanently Ponded
Seasonally Ponded/Aquatic Bed
UW03
Outlet
K-1-108
Google earth
© 2016 Google
N
300 ft


UW03
Figure 2
Legend
Contributing Basin
UW03
Roadrunner Ln
Brow
K-1-109
Brandt Rd
Manasla
Strande Rd
Mallargaard Rd
Google earth
© 2016 Google
N
2000 ft


UW03
Figure 3
Legend
Mid-intensity
UW03
Undisturbed
Roadrunner Ln
Brown Rd
Brondi Rd
Umptanum Rd
Manastash Rd
Riverbottom Rd
Mellergaard Rd
97
K-1-110
Google earth
© 2016 Google
N
3000 ft

April 27, 2017

UW03 - Figure 4



Assessed Waters/Sediment

Water
- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

Sediment
- Category 5 - 303d
- Category 4C
- Category 4B
- Category 4A
- Category 2
- Category 1

Miles
0 0.25 0.5 1

Image courtesy of USGS Earthstar Geographics SIO © 2017 Microsoft Corporation © 2017 HERE © AND

DEPARTMENT OF ECOLOGY
State of Washington

Water Quality Improvement Projects (TMDLs)

WATER QUALITY IMPROVEMENT PROJECTS (TMDLs)

Overview of the process
Project Catalog
- by WRIA
- by County

Funding Opportunities
Project Development Priority Lists
Related Information
TMDL Contacts

RELATED ECOLOGY PROGRAMS

Water Quality

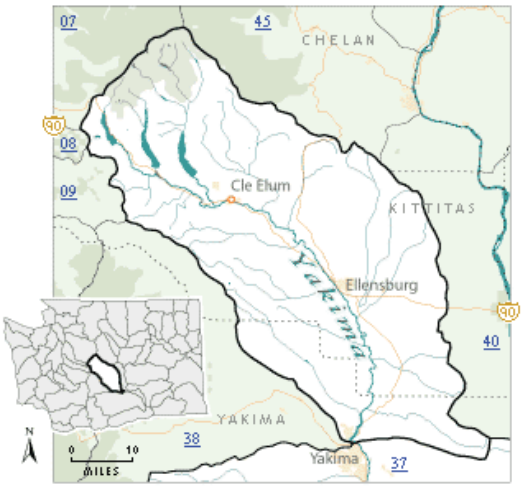
Water Quality Improvement > Water Quality Improvement Projects by WRIA > WRIA 39: Upper Yakima

WRIA 39: Upper Yakima

The following table lists overview information and links to specific water quality improvement projects (including total maximum daily loads, or TMDLs) for this water resource inventory area (WRIA). Please use links (where available) for more information on a project.

Yakima River basin project index:
www.ecy.wa.gov/programs/wq/tmdl/yakima_wq/index.html
Counties

- Kittitas
- Yakima



Project Name	Pollutants	Status**	TMDL Lead
Crystal Creek	Ammonia-N BOD (5-day) Chlorine Fecal Coliform	EPA approved	Jane Creech 509-454-7860
Selah Ditch	Fecal Coliform Temperature	EPA approved	Greg Bohn 509-454-4174
Teanaway River segments: • Upper West Fork Teanaway River • Upper Middle Fork Teanaway River • Upper North Fork Teanaway River • Stafford Creek • Lower West Fork Teanaway River • Lower Middle Fork Teanaway River • Lower North Fork Teanaway River • Mainstem Teanaway River	Temperature	EPA approved	Jane Creech 509-454-7860
Wilson/Cooke Creek Tributaries: • Badger Creek • Bull Ditch • Caribou Creek • Cherry Creek • CID Canal • Coleman Creek • Cook Creek • EWC Canal • Johnson Drain • KRD Canal	Fecal Coliform	EPA approved Has an implementation plan Post-TMDL monitoring report	Jane Creech 509-454-7860 Greg Bohn 509-454-4174

• Mercer Creek • Naneum Creek • Parke Creek • Whiskey Creek • Wilson Creek • Wipple Wasteway			
Yakima River, Upper	Dieldrin DDT Suspended Sediments Turbidity	EPA approved	Jane Creech 509-454-7860
	Temperature	EPA approved Has an implementation plan	Jane Creech 509-454-7860
Yakima River	Toxics	Under development	Jane Creech 509-454-7860

**** Status** will be listed as one of the following: Approved by EPA, Under Development or Implementation. No status means project work has not yet started.*

For more information about WRIA 39:

- Waterbodies in WRIA 39 - using the Water Quality Assessment Query Tool
- Watershed Information for WRIA 39

* The Department of Ecology and other state resource agencies frequently use a system of 62 "Water Resource Inventory Areas" or "WRIAs" to refer to the state's major watershed basins.

Back to top of page

Last updated December 2016

Feedback?

About us
Director Maia Bellon
Tracking progress
Newsroom
Jobs
Staff only
Contact us

Publications & forms
Databases
Laws & rules
Public records disclosure
Public input & events
Environmental education
Sustainability information

中文 | Chinese
Tiếng Việt | Vietnamese
한국어 | Korean
Русский | Russian
Español | Spanish
Accessibility

Access Washington®
Welcome to the State of Washington

Copyright © Washington State Department of Ecology
Privacy Notice | Site Info | Accessibility | Contact the web team |

SHARE

APPENDIX F: KITTITAS COUNTY WETLAND BUFFER GUIDANCE

Chapter 17A.04
CRITICAL AREAS DESIGNATION AND DEVELOPMENT STANDARDS

Sections

17A.04.010 Wetlands.
17A.04.015 No net loss of wetland areas.
17A.04.020 Buffer width requirements.
17A.04.025 Wetland buffer ranges.
17A.04.030 Wetland buffer averaging.
17A.04.035 Natural condition of wetland buffer.
17A.04.040 Allowed uses.
17A.04.045 Building setback lines from wetland buffers.
17A.04.050 Wetland replacement ratios.

17A.04.010 Wetlands.
Wetlands in Kittitas County are defined in Section 17A.02.310 and classified in four categories: Category I (extreme high value), Category II (high value), Category III (average value), Category IV (less than average value). Critical area wetlands in Kittitas County are defined as Category I, Category II, Category III and Category IV wetlands as determined by the planning manager.

Category IV wetlands may be determined by the director to constitute a critical area based upon application of the criteria in this chapter. (Ord. 95-15 (part), 1995; Ord. 94-22 (part), 1994).

17A.04.015 No net loss of wetland areas.
Kittitas County shall require, to the extent practical, and except for Category IV wetlands, a zero net loss of natural wetlands functions and values together with, if reasonably possible through voluntary agreements or government incentives, a gain of wetlands in the long term. (Ord. 94-22 (part), 1994).

17A.04.020 Buffer width requirements.
Wetland buffer requirements apply to all nonexempt activities on regulated wetlands. All wetland buffers shall be measured from the wetland boundary.

Category	Size of Wetland	Required Buffer
I	any size	50 - 200 feet
II	over 2,000 sq. ft.	25 - 100 feet
III	over 10,000 sq. ft.	20 - 80 feet
IV*	43,560 sq. ft. (1 acre)	Building setbacks will be determined by the zoning lot line setbacks, but shall not exceed 25 feet.

*Includes only nonirrigation induced or enhanced Category IV wetlands. Irrigation water does influence ground water table elevations in Kittitas County.

(Ord. 96-14 (part), 1996; Ord. 95-15 (part), 1995; Ord. 94-22 (part), 1994).

17A.04.025 Wetland buffer ranges.
The wetland buffer ranges have been established to reflect the impact of certain intense land uses on wetland function and values. The director shall base the buffer size on the following criteria and shall establish the least restrictive width of buffer necessary to account for all of the following considerations:

1. The overall intensity of the proposed use;
2. The presence of threatened, endangered, or sensitive species;
3. The site's susceptibility to severe erosion;
4. The use of a buffer enhancement plan by the applicant which uses native vegetation or other measures which will enhance the functions and values of the wetland or buffer. (Ord. 94-22 (part), 1994).

17A.04.030 Wetland buffer averaging.
Wetland buffers may be modified by averaging buffer widths. Wetland buffer width averaging shall be allowed only where the applicant demonstrates that the following exists:

1. That averaging is necessary to avoid an extraordinary hardship to the applicant caused by circumstances peculiar to the property;
2. That the wetland contains variations in sensitivity due to existing physical characteristics;
3. That the proposed use would be located adjacent to areas where buffer width is reduced, and that such land uses are low in impact;
4. That width averaging will not adversely impact wetland function and values. (Ord. 9422 (part), 1994).

17A.04.035 Natural condition of wetland buffer.
Natural condition of wetland buffer. Wetland buffer areas shall be retained in their natural condition or may be improved to enhance buffer functions and values. Where buffer disturbance has occurred during construction, revegetation with native vegetation may be required. The Kittitas County noxious weed ordinance shall be adhered to. (Ord. 94-22 (part), 1994).

17A.04.040 Allowed uses.
In addition to exempt activities otherwise identified herein, the following activities are allowed to occur on wetland and wetland buffer areas: nonmotorized outdoor recreational activities including hunting and fishing; educational activities; existing and ongoing agricultural activities, silviculture and mining; and maintenance of existing facilities, structures, ditches, roads, bridges and other utility systems. Up to two acres of Class IV wetlands may be filled, drained or modified with no approval required from the planning manager. If more than two acres of Class IV wetlands are filled, drained or modified, approval of the planning manager is required. Such development activity shall provide mitigation in accordance with Section 17A.04.050 for that portion of the wetland fill or modification that exceeds two acres. Category IV wetlands may be used for secondary stormwater management facilities having no reasonable alternative on-site location, provided there is no significant adverse impact to the functions and values of those wetlands. (Ord. 95-15 (part), 1995; Ord. 94-22 (part), 1994).

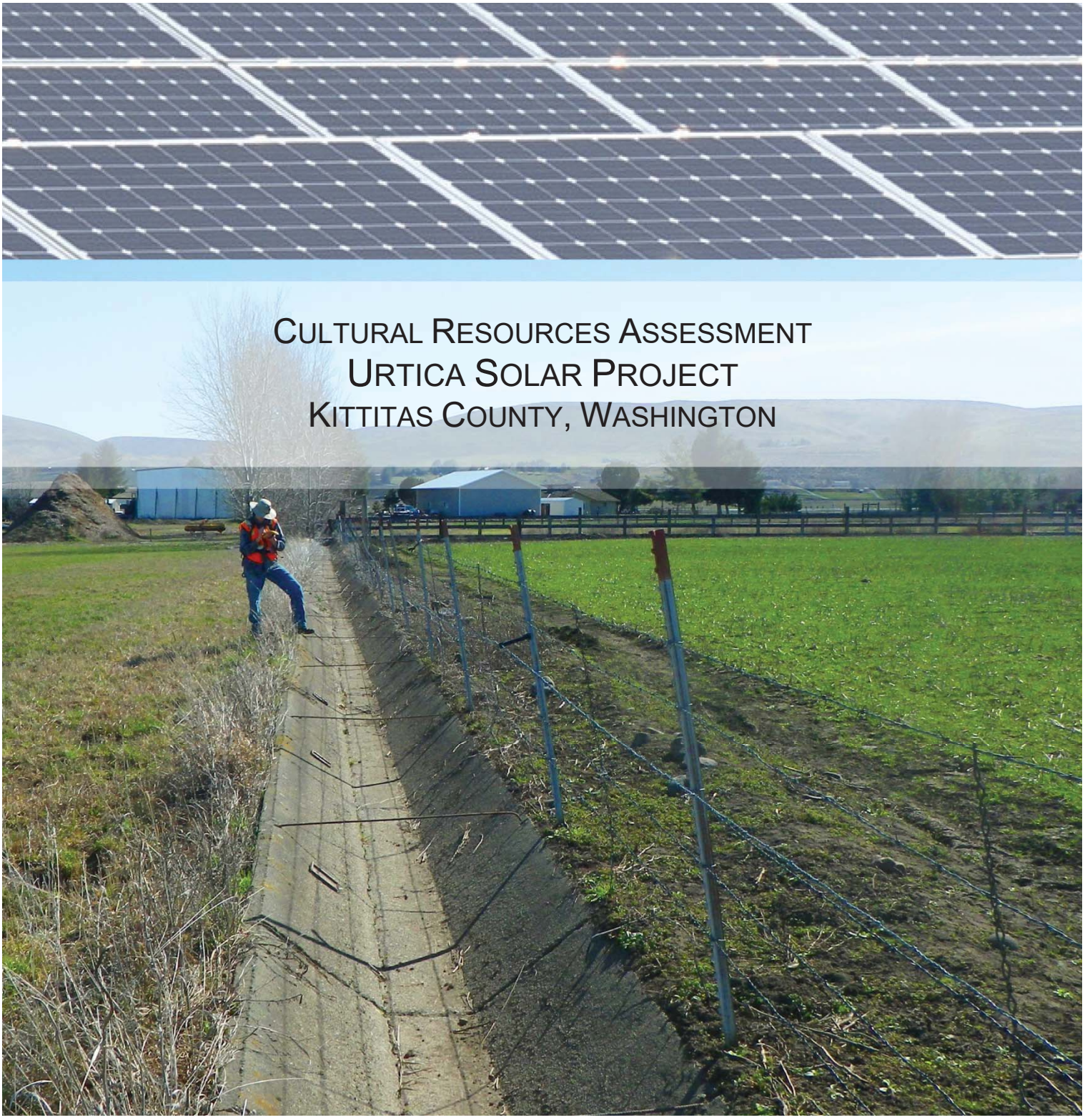
17A.04.045 Building setback lines from wetland buffers.
A building setback line equal to the side yard setback requirement of the applicable zoning district is required from the edge of any wetland buffer. Minor intrusions into the area of the building setback may be allowed if the director determines that such intrusions will not negatively impact the wetland. The setbacks shall be shown on all site plans submitted with the application. (Ord. 94-22 (part), 1994).

17A.04.050 Wetland replacement ratios.
Wetland replacement ratios are expressed in gross area required for replacement. The actual replacement, enhancement or rehabilitation of wetlands shall be determined by the director and meet all applicable standards for such. Replacement areas shall be determined according to function, acreage, type, location, time factors, ability to be self sustaining and projected success. Wetland functions and values shall be calculated using the Kittitas County critical areas policy document and the professional judgment of the director.

Category of Wetland	**Replacement Ratio**
I	3:1
II	2:1
III	1.5:1
IV	1:1 for the portion of a wetland fill or modification

(Ord. 96-14 (part), 1996; Ord. 95-15 (part), 1995; Ord. 94-22 (part), 1994).

Appendix K-2: Urtica Solar Project Cultural Resources Report



CULTURAL RESOURCES ASSESSMENT
URTICA SOLAR PROJECT
KITTITAS COUNTY, WASHINGTON

June 8, 2017

SWCA ENVIRONMENTAL CONSULTANTS
SEATTLE, WASHINGTON

This report has been redacted due to archaeological site confidentiality

Appendix K-3: Urtica Solar Project Permit Applications

KITTITAS COUNTY
DEPARTMENT OF PUBLIC WORKS

ACCESS AND ADDRESS APPLICATION

Application for: ☐ **Address $100.00** ☐ **Access $270.00** **Payment Method:** ☐ **Check** _____ ☐ **Cash**
☒ **Access and Address $330.00**

Owner Name Herbert Snowden
Mailing Address 751 Manastash Rd
Ellensburg, WA 98926
Phone Number 509-962-9075
Email Address NA

Permit #_____

Applicant Name TUUSSO Energy, LLC
Mailing Address 500 Yale Ave North
Seattle, WA 98109
Phone Number 206-303-0198
Email Address jason.evans@tuusso.com

DATE STAMP

Request Access and/or Address for:

☐ Approved Subdivision ☐ Pending Subdivision ☐ Agricultural Access
☐ Single Family Dwelling ☐ Commercial Access ☐ Temporary Access
☒ Other Photovoltaic Solar Project

Number of Lots to be served by the Access: 1
Assessor's Map No.: 17-18-10030:-0004,-0007,-0008,-0009,-0016,-0017,-0018,-0019,-0020,-0021

Plat Name N/A Lot N/A

Road Name of Access Location: Umptanum Road

Distance and Direction to Nearest Intersection or Adjacent Address:
0.30 miles north of the Manastash Rd intersection

Desired Width of Driveway: 12 ft (Minimum Width Requirement is based on length of driveway)

CALL BEFORE YOU DIG 1-800-424-5555 OR 811

Applicant is responsible for calling for underground utility locates 48 hours prior to construction.

☒ **I have attached a site map with details on the access, driveway and any buildings (existing or proposed).**
☒ **Applicant will stake along right-of-way to mark desired location of access.**
☒ **Applicant agrees to perform the work in compliance with the Kittitas County Road Standards and the requirements on the Access Permit.**
☒ **Applicant certifies that the access applied for is only for the purpose indicated.**

Applicant declares he/she is the owner or owner's agent of the real property whose access is under construction.
Applicant Signature _____ Date _____

Reviewers Notes:

NEW ADDRESS: _____

CITY: _____ ZIP: _____

☐ PRIVATE ROAD CERTIFICATION REQUIRED PRIOR TO_____

ACCESS REQUIREMENTS PRIOR TO BUILDING PERMIT:

☐ PAVED APRON REQUIRED – WSDOT DESIGN STANDARDS
☐ CULVERT REQUIRED-MUST BE BEDDED ON A MINIMUM OF 4" OF 5/8 GRAVEL OR EQUIVALENT
-Minimum Culvert Diameter: _____ Inches
-Minimum Beveled End Length: _____ Feet
-Total Culvert Length: _____ Feet
-Minimum Cover of: _____ Inches
☐ 4:1 BEVELS REQUIRED ON CULVERT ENDS
☐ CONSTRUCT APRON(FIRST 20 FEET) WITH NO MORE THAN 6% GRADE
☐ COMPACTED GRAVEL SURFACE LAYER REQUIRED
☐ 10 FOOT TURNING RADIUS ON APRON
☐ SIDE SLOPES OFF OF APRON NOT TO EXCEED A 4:1 SLOPE

☐ PERMIT EXPIRES ON: _____

DRIVEWAY REQUIREMENTS PRIOR TO OCCUPANCY PERMIT:

☐ DRIVEWAY NOT TO EXCEED 15% GRADE
☐ DRIVEWAYS LESS THAN 150 FEET IN LENGTH TO BE A MINIMUM OF 12 FEET WIDE WITH COMPACTED GRAVEL SURFACE LAYER
☐ DRIVEWAYS LONGER THAN 150 FEET IN LENGTH TO BE A MINIMUM OF 16 FEET WIDE WITH COMPACTED GRAVEL SURFACE LAYER
☐ DRIVEWAY SET BACK OF 5 FEET FROM SIDE PROPERTY BOUNDARIES
☐ SIDE SLOPE OFF DRIVEWAY SURFACE LAYER NOT TO EXCEED A 2:1 SLOPE

NOTES: _____

Reviewers Signature Title Date

411 N. Ruby St. Suite 1
Ellensburg, WA 98926
TEL (509) 962-7523
FAX (509) 962-7663

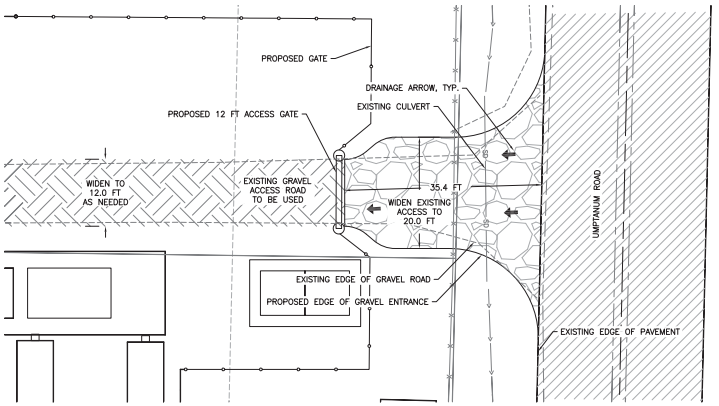
TUUSSO ENERGY - URTICA SITE

A PORTION OF THE SW 1/4 SECTION 10, T. 17 N., R. 18 E., W.M.
KITTATAS COUNTY, STATE OF WASHINGTON



PROPERTY INFORMATION:

APPLICANT:	TUUSSO ENERGY, LLC 500 YALE AVE N SEATTLE, WA 98109
PARCEL NUMBERS:	808533, 869436, 879436, 889436, 950243, 950244, 950245, 950246, 950247, 950248
PARCEL SIZE:	98.17 ACRES
TRACT 1A SIZE:	51.49 ACRES
TRACT 2A SIZE:	46.68 ACRES (NOT LEASED)
PROPERTY ADDRESS:	TBD, ELLENSBURG, WA 98926
ZONE:	AGRICULTURAL
IRRIGATION DISTRICT:	WEST SIDE



SITE ACCESS DETAIL
1"=10'

REVISIONS

DESCRIPTION	BY	DATE

© THE PLANS SET FORTH ON THIS SHEET ARE AND SHALL REMAIN THE PROPERTY OF ENCOMPASS ENGINEERING & SURVEYING

NOT FOR CONSTRUCTION

TUUSSO ENERGY, LLC
URTICA SITE

ACCESS SITE PLAN

Encompass
ENGINEERING & SURVEYING
Western Washington Division
165 NE Juniper Street, Suite 201 ■ Issaquah, WA 98027 ■ Phone: (425) 392-0250 ■ Fax: (425) 391-3055
Eastern Washington Division
407 Southwater Blvd ■ Cle Elum, WA 98922 ■ Phone: (509) 674-7433 ■ Fax: (509) 674-7419

JOB NO.	17018
DATE	JULY 2017
SCALE	AS SHOWN
DESIGNED	SF
DRAWN	SF
CHECKED	TML
APPROVED	TML
SHEET	EX-1

KITTITAS COUNTY
COMMUNITY DEVELOPMENT SERVICES
411 NORTH RUBY STREET SUITE #2 ■ ELLENSBURG, WA 98926
PHONE (509) 962-7506 ■ FAX (509) 962-7682

General Application for Construction

Assessor Map Number:	Official Use Only:
(Use http://www.co.kittitas.wa.us/assessor/property.asp if needed) Example 21-12-35000-0021 1 7 - 1 9 - 1 8 0 4 0 - ___ ___ ___ ___	**Permit #:**
Short Plat/ Subdivision: / Lot #:	**Date Applied:**
	Intake:

Site Address: 4561 No. 6 Road and 2100 Tjossem Road, Ellensburg, WA 98926			
Project Description/ Nature of Work: Camas 5-MW Solar Project		~~Square Foot~~ Total:	
Specific Use of Structure: To generate renewable electricity		No. of Bedrooms: 0	
Heating System Type & Location: N/A	Heating System Fuel Type: N/A	Fireplace Fuel Type: N/A	Hot Water Location & Fuel: N/A
☐ New Residential ☐ Residential Alteration ☐ Residential Addition ☐ Foundation	☐ New Commercial ☐ Commercial Alteration ☐ Commercial Addition ☐ Tenant Improvement	☐ Multi-Family ☐ Demolition ☐ Mobile Home ☐ Accessory Building	☐ Accessory Building Alteration ☐ Agricultural Building ■ Other New Industrial

PROPERTY OWNER:	Valley Land Company, LLC	Day Phone: 509-962-2840
Mailing Address:	1585 Tjossem Road	
City, State, ZIP:	Ellensburg, WA 98926	
E-mail:	jbrunson@fairpoint.net	Cell Phone: 509-899-2840
CONTRACTOR:		Day Phone:
Contact:		
Address, City, State, ZIP:		
E-mail:		Cell Phone:
Contractor License #:		Expiration Date:
ARCHITECT/ ENGINEER/ DESIGNER:		Day Phone:
Contact:		
Address, City, State, ZIP:		
E-mail:		Cell Phone:
Professional License No.:		Expiration Date:

APPLICANT/ AGENT:	Jason Evans	Day Phone: 206-708-6055
Company (if any):	TUUSSO Energy LLC	
Address, City, State, ZIP:	500 Yale Avenue North, Seattle, WA 98109	
E-mail:	Jason.evans@tuusso.com	Cell Phone: 206-303-0198

This Section To Be Completed For Construction Permits Only

Pursuant to RCW 19.27.095 (2)(i-ii) The requirements for a fully completed construction application shall include:

i. The name, address, and phone number of the office of the lender administering the interim construction financing, if any: OR
ii. The name and address of the firm that has issued a payment bond, if any, on behalf of the prime contractor for the protection of the owner, if the bond is for an amount not less than 50% of the total amount of the construction project.

If for any reason the information requested below is not available at the time of application, the applicant shall provide the information as soon as it can be reasonably be obtained.

☐ Lending Agency Name: Phone:

Mailing Address: City: State: ZIP:

☐ I acknowledge by checking this box that this project has no lending agency for construction financing.

☐ Bonding Agency Name: Phone:

Mailing Address: City: State: ZIP

☐ I acknowledge by checking this box that this project has no bonding agency.

If you are the Owner and Acting As Your Own Contractor, please complete the following declaration:

I acknowledge that I am applying for a construction permit through the Kittitas County Community Development Services. I also acknowledge that I *am* not a licensed contractor, specialty or general, or that I am not acting as a contractor and wish to be exempt from the requirements of the Washington State Contractor's Act, per RCW 18.27.090, and will abide by all provisions and conditions of the exemption as stated. I agree that if I use the assistance of any person(s) to provide labor and/or assistance, I will retain only contractors registered and currently licensed as required under the laws of the State of Washington.

I (print name) _____ certify under penalty of perjury under the laws of the State of Washington that the foregoing is true and correct.

Owner Signature: _____ Date: _____

1. All permits shall expire by limitation and be declared void if any one of the following apply:
   a. Work is not started within 365 days of obtaining a permit.
   b. Work is abandoned for 365 days or more after beginning work.
   c. An inspection and approval of work completed has not been performed by Kittitas County Community Development Services for 365 days.
2. The building permit card and approved construction plans shall be kept on the site of work until completion of the project.
3. It shall be the duty of the permit holder or their agent to notify the building official that such work is ready for inspection. It shall by the duty of the person requesting any inspections required by code to provide access to and means for inspection of such work. Work shall not be done beyond the point indicated in each successive inspection without first obtaining the approval of the building official. Any portion that does not comply shall be corrected and such portion shall not be covered or concealed until authorized by the building official.
4. No building or structure shall be used or occupied, and no change in the existing occupancy classification of a building or structure or portion thereof shall be made until the building official has issued a Certificate of Occupancy.
5. Work shall be installed in accordance with the approved construction documents, and any changes made during construction that are not in compliance with the approved construction documents shall be resubmitted for approval as an amended set of construction documents.

I hereby acknowledge that I have read this application and certify under penalty of perjury under the laws of the State of Washington that the above answers are true and complete to the best of my knowledge. I agree to comply with all current codes, laws, regulations and permit requirements related to this project. I hereby certify that I will pay all fees as required by law, including any applicable review fees if I do not purchase the permit. I further agree to, and hereby grant to Kittitas County Community Development Services and Department of Public Works a right to enter onto the premises as described for this permit application, for the purpose of making such inspections and tests as may be required. By signing this application, the Owner certifies that they are the legal owner of the property. All permit fees are non-refundable.

Owners Signature: (Required)		Authorized Agent Signature:	
Print Name:		Print Name:	
Date:		Date:	

Tuusso Energy: Urtica Solar Project

NOI Application

September 5, 2017

SECTION 1. CONTACT INFO

Contact Information Section Hel

This Notice of Intent application requires the following contact types: **Permittee, Site Owner, and Site Contact**. Please use the table below to fill in your required contacts. You may add additional contact types that are not pre-listed.

Note: Please remember you are responsible for notifying the Department of Ecology when your contact information changes.

Contact Type	First Name	Last Name	Organization Name	Action
Permittee	Jason	Evans	Tuusso Energy LLC	Edit - Remove
Site Contact	Jason	Evans	Tuusso Energy LLC	Edit - Remove
Site Owner	Herbert	Snowden		Edit - Remove

Your mailing address will be standardized against the postal service (USPS) mailing database when you click on the "Update" button. Verfication may be necessary.

Honorific: | **Contact Type:** Permittee
First Name: Jason | **Last Name:** Evans
Organization Name: Tuusso Energy LLC | Title:
Mailing Address: 500 Yale Ave N
Country: UNITED STATES
City: Seattle **State:** WA **Zip:** 98109 - 5680
Email Address: jason.evans@tuusso.com
Business Phone: 206 - 708 - 6055 Ext. | Fax Number: - -
Cell Phone: 206 - 303 - 0198 | UBI Number:

Your mailing address will be standardized against the postal service (USPS) mailing database when you click on the "Update" button. Verfication may be necessary.

Honorific: | **Contact Type:** Site Owner
First Name: Herbert | **Last Name:** Snowden
Organization Name: | Title:
Mailing Address: 751 Manastash Rd
Country: UNITED STATES
City: Ellensburg **State:** WA **Zip:** 98926 - 8741
Email Address:
Business Phone: 509 - 962 - 9075 Ext. | Fax Number: - -
Cell Phone: - - | UBI Number:

Copy From... My Profile | Save Contact | Cancel

SECTION 2. FACILITY/SITE INFO

Facility/Site Information

Section Help

Your facility address will be standardized against the postal service (USPS) mailing database when you click on the "Select facility from map" link. Verfication may be necessary.

This Facility/Site's Ownership Type is: Private

Facility/Site Name: Urtica Solar Project

Street Address:

City: Zip:

Or

If the site lacks a street address, list its specific location. Example: Intersection of Highway 61 and 34.

Location Description: Intersection of Manatash Rd and Untanum Rd in Ellensburg, WA 98926

Find my facility/site on a map

Please use the pop up map to complete the latitude, longitude and county information below. Use the pencil tool on the map to locate your facility at the front door or site entrance. *(The map may take a second to pop up.)*

Select facility/site from map

Latitude: 46.974296 **Longitude:** -120.570271 **County:** Kittitas

SECTION 3. SITE/PROJECT INFO

Project Information

Section Help

Type of Construction Activity: *(check all that apply)*

☐ Highway or Road (city, county, state) ☐ Residential ☐ Commercial ☐ Industrial

☐ Utilities ☑ Other *(specify):* Photovoltaic Solar Panel

Project/Site Size: 51.49 acres

The total size of the project site in acres. This is all land that is owned or controlled by the permittee.

Soil Disturbance Size: 40.22 acres

Total area of soil disturbance for your site/project over the life of the project. Include grading, equipment staging, excavation, borrow pit, material storage areas, dump areas, haul roads, side-cast areas, off-site construction support areas, and all other soil disturbance acreage associated with the project. (Note: 1 acre = 43,500 ft²).

Estimated Project Start Date: 4/1/2018

Estimated Project End Date: 10/31/2018

Will 1,000 cubic yards or more of poured concrete or recycled concrete be used over the life of the project? ○ Yes ◉ No

Site Conditions

Are you aware of contaminated soils present on the site? ○ Yes ◉ No

Are you aware of groundwater contamination located within the site boundary? ○ Yes ◉ No

Other Permits

Please enter other permits issued by Water Quality for this site.

Permit Number	Action
	Add

SECTION 4. DISCHARGE LOCATION

Discharge Location/Outfall Information

Section Help

Will water discharge directly or indirectly (through a storm drain system or roadside ditch) into one or more surface waterbodies (wetlands, creeks, lakes, and all other surface waters and water courses)?

No, no discharge to surface waters (100% infiltration) ▼

If your project includes dewatering, you must include dewatering plans and discharge locations in your site Stormwater Pollution Prevention Plan.

Location of Discharge into Surface Waterbody (Outfall Location)

Select the waterbody location (outfall) on the pop up map where the site has the potential to discharge into a waterbody (enter all locations). If you have 100% infiltration, you must select where the infiltration point is as your outfall. *(The map may take a second to pop up.)*

Outfall Number	Outfall Name	Lat/Long	Action
1	Infiltration	46.975182/-120.570207	Edit - Remove

SECTION 5. NOI INFORMATION

Stormwater Pollution Prevention Plan (SWPPP)

You must develop a SWPPP prior to starting construction. Do **not** submit your SWPPP with your application. The exception is that Ecology may request a copy of all or part of your SWPPP if you answered yes to the questions under the Site Conditions heading on the Site/Project Info tab.

☑ I have read and agree to the information above

Best Management Practices (BMPs)

You must use the BMPs listed in the Stormwater Management Manual for Western Washington or the Stormwater Management Manual for Eastern Washington or other manuals approved by Ecology. Alternatively, you may use demonstrably equivalent BMPs on the basis of permit condition S9.C.4. If you intend to use a BMP at your site that is not included in these manuals, but that you believe meets the definition of a demostrably equivalent BMP, you must notify the appropriate regional office. (See Definitions in the Construction Stormwater General Permit).

Note that if you receive permit coverage without indicating the preference for a demostrably equivalent BMP and later decide to use one, you must provide Ecology with notice of the selection of an equivalent BMP no less than 60 days before the intended use of the equivalent BMP.

http://www.ecy.wa.gov/programs/wq/stormwater/construction/contacts.html

☑ I have read and agree to the information above

SECTION 6. DMR

Discharge Monitoring Reports (DMRs)

Permittees must submit monitoring data using Ecology's WQWebDMR program.

To sign up for WQWebDMR, or to register a new site, go to http://www.ecy.wa.gov/programs/wq/permits/paris/webdmr.html. If you are unable to submit your DMRs electronically, you may contact Ecology to request a waiver. Ecology will generally only grant waiver requests to those permittees without internet access. Only a permittee or representative, designated in writing, may request access to or a waiver from WQWebDMR. If you have questions on this process, contact Ecology's WQWebDMR staff at WQWebPortal@ecy.wa.gov or 1-800-633-6193, Option 3 (toll free).

☑ I have read and agree to the information above

SECTION 7. SEPA

State Environmental Policy Act (SEPA)

Section Help

This Notice of Intent (NOI) is incomplete and cannot be approved until the applicable SEPA requirements under Chapter 197-11 WAC are met.

Who is the SEPA lead agency on your site? Energy Facility Site Evaluation Council

Has the SEPA lead agency issued a final decision on your checklist? ○ No ○ Yes ○ Exempt

More SEPA information is available at: http://www.ecy.wa.gov/programs/sea/sepa/e-review.html

SECTION 8. PUBLIC NOTICE

Public Notice

Section Help

You must publish a public notice at least **once** a week for **two** consecutive weeks with **seven days** between publications, in at least a **single** newspaper of general circulation in the county in which the construction is to take place. Ecology cannot grant permit coverage sooner than the end of the 30-day public comment period, which begins on the date of the **second** public notice.

You may choose to use a system generated public notice and download it below. If not, you need to upload the public notice used.

- (•) I will use the system generated public notice document
- ( ) I will upload my own public notice

```
Tuusso Energy LLC, Jason Evans, 500 Yale Ave N Seattle, WA 98109, is seeking coverage under
the Washington State Department of Ecology's Construction Stormwater NPDES and State Waste
Discharge General Permit.
The proposed project, Urtica Solar Project, is located at  Intersection of Manatash Rd and
Untanum Rd in Ellensburg, WA 98926 in  in Kittitas county.
This project involves 40.22 acres of soil disturbance for Other (Solar Panel Farm)
construction activities.
All discharges and runoff goes to ground water.
Any persons desiring to present their views to the Washington State Department of Ecology
regarding this Application, or interested in Ecology's action on this Application, may
notify Ecology in writing no later than 30 days of the last date of publication of this
notice. Ecology reviews public comments and considers whether discharges from this project
would cause a measurable change in receiving water quality, and, if so, whether the project
is necessary and in the overriding public interest according to Tier II antidegradation
requirements under WAC 173-201A-320.

Comments can be submitted to:
Department of Ecology
Attn: Water Quality Program, Construction Stormwater
P.O. Box 47696, Olympia, WA 98504-7696
```

Clicking the text will copy it to your clipboard, if allowed. Open notice in a new window for printing.

To add a public notice to your application, select the newspaper name and enter your public notice dates, then click on the "Add" link. If you do not click the "Add" link, the public notice entry will be lost.

Note: This system does not publish your public notice in the newspaper for you. You must submit your public notice text to your selected newspaper.

Newspaper Name	First Notice	Second Notice	Action
Ellensburg - Daily Record ▼	*	*	Add

* First notice date is required.
* Second notice date is required.

SECTION 9. QUESTIONS

For Questions...

Please contact the following staff per your construction site's location.

If your construction site is located in:	Contact the following staff:
City of Seattle, Kitsap, Pierce, or Thurston County	Josh Klimek 360-407-7451 josh.klimek@ecy.wa.gov
Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Skagit, Snohomish, Spokane, Stevens, Walla Walla, Whatcom, or Whitman County	Shawn Hopkins 360-407-6442 shawn.hopkins@ecy.wa.gov
Benton, Chelan, Clallam, Clark, Cowlitz, Douglas, Grays Harbor, Jefferson, Kittitas, Klickitat, Lewis, Mason, Okanogan, Pacific, Skamania, Wahkiakum, or Yakima County	Joyce Smith 360-407-6858 joyce.smith@ecy.wa.gov
Island, King, or San Juan County	RaChelle Stane 360-407-6556 rachelle.stane@ecy.wa.gov

Tuusso Energy LLC, Jason Evans, 500 Yale Ave N Seattle, WA 98109, is seeking coverage under the Washington State Department of Ecology's Construction Stormwater NPDES and State Waste Discharge General Permit.

The proposed project, Urtica Solar Project, is located at Intersection of Manatash Rd and Untanum Rd in Ellensburg, WA 98926 in in Kittitas county.

This project involves 40.22 acres of soil disturbance for Other (Solar Panel Farm) construction activities.

All discharges and runoff goes to ground water.

Any persons desiring to present their views to the Washington State Department of Ecology regarding this application, or interested in Ecology's action on this application, may notify Ecology in writing no later than 30 days of the last date of publication of this notice. Ecology reviews public comments and considers whether discharges from this project would cause a measurable change in receiving water quality, and, if so, whether the project is necessary and in the overriding public interest according to Tier II antidegradation requirements under WAC 173-201A-320.

Comments can be submitted to:

Department of Ecology

Attn: Water Quality Program, Construction Stormwater

P.O. Box 47696, Olympia, WA 98504-7696

Construction Stormwater General Permit

Stormwater Pollution Prevention Plan (SWPPP)

for

Tuusso Energy: Urtica Solar Project

Prepared for:

The Washington State Department of Ecology

Central Regional Office

Permittee / Owner	Developer	Operator / Contractor
Tuusso Energy LLC	Jason Evans	TBD

TBD (Off of Untanum Rd), Ellensburg, WA 98926

Certified Erosion and Sediment Control Lead (CESCL)

Name	Organization	Contact Phone Number
TBD	TBD	TBD

SWPPP Prepared By

Name	Organization	Contact Phone Number
Sarah Foster, EI	Encompass Engineering & Surverying	(509)-674-7433

SWPPP Preparation Date

July 28,2017

Project Construction Dates

Activity / Phase	Start Date	End Date
Phase 1	4/1/2018	10/31/2018

Table of Contents

1 Project Information 4
1.1 Existing Conditions 4
1.2 Proposed Construction Activities 4
2 Construction Stormwater Best Management Practices (BMPs) 6
2.1 The 13 Elements 6
2.1.1 Element 1: Preserve Vegetation / Mark Clearing Limits 6
2.1.2 Element 2: Establish Construction Access 6
2.1.3 Element 3: Control Flow Rates 7
2.1.4 Element 4: Install Sediment Controls 7
2.1.5 Element 5: Stabilize Soils 8
2.1.6 Element 6: Protect Slopes 8
2.1.7 Element 7: Protect Drain Inlets 9
2.1.8 Element 8: Stabilize Channels and Outlets 9
2.1.9 Element 9: Control Pollutants 9
2.1.10 Element 10: Control Dewatering 11
2.1.11 Element 11: Maintain BMPs 11
2.1.12 Element 12: Manage the Project 12
2.1.13 Element 13: Protect Low Impact Development (LID) BMPs 13
3 Pollution Prevention Team 14
4 Monitoring and Sampling Requirements 15
4.1 Site Inspection 15
4.2 Stormwater Quality Sampling 15
4.2.1 Turbidity Sampling 15
4.2.2 pH Sampling 17
5 Discharges to 303(d) or Total Maximum Daily Load (TMDL) Waterbodies 18
5.1 303(d) Listed Waterbodies 18
5.2 TMDL Waterbodies 18
6 Reporting and Record Keeping 19
6.1 Record Keeping 19
6.1.1 Site Log Book 19
6.1.2 Records Retention 19
6.1.3 Updating the SWPPP 19
6.2 Reporting 19
6.2.1 Discharge Monitoring Reports 19
6.2.2 Notification of Noncompliance 20

List of Tables

Table 1 – Summary of Site Pollutant Constituents 4
Table 2 – Pollutants 9
Table 3 – pH-Modifying Sources 10
Table 4 – Dewatering BMPs 11
Table 5 – Management 12
Table 7 – Team Information 14
Table 8 – Turbidity Sampling Method 15
Table 9 – pH Sampling Method 17

List of Appendices

A. Site Map
B. BMP Details
C. Correspondance
D. Site Inspection Form
E. Construction Stormwater General Permit
F. 303(d) List Waterbodies / TMDL Waterbodies Information
G. Contaminated Site Information
H. Engineering Calculations

List of Acronyms and Abbreviations

Acronym / Abbreviation	Explanation
303(d)	Section of the Clean Water Act pertaining to Impaired Waterbodies
BFO	Bellingham Field Office of the Department of Ecology
BMP(s)	Best Management Practice(s)
CESCL	Certified Erosion and Sediment Control Lead
CO_2	Carbon Dioxide
CRO	Central Regional Office of the Department of Ecology
CSWGP	Construction Stormwater General Permit
CWA	Clean Water Act
DMR	Discharge Monitoring Report
DO	Dissolved Oxygen
Ecology	Washington State Department of Ecology
EPA	United States Environmental Protection Agency
ERO	Eastern Regional Office of the Department of Ecology
ERTS	Environmental Report Tracking System
ESC	Erosion and Sediment Control
GULD	General Use Level Designation
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Units
NWRO	Northwest Regional Office of the Department of Ecology
pH	Power of Hydrogen
RCW	Revised Code of Washington
SPCC	Spill Prevention, Control, and Countermeasure
su	Standard Units
SWMMEW	Stormwater Management Manual for Eastern Washington
SWMMWW	Stormwater Management Manual for Western Washington
SWPPP	Stormwater Pollution Prevention Plan
TESC	Temporary Erosion and Sediment Control
SWRO	Southwest Regional Office of the Department of Ecology
TMDL	Total Maximum Daily Load
VFO	Vancouver Field Office of the Department of Ecology
WAC	Washington Administrative Code
WSDOT	Washington Department of Transportation
WWHM	Western Washington Hydrology Model

1 Project Information

Project/Site Name: Urtica Solar Project
Street/Location: TBD (Off of Umptanum Rd)
City: Ellensburg State: WA Zip code: 98926
Subdivision: NA
Receiving waterbody: Existing irrigation network

1.1 Existing Conditions

Total acreage (including support activities such as off-site equipment staging yards, material storage areas, borrow areas).

Total acreage:	51.49
Disturbed acreage:	40.22
Existing structures:	0
Landscape topography:	Gently sloped grassland to the east. 2 irrigation ponds exist near the center of the site, and enter an irrigation ditch flowing east through the site.
Drainage patterns:	Flows generally to the east along an irrigation ditch that runs through the northern portion of the site.
Existing Vegetation:	Range/grassland
Critical Areas (wetlands, streams, high erosion risk, steep or difficult to stabilize slopes):	Irrigation ditch running west to east through the northern portion of the site, and 2 ponds that are located just north of the ditch.

List of known impairments for 303(d) listed or Total Maximum Daily Load (TMDL) for the receiving waterbody: None

Table 1 includes a list of suspected and/or known contaminants associated with the construction activity.

No known contamination on site or associated with construction activity.

Table 1 – Summary of Site Pollutant Constituents

Constituent (Pollutant)	Location	Depth	Concentration
NA	NA	NA	NA

1.2 Proposed Construction Activities

Description of site development (example: subdivision):
Photovoltaic solar facility project site with all weather-access roads, inverter stations, and modular trackers with solar panels

Description of construction activities (example: site preparation, demolition, excavation):

1. Pre-construction meeting
2. Grade and install construction entrance
3. Install perimeter protection
4. Grade and stabilize construction roads
5. Install vibratory driven H piles for wide flange steel beams
6. Install electrical underground and mechanical trackers
7. Install panels
8. Perform any required site restoration

Description of site drainage including flow from and onto adjacent properties. Must be consistent with Site Map in Appendix A:
Flows from the site will generally flow to the east into the existing irrigation ditch in the northern portion of the site.

Description of final stabilization (example: extent of revegetation, paving, landscaping):
The site will be revegetated with native vegetation.

Contaminated Site Information:
Proposed activities regarding contaminated soils or groundwater (example: on-site treatment system, authorized sanitary sewer discharge):
No contamination is known to be on site.

2 Construction Stormwater Best Management Practices (BMPs)

The SWPPP is a living document reflecting current conditions and changes throughout the life of the project. These changes may be informal (i.e., hand-written notes and deletions). Update the SWPPP when the CESCL has noted a deficiency in BMPs or deviation from original design.

2.1 The 13 Elements

2.1.1 Element 1: Preserve Vegetation / Mark Clearing Limits

List and describe BMPs: Preserving Natural Vegetation

BMP C101: Preserving Natural Vegetation

Natural vegetation will be preserved along the 2 irrigation ponds and the irrigation ditch that runs west to east through the site.

BMP C102: Buffer Zones

Buffer zones will be established at the limits of the proposed facility to protect existing wetlands and relieve downstream impacts. Existing vegetation will be maintained within the buffer zones throughout construction.

Installation Schedules: TBD

Inspection and Maintenance plan: TBD

Responsible Staff: TBD

2.1.2 Element 2: Establish Construction Access

List and describe BMPs:

BMP C105 – Stabilized Construction Entrance

A single, stabilized construction entrance will be provided off of Umptanum Rd, where vehicles will be entering/exiting, in order to prevent tracking out from the site.

Installation Schedules: TBD

Inspection and Maintenance plan: TBD

Responsible Staff: TBD

2.1.3 Element 3: Control Flow Rates

Will you construct stormwater retention and/or detention facilities?
☐ Yes ☒ No

Will you use permanent infiltration ponds or other low impact development (example: rain gardens, bio-retention, porous pavement) to control flow during construction?
☐ Yes ☒ No

Project will not impair or alter downstream conveyance systems. Full dispersion on site will be used to account for increased flows due to proposed impervious areas. Per Chapter 2.2.6 of the SWMMEW there are exemptions for new development when flow control is not required as long as certain conditions are met. Per exemption 1, “Any project able to disperse, without discharging to surface waters, the total 25-year runoff volume for the proposed development condition” is exempt from meeting the flow control requirements. The Urtica project will use full dispersion as the main way to handle increased flows due to impervious areas. As outlined in SWMMEW Chapter 6.5, BMP F6.42, full dispersion allows up to 10% of the site that is impervious to be characterized as non-effective impervious area by dispersing runoff into the native vegetation area. On the Urtica site, the impervious areas may conservatively make up to 3.2% of the site while the rest of the site maintains plantings similar to existing vegetation. This is under the 10% threshold, making full dispersion a viable option.

List and describe BMPs:

BMP F6.42- Full dispersion: Runoff from impervious areas within the site will be dispersed within the site utilizing the native vegetation.

BMP C102 – Buffer Zones (See Element 1)

BMP C233 – Silt Fence will also control flow rates from the site during construction (See Element 4).

Installation Schedules: TBD

Inspection and Maintenance plan: TBD

Responsible Staff: TBD

2.1.4 Element 4: Install Sediment Controls

List and describe BMPs:

BMP C233- Silt Fence: Silt Fence will surround the site at all areas downslope of all disturbed areas and will be placed upslope of any existing water bodies. The silt fence will also serve to mark the clearing limits per Element 1 above.

Installation Schedules: TBD

Inspection and Maintenance plan: TBD

Responsible Staff: TBD

2.1.5 Element 5: Stabilize Soils

The Central Basin*, East of the Cascade Mountain Crest

Season	Dates	Number of Days Soils Can be Left Exposed
During the Dry Season	July 1 – September 30	30 days
During the Wet Season	October 1 – June 30	15 days

*Note: The Central Basin is defined as the portions of Eastern Washington with mean annual precipitation of less than 12 inches.

Soils must be stabilized at the end of the shift before a holiday or weekend if needed based on the weather forecast.

Anticipated project dates: Start date: 4/1/2018 End date: 10/31/2018

Will you construct during the wet season?
☒ Yes ☐ No

List and describe BMPs:

BMP C123- Plastic Covering: Plastic covering will be used as necessary to protect any soil stockpiles that are produced from construction activity.

Installation Schedules: TBD

Inspection and Maintenance plan: TBD

Responsible Staff: TBD

2.1.6 Element 6: Protect Slopes

Will steep slopes be present at the site during construction?
☐ Yes ☒ No
The site is relatively flat and is not expected to require protection for slopes.

List and describe BMPs: None

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

2.1.7 Element 7: Protect Drain Inlets

There are no storm drain inlets on the site.

List and describe BMPs: None

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

2.1.8 Element 8: Stabilize Channels and Outlets

Provide stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent stream banks, slopes, and downstream reaches, will be installed at the outlets of all conveyance systems.

As mentioned previously in Element 3, full dispersion will be in effect at the project site and off-site runoff will be minimal. Due to this there will be no on-site conveyance channels or outlets to account for.

List and describe BMPs: None

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

2.1.9 Element 9: Control Pollutants

The following pollutants are anticipated to be present on-site: No known pollutants

Table 2 – Pollutants

Pollutant (List pollutants and source, if applicable)
NA

List and describe BMPs: None

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

Will maintenance, fueling, and/or repair of heavy equipment and vehicles occur on-site?
☒ Yes ☐ No

Contractor is required to keep a spill kit on site and use spill prevention measures throughout the construction process, in order to address any potential fuel spills or equipment breakdowns.

List and describe BMPs: None

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

Will wheel wash or tire bath system BMPs be used during construction?
☐ Yes ☒ No

List and describe BMPs: Wheel wash is not proposed at this time; however, if construction activities are such that sediment may be tracked with tires off-site a wheel wash will be used and any wastewater generated would be disposed at a local permitted facility.

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

Will pH-modifying sources be present on-site?
☐ Yes ☒ No

Table 3 – pH-Modifying Sources

☒	None
☐	Bulk cement
☐	Cement kiln dust
☐	Fly ash
☐	Other cementitious materials
☐	New concrete washing or curing waters
☐	Waste streams generated from concrete grinding and sawing
☐	Exposed aggregate processes
☐	Dewatering concrete vaults
☐	Concrete pumping and mixer washout waters
☐	Recycled concrete
☐	Recycled concrete stockpiles
☐	Other (i.e., calcium lignosulfate) [please describe:]

List and describe BMPs: None

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

Concrete trucks must not be washed out onto the ground, or into storm drains, open ditches, streets, or streams. Excess concrete must not be dumped on-site, except in designated concrete washout areas with appropriate BMPs installed.

Will uncontaminated water from water-only based shaft drilling for construction of building, road, and bridge foundations be infiltrated provided the wastewater is managed in a way that prohibits discharge to surface waters?
☐ Yes ☒ No

List and describe BMPs: None

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

2.1.10 Element 10: Control Dewatering

No dewatering is proposed or expected to occur as part of this project.

Table 4 – Dewatering BMPs

☐	Infiltration
☐	Transport off-site in a vehicle (vacuum truck for legal disposal)
☐	Ecology-approved on-site chemical treatment or other suitable treatment technologies
☐	Sanitary or combined sewer discharge with local sewer district approval (last resort)
☐	Use of sedimentation bag with discharge to ditch or swale (small volumes of localized dewatering)

List and describe BMPs: None

Installation Schedules: NA

Inspection and Maintenance plan: NA

Responsible Staff: NA

2.1.11 Element 11: Maintain BMPs

All temporary and permanent Erosion and Sediment Control (ESC) BMPs shall be maintained and repaired as needed to ensure continued performance of their intended function.

Maintenance and repair shall be conducted in accordance with each particular BMP specification (see *Volume II of the SWMMWW or Chapter 7 of the SWMMEW*).

Visual monitoring of all BMPs installed at the site will be conducted at least once every calendar week and within 24 hours of any stormwater or non-stormwater discharge from the site. If the site becomes inactive and is temporarily stabilized, the inspection frequency may be reduced to once every calendar month.

All temporary ESC BMPs shall be removed within 30 days after final site stabilization is achieved or after the temporary BMPs are no longer needed.

Trapped sediment shall be stabilized on-site or removed. Disturbed soil resulting from removal of either BMPs or vegetation shall be permanently stabilized.

Additionally, protection must be provided for all BMPs installed for the permanent control of stormwater from sediment and compaction. BMPs that are to remain in place following completion of construction shall be examined and restored to full operating condition. If sediment enters these BMPs during construction, the sediment shall be removed and the facility shall be returned to conditions specified in the construction documents.

2.1.12 Element 12: Manage the Project

The project will be managed based on the following principles:

- Projects will be phased to the maximum extent practicable and seasonal work limitations will be taken into account.
- Inspection and monitoring:
    - Inspection, maintenance and repair of all BMPs will occur as needed to ensure performance of their intended function.
    - Site inspections and monitoring will be conducted in accordance with Special Condition S4 of the CSWGP. Sampling locations are indicated on the Site Map. Sampling station(s) are located in accordance with applicable requirements of the CSWGP.
- Maintain an updated SWPPP.
    - The SWPPP will be updated, maintained, and implemented in accordance with Special Conditions S3, S4, and S9 of the CSWGP.

As site work progresses the SWPPP will be modified routinely to reflect changing site conditions. The SWPPP will be reviewed monthly to ensure the content is current.

Table 5 – Management

☒	Design the project to fit the existing topography, soils, and drainage patterns
☒	Emphasize erosion control rather than sediment control
☒	Minimize the extent and duration of the area exposed
☒	Keep runoff velocities low
☒	Retain sediment on-site
☒	Thoroughly monitor site and maintain all ESC measures
☐	Schedule major earthwork during the dry season
☐	Other (please describe)

2.1.13 Element 13: Protect Low Impact Development (LID) BMPs

There are no existing or proposed LID facilities associated with the project site. Buffer zones will be established during construction to protect the on-site irrigation network.

3 Pollution Prevention Team

Table 7 – Team Information

Title	Name(s)	Phone Number
Certified Erosion and Sediment Control Lead (CESCL)	TBD	TBD
Resident Engineer	TBD	TBD
Emergency Ecology Contact	TBD	TBD
Emergency Permittee/ Owner Contact	TBD	TBD
Non-Emergency Owner Contact	TBD	TBD
Monitoring Personnel	TBD	TBD
Ecology Regional Office	Central Regional Office	(509)-575-2490

4 Monitoring and Sampling Requirements

Monitoring includes visual inspection, sampling for water quality parameters of concern, and documentation of the inspection and sampling findings in a site log book. A site log book will be maintained for all on-site construction activities and will include:

- A record of the implementation of the SWPPP and other permit requirements
- Site inspections
- Stormwater sampling data

File a blank form under Appendix D.

The site log book must be maintained on-site within reasonable access to the site and be made available upon request to Ecology or the local jurisdiction.

Numeric effluent limits may be required for certain discharges to 303(d) listed waterbodies. See CSWGP Special Condition S8 and Section 5 of this template.

4.1 Site Inspection

Site inspections will be conducted at least once every calendar week and within 24 hours following any discharge from the site. For sites that are temporarily stabilized and inactive, the required frequency is reduced to once per calendar month.

The discharge point(s) are indicated on the Site Map (see Appendix A) and in accordance with the applicable requirements of the CSWGP.

4.2 Stormwater Quality Sampling

4.2.1 Turbidity Sampling

Requirements include calibrated turbidity meter or transparency tube to sample site discharges for compliance with the CSWGP. Sampling will be conducted at all discharge points at least once per calendar week.

Method for sampling turbidity:

Table 8 – Turbidity Sampling Method

☒	Turbidity Meter/Turbidimeter (required for disturbances 5 acres or greater in size)
☐	Transparency Tube (option for disturbances less than 1 acre and up to 5 acres in size)

The benchmark for turbidity value is 25 nephelometric turbidity units (NTU) and a transparency less than 33 centimeters.

If the discharge's turbidity is 26 to 249 NTU **or** the transparency is less than 33 cm but equal to or greater than 6 cm, the following steps will be conducted:

1. Review the SWPPP for compliance with Special Condition S9. Make appropriate revisions within 7 days of the date the discharge exceeded the benchmark.

2. Immediately begin the process to fully implement and maintain appropriate source control and/or treatment BMPs as soon as possible. Address the problems within 10 days of the date the discharge exceeded the benchmark. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when the Permittee requests an extension within the initial 10-day response period.
3. Document BMP implementation and maintenance in the site log book.

If the turbidity exceeds 250 NTU **or** the transparency is 6 cm or less at any time, the following steps will be conducted:

1. Telephone or submit an electronic report to the applicable Ecology Region's Environmental Report Tracking System (ERTS) within 24 hours.
    - **Central Region** (Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, Yakima): (509) 575-2490 or http://www.ecy.wa.gov/programs/spills/forms/nerts_online/CRO_nerts_online.html
    - **Eastern Region** (Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman): (509) 329-3400 or http://www.ecy.wa.gov/programs/spills/forms/nerts_online/ERO_nerts_online.html
    - **Northwest Region** (King, Kitsap, Island, San Juan, Skagit, Snohomish, Whatcom): (425) 649-7000 or http://www.ecy.wa.gov/programs/spills/forms/nerts_online/NWRO_nerts_online.html
    - **Southwest Region** (Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Lewis, Mason, Pacific, Pierce, Skamania, Thurston, Wahkiakum,): (360) 407-6300 or http://www.ecy.wa.gov/programs/spills/forms/nerts_online/SWRO_nerts_online.html
2. Immediately begin the process to fully implement and maintain appropriate source control and/or treatment BMPs as soon as possible. Address the problems within 10 days of the date the discharge exceeded the benchmark. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when the Permittee requests an extension within the initial 10-day response period
3. Document BMP implementation and maintenance in the site log book.
4. Continue to sample discharges daily until one of the following is true:
    - Turbidity is 25 NTU (or lower).
    - Transparency is 33 cm (or greater).
    - Compliance with the water quality limit for turbidity is achieved.
        - 1 - 5 NTU over background turbidity, if background is less than 50 NTU
        - 1% - 10% over background turbidity, if background is 50 NTU or greater
    - The discharge stops or is eliminated.

4.2.2 pH Sampling

pH monitoring is required for “Significant concrete work” (i.e., greater than 1000 cubic yards poured concrete over the life of the project). The use of recycled concrete or engineered soils (soil amendments including but not limited to Portland cement-treated base [CTB], cement kiln dust [CKD] or fly ash) also requires pH monitoring.

For significant concrete work, pH sampling will start the first day concrete is poured and continue until it is cured, typically three (3) weeks after the last pour.

For engineered soils and recycled concrete, pH sampling begins when engineered soils or recycled concrete are first exposed to precipitation and continues until the area is fully stabilized.

If the measured pH is 8.5 or greater, the following measures will be taken:

1. Prevent high pH water from entering storm sewer systems or surface water.
2. Adjust or neutralize the high pH water to the range of 6.5 to 8.5 su using appropriate technology such as carbon dioxide (CO_2) sparging (liquid or dry ice).
3. Written approval will be obtained from Ecology prior to the use of chemical treatment other than CO_2 sparging or dry ice.

Method for sampling pH: None required

Table 9 – pH Sampling Method

☐	pH meter
☐	pH test kit
☐	Wide range pH indicator paper

5 Discharges to 303(d) or Total Maximum Daily Load (TMDL) Waterbodies

5.1 303(d) Listed Waterbodies

Is the receiving water 303(d) (Category 5) listed for turbidity, fine sediment, phosphorus, or pH?

☐ Yes ☒ No

List the impairment(s):

NA

5.2 TMDL Waterbodies

Waste Load Allocation for CWSGP discharges:

NA

List and describe BMPs:

NA

Discharges to TMDL receiving waterbodies will meet in-stream water quality criteria at the point of discharge.

The Construction Stormwater General Permit Proposed New Discharge to an Impaired Water Body form is included in Appendix F.

6 Reporting and Record Keeping

6.1 Record Keeping

6.1.1 Site Log Book

A site log book will be maintained for all on-site construction activities and will include:

- A record of the implementation of the SWPPP and other permit requirements
- Site inspections
- Sample logs

6.1.2 Records Retention

Records will be retained during the life of the project and for a minimum of three (3) years following the termination of permit coverage in accordance with Special Condition S5.C of the CSWGP.

Permit documentation to be retained on-site:

- CSWGP
- Permit Coverage Letter
- SWPPP
- Site Log Book

Permit documentation will be provided within 14 days of receipt of a written request from Ecology. A copy of the SWPPP or access to the SWPPP will be provided to the public when requested in writing in accordance with Special Condition S5.G.2.b of the CSWGP.

6.1.3 Updating the SWPPP

The SWPPP will be modified if:

- Found ineffective in eliminating or significantly minimizing pollutants in stormwater discharges from the site.
- There is a change in design, construction, operation, or maintenance at the construction site that has, or could have, a significant effect on the discharge of pollutants to waters of the State.

The SWPPP will be modified within seven (7) days if inspection(s) or investigation(s) determine additional or modified BMPs are necessary for compliance. An updated timeline for BMP implementation will be prepared.

6.2 Reporting

6.2.1 Discharge Monitoring Reports

Cumulative soil disturbance is one (1) acre or larger; therefore, Discharge Monitoring Reports (DMRs) will be submitted to Ecology monthly. If there was no discharge during a given monitoring period the DMR will be submitted as required, reporting “No Discharge”. The DMR due date is fifteen (15) days following the end of each calendar month.

DMRs will be reported online through Ecology's WQWebDMR System.

6.2.2 Notification of Noncompliance

If any of the terms and conditions of the permit is not met, and the resulting noncompliance may cause a threat to human health or the environment, the following actions will be taken:

1. Ecology will be notified within 24-hours of the failure to comply by calling the applicable Regional office ERTS phone number (Regional office numbers listed below).
2. Immediate action will be taken to prevent the discharge/pollution or otherwise stop or correct the noncompliance. If applicable, sampling and analysis of any noncompliance will be repeated immediately and the results submitted to Ecology within five (5) days of becoming aware of the violation.
3. A detailed written report describing the noncompliance will be submitted to Ecology within five (5) days, unless requested earlier by Ecology.

Anytime turbidity sampling indicates turbidity is 250 NTUs or greater, or water transparency is 6 cm or less, the Ecology Regional office will be notified by phone within 24 hours of analysis as required by Special Condition S5.A of the CSWGP.

- **Central Region** at (509) 575-2490 for Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, or Yakima County
- **Eastern Region** at (509) 329-3400 for Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, or Whitman County
- **Northwest Region** at (425) 649-7000 for Island, King, Kitsap, San Juan, Skagit, Snohomish, or Whatcom County
- **Southwest Region** at (360) 407-6300 for Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Lewis, Mason, Pacific, Pierce, Skamania, Thurston, or Wahkiakum

Include the following information:

1. Your name and / Phone number
2. Permit number
3. City / County of project
4. Sample results
5. Date / Time of call
6. Date / Time of sample
7. Project name

In accordance with Special Condition S4.D.5.b of the CSWGP, the Ecology Regional office will be notified if chemical treatment other than CO_2 sparging is planned for adjustment of high pH water.

Please see Page G-3-35 for shared SWPPP Appendices

Appendix K-4: Urtica Solar Project Geotechnical Engineering Study

Swiftwater
Environmental & Geotechnical

Geotechnical Engineering Study, Phase 1
Urtica Solar Array Site
751 Manashtash Road and Umptanum Road
Ellensburg, Washington
Project No. 170018:GES

Site Description

The subject site comprises 10 adjacent tax lots, Kittitas County Tax Parcel Nos. 808533, 869436, 879436, 889436, 950248, 950247, 950245, 950246, 950244 and 950243 and is located at 751 Manastash Road in Ellensburg, Washington. The site is roughly rectangular in shape with the long axis oriented roughly east to west. There are two ponds (which may have been converted into one) located in the southwest quadrant of the site and there is a drainage feature that lies about 10-15 below existing outside grade that runs from the east margin of the southernmost pond from west to east toward Manastash Road. This lower area is elongate and lies in the northeast quadrant of the site towards Manastash. An access road bisects the site from north to south and runs nearly the length of the site. The site is slopes gently from north to south.

Proposed Site Development

It is our understanding that a series of linear solar panel racks will be constructed on the property along with access/maintenance roads and power infrastructure for distribution to the power grid. Locations for the racks have not been selected and we have not been provided with detailed plans and specifications for installation of the solar panels nor have we been provided with a grading plan. However, based on review of similar projects, we believe that very little grading will be required to construct the solar panel racks. We understand that the solar panels are attached end to end on horizontal steel rods that are supported on driven H-beams. The solar panels are attached to the horizontal supports which are oriented north-south. The panels rotate so that they are always exposed to the sun as it moves from east

to west. We assume that the maintenance roads will run between the racks, provide access to the electrical infrastructure elements, and will probably run around the perimeter of the array.

If development plans should change or if our assumptions regarding development are incorrect, Swiftwater Environmental and Geotechnical (SEG) should be contacted as soon as possible to review and/or revise the recommendations contained herein. SEG should be provided an opportunity to review final plans and specifications to confirm that these recommendations have been incorporated into the plans.

Subsurface Conditions

On April 27, 2017, SEG personnel observed the installation of two test borings using a track-mounted vibratory drilling rig – a GeoProbe 8140 LC – also known as a sonic rig. A four-inch steel hollow-stem drill string is driven into the soil under high-frequency vibratory loading. Standard Penetration Testing (SPT) is then carried out at standard depths for this type of report. For this project, we directed the drillers to complete at least one SPT at the surface before drilling commenced to collect N-values for the surficial soils. SPTs were then variously carried out at standard depths of 2.5', 5.0', 7.5', 10.0', 12.5' and 15.0', as need based on materials observed in the continuous sample. Based on hardness of drilling during advancement of the core barrel, we decided to forego some of the intermediate samples since we would be reviewing a complete sample after drilling was completed and would be able to identify unusual strata within the samples. Samples were collected from the SPT split-spoons at the appropriate depths and prepared for storage and removal from the site

As noted above, one of the advantages of using the sonic drill rig is that a continuous four-inch diameter sample is collected in the hollow stem drill string as it is advanced. The continuous soil sample is extruded into polyethylene bags and removed from the immediate area of the drill rig. The continuous sample can then be examined by cutting the bag open to expose the entire one and a half to four-foot sample. We were thus able to closely examine the soil profile and to identify bearing soils with unusual precision. The borings were advanced to a maximum depth of 16.5 feet below existing grade. We understand that standard H-beam penetration for this type of installation is six to eight feet below grade. Boring locations are shown on the attached Boring Location Plan (Figure 2) along with the Boring Logs on subsequent pages. Please refer to the Boring Logs for detailed descriptions of the site soils. A general description of soils and groundwater conditions is provided below.

The boring locations were selected to attempt to be representative of the entire site. Boring U-1 was completed in the north-west quadrant of the site, to the north as west of the existing pond and Boring U-2 was located in the southcentral quadrant of the site about 250 feet north and about 355 feet west of the entrance gate. Once again, the soil profiles in both borings were very consistent and we believe that based on the likely depositional environment and also on the locally flat topography (with the exception of the east-west drainage, by a gray to brown sandy GRAVEL with trace silt to gravelly SAND with trace silty, moist and uniformly very dense (N Value consistently > than 50). In each boring, there was a thin topsoil layer consisting of a brown silty fine SAND with scattered organics that extended to a depth of about one and a half to four feet below grade and comprises a topsoil-like loamy material. This material is not suitable for embedment or for lateral force. The driller reported an extensive change to very hard drilling at about four and a half to five feet below grade and the SPT sample at five feet revealed a gray to dark gray silty sandy, partially cemented gravel with thin (<l" fine sand seams) that contained perched

groundwater. N-values in this material was in excess of 40 and remained there until termination of the hole at 16.5 feet below grade.

In Boring U-2, we observed a soil profile that was nearly identical to that found in U-1. Boring U-2 was terminated in this unit at 16.5 feet below grade.

In both borings, we observed that drilling was difficult with depth beginning at about three and a half to four feet below grade indicating that adequate embedment soils are present from about three to four feet below grade.

Groundwater

We encountered minor seepage in both borings from about 8.5 feet to 10 feet below grade. This water was encountered in thin relative clean sand seams and appears to have been "perched" within the seams as additional groundwater was not noted below these depths. Additional groundwater flow may be observed during the wetter winter months and planning should be implemented accordingly. As noted above, we did not observe groundwater in either of these borings. It should be expected that groundwater may be present during wetter parts of the year and plans should be implemented accordingly.

If grading and/or construction is carried out during the winter or spring months, the contractor should anticipate that possible groundwater seepage might be present and should plan accordingly. The entire profile of the site soils is moisture sensitive and those soils will be difficult to use as structural fill during the rainy winter and spring months. The underlying partially cemented sandy gravel soils will be less moisture-sensitive, but natural variability of the fine-grained fraction (e.g. silts and clay minerals) might cause these soils to be moisture-sensitive as well. In any case, if excavated site soils are to be used as structural fill, they should be protected from moisture while stock-piled.

Geologic Setting

According to the USGS Open File Report 1127, *Late Cenozoic Deposits, Landforms, Stratigraphy, and Tectonism in Kittitas Valley, Washington*, Richard B. Waitt, Jr., 1979, the subject site and surrounding area are underlain by Qs (Quaternary Alluvium, Sidestream Facies) which is characterized as downstream aggradation deposits with their source being upstream glacial moraines located to the west and northwest areas of the Kittitas Valley. These deposits consist primarily of basaltic gravels and sands with varying amounts of silt and clay minerals. The gravel varies from fine to coarse with occasional specimens in excess of one and a half meters. These undifferentiated sandy GRAVEL deposits are overlain by varying thicknesses of topsoil, weathered sandy gravel horizons, and loessal (wind) deposits that comprise the silty SAND and sandy SILT units that we observed from the surface down to the relatively un-weathered partially cemented gravel. The gravel deposits consistently displayed some level of cementation that is most likely caused by breakdown of the basaltic rock to silt and clay minerals and then subsequent re-lithification under normal loading. The soils we observed in our borings at the subject site are consistent with this mapping.

In Boring U-2, we encountered a fine-grained, reddish brown to tan silty clay to clayey silt unit underlying the sandy gravel deposits. We contacted Dr. Nick Zentner, Professor of Geological Sciences at Central Washington University about this unit. Dr. Zentner indicated that it is probably an alluvial deposit that develops in slow-water areas and ox-bows proximate to streams and to the Yakima River. Dr. Zentner

stated that these deposits are horizontally discontinuous and are found throughout the valley. The deposit on the subject site is thus likely limited in lateral extent, especially given that we did not encounter it in Boring U-1.

General Discussion and Recommendations

Based on the results of our site investigation, construction of the proposed solar panel array is entirely feasible from a geotechnical standpoint provided that adequate vertical H-beam supports are provided. The density of the soil matrix combined with the weight of the hammer might possibly damage the pile leading to less than satisfactory bearing capacity values. In this case, it would be prudent to complete a couple of test borings to determine if the piles can be placed with damage.

We understand that the site will be developed by constructing linear racks of structural members to which the solar panels will be attached. The racks will be oriented north to south, which support the solar panels on east to west oscillating horizontal members. Those horizontal members are in turn supported on a series of driven steel H-beams. We have reviewed plans for similar installations and it appears that there is variation in the length of the horizontal supports meaning there will be variation on the total loading for each individual H-beam. For example, some H-beams will support eight solar panels along with their mounting and support equipment while others will support six panels, etc. This means that for a design bearing capacity, pile embedment depths will vary or possibly, the H-beam sizing will need to be increased. *In either case, it is critical that final plans be reviewed by SEG to ensure that appropriate bearing capacities and embedment lengths have been incorporated into the plans and specifications.* Further, SEG should be retained to provide construction monitoring to ensure that the H-beams are installed in accordance with the plans and specifications and to document that adequate bearing capacity is developed.

Final bearing capacities and embedment lengths can be computed once the loading for the piles has been provided to us. Alternatively, we can estimate the loading for each pile if we are provided with information about the weight of the panels, supporting members and ancillary equipment. In either case, we have been informed that this information will be forthcoming and we can then complete the pile designs. We have attached a figure that shows the appropriate embedment zone for the H-beams.

We strongly recommend that once the bearing capacities and embedment lengths have been determined, a series of test piles should be driven using the same equipment that will be used during construction. The purpose of this testing is two-fold: 1) it is necessary to determine that the piles can be driven into the bearing soils to the required embedment depth without damaging the pile and, 2) it is required in order to load test the resulting piles to determine that adequate bearing capacity is being developed.

Wind Loading

The Kittitas Valley, particularly the Ellensburg area, is known for year-around windy conditions. We understand that the solar panels that will be used for this project are 32-square-foot panels mounted immediately adjacent to one another in linear "bays" of seven or eight panels. Therefore, for purposes of computing wind-loading, each bay will effectively be a single panel of 224 or 256 square feet.

We computed the maximum wind load for a 32-square-foot panel using the Uniform Building Code (UBC, 1997) formula with the preferred alternate methodology for computing wind pressure. We also used the Engineering News Record (ENR) methodology in order to check consistency across methodology. The following are wind loads for a four-foot by eight-foot panel erected vertically that is exposed to wind that

is moving over a flat surface with few obstructions. Wind speeds were obtained from the Applied Technology Council (ATC) website wherein maximum wind speeds are obtained by location. The ASCE site-specific wind speed values are obtained from the ASCE manuals noted, but were retrieved from the ATC Windspeed by Location website. The wind speed values were then used in the UBC formula to calculate the following values for wind pressure in pounds for a single four-foot by eight-foot solar panel.

• ASCE 7-93 Wind speed (fastest mile in mph	70 mph	593 lbs
• ASCE 7-05 Wind speed (3 second peak gust)	85 mph	878 lbs
• ASCE 7-10 100-year Mean Recurrence Interval	91 mph	1006 lbs
• ASCE 7-10 Risk Category II	110 mph	1470 lbs

The wind pressure values are the functional equivalent of lateral pressure on the H-beams. These values are maximum values. Wind pressure and equivalent lateral pressure will be less than the values shown because the solar panels are rarely, or never, in a vertical position and presumably can be rotated to a horizontal position before or during high-wind events to "spill" wind over time. Further, we believe that end to end placement of the panels will lead to an overall increase in per-panel value due to the failure of the wind to "spill" over the panel edges. Once we have received the H-beam size information, we can compute actual lateral loads based on the wind pressure values above.

Site Preparation and Earthwork

We anticipate that site preparation for the subject site will consist of installation of Temporary Erosion and Sedimentation Control (TESC) measures, installation of grade staking, establishing clearing and grading limits, site clearing and stripping, and possible stockpiling of strippings and organic material in non-structural areas. Once these activities have been completed, installation of underground utilities and final grading can occur and construction of the solar panel array can commence.

Infiltration and Temporary Erosion and Sedimentation Control (TESC)

It is important to understand and utilize Low Impact Development (LID) practices and LID Best Management Practices (BMP) in Eastern Washington to reduce or eliminate concentrated storm water runoff and erosion. BMP also help limit the introduction of pollutants/contamination into Eastern Washington's arid land soils and rangeland soils. BMP that address these issues can be found in the Washington State Department of Ecology (DOE) publication 13-10-036, *Eastern Washington Low Impact Development Guidance Manual*, June 13, 2013.

Construction of the solar array will tend to create a *variable* increase in the total *and effective* impervious area of the site that is equivalent to the area of the solar panels and associated infrastructure. The increase is variable because the panels move in accordance with the position of the sun and are tilted most of the time. There will also be an increase in less pervious area because of the proposed gravel access roads.

Based on the results of our subsurface investigation, we believe that infiltration into the upper, topsoil-like silty sand/sandy silt soils is not only feasible, but is ongoing. This site, like many others in the vicinity of Ellensburg, have been cultivated using flood irrigation methods. This consists of running a perforated PVC pipe along the upslope side of a site and simply flooding the entire area. Irrigation water percolates into the soil and is stored above the underlying relatively impervious layer found throughout the area.

Based on our observations at several of these sites and on publications and anecdotal testimonies, it is clear that these soils are quite capable of infiltrating storm water during an average year. According to the referenced DOE publication, Ellensburg is located in Climate Region 2 – Central Basin – and receives an average of about 8 inches of precipitation per year, some of it in the form of snow. Given the variable nature of the solar panel position, and relatively low precipitation in the area, combined with the natural permeability of the upper soil horizon, it is our opinion that infiltration of normal storm water amounts will occur and that normal levels of storm water will not be concentrated to a significant extent.

Based on the texture and class of the soil types that we encountered, and on a review of various documents related to storm water control in Eastern Washington, it is our opinion that it is reasonable to assume an infiltration rate of 1.02 inches/hour for the upper, silty sand unit and 0.27 inches/hour for the underlying sandy gravel. The rate for the sandy gravel unit is assumed to be low because of the presence of fine-grained silt and clay minerals in the interstitial spaces and fractures of this partially cemented unit.

Temporary construction ingress and egress should be completed prior to the start of on-going construction traffic. A temporary construction entrance should be constructed of 8-12 inches of quarry spalls. If the soils in the entrance location are soft, a layer of geotextile fabric can be laid down as a barrier prior to placement of quarry spalls. The quarry spalls will provide a stable entrance/exit to the site and will limit tracking of mud onto South Thorp Highway during and after wet weather. TESC measures consist of installation of silt fencing *as needed* around the site entrance, around the perimeter of the low side of the site, and at discharge points where sediment-laden surface water may enter off-site drainage features. Because the subject site is flat and slopes very gently to the south, silt fencing will probably not be required at the south perimeter unless desired by Kittitas County.

Stripping

No well-developed sod or heavily organic topsoil layer was observed at this site because of ongoing cultivation, thus stripping should not be required. If a topsoil horizon is observed in areas where maintenance roads are proposed, the topsoil should be removed down to mineral soil and replaced with crushed rock or structural fill. It is important that all deleterious material is removed prior to placement of structural fill. Topsoil strippings can be stockpiled for use in non-structural areas, as desired, but should not be allowed to mix with soils that will be used for structural fill.

Native Soils and Imported Soils

Native site soils encountered below the surface contain significant fines and are very moisture sensitive. However, if moisture content is near optimum, the soil can be used as compacted structural fill. Excavated site soils should be stockpiled and covered immediately if they are to be saved and used as structural fill. If the soils are above optimum moisture content, it may be possible to aerate them to reduce moisture content. This is possible during the warmer summer months, but it is difficult to achieve uniform moisture content. It may also be possible to use Portland cement as an admixture to reduce moisture content. If the site soils cannot be adequately compacted, it may be necessary to use imported soil for structural fill. Imported soil should be a well-graded granular mineral soil with fines content below five percent (i.e. less than five percent passing the No. 200 sieve) and should be at or slightly above the optimum moisture content. If construction is scheduled to occur during periods where precipitation is expected, a contingency should be built into the project budget for imported soil/crushed rock base (CRB) and other costs associated with placement of imported structural fill.

Subgrade Preparation

Once the site has been prepared for construction of the maintenance roads and placement of the H-beams, a SEG representative should observe subgrade conditions to confirm that they are as expected and to provide additional recommendations, if necessary. If disturbed native soil is encountered in structural areas (e.g. maintenance road prism or foundations for solar panel infrastructure) the fill should re-compacted in accordance with the specifications for structural fill or should be removed and replaced with structural fill as required to reach design grade. As an alternative, CRB can be placed and compacted. SEG should observe and confirm subgrade conditions as construction progresses. The contractor should be prepared to retain a local materials testing firm to sample soils to be used as structural fill, collect samples for Proctor testing, and to provide compaction testing as structural fill is placed, as needed.

Structural Fill

Structural fill is fill that is deliberately placed in thin lifts and compacted to a design specification. Structural fill is intended to support overlying structures in a manner that produces little or no post-construction movement. It is typically used under foundations, slabs, in utility trenches, roads, behind retaining walls, and in constructed slopes. Structural fill should be placed in loose lifts that do not exceed 12 inches and compacted to a relative compaction of 95 percent of maximum dry density as determined by Modified Proctor (ASTM D1557). Compaction specifications may vary, especially in utility trenches in public or private roads as specified by the local jurisdiction. Moisture content is critical to achieving adequate densification (compaction) and the upper unit of the site soils is very moisture sensitive, e.g. a small change in moisture content can make them unusable as structural fill. *If the soils are stockpiled and not covered, precipitation will make them difficult or impossible to use as structural fill.*

Foundations

We believe that foundations for the electrical infrastructure elements of the project can be supported on undisturbed, competent, native sandy gravel soils found below the upper topsoil-like horizon, on re-compacted native soils, on structural fill, or on CRB. Where loose or unsuitable soils are encountered at design subgrade, it will be necessary to re-compact the native soils to structural fill specifications or to over-excavate down to competent native soils then place structural fill or CRB up to design subgrade.

If the subgrade is prepared as described above, the following parameters may be used for design:

- Allowable soil bearing capacity — 1,500 psf
- Passive earth pressure — 300 pcf (equivalent fluid)
- Coefficient of friction — 0.35

A one-third increase in the allowable soil bearing capacity may be assumed for short-term wind and seismic loading conditions. The passive pressure and friction values above include a factor-of-safety of at least 1.5. With anticipated structural loads, total settlement of one inch and differential settlement of one-half inch is anticipated. Most settlement should occur during construction, as dead loads are applied.

Seismic Design

The 2015 International Building Code recognizes the American Society of Civil Engineers (ASCE) for seismic site class definitions. In accordance with Table 20.3-1 of the ASCE Minimum Design Loads for Buildings and Other Structures manual, Site Class D should be used for design.

Based on our observations of the upper native silty sand soils and the underlying partially cemented sandy gravels, it is our opinion that the subject site has very low susceptibility to liquefaction. Liquefaction is a phenomenon wherein loose, saturated soils suddenly lose shear strength and begin to behave as a fluid. Liquefaction typically occurs under seismic loading conditions and if structures are supported on soils that liquefy, structural damage can occur. The site groundwater and native soil conditions we observed in the test borings have allowed us to reach this conclusion.

Drainage

We did observe occasional mottling/rust-staining in the weathered till units indicating presence of water at some time in the past. During the rainy winter months, it is prudent to anticipate seepage in excavations and groundwater control measures should be on-site or readily available, including trash pumps, sumps and discharge ditches. Seepage may create instability in the walls of excavations – SEG should be notified if seepage is observed in excavations so that control measures may be discussed with the contractor and properly implemented. The site should be graded such that surface water is directed away from structures and slopes. Surface water must never be allowed to pond near the tops or toes of slopes. Based on the soil types observed in our test pits, it is our opinion that infiltration is not feasible at this site. Storm water discharge BMPs should be implemented to control runoff from the site. Sediment-laden surface water must be treated such that water discharged from the site meet all water quality requirements. Storm water should not be discharged over the slope to the north of the site.

Excavations/Slopes

Soils observed in the upper one and a half to two feet of the test borings would be classified as OSHA/WISHA Type C. Temporary excavations like utility excavations and foundation excavations with heights in excess of four feet must be sloped no steeper than 1.5H:1V. If seepage is observed in these excavations, they may need to be sloped at 2H:1V to prevent sloughing due to seepage pressure. The dense native sandy gravel soil observed below about two feet would be considered OSHA/WISHA Type B soils and can be laid back at 1H:1V.

SEG should be contacted to observe temporary slopes and utility excavations as they are constructed or excavated to assess slope stability and recommend additional measures, if necessary.

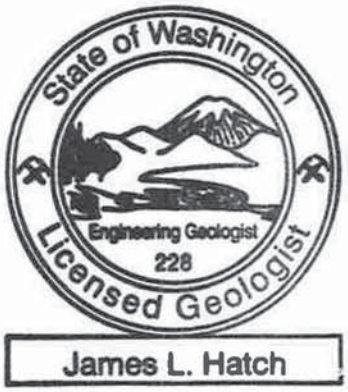
Utility Support, Trenches, and Trench Backfill

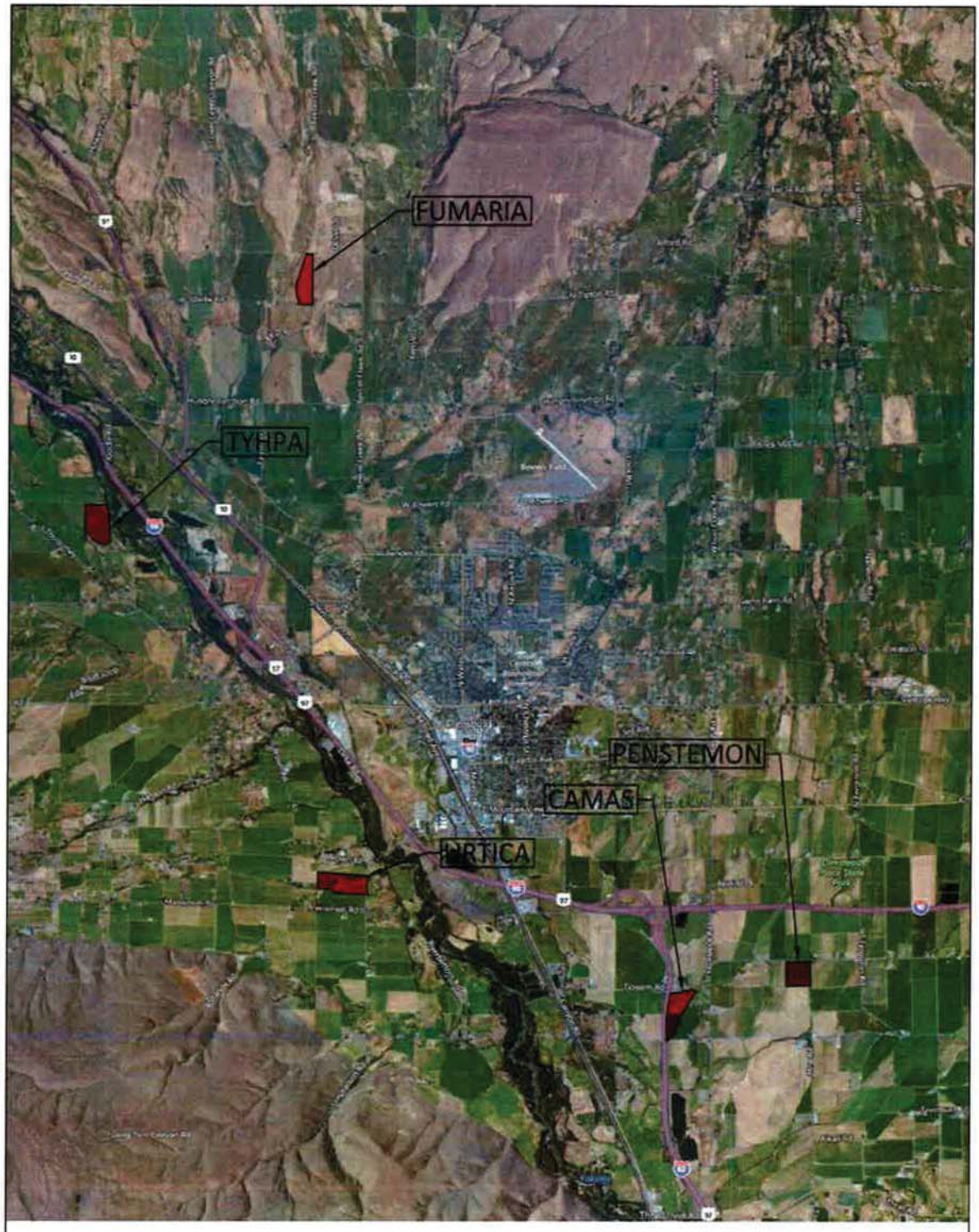
Site soils should be suitable for support of solar panel infrastructure and utilities. In shallower trenches, particularly shallower than about two feet, it may be necessary to over-excavate loose or wet soil down to suitable, stable soils, and then replace them with compacted structural fill or CRB. Groundwater seepage may be encountered in trench walls, particularly if deeper than two to three feet. Seepage may cause caving of the trench walls and temporary shoring may be required. Dewatering measures may also be needed to control seepage and SEG should be contacted to assess the need for such measures.

Site soils may be suitable for use as backfill provided the moisture content is optimal as determined in the laboratory. Trench backfill should be placed and compacted in accordance with the specifications for structural fill as described above or in accordance with specifications provided by the local jurisdiction. CRB should be placed in 6-8 inch lifts and compacted with a plate compactor or other compaction device.

Limitations

This report is an instrument of service and has been prepared for the exclusive use of Tuusso Energy, LLC and their representatives and agents. The recommendations and conclusions provided in this study are professional opinions consistent with the level of care and skill that is typical of other members of the profession currently practicing in this area. A warranty is neither expressed nor implied. Variations in the soil and groundwater conditions observed in the test boring locations may exist and may not become apparent until construction commences. SEG should reevaluate the conclusions contained in this study if such variations are encountered.





TUUSO ENERGY, LLC
ELLENSBURG SOLAR PROJECTS
LOCATION MAP

Swiftwater
Environmental & Geotechnical
Western Washington Division
165 NE Juniper Street, Suite 201A • Issaquah, WA 98027 • Phone: (425) 323-0787
Eastern Washington Division
407 Swiftwater Blvd., Suite A • Cle Elum, WA 98922 • Phone: (425) 323-0787

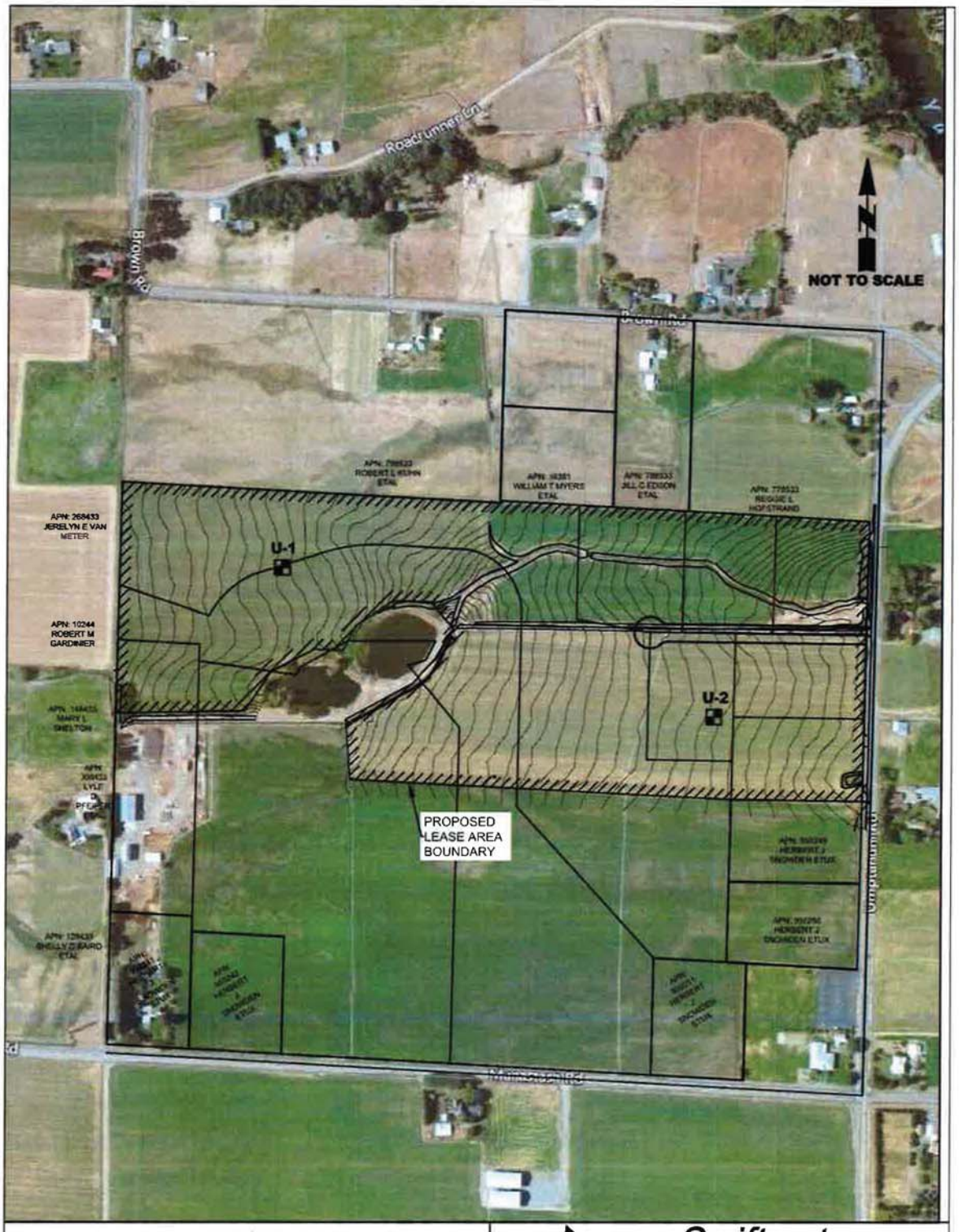
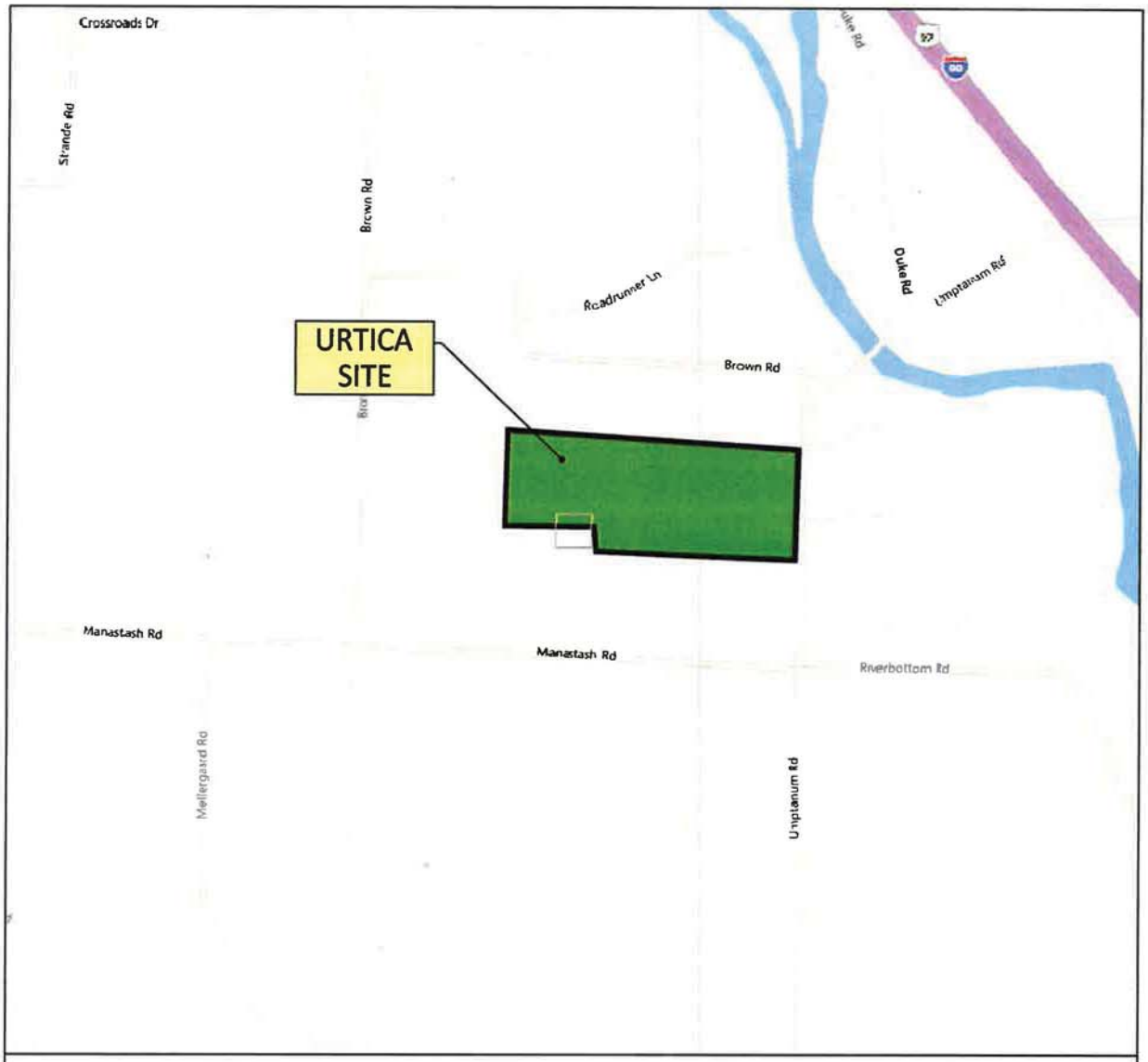
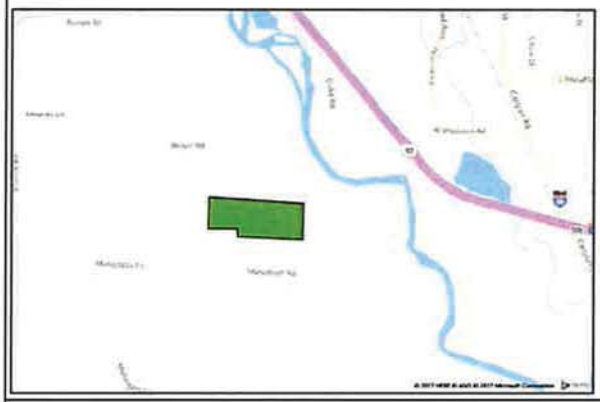


FIG. 2
URTICA SITE
TEST BORING LOCATIONS

Swiftwater
Environmental & Geotechnical
Western Washington Division
165 NE Juniper Street, Suite 201A • Issaquah, WA 98027 • Phone: (425) 321-0787
Eastern Washington Division
407 Swiftwater Blvd., Suite A • Cle Elum, WA 98922 • Phone: (425) 321-0787





NOT TO SCALE

URTICA VICINITY MAP

Swiftwater
Environmental & Geotechnical
Western Washington Division
165 NE Juniper Street, Suite 201A • Issaquah, WA 98027 • Phone: (425) 321-0787
Eastern Washington Division
407 Swiftwater Blvd., Suite A • Cle Elum, WA 98922 • Phone: (425) 321-0787

Swiftwater
Environmental & Geotechnical

Project:	Tuusso Energy - URTICA Site	170018	Date: 4/27/2017
Location	751 Manastash Road and Umpt	Surface Elevation	Groundwater 8.5'
Earthwork Contractor	Excavation Equip.	Logged By	
Holocene Drilling	GeoProbe 8104 LC	JH	

Depth (feet) From	Depth (feet) To	Tests	USCS Soil Class.	
0.0	4.5 +/-	N - 6	**SM**	Dark brown silty fine SAND, trace gravel, moist, loose to medium dense, (Topsoil - like.) Very dense - partially cemented.
4.5	5.0	N - 50	**SM/GP**	Gray sandy GRAVEL to gravelly SAND, trace to some silt, moist, dense grading to very dense with depth. Some cementation
10.0	11.5	N - 50	**SM/GP**	Same
15.0	16.5	N - 40	**SM/GP**	Same - Test boring terminated at 16.5 feet below grade

Notes: 3-6" Topsoil / Sod @ Surface

Minor seepate noted at -8.5

TEST BORING NO.	**U-1**
Page	1 OF 1

Swiftwater
Environmental & Geotechnical

Project:	Tuusso Energy - URTICA Site	170018	Date: 4/27/2017
Location	751 Manastash Road and Umpt	Surface Elevation	Groundwater 9.0' bsg
Earthwork Contractor	Excavation Equip.	Logged By	
Holocene Drilling	GeoProbe 8104 LC	JH	

Depth (feet) From	To	Tests	USCS Soil Class.	
0.0	1.5	N - 6	SM	Dark brown silty fine SAND, trace gravel, moist, loose to medium
				dense, (Topsoil - like.) Very dense - partially cemented.
4.0	5.0	N - 50/1"	SM/GP	Gray sandy GRAVEL to gravelly SAND, trace to some silt, moist,
				dense grading to very dense with depth partial cementation on a
				boulder Cased hole and completed boring
10.0	11.5	N - 50	SM/GP	Same, 2" recovery.
15.0	16.5	N - 40	SM/GP	Same - Test boring terminated at 16.5 feet below grade

Notes: 3-6" Topsoil / Sod @ Surface

Minor seepate noted at -8.5

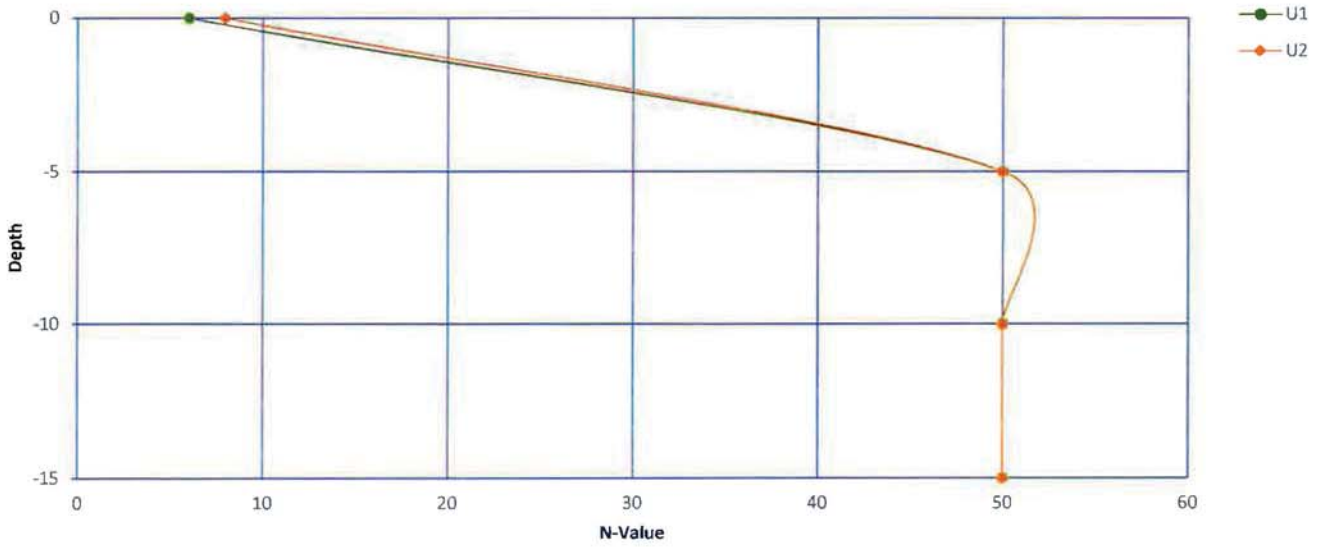
TEST BORING NO.	U-2
Page	1 OF 1

Swiftwater
Environmental & Geotechnical

Project:	Tuusso - Urtica Site	Project No. 170017:GES	Date: 6/6/2017
Location	3401 South Thrope Highway	Surface Elevation	Groundwater N/A
Earthwork Contractor	Excavation Equip.	Logged By	
Holocene Driling	Geoprobe 8104	JH	

U-1		U-2	
Depth (ft)	N	Depth (ft)	N
0.0	40.0	0.0	40.0
-5.0	50.0	-5.0	50.0
-10.0	50.0	-10.0	50.0
-15.0	50.0	-15.0	50.0

Approximate Embedment Depth



Note: Tests conducted per ASTM D1586-11 (Standard test method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils)

Appendix K-5: Urtica Solar Project Drainage Report

Tuusso Energy
Urtica Solar Project:
DRAINAGE REPORT

Date: July 2017

Prepared by:
Encompass Engineering & Surveying
407 Swiftwater Blvd
Cle Elum, WA 98922

Table of Contents

I. INTRODUCTION 2
II. EXISTING CONDITIONS 3
a. Drainage Basins 3
b. Downstream Analysis 3
c. Soil Report 3
III. PROPOSED CONDITIONS 3
a. Solar Panel Array 4
b. Drainage Basin 4
IV. HYDROLOGIC MODELING- SANTA BARBARA URBAN HYDROGRAPH METHOD 4
a. Precipitation 4
b. Curve Number 5
c. Time of Concentration 5
d. Flow Calculations 5
V. HYDROLOGIC ANALYSIS 6
VI. COMPLIANCE WITH SWMMEW CORE ELEMENTS 7
VII. CONCLUSION 7

List of Figures

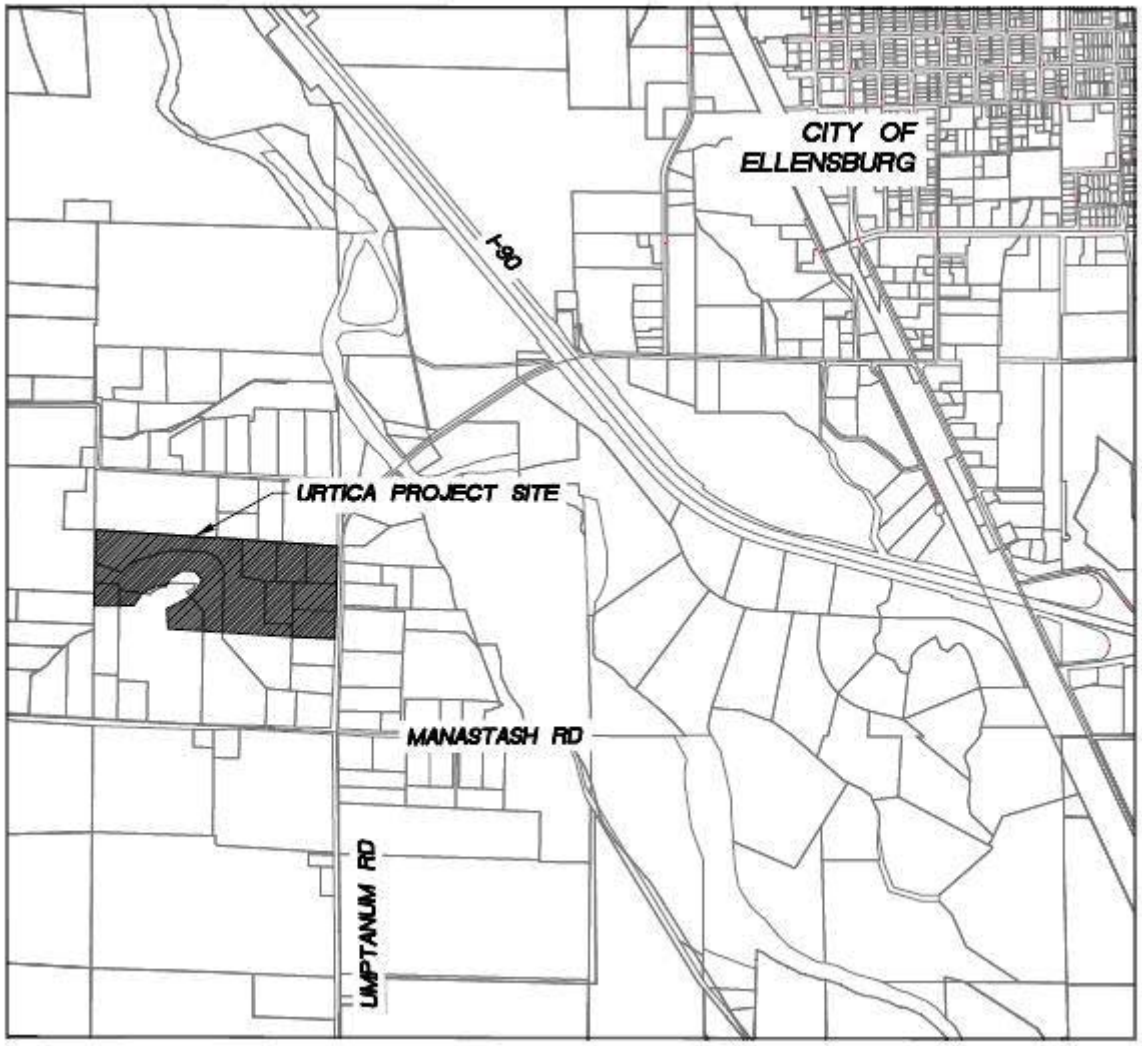
Figure 1- Existing Conditions Exhibit
Figure 2- Proposed Conditions Exhibit

Appendix

Appendix A- NRCS Web Soil Survey
Appendix B- *SWMMEW* Isopluvial Maps
Appendix C- Curve Number Calculations
Appendix D- Hydrocad Report: Existing Basin
Appendix E- Hydrocad Report: Proposed Basin

I. INTRODUCTION

Per Kittitas County assessor records the Tuusso Energy: Urtica Solar Project site is comprised of Tax Parcel Nos. 950243, 950244, 950245, 950246, 950247, and 950248 and portions of 808533, 869436, 879436, and 889436. It is in the northwest corner of the intersection of Manastash Road and Umptanum Road in Ellensburg, WA, in the SW ¼ of Section 10, Township 17 North, Range 18 East W.M. The project site is 51.49 acres and currently used as agricultural land to produce hay. See Vicinity Map below.



VICINITY MAP

The purpose of this project is to convert the site to a photovoltaic solar project with minimal change to the existing topography and site features. The proposed site will consist of rows of modular trackers with solar panels, all-weather access roads, and inverter stations to convert power from the solar panels. The solar panels are attached to horizontal supports that run north-south, and the panels themselves rotate east to west, in order to maximize sun exposure. Access to the site is from the east side of the site, off of Umptanum Road.

II. EXISTING CONDITIONS

The site is currently an open field used to make hay using flood irrigation methods. The overall topography of the site gently slopes to the east. The surface water that does not infiltrate flows to the east. Two ponds are located near the middle of the site and discharge into an existing irrigation ditch that runs west to east through the site. Existing conditions can be seen in Figure 1.

a. Drainage Basins

For the purpose of this report, the site is considered to be made up of two drainage basins, which can be seen in Figure 1. Drainage Basin 1 is the smaller of the two and encompasses the southern portion of the site. Drainage from this area flows east, to the south-east corner of the site, where it enters a culvert and crosses under Umptanum Road. Drainage Basin 2 is the larger drainage basin the encompasses the northern portion of the site. Drainage from Basin 2 flows into the existing irrigation pond and ditch that flows through the site to the east. There are no structures on the existing site, however there is an existing gravel road, which results in 0.33 acres of the site being impervious. The remaining 51.16 acres are pervious.

b. Downstream Analysis

The majority of the site (Basin 2) drains to the east into the irrigation ponds are/or irrigation ditch that flows west to east through the site. The pond and ditch are currently maintained by the current landowner. The irrigation pond and ditch are part of a larger irrigation network that serves the rural areas southwest of Ellensburg. As this pond and ditch are irrigation facilities, the flow rates are currently controlled as needed. The ditch flows into a culvert and crosses under Umptanum road, and then continues on to the southeast as part of the existing irrigation network. Basin 1 drains to the south-east corner of the site, where it enters a culvert and crosses under Umptanum Road. It then becomes part of the larger irrigation network that serves the whole area. No issues have been brought up in relation to the existing irrigation infrastructure downstream of the project site.

c. Soil Report

An NRCS Web Soil Survey was performed for the site in order to obtain onsite soil types. The results of the report give descriptions of the soils found in the project area and the corresponding hydrologic soil groups. The results can be seen in APPENDIX A. The site is composed of Nanum ashy loam with 2-5% slopes, Brickmill gravelly ashy loam with 0-2% slopes, Ackna Ashy loam with 0-2% slopes and Brysill cobbly ashy loam with 0-2% slopes. Both the Brickmill Loam and Brysill loam belong to Hydrologic Soil Group C, while the Ackna loam belongs to Group B. The Nanum loam has a dual C/D rating, meaning it is classified as Group C for drained areas and Group D for undrained areas. For this study, it is classified as Group D, which a conservative classification.

III. PROPOSED CONDITIONS

The proposed development on this site consists of adding solar trackers, fencing, and associated electrical infrastructure as well as improving and building upon the existing access road. The new impervious surface will be a portion of the solar trackers (described below), the proposed all-weather

access road (which may be compacted soil or gravel) that will run east/west through the site, and the electrical infrastructure that is made up of five inverters and one utility disconnect with a project metering location. Each inverter as well as the utility disconnect, resides on its own concrete pad. The access road was conservatively modeled as a gravel road.

a. Solar Panel Array

A series of modular trackers will be installed throughout the site. Each tracker is essentially a long horizontal support (of various lengths), held in place by evenly spaced, driven H-beams. The trackers are oriented north-south, with solar panels attached to the entire length of the tracker. The solar panels rotate and tilt east to west to maximize sun exposure. The panels will generate runoff within the site, however, due to the way the panels tilt and that they are not continuous structures, they are not considered impervious in the proposed conditions calculations. The panels do not reduce available ground surface for infiltration. The ground below the solar panels will have native plantings, and therefore it will continue to intercept and infiltrate runoff water from the panels. The only impervious area due to the solar panels is from the posts in the ground upon which the solar panels are attached. For impervious calculations, the posts are conservatively estimated to make up 5% of the total area of the solar tracker configuration.

b. Drainage Basin

Minimal grading and ground disturbance will take place as part of this project. The access road, concrete pads for the electrical infrastructure, and solar tracker posts are the only impervious surfaces proposed for the site. The portion of the solar panel array installation that disturbs the ground is very minimal as well. Because of this, existing topography and drainage patterns will remain relatively undisturbed, and the proposed drainage basins encompass the same area as the existing drainage basins. Proposed conditions can be seen in Figure 2.

IV. HYDROLOGIC MODELING- SANTA BARBARA URBAN HYDROGRAPH METHOD

Hydrologic analysis for the proposed project is consistent with Title 12 of the Kittitas County Code and the 2004 *SWMMEW*. In order to properly analyze the impacts of the proposed development on the watershed, runoff modeling was done using the Santa Barbara Urban Hydrograph method (SBUH), SCS Type 1A 24-hour storm event for Region 2 per the 2004 *SWMMEW*. This was done to determine peak runoff during the 2-year, 10-year, 25-year and 100-year storm events. Calculations were performed utilizing HydroCAD version 10.00-18, which is accepted by the Department of Ecology as a proper simulation modeling program.

a. Precipitation

The precipitation information used for the pre-development and post-development run-off calculations is based on the Isopluvials provided in the 2004 *SWMMEW* and can be seen in APPENDIX B. The inputs for this project site southwest of Ellensburg are seen below:

P_{2yr} = 1.0”
P_{10yr} = 1.2”
P_{25yr} = 1.6”
P_{100yr} = 2.0”

b. Curve Number

The SCS Curve Number (CN) is a function of the soil type and ground cover. It is used to determine the portion of the precipitation depth that will be conveyed as runoff. The curve numbers are pulled from *Technical Release 55 Urban Hydrology for Small Watersheds*, and the curve numbers used can be seen in Table 1.

Table 1: Curve Numbers Used

DESCRIPTION	HYDROLOGIC SOIL GROUP			
	A	B	C	D
Meadow	30	58	71	78
Impervious areas	98	98	98	98
Gravel Roads	76	85	89	91
Dirt Roads	72	87	87	89

Using the soils report and the curve number table, a composite curve number was determined for the proposed and existing basins. A detailed curve number breakdown can be seen in APPENDIX C. Calculations can also be seen in APPENDIX D and E as part of the HydroCAD report.

c. Time of Concentration

Time of concentration is the time it takes for the runoff to get from the most hydrologically distant location to the point of collection for the basin. The flow path is broken up into three segments, with the hydrologic travel time calculated separate for each segment.

- Sheet flow- flow over plane surfaces which usually occurs at the headwaters of a catchment area. The maximum allowable length for sheet flow is 300-ft
- Shallow concentrated flow-flow in headwater areas where flow begins to concentrate in small rills or rough channels
- Channel flow- flow that is concentrated in defined channels

The time of concentration is the total of the travel times for each flow segment. Time of concentration calculations can be seen in APPENDIX D and E as part of the HydroCAD report.

d. Flow Calculations

HydroCAD uses all of the inputs described above in order to determine the peak flows for various storm events. All the inputs are combined to create an instantaneous hydrograph which is then routed through a modeled reservoir with a time delay equal to the time of concentration in order to generate the runoff hydrograph. The runoff hydrograph can be found in APPENDIX D and E as part of the HydroCAD report. The peak runoff values for the 2, 10, 25 and 100-year storms for each basin can be seen below in Table 2.

Table 2: Flow rates

Q (cfs)				
Time Span	**2-yr**	10-yr	**25-yr**	100-yr
Existing Basin 1	**0.00**	0.00	**0.03**	0.10
Existing Basin 2	**0.00**	0.04	**0.18**	0.47
Proposed Basin 1	**0.02**	0.03	**0.04**	0.11
Proposed Basin 2	**0.00**	0.05	**0.20**	0.54

V. HYDROLOGIC ANALYSIS

As seen in the calculated peak flow rates, the increased runoff due to proposed site development is minimal. For Basin 1, the 2-yr peak flow is increased by 0.02 cfs and the 25-yr peak flow is increased by 0.01 cfs. For Basin 2, the 2-yr peak flow remains at 0 cfs and the 25-yr peak flow is increased by 0.02 cfs. Typically, *SWMMEW* requires developments to release runoff at or below one half of the existing 2-yr peak flow and at or below the existing 25-yr peak flow, as well as for that runoff to be treated.

Per Chapter 2.2.6 of the *SWMMEW* there are exemptions for new development when flow control is not required as long as certain conditions are met. Per chapter 2.6.6 exemption 1, states: "Any project able to disperse, without discharging to surface waters, the total 25-year runoff volume for the proposed development condition" is exempt from meeting the flow control requirements. The Urtica project will use full dispersion as the main way to handle increased flows due to impervious areas. As outlined in *SWMMEW* Chapter 6.5, BMP F6.42, full dispersion allows up to 10% of the site that is impervious to be characterized as non-effective impervious area by dispersing runoff into the native vegetation area. On the Urtica site, the impervious areas may conservatively make up to 3.2% of the site while the rest of the site maintains plantings similar to existing vegetation. This is under the 10% threshold, making full dispersion a viable option.

Chapter 2.2.5 of the *SWMMEW* summarizes the requirements for treating storm water runoff to reduce pollutant loads and concentrations. Runoff treatment is required for all projects creating 5,000 square feet or more of pollutant-generating impervious surfaces (PGIS). The Urtica site is not classified as a high use site and all of the proposed impervious surfaces are considered Non-Pollutant Generating Impervious Surfaces (NPGIS). Infrequently used maintenance access roads are classified as NPGIS, and thus are exempt from basic treatment requirements. The solar panels are detached impervious surfaces which the water flows off of and into natural vegetation below. The inverter pads are concrete pads, which the inverters and transformers sit on. The inverters contain no fluids. The transformers may be "dry", meaning they contain no fluids, or they may contain fluids, that has not been finalized yet. If they do contain fluid, it would be Envirotemp or a similar biodegradable vegetable based coolant. Therefore, the inverter pads will be considered NPGIS as well, however if that classification is challenged, they make up no more than 3,600 square feet, which is below the 5,000 square feet threshold. The Urtica site meets the exemption requirement, therefore no treatment measures will be necessary or put in place.

While analyzing the effects of increased storm water runoff, it is also important to note any other changes that will occur on the site due to the development. One thing of note on the Urtica site is that it is currently cultivated using flood irrigation methods. In this method, an excess amount of water is delivered to the site for irrigation, and the general assumption is that half of the applied water actually goes to the crop while the other half is lost to evaporation, runoff, infiltration or transpiration (*Alliance for Water Efficiency: Flood Irrigation Introduction*). With the construction of this project, the flood irrigation will be minimized, if not stopped completely. The net loss of surface water due to reducing flood irrigation will be greater than the minimal increases in stormwater runoff due to the construction associated with the solar panel farm. Therefore, the additional runoff of the peak 2-yr and 25-yr storms ranging from 0.00 and 0.02 cfs, is considered negligible when analyzing the site as a whole.

VI. COMPLIANCE WITH *SWMMEW* CORE ELEMENTS

All new development projects must comply with the 8 Core Elements outlined in Chapter 2 in the *SWMMEW* when applicable. Exemptions exist for each Core Element and vary depending on requirements that must be met. The Core Elements are listed below in relation to the proposed development of the Tuusso Energy: Urtica Solar Project, and exemptions are noted when applicable.

1. Preparation of a Stormwater Site Plan:
    - This can be seen in Figure 2- Proposed Drainage Basin Map, and will be included in the civil plans.
2. Construction Stormwater Pollution Prevention:
    - This will be included as part of the SWPPP submittal.
3. Source Control Pollution
    - The only potential fluid on the site is a biodegradable vegetable based coolant, which is not classified as a pollutant. Therefore, no point source pollutants are on the site.
4. Preservation of Natural Drainage Systems
    - Minimal grading will occur on site and natural drainage patterns will be maintained.
5. Runoff Treatment
    - The site satisfies the requirement for full dispersion and is not a high use site, making it exempt from runoff treatment.
6. Flow Control
    - Per Exemption 1 in chapter 2.6.6 of *SWMMEW*, the site will use full dispersion to control the 2 and 25-yr flows.
7. Operation and Maintenance
    - No on-site maintenance is required for full dispersion. Maintenance of the existing drainage ditches will be performed by the current landowner.
8. Local Requirements
    - There are no local ordinances above and beyond what is outlined in *SWMMEW*

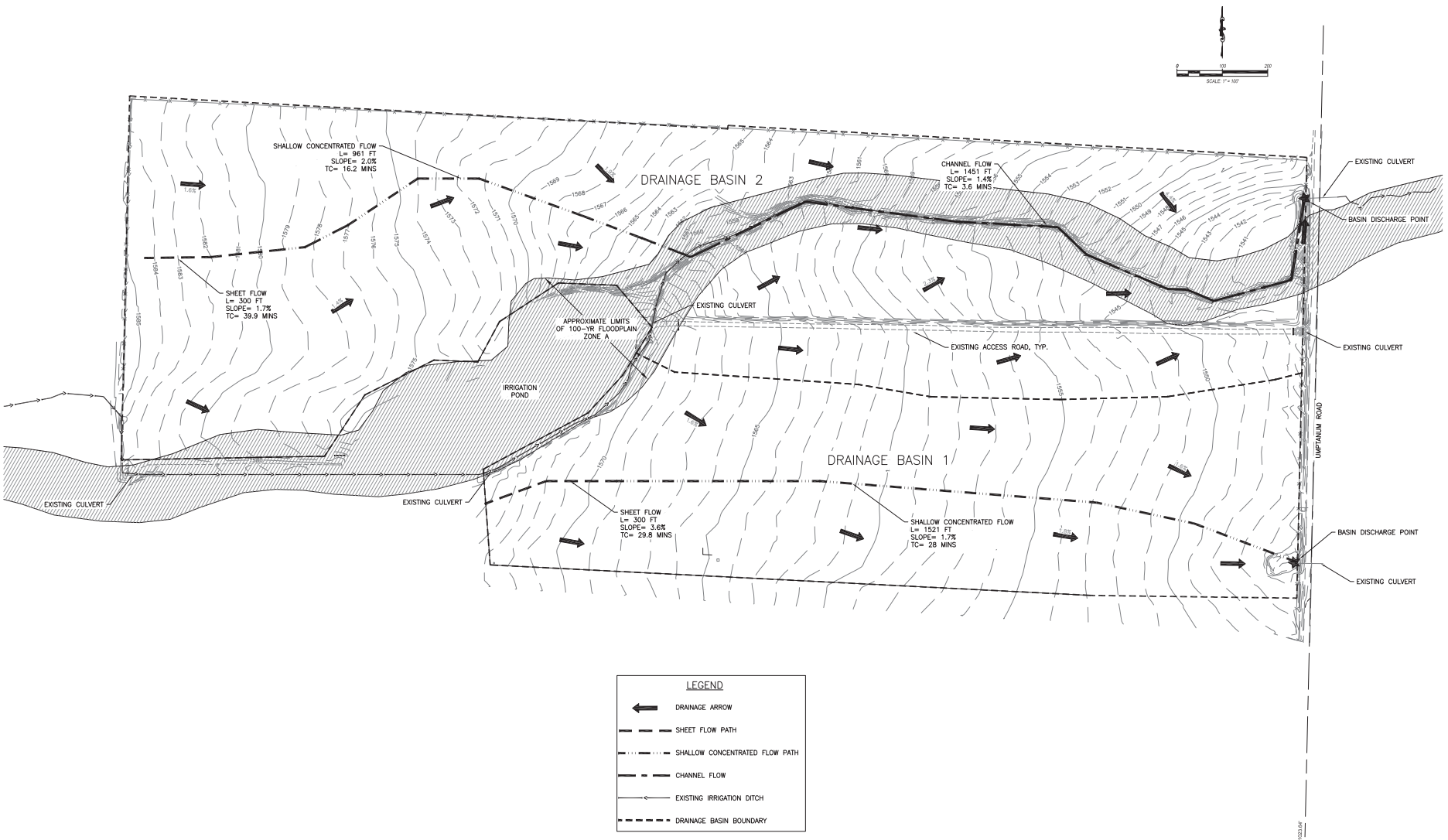
VII. CONCLUSION

The Tuusso Energy: Urtica Solar Project involves transforming 53.49 acres of an existing hay field, into a solar project. The project consists of adding an array of solar panels, an access road, and the

associated electrical infrastructure. Existing topography will be preserved to the maximum extent possible and native plantings will be made throughout the site. From a stormwater and drainage standpoint, the biggest impacts of the project will be from converting 1.67 acres into impervious surfaces in the form of an all-weather access road, electrical infrastructure, and posts for the solar trackers. 1.67 acres is an overestimate of impervious area, as it maxes out the percentage of impervious to pervious surfaces based on the design of the solar panel trackers. All site and location factors were taken into account in order to perform the SBUH hydrologic modelling method. The calculations from the modelling showed that the runoff generated from the 2-yr storm increased from 0.00 cfs to 0.02 cfs for Basin 1, and remained the same at 0.00 cfs for Basin 2. Runoff generated from the 25-yr storm increased from 0.03 cfs to 0.04 cfs for Basin 1 and from 0.18 cfs to 0.20 cfs for Basin 2. This increased runoff can be handled by full dispersion throughout the site, due to protecting a majority of the existing vegetation. The increased runoff is also considered negligible, due to the reduction of flood irrigation to the site which will accompany the project.

TUUSSO ENERGY - URTICA SITE

A PORTION OF THE SW 1/4 SECTION 10, T. 17 N., R. 18 E., W.M.
KITTITAS COUNTY, STATE OF WASHINGTON



K-5-10

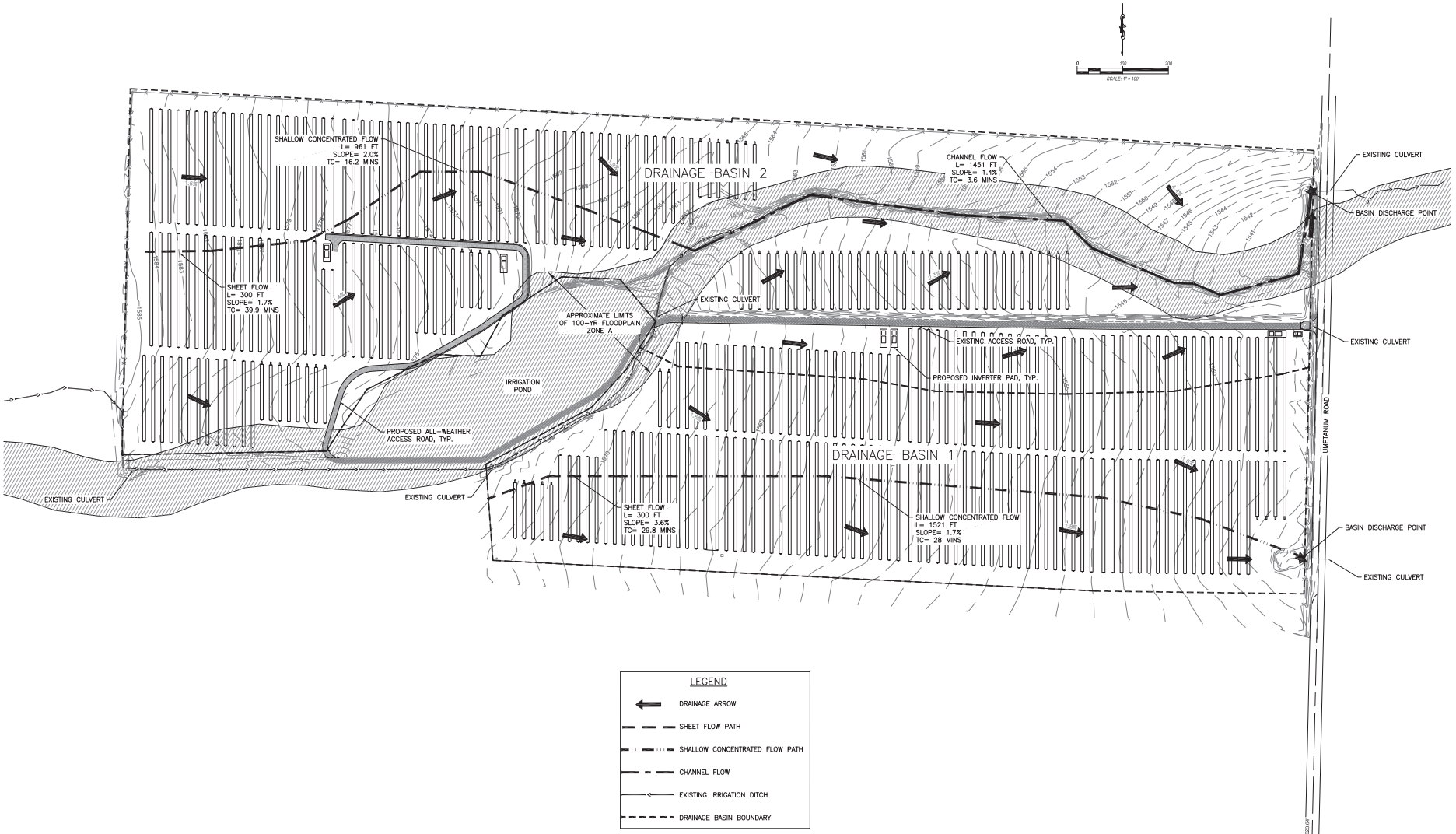
TUUSSO ENERGY, LLC
URTICA SITE
EXISTING DRAINAGE CONDITIONS

Encompass
ENGINEERING & SURVEYING
Western Washington Division
165 NE Juniper Street, Suite 201 • Issaquah, WA 98027 • Phone: (425) 392-0250 • Fax: (425) 391-3055
Eastern Washington Division
407 Swallmeier Blvd. • Ste. Ellum, WA 98926 • Phone: (509) 674-7433 • Fax: (509) 674-7419

JOB NO.	17016
DATE	July 2017
SCALE	AS SHOWN
DESIGNED	SF
DRAWN	SF
CHECKED	GC/MKK
APPROVED	TML
SHEET	FIG-1

TUUSSO ENERGY - URTICA SITE

A PORTION OF THE SW 1/4 SECTION 10, T. 17 N., R. 18 E., W.M.
KITTITAS COUNTY, STATE OF WASHINGTON



K-5-11

TUUSSO ENERGY, LLC
URTICA SITE

PROPOSED DRAINAGE CONDITIONS

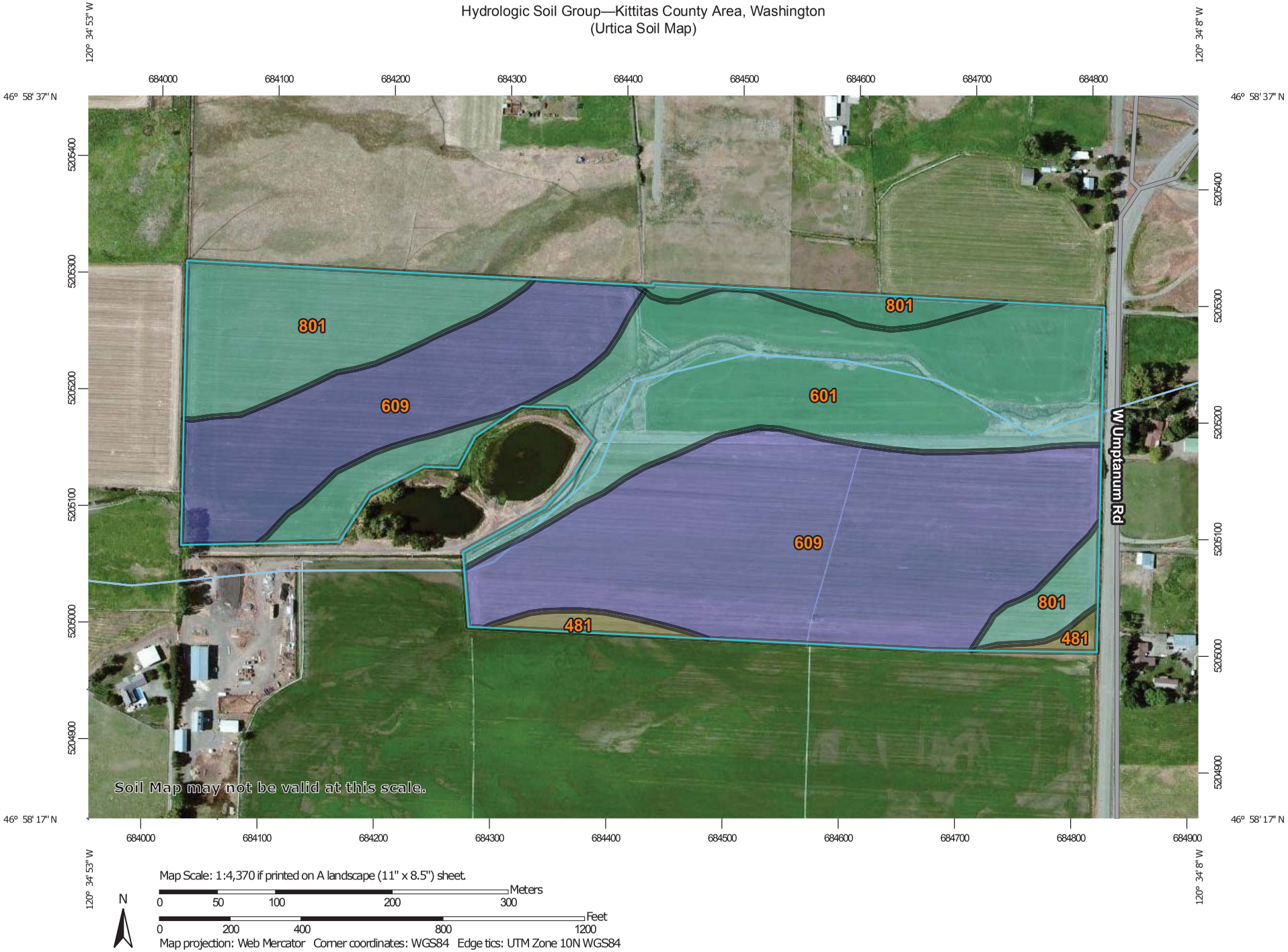
Encompass
ENGINEERING & SURVEYING
Western Washington Division
165 NE Juniper Street, Suite 201 • Issaquah, WA 98027 • Phone: (425) 392-0250 • Fax: (425) 391-3055
Eastern Washington Division
407 Swallmeier Blvd. • Ste. Ellum, WA 98926 • Phone: (509) 674-7433 • Fax: (509) 674-7419

JOB NO.	17018
DATE	July 2017
SCALE	AS SHOWN
DESIGNED	SF
DRAWN	SF
CHECKED	GG/MKK
APPROVED	TML
SHEET	FIG-2

Appendix A:

NRCS WEB SOIL SURVEY

Hydrologic Soil Group—Kittitas County Area, Washington
(Urtica Soil Map)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Kittitas County Area, Washington
Survey Area Data: Version 9, Sep 9, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 19, 2010—Aug 19, 2010

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

K-5-14

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Kittitas County Area, Washington (WA637)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
481	Nanum ashy loam, 2 to 5 percent slopes	C/D	0.9	1.8%
601	Brickmill gravelly ashy loam, 0 to 2 percent slopes	C	15.4	29.9%
609	Ackna ashy loam, 0 to 2 percent slopes	B	26.9	52.3%
801	Brysill cobbly ashy loam, 0 to 2 percent slopes	C	8.3	16.1%
Totals for Area of Interest			**51.5**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

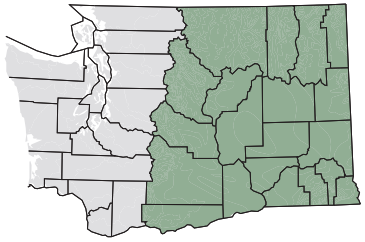
Tie-break Rule: Higher

Appendix B:

SWMMEW ISOPLUVIAL MAPS



Eastern Washington Stormwater Manual



2-Year 24-Hour Isopluvials

Source: NOAA Atlas 2, Volume IX, 1973
Precipitation in inches

County(2003, 1:24,000)
City(2003, 1:24,000)
Latitude/Longitude(1/10 degree)
Isopluvial(1973, 1:2,000,000)
NOAA/NWS Station(1931-1998)

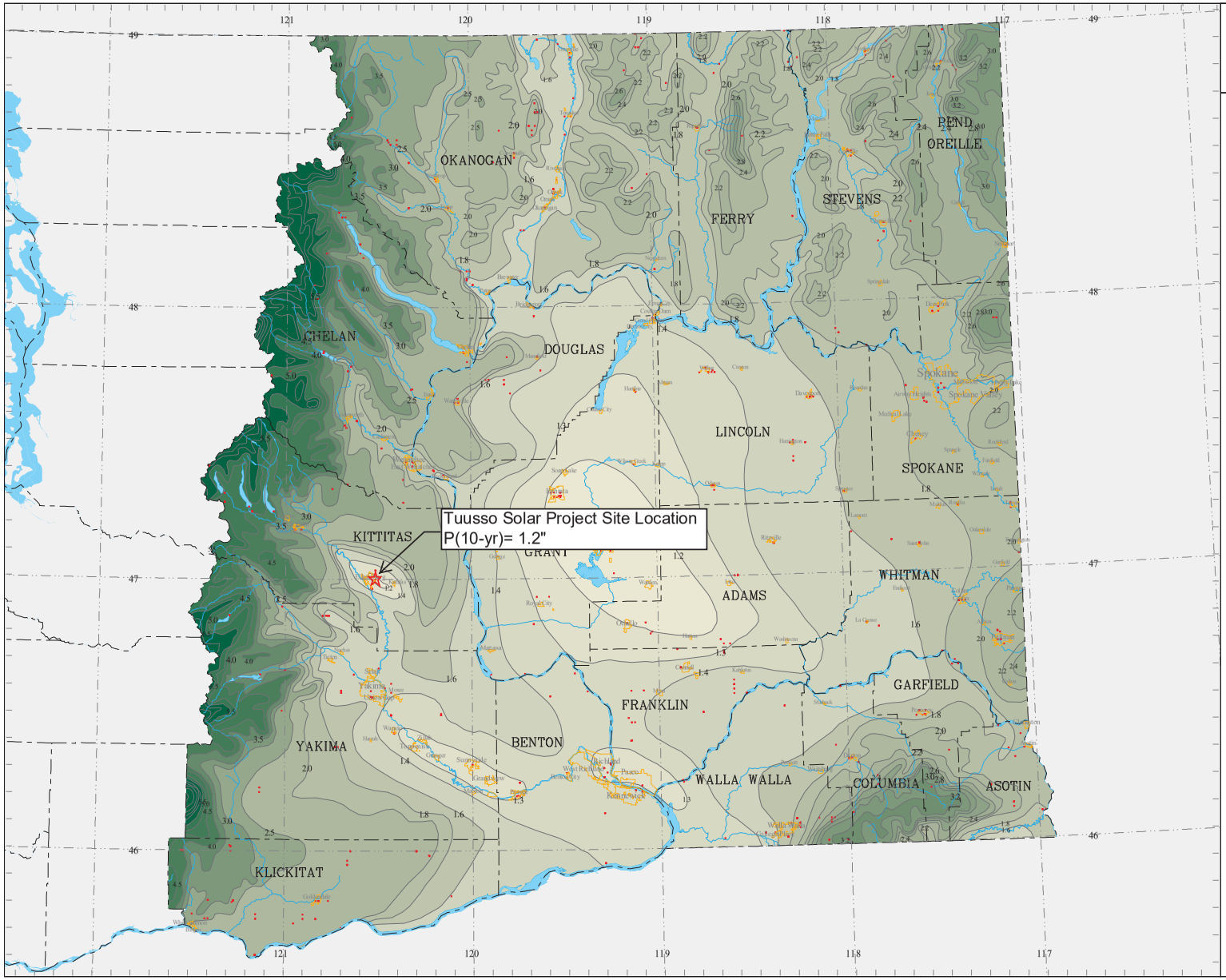
N

Scale 1:1,600,000
Miles
0 16.5 33

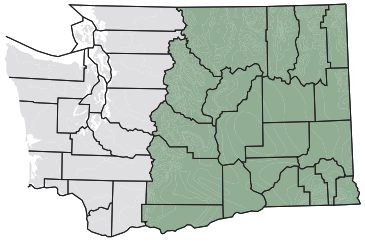
Water Quality Program

WASHINGTON STATE DEPARTMENT OF ECOLOGY

GIS Technical Services
02/25/04
Figure_4.3.3



Eastern Washington Stormwater Manual



10-Year 24-Hour Isopluvials

Source: NOAA Atlas 2, Volume IX, 1973
Precipitation in inches

County(2003, 1:24,000)
City(2003, 1:24,000)
Latitude/Longitude(1/10 degree)
Isopluvial(1973, 1:2,000,000)
NOAA/NWS Station(1931-1998)

N

Scale 1:1,600,000
Miles
0 16.5 33

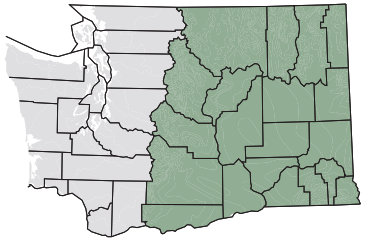
Water Quality Program

WASHINGTON STATE DEPARTMENT OF ECOLOGY

GIS Technical Services
02/25/04
Figure_4.3.4



Eastern Washington Stormwater Manual



25-Year 24-Hour Isopluvials

Source: NOAA Atlas 2, Volume IX, 1973
Precipitation in inches

- County(2003, 1:24,000)
- City(2003, 1:24,000)
- Latitude/Longitude(1/10 degree)
- Isopluvial(1973, 1:2,000,000)
- NOAA/NWS Station(1931-1998)

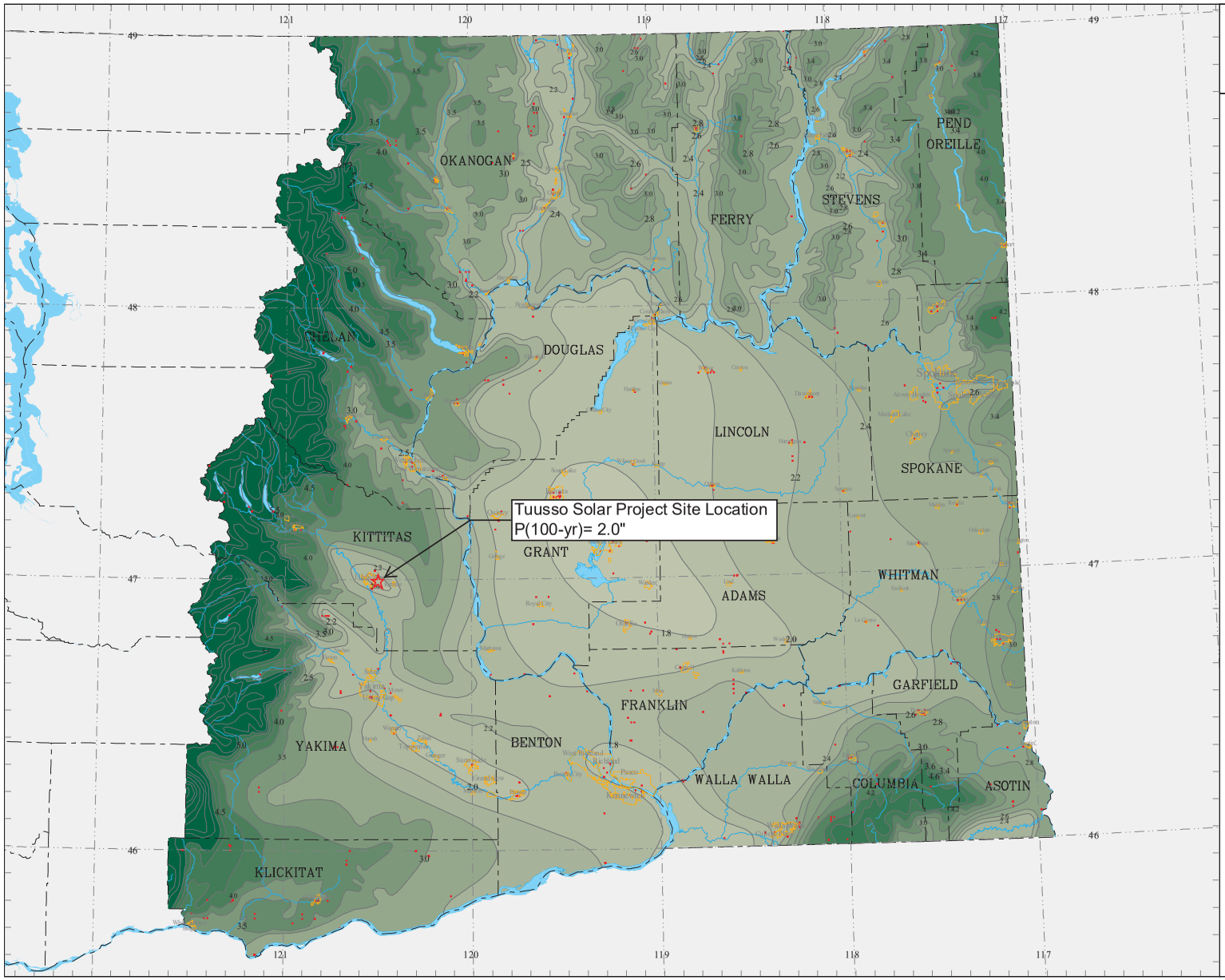
N

Scale 1:1,600,000
Miles
0 16.5 33

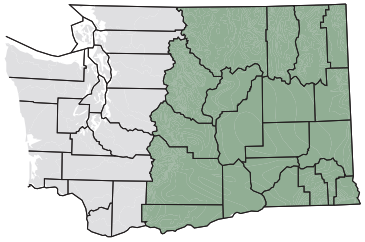
Water Quality Program

WASHINGTON STATE DEPARTMENT OF ECOLOGY

GIS Technical Services
02/25/04
Figure_4.3.5



Eastern Washington Stormwater Manual



100-Year 24-Hour Isopluvials

Source: NOAA Atlas 2, Volume IX, 1973
Precipitation in inches

County(2003, 1:24,000)
City(2003, 1:24,000)
Latitude/Longitude(1/10 degree)
Isopluvial(1973, 1:2,000,000)
NOAA/NWS Station(1931-1998)

Scale 1:1,600,000
Miles
0 16.5 33

Water Quality Program

WASHINGTON STATE DEPARTMENT OF ECOLOGY

GIS Technical Services
02/25/04
Figure_4.3.7

Appendix C:

CURVE NUMBER CALCULATIONS

Predevelopment Conditions

Basin Name	Total Area (sf)	Total Area (ac)	Meadow (sf)	Meadow (ac)	HSG	CN	Meadow (sf)	Meadow (ac)	HSG	CN	Meadow (sf)	Meadow (ac)	HSG	CN	Dirt Road (sf)	Dirt Road (ac)	HSG	CN	**Composite CN**
Exisiting Basin 1	749232	17.20	631620	14.50	B	58	78408.00	1.80	C	71	39204.00	0.90	D	78	0.00	0.00	-	-	**60**
Existing Basin 2	1490892.4	34.23	540144	12.40	B	58	936308.42	21.49	C	71	0.00	0.00	D	78	14440.00	0.33	C	87	**66**

Postdevelopment Conditions

Basin Name	Total Area (sf)	Total Area (ac)	Impervious Area (sf)	Impervious Area (ac)	HSG	CN	Meadow (sf)	Meadow (ac)	HSG	CN	Meadow (sf)	Meadow (ac)	HSG	CN	Meadow (sf)	Meadow (ac)	HSG	CN	**Composite CN**
Proposed Basin 1	749232	17.20	9375.275	0.22	D	98	622244.73	14.28	B	58	78408.00	1.80	C	71	39204.00	0.90	D	78	**61**
Proposed Basin 2	1490892.4	34.23	62317.1	1.43	D	93	508985.45	11.68	B	58	919589.87	21.11	C	71	0.00	0.00	-	-	**67**

Impervious Area Break Down							Basin 1 Post Area					Basin 2 Post Area				
	Basin 1			Basin 2			Solar Trackers	Length	Width	#	area (sf)	Solar Trackers	Length	Width	#	area (sf)
							72 ft trackers	248	6.5	92	148304	72 ft trackers	248	6.5	105	169260
Lot or Tract	Area (sf)	CN classification	CN	Area (sf)	CN classification	CN	52 ft trackers	188	6.5	25	30550	52 ft trackers	188	6.5	29	35438
Road	0	Gravel	91	46280	Gravel	91	36 ft traclers	121	6.5	11	8651.5	36 ft trackers	121	6.5	56	44044
Inverters	0	Impervious	98	3600	Impervious	98				Total	187506				Total	248742
Post	9375	Impervious	98	12437	Impervious	98				assumed % impervious (posts)	5%				assumed % impervious (posts)	5%
		Composite CN	98		Composite CN	93				impervious area	9375.28				impervious area	12437.1

Appendix D:

HydroCAD REPORT:
EXISTING BASINS

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
14.500	58	HSG B Meadow (1S)
1.800	71	HSG C Meadow (1S)
0.900	78	HSG D Meadow (1S)

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	14.500	1.800	0.900	0.000	17.200		1S

Time span=5.00-72.00 hrs, dt=0.05 hrs, 1341 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Existing Basin 1 Runoff Area=17.200 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=1,821' Tc=57.8 min CN=60/0 Runoff=0.00 cfs 0.000 af

Summary for Subcatchment 1S: Existing Basin 1

[45] Hint: Runoff=Zero

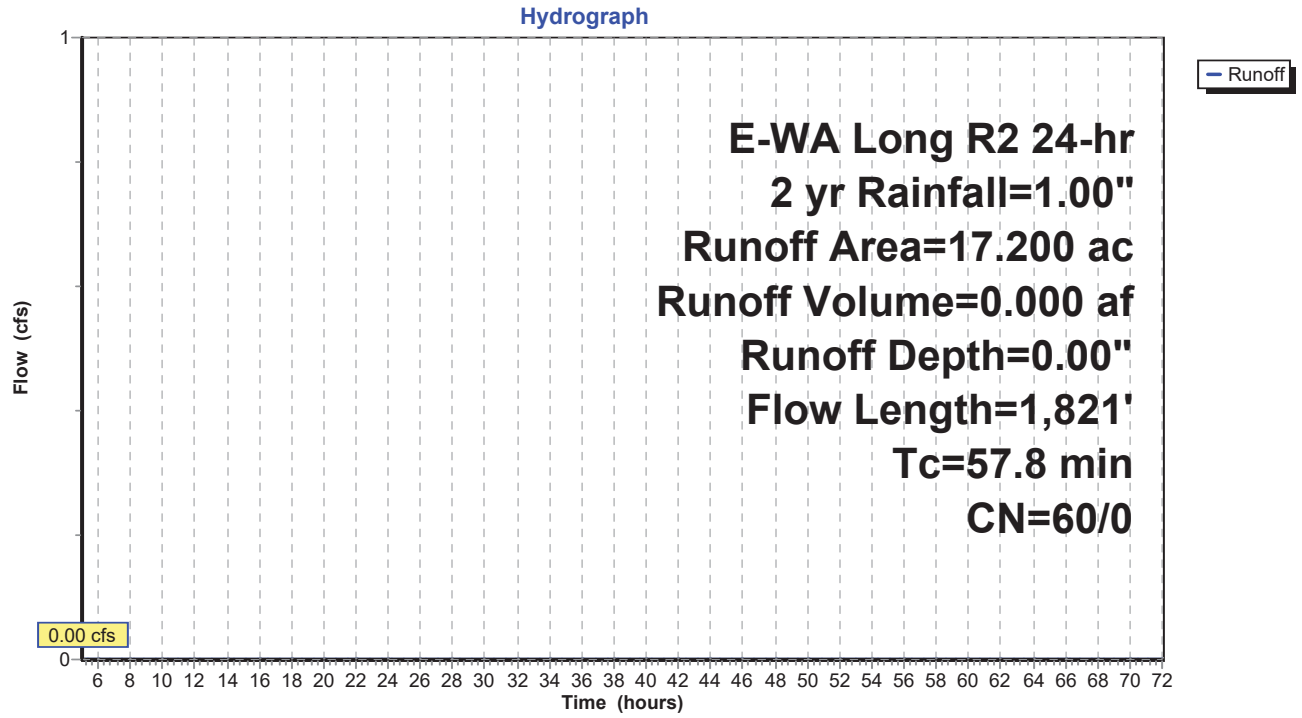
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 2 yr Rainfall=1.00"

	Area (ac)	CN	Description
*	14.500	58	HSG B Meadow
*	1.800	71	HSG C Meadow
*	0.900	78	HSG D Meadow
	17.200	60	Weighted Average
	17.200	60	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.8	300	0.0360	0.17		**Sheet Flow,** Range n= 0.130 P2= 1.00"
28.0	1,521	0.0167	0.90		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
57.8	1,821	Total			

Subcatchment 1S: Existing Basin 1



Time span=5.00-72.00 hrs, dt=0.05 hrs, 1341 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Existing Basin 1 Runoff Area=17.200 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=1,821' Tc=57.8 min CN=60/0 Runoff=0.00 cfs 0.000 af

Summary for Subcatchment 1S: Existing Basin 1

[45] Hint: Runoff=Zero

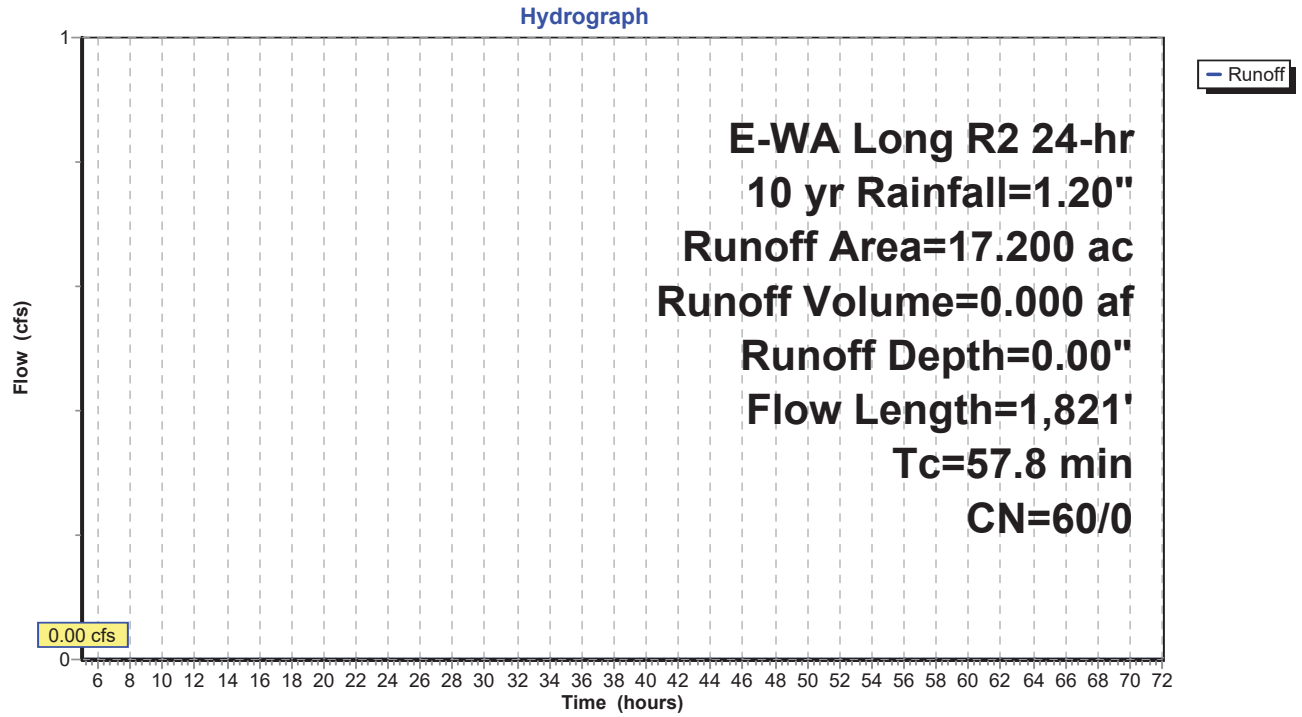
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 10 yr Rainfall=1.20"

	Area (ac)	CN	Description
*	14.500	58	HSG B Meadow
*	1.800	71	HSG C Meadow
*	0.900	78	HSG D Meadow
	17.200	60	Weighted Average
	17.200	60	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.8	300	0.0360	0.17		**Sheet Flow,** Range n= 0.130 P2= 1.00"
28.0	1,521	0.0167	0.90		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
57.8	1,821	Total			

Subcatchment 1S: Existing Basin 1



Time span=5.00-72.00 hrs, dt=0.05 hrs, 1341 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Existing Basin 1 Runoff Area=17.200 ac 0.00% Impervious Runoff Depth=0.01"
Flow Length=1,821' Tc=57.8 min CN=60/0 Runoff=0.03 cfs 0.015 af

Summary for Subcatchment 1S: Existing Basin 1

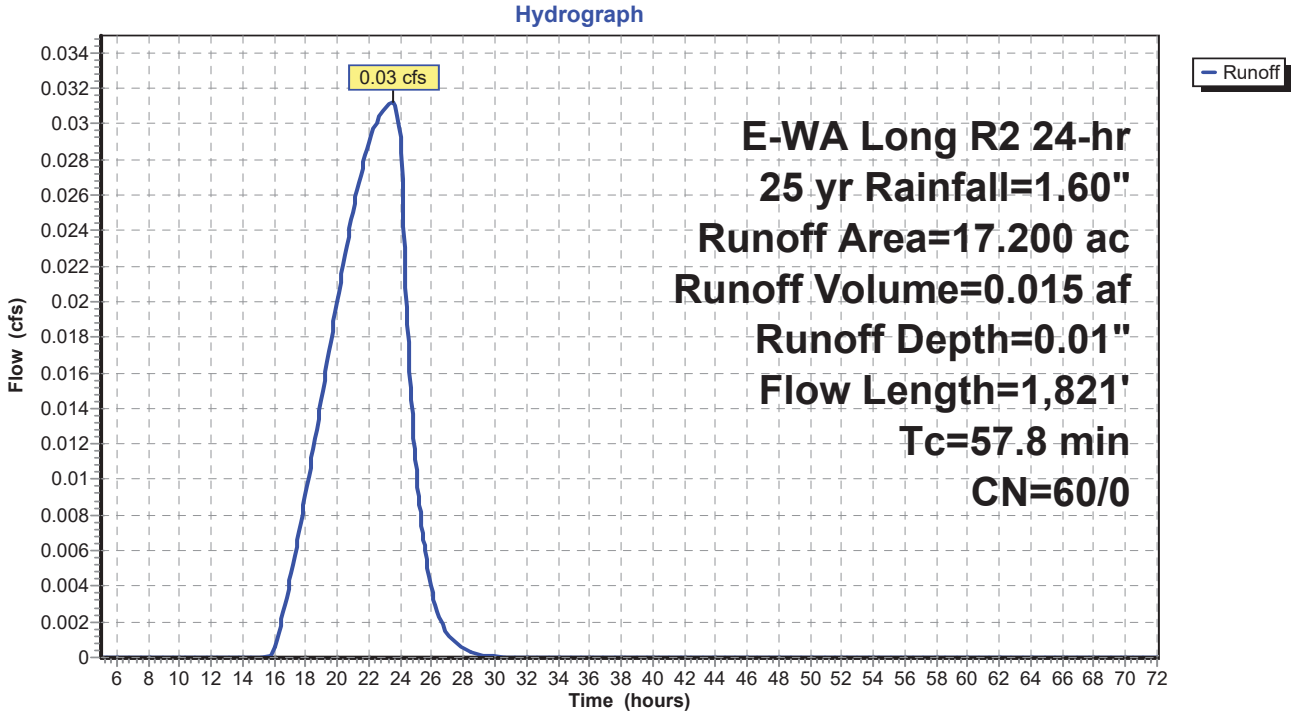
Runoff = 0.03 cfs @ 23.53 hrs, Volume= 0.015 af, Depth= 0.01"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 25 yr Rainfall=1.60"

	Area (ac)	CN	Description
*	14.500	58	HSG B Meadow
*	1.800	71	HSG C Meadow
*	0.900	78	HSG D Meadow
	17.200	60	Weighted Average
	17.200	60	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.8	300	0.0360	0.17		**Sheet Flow,** Range n= 0.130 P2= 1.00"
28.0	1,521	0.0167	0.90		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
57.8	1,821	Total			

Subcatchment 1S: Existing Basin 1



Time span=5.00-72.00 hrs, dt=0.05 hrs, 1341 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Existing Basin 1 Runoff Area=17.200 ac 0.00% Impervious Runoff Depth=0.06"
Flow Length=1,821' Tc=57.8 min CN=60/0 Runoff=0.10 cfs 0.087 af

Summary for Subcatchment 1S: Existing Basin 1

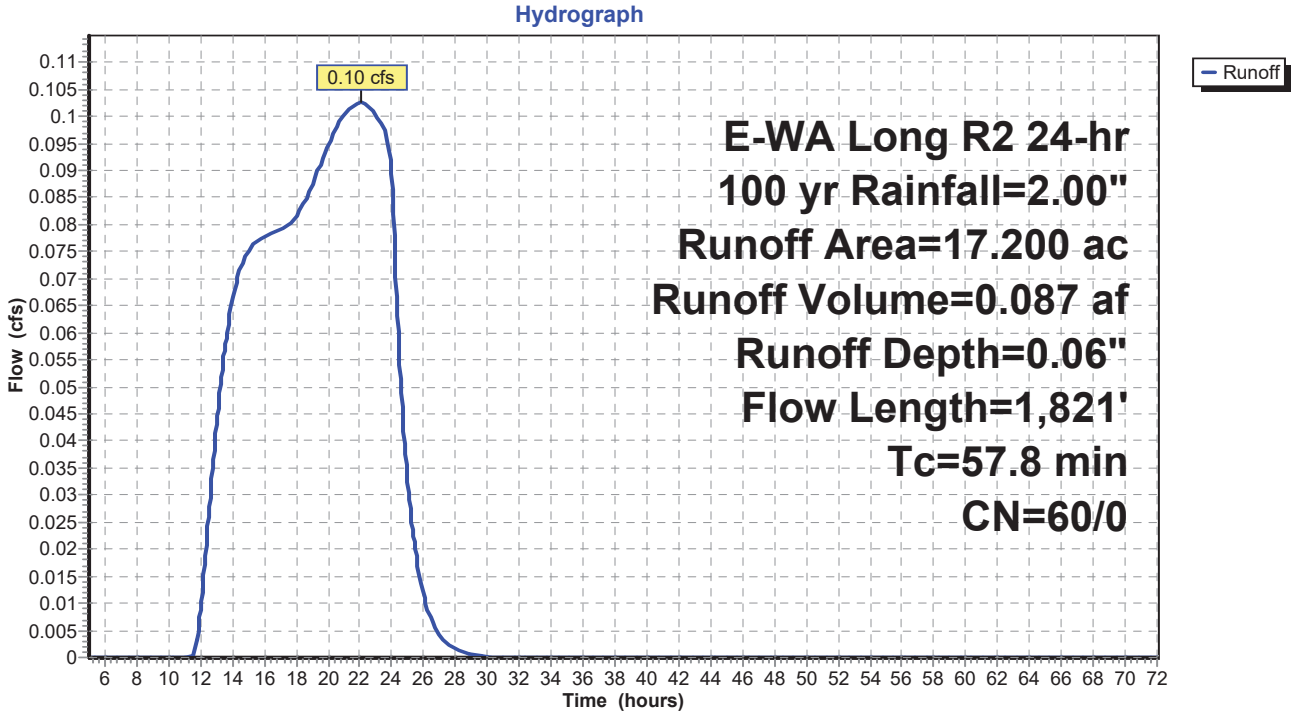
Runoff = 0.10 cfs @ 22.04 hrs, Volume= 0.087 af, Depth= 0.06"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 100 yr Rainfall=2.00"

	Area (ac)	CN	Description
*	14.500	58	HSG B Meadow
*	1.800	71	HSG C Meadow
*	0.900	78	HSG D Meadow
	17.200	60	Weighted Average
	17.200	60	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.8	300	0.0360	0.17		**Sheet Flow,** Range n= 0.130 P2= 1.00"
28.0	1,521	0.0167	0.90		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
57.8	1,821	Total			

Subcatchment 1S: Existing Basin 1



Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.330	87	Dirt Road (2S)
12.400	58	HSG B Meadow (2S)
21.490	71	HSG C Meadow (2S)

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	12.400	21.490	0.000	0.000	33.890		2S
0.000	0.000	0.000	0.000	0.330	0.330	Dirt Road	2S

Time span=5.00-72.00 hrs, dt=0.05 hrs, 1341 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 2S: Existing Basin 2 Runoff Area=34.220 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=2,712' Tc=59.7 min CN=66/0 Runoff=0.00 cfs 0.000 af

Summary for Subcatchment 2S: Existing Basin 2

[45] Hint: Runoff=Zero

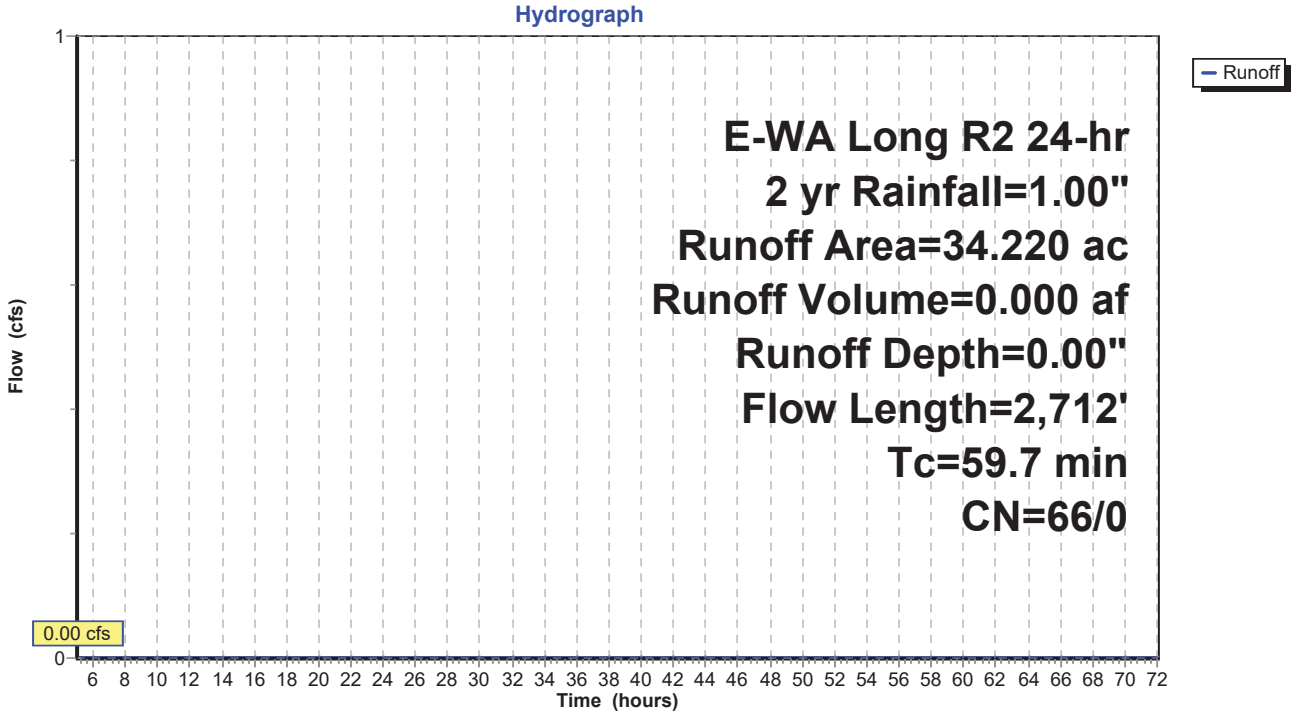
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 2 yr Rainfall=1.00"

	Area (ac)	CN	Description
*	12.400	58	HSG B Meadow
*	21.490	71	HSG C Meadow
*	0.330	87	Dirt Road
	34.220	66	Weighted Average
	34.220	66	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
39.9	300	0.0173	0.13		**Sheet Flow,** Range n= 0.130 P2= 1.00"
16.2	961	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.6	1,451	0.0141	6.67	233.45	**Channel Flow,** Area= 35.0 sf Perim= 23.0' r= 1.52' n= 0.035 Earth, dense weeds
59.7	2,712	Total			

Subcatchment 2S: Existing Basin 2



Time span=5.00-72.00 hrs, dt=0.05 hrs, 1341 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 2S: Existing Basin 2 Runoff Area=34.220 ac 0.00% Impervious Runoff Depth=0.01"
Flow Length=2,712' Tc=59.7 min CN=66/0 Runoff=0.04 cfs 0.015 af

Summary for Subcatchment 2S: Existing Basin 2

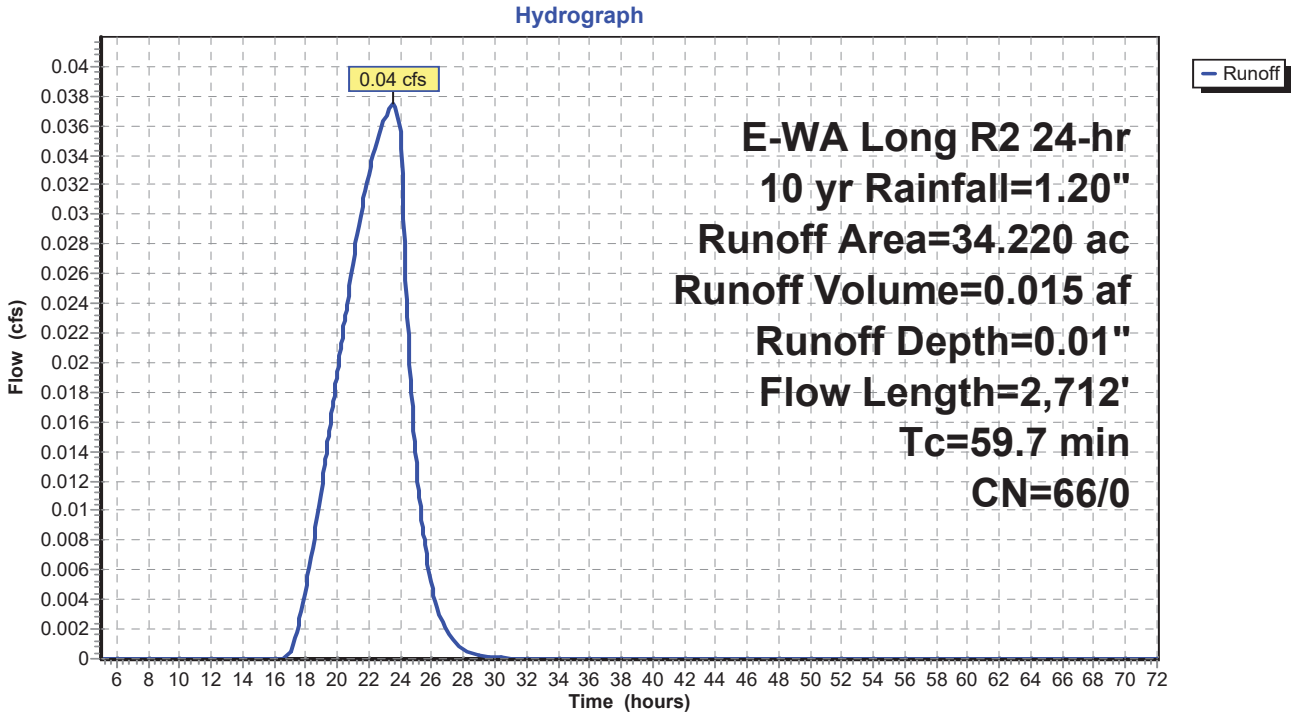
Runoff = 0.04 cfs @ 23.58 hrs, Volume= 0.015 af, Depth= 0.01"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 10 yr Rainfall=1.20"

	Area (ac)	CN	Description
*	12.400	58	HSG B Meadow
*	21.490	71	HSG C Meadow
*	0.330	87	Dirt Road
	34.220	66	Weighted Average
	34.220	66	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
39.9	300	0.0173	0.13		**Sheet Flow,** Range n= 0.130 P2= 1.00"
16.2	961	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.6	1,451	0.0141	6.67	233.45	**Channel Flow,** Area= 35.0 sf Perim= 23.0' r= 1.52' n= 0.035 Earth, dense weeds
59.7	2,712	Total			

Subcatchment 2S: Existing Basin 2



Time span=5.00-72.00 hrs, dt=0.05 hrs, 1341 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 2S: Existing Basin 2 Runoff Area=34.220 ac 0.00% Impervious Runoff Depth=0.06"
Flow Length=2,712' Tc=59.7 min CN=66/0 Runoff=0.18 cfs 0.162 af

Summary for Subcatchment 2S: Existing Basin 2

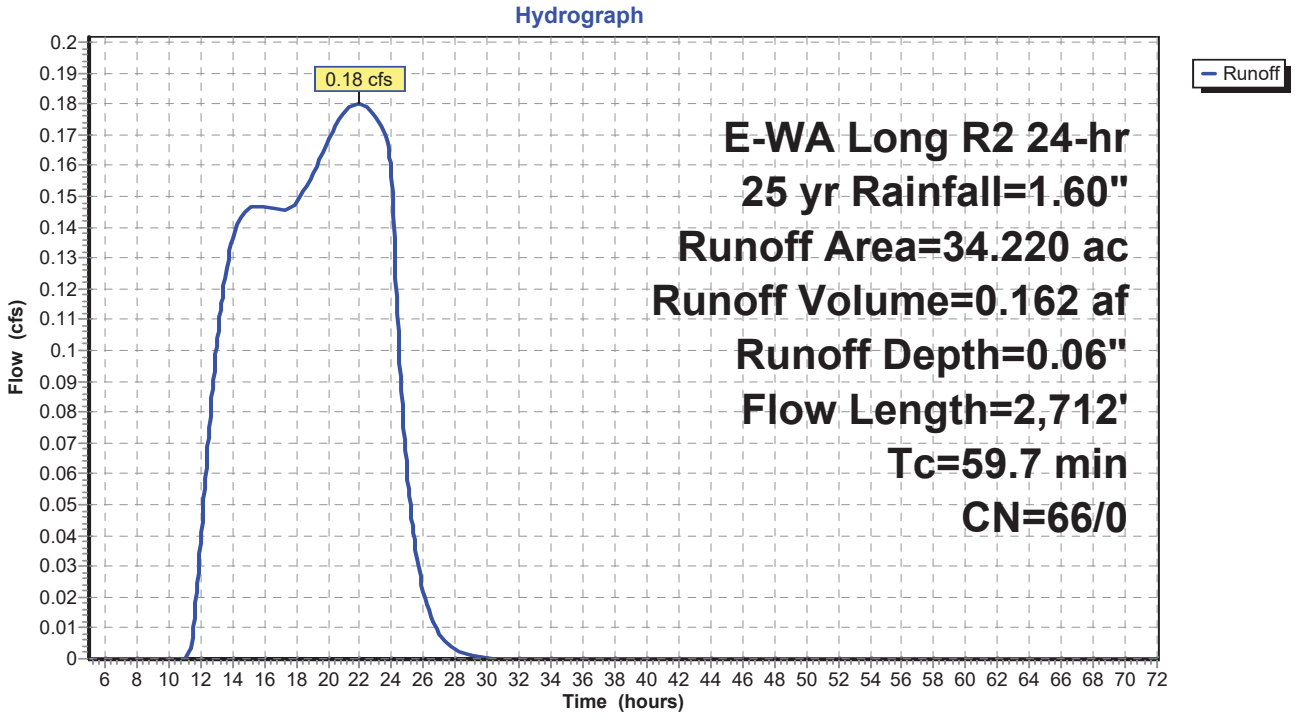
Runoff = 0.18 cfs @ 21.95 hrs, Volume= 0.162 af, Depth= 0.06"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 25 yr Rainfall=1.60"

	Area (ac)	CN	Description
*	12.400	58	HSG B Meadow
*	21.490	71	HSG C Meadow
*	0.330	87	Dirt Road
	34.220	66	Weighted Average
	34.220	66	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
39.9	300	0.0173	0.13		**Sheet Flow,** Range n= 0.130 P2= 1.00"
16.2	961	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.6	1,451	0.0141	6.67	233.45	**Channel Flow,** Area= 35.0 sf Perim= 23.0' r= 1.52' n= 0.035 Earth, dense weeds
59.7	2,712	Total			

Subcatchment 2S: Existing Basin 2



Time span=5.00-72.00 hrs, dt=0.05 hrs, 1341 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 2S: Existing Basin 2 Runoff Area=34.220 ac 0.00% Impervious Runoff Depth=0.15"
Flow Length=2,712' Tc=59.7 min CN=66/0 Runoff=0.47 cfs 0.438 af

Summary for Subcatchment 2S: Existing Basin 2

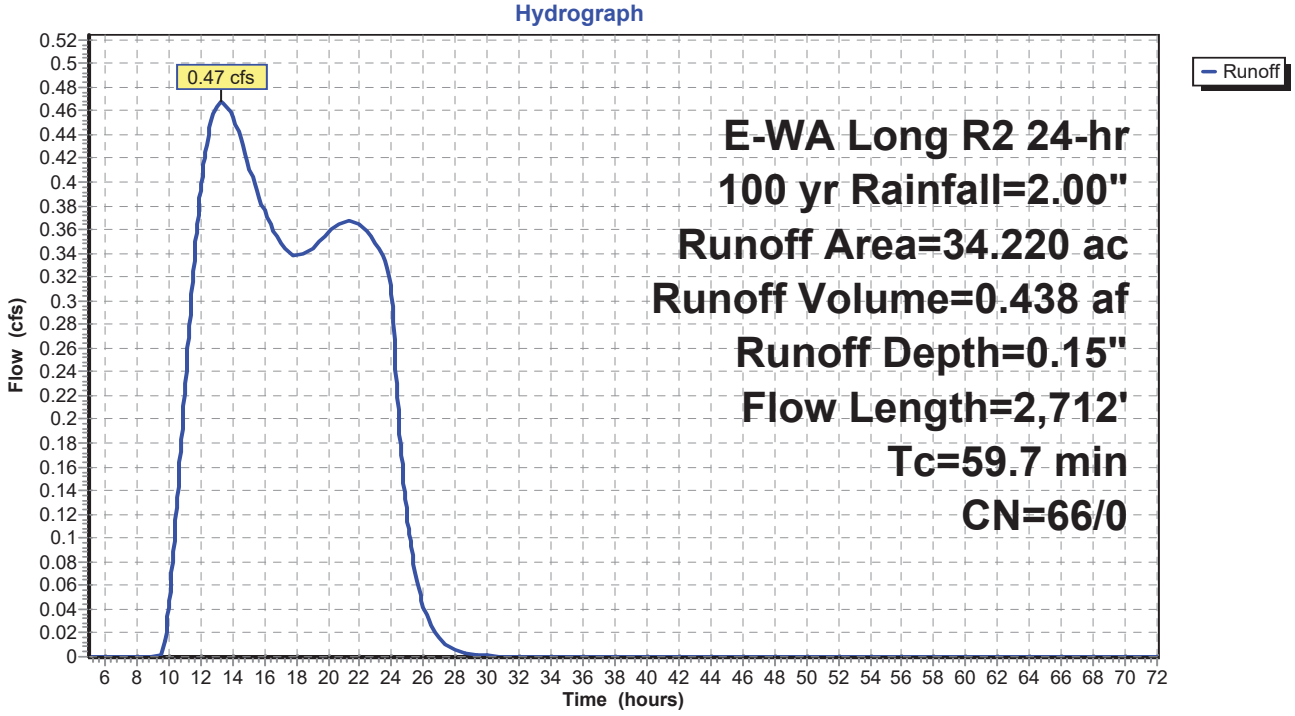
Runoff = 0.47 cfs @ 13.33 hrs, Volume= 0.438 af, Depth= 0.15"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 100 yr Rainfall=2.00"

	Area (ac)	CN	Description
*	12.400	58	HSG B Meadow
*	21.490	71	HSG C Meadow
*	0.330	87	Dirt Road
	34.220	66	Weighted Average
	34.220	66	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
39.9	300	0.0173	0.13		**Sheet Flow,** Range n= 0.130 P2= 1.00"
16.2	961	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.6	1,451	0.0141	6.67	233.45	**Channel Flow,** Area= 35.0 sf Perim= 23.0' r= 1.52' n= 0.035 Earth, dense weeds
59.7	2,712	Total			

Subcatchment 2S: Existing Basin 2



Appendix E:

HydroCAD REPORT:
PROPOSED BASINS

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.220	98	Impervious Areas (3S)
14.280	58	Meadow HSG B (3S)
1.800	71	Meadow HSG C (3S)
0.900	78	Meadow HSG D (3S)

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.000	0.220	0.220	Impervious Areas	3S
0.000	14.280	1.800	0.900	0.000	16.980	Meadow	3S

Time span=5.00-72.00 hrs, dt=0.05 hrs, 1341 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 3S: Proposed Basin 1 Runoff Area=17.200 ac 1.28% Impervious Runoff Depth>0.01"
Flow Length=1,821' Tc=57.8 min CN=60/98 Runoff=0.02 cfs 0.014 af

Summary for Subcatchment 3S: Proposed Basin 1

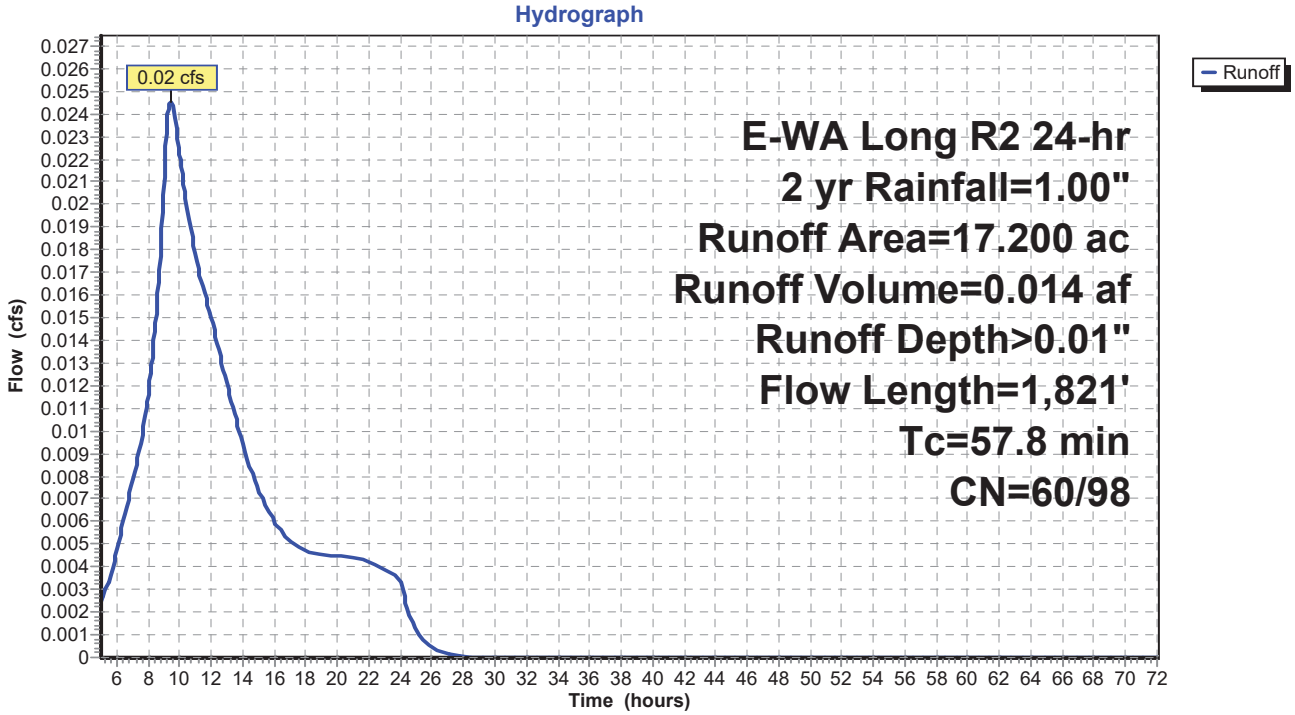
Runoff = 0.02 cfs @ 9.43 hrs, Volume= 0.014 af, Depth> 0.01"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 2 yr Rainfall=1.00"

	Area (ac)	CN	Description
*	0.220	98	Impervious Areas
*	14.280	58	Meadow HSG B
*	1.800	71	Meadow HSG C
*	0.900	78	Meadow HSG D
	17.200	61	Weighted Average
	16.980	60	98.72% Pervious Area
	0.220	98	1.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.8	300	0.0360	0.17		**Sheet Flow,** Range n= 0.130 P2= 1.00"
28.0	1,521	0.0167	0.90		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
57.8	1,821	Total			

Subcatchment 3S: Proposed Basin 1



Time span=5.00-72.00 hrs, dt=0.05 hrs, 1341 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 3S: Proposed Basin 1 Runoff Area=17.200 ac 1.28% Impervious Runoff Depth>0.01"
Flow Length=1,821' Tc=57.8 min CN=60/98 Runoff=0.03 cfs 0.018 af

Summary for Subcatchment 3S: Proposed Basin 1

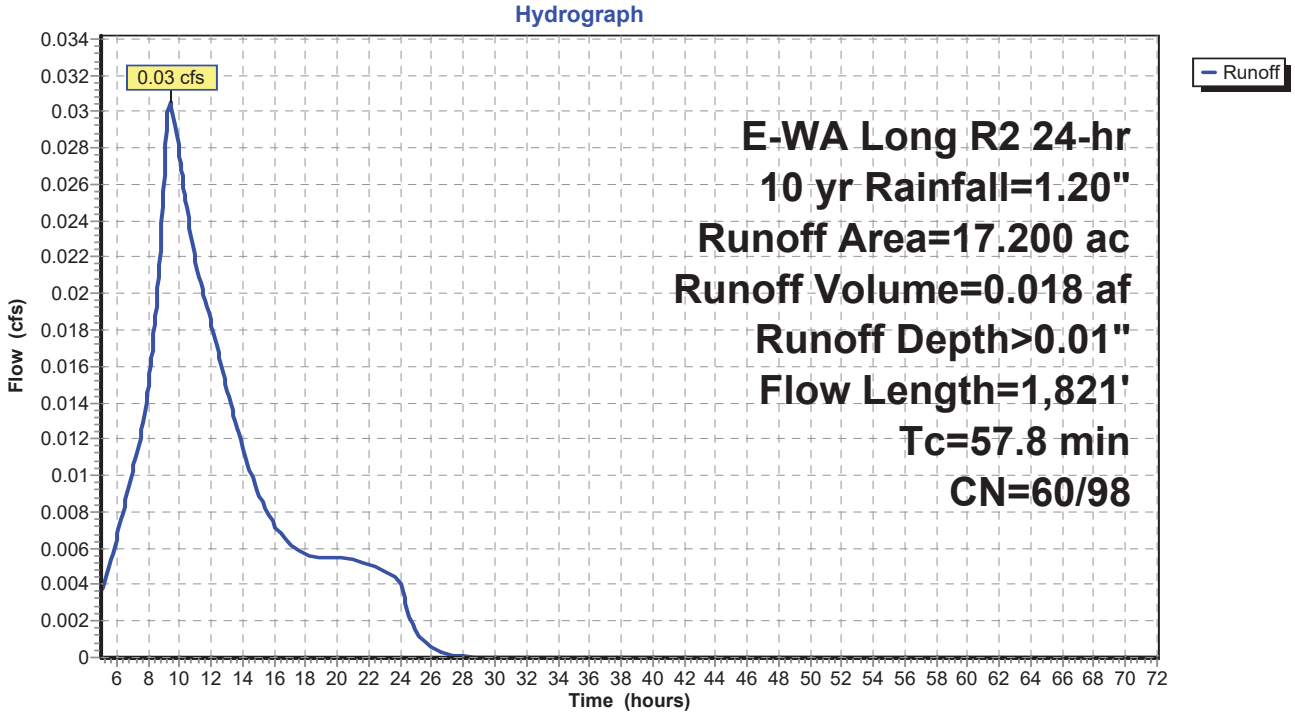
Runoff = 0.03 cfs @ 9.42 hrs, Volume= 0.018 af, Depth> 0.01"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 10 yr Rainfall=1.20"

	Area (ac)	CN	Description
*	0.220	98	Impervious Areas
*	14.280	58	Meadow HSG B
*	1.800	71	Meadow HSG C
*	0.900	78	Meadow HSG D
	17.200	61	Weighted Average
	16.980	60	98.72% Pervious Area
	0.220	98	1.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.8	300	0.0360	0.17		**Sheet Flow,** Range n= 0.130 P2= 1.00"
28.0	1,521	0.0167	0.90		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
57.8	1,821	Total			

Subcatchment 3S: Proposed Basin 1



Time span=5.00-72.00 hrs, dt=0.05 hrs, 1341 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 3S: Proposed Basin 1 Runoff Area=17.200 ac 1.28% Impervious Runoff Depth>0.03"
Flow Length=1,821' Tc=57.8 min CN=60/98 Runoff=0.04 cfs 0.039 af

Summary for Subcatchment 3S: Proposed Basin 1

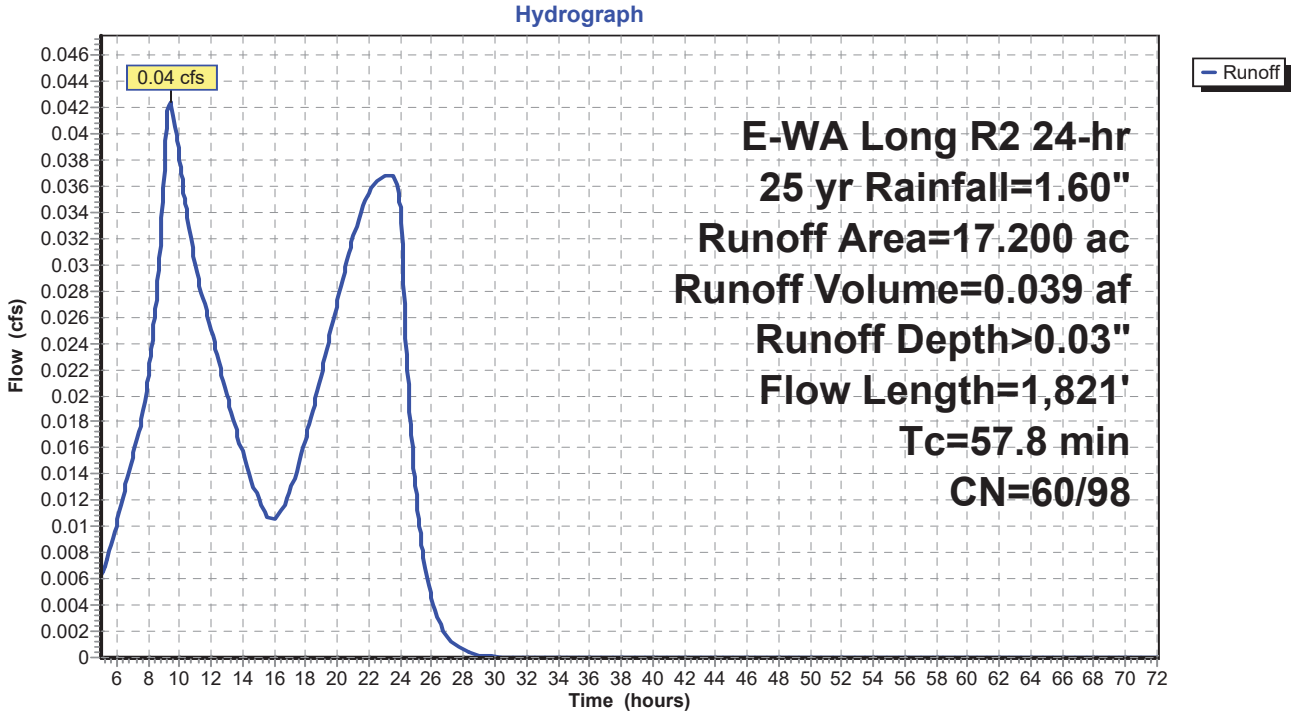
Runoff = 0.04 cfs @ 9.41 hrs, Volume= 0.039 af, Depth> 0.03"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 25 yr Rainfall=1.60"

	Area (ac)	CN	Description
*	0.220	98	Impervious Areas
*	14.280	58	Meadow HSG B
*	1.800	71	Meadow HSG C
*	0.900	78	Meadow HSG D
	17.200	61	Weighted Average
	16.980	60	98.72% Pervious Area
	0.220	98	1.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.8	300	0.0360	0.17		**Sheet Flow,** Range n= 0.130 P2= 1.00"
28.0	1,521	0.0167	0.90		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
57.8	1,821	Total			

Subcatchment 3S: Proposed Basin 1



Time span=5.00-72.00 hrs, dt=0.05 hrs, 1341 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 3S: Proposed Basin 1 Runoff Area=17.200 ac 1.28% Impervious Runoff Depth>0.08"
Flow Length=1,821' Tc=57.8 min CN=60/98 Runoff=0.11 cfs 0.117 af

Summary for Subcatchment 3S: Proposed Basin 1

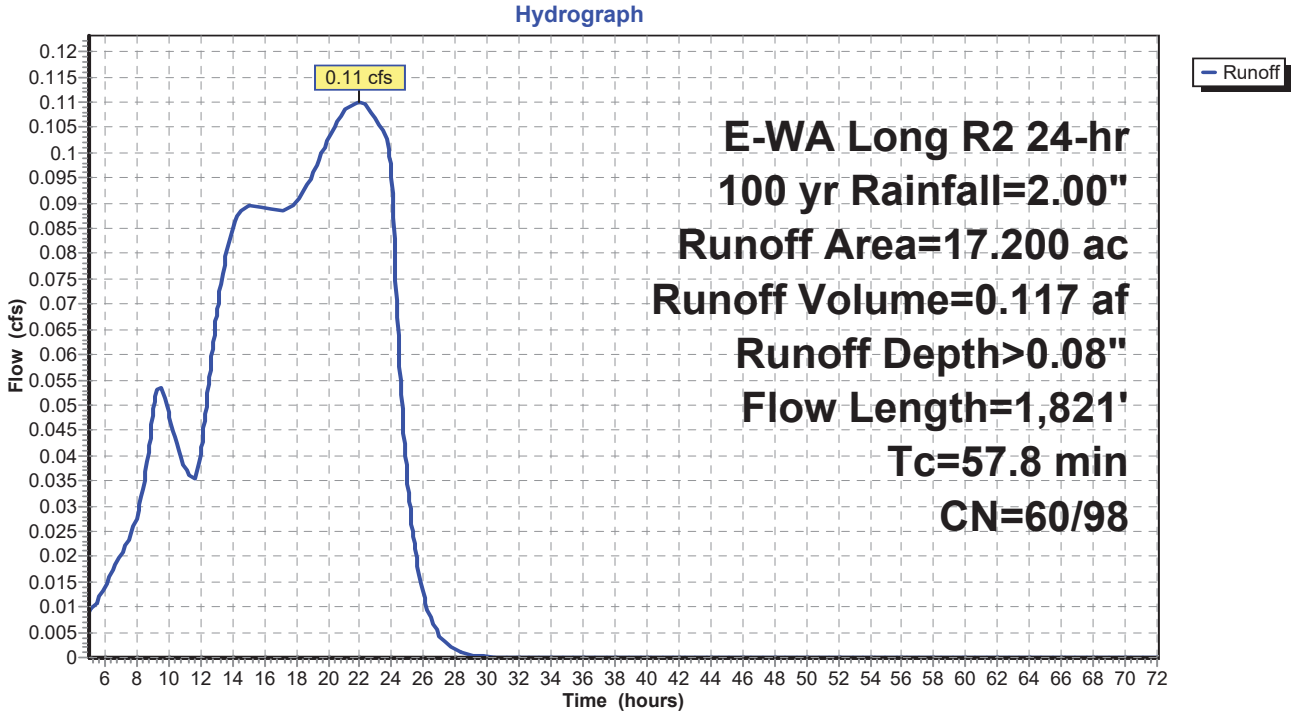
Runoff = 0.11 cfs @ 21.94 hrs, Volume= 0.117 af, Depth> 0.08"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 100 yr Rainfall=2.00"

	Area (ac)	CN	Description
*	0.220	98	Impervious Areas
*	14.280	58	Meadow HSG B
*	1.800	71	Meadow HSG C
*	0.900	78	Meadow HSG D
	17.200	61	Weighted Average
	16.980	60	98.72% Pervious Area
	0.220	98	1.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.8	300	0.0360	0.17		**Sheet Flow,** Range n= 0.130 P2= 1.00"
28.0	1,521	0.0167	0.90		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
57.8	1,821	Total			

Subcatchment 3S: Proposed Basin 1



Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.430	93	Impervious (4S)
11.680	58	Meadow HSG B (4S)
21.110	71	Meadow HSG C (4S)

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.000	1.430	1.430	Impervious	4S
0.000	11.680	21.110	0.000	0.000	32.790	Meadow	4S

Time span=5.00-72.00 hrs, dt=0.05 hrs, 1341 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 4S: Proposed Basin 2 Runoff Area=34.220 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=2,712' Tc=59.7 min CN=67/0 Runoff=0.00 cfs 0.000 af

Summary for Subcatchment 4S: Proposed Basin 2

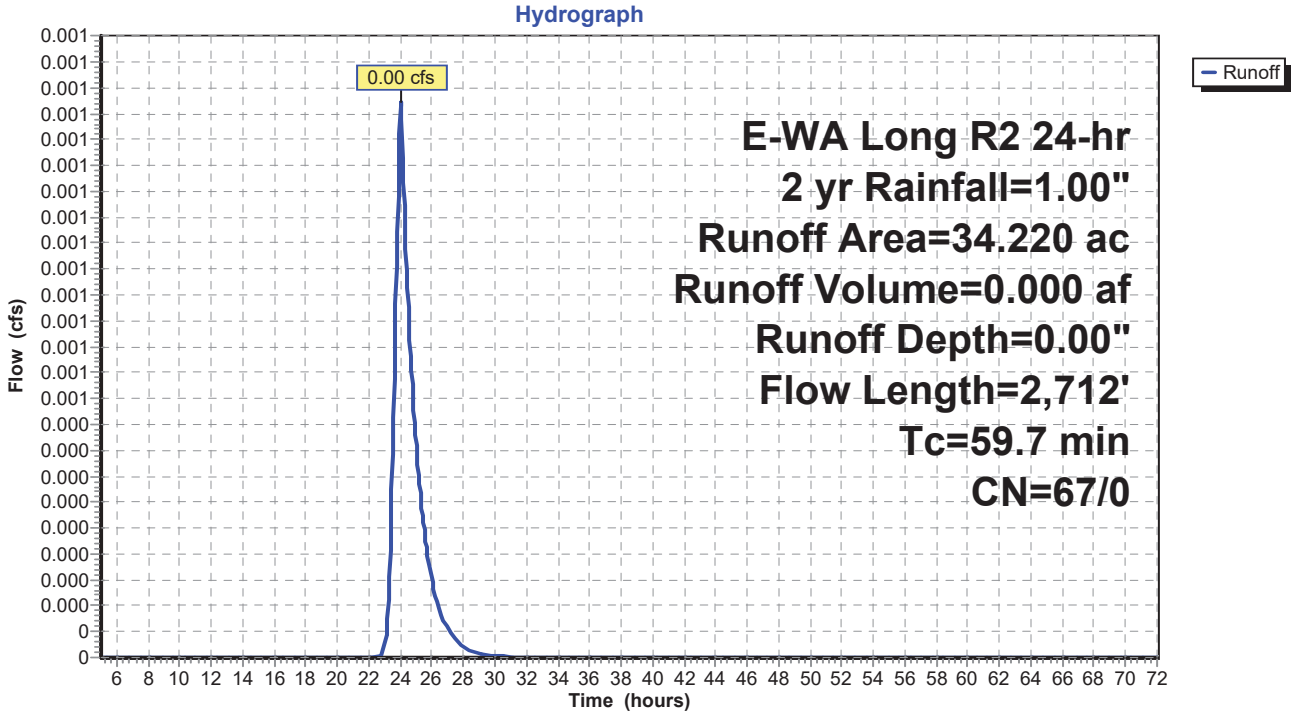
Runoff = 0.00 cfs @ 24.02 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 2 yr Rainfall=1.00"

	Area (ac)	CN	Description
*	1.430	93	Impervious
*	11.680	58	Meadow HSG B
*	21.110	71	Meadow HSG C
	34.220	67	Weighted Average
	34.220	67	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
39.9	300	0.0173	0.13		**Sheet Flow,** Range n= 0.130 P2= 1.00"
16.2	961	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.6	1,451	0.0141	6.67	233.45	**Channel Flow,** Area= 35.0 sf Perim= 23.0' r= 1.52' n= 0.035
59.7	2,712	Total			

Subcatchment 4S: Proposed Basin 2



Time span=5.00-72.00 hrs, dt=0.05 hrs, 1341 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 4S: Proposed Basin 2 Runoff Area=34.220 ac 0.00% Impervious Runoff Depth=0.01"
Flow Length=2,712' Tc=59.7 min CN=67/0 Runoff=0.05 cfs 0.026 af

Summary for Subcatchment 4S: Proposed Basin 2

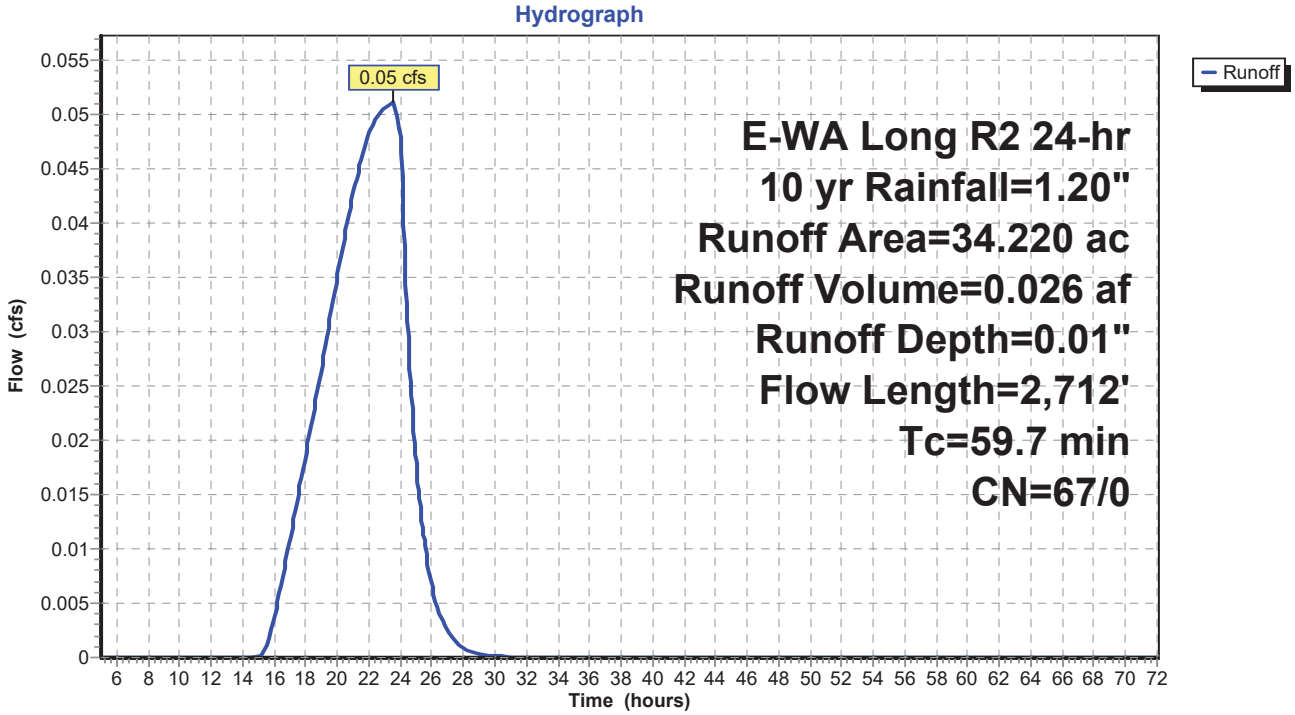
Runoff = 0.05 cfs @ 23.50 hrs, Volume= 0.026 af, Depth= 0.01"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 10 yr Rainfall=1.20"

	Area (ac)	CN	Description
*	1.430	93	Impervious
*	11.680	58	Meadow HSG B
*	21.110	71	Meadow HSG C
	34.220	67	Weighted Average
	34.220	67	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
39.9	300	0.0173	0.13		**Sheet Flow,** Range n= 0.130 P2= 1.00"
16.2	961	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.6	1,451	0.0141	6.67	233.45	**Channel Flow,** Area= 35.0 sf Perim= 23.0' r= 1.52' n= 0.035
59.7	2,712	Total			

Subcatchment 4S: Proposed Basin 2



Time span=5.00-72.00 hrs, dt=0.05 hrs, 1341 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 4S: Proposed Basin 2 Runoff Area=34.220 ac 0.00% Impervious Runoff Depth=0.07"
Flow Length=2,712' Tc=59.7 min CN=67/0 Runoff=0.20 cfs 0.195 af

Summary for Subcatchment 4S: Proposed Basin 2

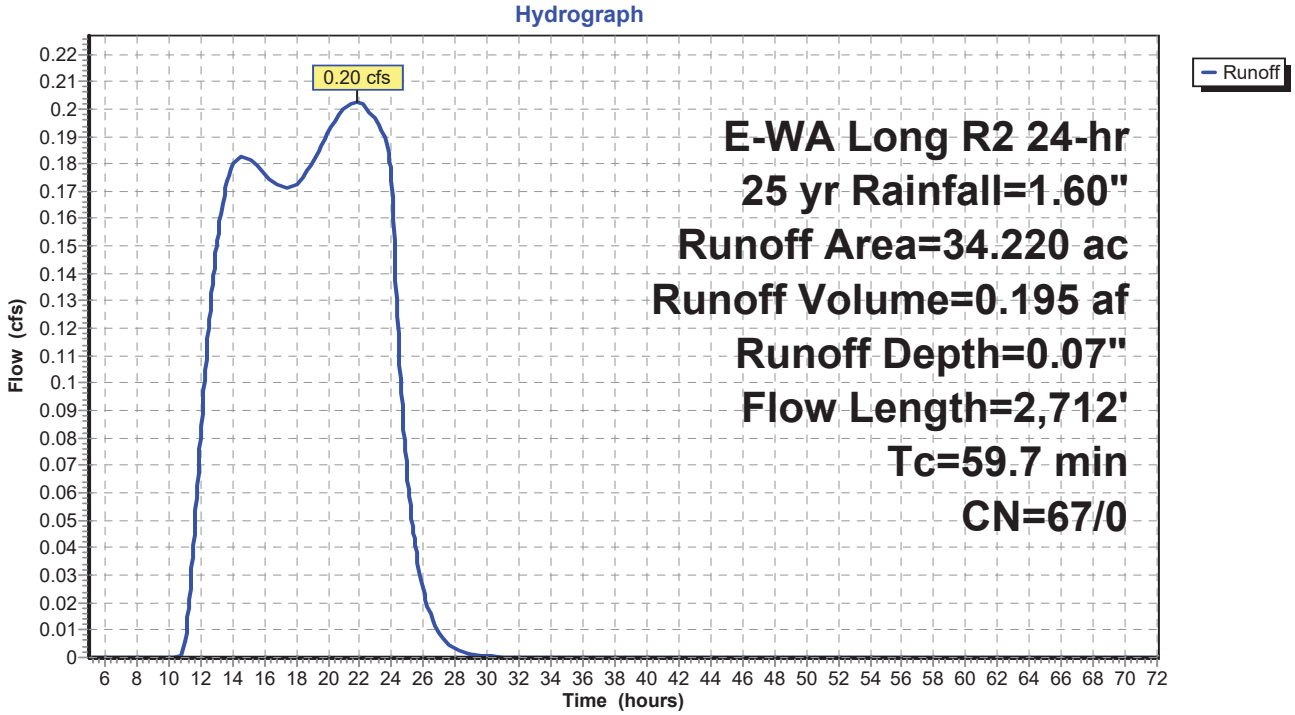
Runoff = 0.20 cfs @ 21.79 hrs, Volume= 0.195 af, Depth= 0.07"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 25 yr Rainfall=1.60"

	Area (ac)	CN	Description
*	1.430	93	Impervious
*	11.680	58	Meadow HSG B
*	21.110	71	Meadow HSG C
	34.220	67	Weighted Average
	34.220	67	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
39.9	300	0.0173	0.13		**Sheet Flow,** Range n= 0.130 P2= 1.00"
16.2	961	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.6	1,451	0.0141	6.67	233.45	**Channel Flow,** Area= 35.0 sf Perim= 23.0' r= 1.52' n= 0.035
59.7	2,712	Total			

Subcatchment 4S: Proposed Basin 2



Time span=5.00-72.00 hrs, dt=0.05 hrs, 1341 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 4S: Proposed Basin 2 Runoff Area=34.220 ac 0.00% Impervious Runoff Depth=0.17"
Flow Length=2,712' Tc=59.7 min CN=67/0 Runoff=0.54 cfs 0.494 af

Summary for Subcatchment 4S: Proposed Basin 2

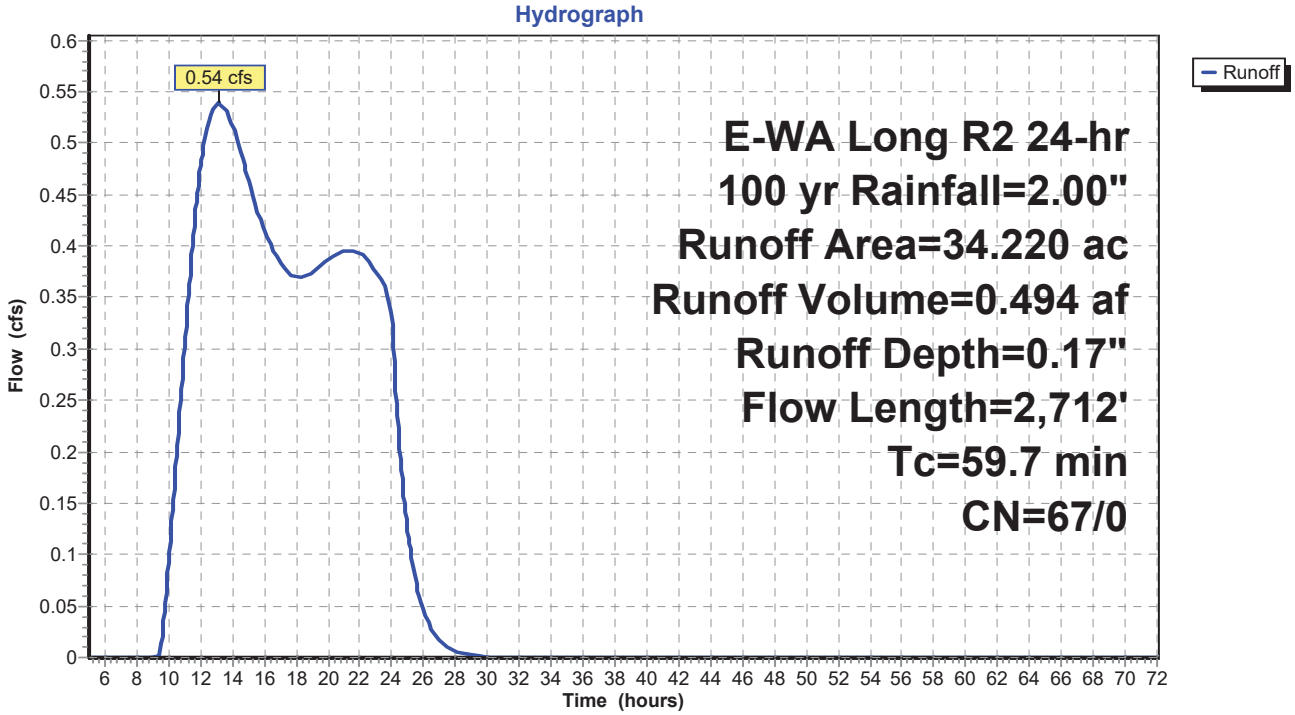
Runoff = 0.54 cfs @ 13.13 hrs, Volume= 0.494 af, Depth= 0.17"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 5.00-72.00 hrs, dt= 0.05 hrs
E-WA Long R2 24-hr 100 yr Rainfall=2.00"

	Area (ac)	CN	Description
*	1.430	93	Impervious
*	11.680	58	Meadow HSG B
*	21.110	71	Meadow HSG C
	34.220	67	Weighted Average
	34.220	67	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
39.9	300	0.0173	0.13		**Sheet Flow,** Range n= 0.130 P2= 1.00"
16.2	961	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.6	1,451	0.0141	6.67	233.45	**Channel Flow,** Area= 35.0 sf Perim= 23.0' r= 1.52' n= 0.035
59.7	2,712	Total			

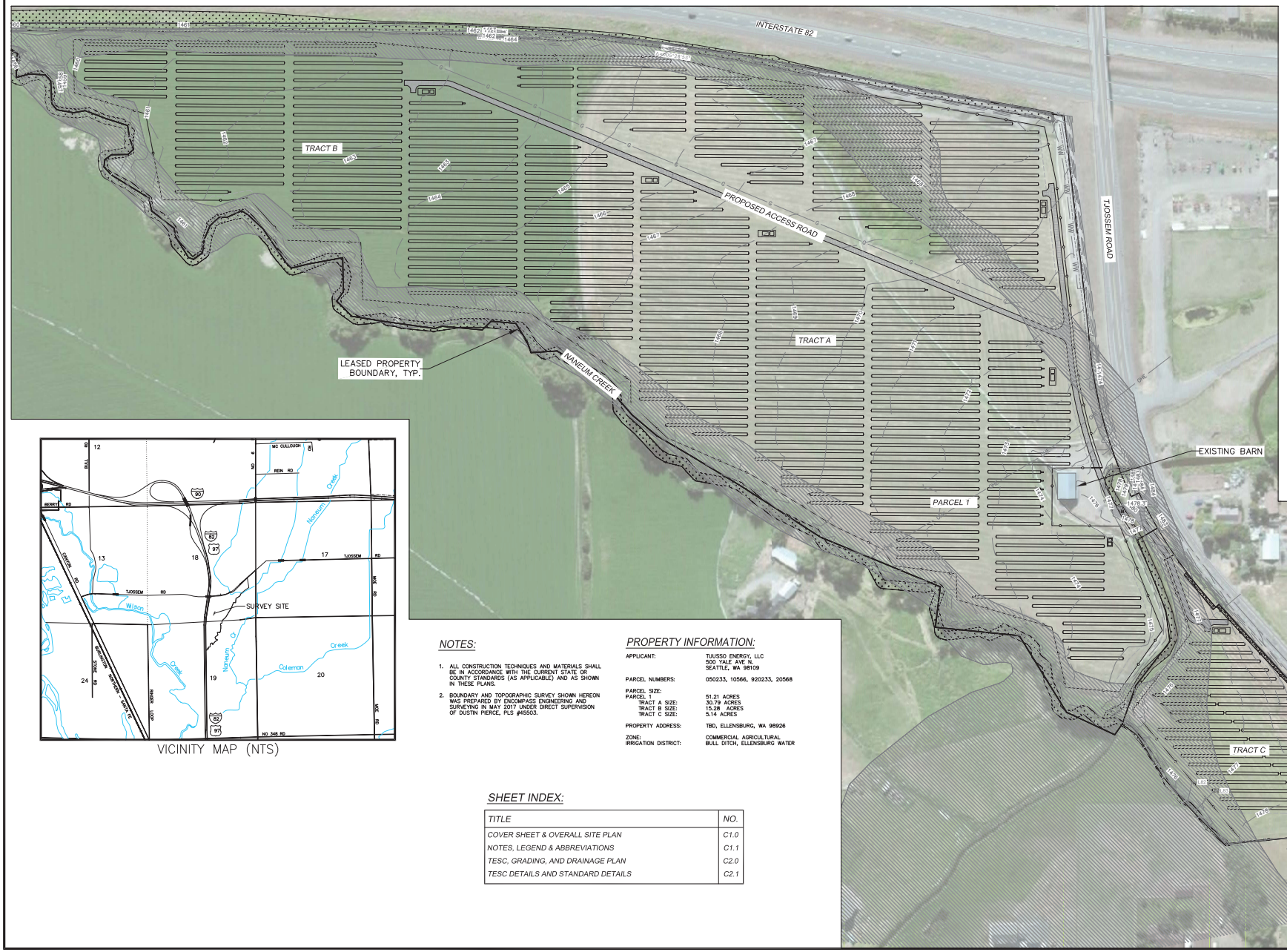
Subcatchment 4S: Proposed Basin 2



Appendix L: TUUSSO Solar Project Site Plans and Designs

TUUSSO ENERGY - CAMAS SITE

A PORTION OF THE SE 1/4 OF SECTION 18 AND THE NE 1/4 OF SECTION 19, T. 17 N., R. 19 E. W.M.
KITTATAS COUNTY, STATE OF WASHINGTON

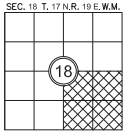


NORTH

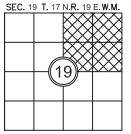
SCALE 1" = 100'

811 Know what's below. Call before you dig.

INDEX LOCATION
SEC. 18 T. 17 N.R. 19 E.W.M.



INDEX LOCATION
SEC. 19 T. 17 N.R. 19 E.W.M.



VICINITY MAP (NTS)

NOTES:

1. ALL CONSTRUCTION TECHNIQUES AND MATERIALS SHALL BE IN ACCORDANCE WITH THE CURRENT STATE OR COUNTY STANDARDS (AS APPLICABLE) AND AS SHOWN IN THESE PLANS.
2. BOUNDARY AND TOPOGRAPHIC SURVEY SHOWN HEREON WAS PREPARED BY ENCOMPASS ENGINEERING AND SURVEYING IN MAY 2017 UNDER DIRECT SUPERVISION OF DUSTIN PIERCE, PLS #45503.

PROPERTY INFORMATION:

APPLICANT:	TUUSSO ENERGY, LLC 500 YALE AVE N. SEATTLE, WA 98109
PARCEL NUMBERS:	050233, 10566, 920233, 20568
PARCEL SIZE:	
PARCEL 1	51.21 ACRES
TRACT A SIZE:	30.79 ACRES
TRACT B SIZE:	15.28 ACRES
TRACT C SIZE:	5.14 ACRES
PROPERTY ADDRESS:	TBD, ELLENSBURG, WA 98926
ZONE:	COMMERCIAL AGRICULTURAL
IRRIGATION DISTRICT:	BULL DITCH, ELLENSBURG WATER

SHEET INDEX:

TITLE	NO.
COVER SHEET & OVERALL SITE PLAN	C1.0
NOTES, LEGEND & ABBREVIATIONS	C1.1
TESC, GRADING, AND DRAINAGE PLAN	C2.0
TESC DETAILS AND STANDARD DETAILS	C2.1

REVISIONS

DESCRIPTION	BY	DATE

© THE PLANS SET FORTH ON THIS SHEET ARE, AND SHALL REMAIN THE PROPERTY OF ENCOMPASS ENGINEERING & SURVEYING

TODD MICOULIS WOODWARD, STATE OF WASHINGTON, 46995, REGISTERED PROFESSIONAL ENGINEER

TUUSSO ENERGY, LLC
CAMAS SITE
COVER SHEET & OVERALL SITE PLAN

Encompass ENGINEERING & SURVEYING
165 NE Juniper Street, Suite 201 • Issaquah, WA 98027 • (425) 392-0250 • Fax: (425) 391-3055
Western Washington Division
407 Southeast Blvd. • Cle Elum, WA 98922 • Phone: (509) 674-7433 • Fax: (509) 674-7419
Eastern Washington Division

JOB NO.	17017
DATE	Sept. 27 2017
SCALE	AS SHOWN
DESIGNED	SF
DRAWN	SF
CHECKED	TML
APPROVED	TML
SHEET	C1.0

STANDARD PLAN NOTES:

1. ALL CONSTRUCTION TECHNIQUES AND MATERIALS SHALL BE IN ACCORDANCE WITH THE CURRENT STATE OR COUNTY STANDARDS AND AS SHOWN IN THESE PLANS.
2. A COPY OF THE APPROVED PLANS MUST BE ON SITE WHENEVER CONSTRUCTION IS IN PROGRESS.
3. THE CONTRACTOR SHALL OBTAIN ALL PERMITS REQUIRED FOR WORK THAT ARE NOT PROVIDED BY THE OWNER PRIOR TO START OF CONSTRUCTION.
4. PAVED OR SIMILAR ESTABLISHED SURFACES INCLUDING ROADWAYS, SIDEWALKS AND CURBS THAT ARE TO REMAIN BUT ARE DAMAGED BY NEW CONSTRUCTION SHALL BE REPAIRED AS REQUIRED BY THE INSPECTOR.
5. ALL SURVEYING AND STAKING OF IMPROVEMENTS SHALL BE APPROVED BY THE OWNER. CONTRACTOR SHALL COORDINATE AND VERIFY WITH THE OWNER PRIOR TO OBTAINING STAKING SERVICES.
6. THE CONTRACTOR SHALL NOTIFY THE KITITTAS COUNTY FIRE DISTRICT (509-386-1495) TWENTY-FOUR (24) HOURS IN ADVANCE OF ALL WATER SERVICE INTERRUPTIONS, HYDRANT SHUT-OFFS, AND STREET CLOSURES OR OTHER ACCESS BLOCKAGE. THE CONTRACTOR SHALL ALSO NOTIFY THE DISTRICT OF ALL NEW, RELOCATED, OR ELIMINATED HYDRANTS RESULTING FROM THIS WORK.
7. ALL LOCATIONS OF EXISTING UTILITIES SHOWN HEREON HAVE BEEN ESTABLISHED BY FIELD SURVEY OR OBTAINED FROM AVAILABLE RECORDS AND SHOULD THEREFORE BE CONSIDERED APPROXIMATE ONLY AND NOT NECESSARILY COMPLETE. IT IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR TO INDEPENDENTLY VERIFY THE ACCURACY OF ALL UTILITY LOCATIONS SHOWN AND TO FURTHER DISCOVER AND AVOID ANY OTHER UTILITIES NOT SHOWN HEREON WHICH MAY BE AFFECTED BY THE IMPLEMENTATION OF THIS PLAN.
8. THE CONTRACTOR SHALL LOCATE AND PROTECT ALL ACTIVE CASTINGS AND UTILITIES DURING CONSTRUCTION AND SHALL CONTACT THE UNDERGROUND UTILITIES LOCATOR SERVICE (1-800-424-5555 OR 811) AT LEAST 48 HOURS PRIOR TO CONSTRUCTION.
9. THE CONTRACTOR SHALL ADJUST ALL EXISTING MANHOLE RIMS, DRAINAGE STRUCTURE LIDS, VALVE BOXES AND UTILITY ACCESS STRUCTURES TO FINISH GRADE WITHIN AREAS AFFECTED BY THE PROPOSED IMPROVEMENTS.
10. THE CONTRACTOR SHALL PROVIDE FOR ALL COMPACTION TESTS REQUIRED BY THE INSPECTOR.
11. BACKFILL MATERIAL SHALL MEET STATE OR COUNTY STANDARDS.
12. INSPECTION AND ACCEPTANCE OF ALL WORK WILL BE ACCOMPLISHED BY THE DESIGNATED INSPECTOR. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE AND SCHEDULE APPROPRIATE INSPECTIONS, ALLOWING PROPER ADVANCE NOTICE. THE INSPECTOR MAY REQUIRE RECONSTRUCTION OF ITEMS THAT DO NOT MEET THE CONTRACT DOCUMENTS OR THAT WERE CONSTRUCTED WITHOUT INSPECTION.
13. THE CONTRACTOR SHALL PROVIDE AND MAINTAIN BEST MANAGEMENT PRACTICES AS SHOWN HEREIN TO INSURE THAT SEDIMENT-LADEN WATER DOES NOT ENTER THE WATER OF THE STATE. AS CONSTRUCTION PROGRESSES AND UNEXPECTED (SEASONAL) CONDITIONS DICTATE, ADDITIONAL BEST MANAGEMENT PRACTICES MAY BE REQUIRED. THEREFORE, DURING THE COURSE OF CONSTRUCTION IT SHALL BE THE OBLIGATION AND RESPONSIBILITY OF THE CONTRACTOR TO ADDRESS ANY NEW CONDITIONS THAT MAY BE CREATED BY HIS ACTIVITIES AND TO PROVIDE ADDITIONAL FACILITIES THAT MAY BE NEEDED TO PROTECT ADJACENT PROPERTIES.
14. THE CONTRACTOR SHALL KEEP ALL STREETS AND PUBLIC RIGHT-OF-WAY CLEAN AT ALL TIMES BY SWEEPING.
15. CONTRACTOR SHALL PROVIDE TRAFFIC CONTROL AS NECESSARY THROUGHOUT THE PROJECT. TRAFFIC CONTROL SHALL BE IN ACCORDANCE WITH THE MUTCD, STATE, AND/OR COUNTY STANDARDS.
16. CONTRACTOR SHALL NOT MAKE ANY REVISIONS IN THE FIELD WITHOUT PRIOR WRITTEN APPROVAL BY THE ENGINEER.
17. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ADEQUATE SAFEGUARDS, SAFETY DEVICES, PROTECTIVE EQUIPMENT, FLAGGERS, AND ANY OTHER NEEDED ACTIONS TO PROTECT THE LIFE, HEALTH, AND SAFETY OF THE PUBLIC, AND TO PROTECT PROPERTY IN CONNECTION WITH THE PERFORMANCE OF WORK COVERED BY THE CONTRACTOR. ANY WORK WITHIN THE TRAVELED RIGHT-OF-WAY THAT MAY INTERRUPT NORMAL TRAFFIC FLOW SHALL REQUIRE AT LEAST ONE FLAGGER FOR EACH LANE OF TRAFFIC AFFECTED. ALL SECTIONS OF THE WSDOT STANDARD SPECIFICATIONS 1-07.23 – TRAFFIC CONTROL, SHALL APPLY.
18. ANY TRENCH DEEPER THAN 5 FEET WILL REQUIRE SHORING FOR TRENCH WALL STABILIZATION.

GENERAL TESC NOTES:

1. APPROVAL OF THIS TEMPORARY EROSION AND SEDIMENTATION CONTROL (TESC) PLAN DOES NOT CONSTITUTE AN APPROVAL OF PERMANENT ROAD OR DRAINAGE DESIGN (E.G. SIZE AND LOCATION OF ROADS, PIPES, RESTRICTORS, CHANNELS, RETENTION FACILITIES, UTILITIES, ETC.).
2. THE IMPLEMENTATION OF THESE TESC PLANS AND THE CONSTRUCTION, MAINTENANCE, REPLACEMENT, AND UPGRADING OF THESE TESC FACILITIES IS THE RESPONSIBILITY OF THE APPLICANT OR A TESC SUPERVISOR UNTIL ALL CONSTRUCTION IS APPROVED.
3. THE BOUNDARIES OF THE CLEARING LIMITS SHOWN ON THIS PLAN SHALL BE CLEARLY FLAGGED BY A CONTINUOUS LENGTH OF SURVEY TAPE (OR FENCING, IF REQUIRED) PRIOR TO CONSTRUCTION. DURING THE CONSTRUCTION PERIOD, NO DISTURBANCE BEYOND THE CLEARING LIMITS SHALL BE PERMITTED. THE CLEARING LIMITS SHALL BE MAINTAINED BY THE APPLICANT/TESC SUPERVISOR FOR THE DURATION OF CONSTRUCTION.
4. THE TESC FACILITIES SHOWN ON THIS PLAN MUST BE CONSTRUCTED PRIOR TO OR IN CONJUNCTION WITH ALL CLEARING AND GRADING SO AS TO ENSURE THAT THE TRANSPORT OF SEDIMENT TO SURFACE WATERS, DRAINAGE SYSTEMS, AND ADJACENT PROPERTIES IS MINIMIZED.
5. THE TESC FACILITIES SHOWN ON THIS PLAN ARE THE MINIMUM REQUIREMENTS FOR ANTICIPATED SITE CONDITIONS. DURING THE CONSTRUCTION PERIOD, THESE TESC FACILITIES SHALL BE UPGRADED AS NEEDED FOR UNEXPECTED STORM EVENTS AND MODIFIED TO ACCOUNT FOR CHANGING SITE CONDITIONS (E.G. ADDITIONAL SUMP PUMPS, RELOCATION OF DITCHES AND SILT FENCES, ETC.).
6. ANY AREAS OF EXPOSED SOILS, INCLUDING ROADWAY EMBANKMENTS, THAT WILL NOT BE DISTURBED FOR TEN DAYS DURING THE WET SEASON OR FOURTEEN DAYS DURING THE DRY SEASON SHALL BE IMMEDIATELY STABILIZED WITH THE APPROVED TESC METHODS (E.G., SEEDING, MULCHING, PLASTIC COVERING, ETC.).
7. ANY AREA NEEDING TESC MEASURES, NOT REQUIRING IMMEDIATE ATTENTION, SHALL BE ADDRESSED WITHIN FIFTEEN (15) DAYS.
8. THE TESC FACILITIES ON INACTIVE SITES SHALL BE INSPECTED AND MAINTAINED A MINIMUM OF ONCE A MONTH OR WITHIN 48 HOURS FOLLOWING A STORM EVENT.
9. AT NO TIME SHALL MORE THAN ONE (1) FOOT OF SEDIMENT BE ALLOWED TO ACCUMULATE WITHIN A CATCH BASIN. ALL CATCH BASINS AND CONVEYANCE LINES SHALL BE CLEANED PRIOR TO PAVING. THE CLEANING OPERATION SHALL NOT FLUSH SEDIMENT-LADEN WATER INTO THE DOWNSTREAM SYSTEM.
10. STABILIZED CONSTRUCTION ENTRANCES AND ROADS SHALL BE INSTALLED AT THE BEGINNING OF CONSTRUCTION AND MAINTAINED FOR THE DURATION OF THE PROJECT. ADDITIONAL MEASURES, SUCH AS WASH PADS, MAY BE REQUIRED TO ENSURE THAT ALL PAVED AREAS ARE KEPT CLEAN FOR THE DURATION OF THE PROJECT.
11. ANY PERMANENT RETENTION/DETENTION FACILITY USED AS A TEMPORARY SETTLING BASIN SHALL BE MODIFIED WITH THE NECESSARY EROSION CONTROL MEASURES AND SHALL PROVIDE ADEQUATE STORAGE CAPACITY. IF THE PERMANENT FACILITY IS TO FUNCTION ULTIMATELY AS AN INFILTRATION SYSTEM, THE TEMPORARY FACILITY MUST BE GRADED SO THAT THE BOTTOM AND SIDES ARE AT LEAST ONE FOOT ABOVE THE FINAL GRADE OF THE PERMANENT FACILITY.
12. WHERE STRAW MULCH FOR TEMPORARY EROSION CONTROL IS REQUIRED, IT SHALL BE APPLIED AT A MINIMUM THICKNESS OF TWO INCHES

STANDARD GRADING NOTES:

1. ALL GRADING ACTIVITIES, INCLUDING EXCAVATION, BACKFILL AND COMPACTION, SHALL BE DONE IN ACCORDANCE WITH STATE OR COUNTY STANDARDS AS APPLICABLE.
2. WITHIN ANY AREAS TO RECEIVE STRUCTURAL FILL, PAVEMENTS OR HARDSCAPE, THE SUBGRADE SHALL BE SCARIFIED, MOISTURE CONDITIONED, AND COMPACTED TO AT LEAST 95% MAXIMUM DENSITY (ASTM D 1557).
3. CONTRACTOR SHALL OBTAIN AN APPROVAL BY THE GEOTECHNICAL ENGINEER PRIOR TO PROCEEDING WITH ANY OVEREXCAVATION. CONTRACTOR SHALL VERIFY THE AMOUNT OF OVEREXCAVATION WITH GEOTECHNICAL ENGINEER.
4. COMPACTION SHALL BE DONE PER STATE OR COUNTY STANDARDS AS APPLICABLE. SITE EXCAVATION AND/OR SUBGRADE PREPARATION SHALL BE COMPLETED BEFORE PLACING STRUCTURAL FILL. COMPACTION SHALL BE VERIFIED BY DENSITY TESTING.
5. ALL TEMPORARY CUT SLOPES SHALL NOT EXCEED 1.5H:1V. ALL PERMANENT CUT SLOPES SHALL NOT EXCEED 2H:1V OR AS SHOWN ON PLANS. ALL PERMANENT FILL SLOPES SHALL NOT EXCEED 2H:1V.
6. CONTRACTOR SHALL IMPLEMENT APPROPRIATE PROTECTION AND TRAFFIC CONTROL DURING CONSTRUCTION TO DIRECT TRUCK TRAFFIC.
7. ANY AND ALL FILL MATERIAL PLACED ON THE LOT SHALL BE COMPACTED AND A COMPACTION INSPECTION REPORT FOR THE COMPACTION AND BEARING CAPACITY OF THAT FILL MATERIAL SHALL BE PROVIDED TO THE STATE OR COUNTY AS APPLICABLE WITHIN 60 DAYS OF THE PLACEMENT OF THE FILL MATERIAL.
8. ALL EXCESS SOIL SHALL BE OFF-HAULED TO A LEGAL DISPOSAL SITE. NO EXCESS SOIL SHALL BE SPREAD ON THE SITE WITHOUT CLEARLY BEING SHOWN ON THE APPROVED GRADING PLAN.
9. ALL CUT AND FILL SLOPES AND ALL EXPOSED DIRT SHALL BE PLANTED, WATERED AND MAINTAINED UNTIL EFFECTIVE EROSION CONTROL HAS BEEN ESTABLISHED TO THE SATISFACTION OF THE STATE OR COUNTY AS APPLICABLE.
10. CONTRACTOR SHALL PROVIDE HIS/HER OWN EARTHWORK CALCULATIONS FOR ALL CUT AND FILL OPERATIONS.

ABBREVIATIONS:

AC – ASPHALT CONCRETE
ACP – ABESTOS CEMENT PIPE
ADD'L – ADDITIONAL
AD – AREA DRAIN
ADJ – ADJACENT
ANSI – AMERCIAN NATIONAL STANDARDS INSTITUTE
ALT – ALTERNATE
ALUM – ALUMINUM
APPROX – APPROXIMATE(LY)
ARCH – ARCHITECT(URAL)
AP – ANGLE POINT
ASPH – ASPHALT
ASSY – ASSEMBLY
ASTM – AMERICAN SOCIETY OF TESTING AND MATERIALS
AVE – AVENUE
BC – BACK OF CURB
BF – BLIND FLANGE
BLDG – BUILDING
BLDC – BUILDING CORNER
BLK – BLOCK
BLVD – BOULEVARD
BM – BENCHMARK
BNDY – BOUNDARY
BO – BLOW OFF
BOW – BOTTOM OF WALL (AT FINISHED GRADE)
BSBL – BUILDING SETBACK LINE
BVC – BEGINNING OF VERTICAL CURVE
BVCE – BEGIN VERTICAL CURVE ELEVATION
BVCS – BEGIN VERTICAL CURVE STATION
BW – BACK OF WALK
CB – CATCH BASIN
CF – CUBIC FEET (FOOT)
CIP – CAST IRON PIPE
CJ – CONSTRUCTION JOINT
CL – CLASS
C/L – CENTER LINE
CLR – CLEARENCE
CMP – CORRUGATED METAL PIPE
CO – CLEAN OUT
CONN – CONNECTION
CONT – CONTINUOUS (CONTINUED)
CONTR – CONTRACTOR
C, CONC – CONCRETE
CONST – CONSTRUCTION
CP – CONTROL POINT
CFS – CUBIC FEET PER SECOND
CTR – CENTER(ED)
CTV – CABLE TV
C&G – CURB AND GUTTER
CY – CUBIC YARD
DCVA – DOUBLE CHECK VALVE ASSEMBLY
DDCV – DOUBLE DETECTOR CHECK VALVE
DEPT. – DEPARTMENT
DET – DETAIL OR DETENTION
DIP – DUCTILE IRON PIPE
DIA(S) – DIAMETER
DIM – DIMENSION
DOT – DEPARTMENT OF TRANSPORTATION
DS – DOWN SPOUT
DWG – DRAWING
E – EAST(ING)
EA – EACH
EL – ELEVATION
ELEC – ELETRICAL
EP – EDGE OF PAVEMENT
EQUIV – EQUIVALENT
EVC – END OF VERTICAL CURVE
EVCE – END OF VERTICAL CURVE ELEVATION
EVCS – END OF VERTICAL CURVE STATION
EX, EXIST – EXISTING
FC – FACE OF CURB
FD – FLOOR DRAIN
FDC – FIRE DEPARTMENT CONNECTION
FFE – FINISH FLOOR ELEVATION
FH – FIRE HYDRANT
FL – FLANGED OR FLOW LINE
FLR – FLOOR
FS – FINISHED SURFACE
FT (') – FOOT (FEET)
FTG – FOOTING
G – GAS MAIN
GA – GAUGE
GALV – GALVANIZED
GB – GRADE BREAK
GM– GAS METER
GRD – GRADE
HB – HOSE BIBB
HDPE – HIGH DENSITY POLYETHYLENE
HORIZ (H) – HORIZONTAL
HT – HEIGHT
HYD – HYDRANT
ID – INSIDE DIAMETER
IE – INVERT ELEVATION
IN (") – INCHES
INV – INVERT
IRR – IRRIGATION WATER
L – LENGTH
LB, # – POUND(S)
LF – LINEAR FEET
LN – LANE
MAT'L – MATERIAL
MAX – MAXIMUM
MFR – MANUFACTURER
MH – MANHOLE
MIN – MINIMUM
MISC – MISCELLANEOUS
MJ – MECHANICAL JOINT
N – NORTH(ING)
NO (#) – NUMBER
N.T.S. – NOT TO SCALE
O.C. – ON CENTER
O.D. – OUTSIDE DIAMETER
O/W – OIL WATER
P – POWER
PC – POINT OF CURVATURE
PERF – PERFORATED
PI – POINT OF INTERSECTION
PIV – POST INDICTOR VALVE
PL – PROPERTY LINE
PP – POWER POLE
PROV – PROVIDED
PSF – POUNDS PER SQUARE FOOT
PSI – POUNDS PER SQUARE INCH
PT – POINT OF TANGENCY
PVC – POLYVINYL CHLORIDE
PVI – POINT OF VERTICAL INTERSECTION
PVMT – PAVEMENT
PVT – POINT OF VERTICAL TANGENT
QTY – QUANTITY
RAD (R) – RADIUS
RCP – REINFORCED CONCRETE PIPE
RD – ROAD
REF – REFERENCE
REINF – REINFORCED
REQ – REQUIRED
RET – RETAINING
ROW – RIGHT-OF-WAY
RR – RAILROAD
S – SOUTH
S, SL – SLOPE
SCH – SCHEDULE
SD – STORM DRAIN
SF – SQUARE FOOT
SHT – SHEET
SIM – SIMILAR
SPEC – SPECIFICATION(S)
SQ – SQUARE
SS – SANITARY SEWER
ST – STREET
STA – STATION
STD – STANDARD
STL – STEEL
T – TELEPHONE WIRE
TBM – TEMPORARY BENCH MARK
TC – TOP OF CURB
TEMP – TEMPORARY
TG/RIM – TOP OF GRATE/RIM
THRU – THROUGH
TOE – TOE OF WALL OR SLOPE
TOP – TOP OF WALL OR SLOPE
TOW – TOP OF WALL
TYP – TYPICAL
VC – VERTICAL CURVE
VOL – VOLUME
W – WEST
W/ – WITH
WM – WATER METER
W/O – WITHOUT
WQ – WATER QUALITY
WT – WEIGHT
WWF – WELDED WIRE FABRIC
WV – WATER VALVE
YD – YARD DRAIN

LEGEND

	EXISTING:	PROPOSED:
BOUNDARY LINE/RIGHT-OF-WAY		
LOT LINE		
STREET MONUMENT (IN CONCRETE)		
PROPERTY CORNER		
BENCHMARK/CONTROL POINT		
TEMPORARY BENCHMARK	TBM	TBM
EASEMENT LINE		
CENTERLINE		
CURB/GUTTER/SIDEWALK LINE		
EDGE OF PAVEMENT LINE		
CHAIN LINK FENCE LINE		
SIGN		
STREET LIGHT (ELECTROLIER)		
GRADE BREAK LINE		
CONTOUR LINE (MAJOR)	1650	1650
CONTOUR LINE (MINOR)	1651	1651
CATCH BASIN (TYPE 1)		
STORM DRAIN MANHOLE/CATCH BASIN TYPE 2	SD	SD
STORM DRAIN LINE		
CONTROL STRUCTURE		
RIP-RAP PAD		
SANITARY SEWER LINE	SS	SS
SANITARY SEWER CLEANOUT		
SANITARY SEWER MANHOLE		
WATERMAIN LINE	W	W
GATE VALVE (MECHANICAL JOINT)		
GATE VALVE (FLANGE)		
WATER METER		
FIRE HYDRANT		
CAP		
GAS LINE	G	G
GAS VALVE		
UNDERGROUND ELECTRIC LINE	E	E
POWER POLE / UTILITY POLE		
GUY ANCHOR		
ELECTRICAL TRANSFORMER / VAULT	P	P
TELEPHONE VAULT/PEDESTAL	T	T
TELEPHONE MANHOLE	T	T
100-YR FLOODPLAIN HATCH		
CONCRETE HATCH		
GRAVEL HATCH		
ALL WEATHER ROAD HATCH (COMPACTED SOIL OR GRAVEL)		
PROPOSED LANDSCAPING STRIP		

CONTRACTOR RESPONSIBILITY:

CONTRACTOR AGREES THAT HE SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS, INCLUDING THE SAFETY OF ALL PERSONS AND PROPERTY, DURING THE COURSE OF CONSTRUCTION OF THIS PROJECT, AND THAT THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS. THE CONTRACTOR SHALL DEFEND, INDEMNIFY AND HOLD THE OWNER AND THE ENGINEER HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXCEPTING FOR LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE OWNER OR THE ENGINEER.

DISCREPANCIES:

IF THERE ARE ANY DISCREPANCIES BETWEEN DIMENSIONS IN DRAWINGS AND EXISTING CONDITIONS WHICH WILL AFFECT THE WORK, THE CONTRACTOR SHALL BRING SUCH DISCREPANCIES TO THE ATTENTION OF THE ENGINEER FOR ADJUSTMENT BEFORE PROCEEDING WITH THE WORK. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROPER FITTING OF ALL WORK AND FOR THE COORDINATION OF ALL TRADES, SUBCONTRACTORS, AND PERSONS ENGAGED UPON THIS CONTRACT.

REVISIONS		
DESCRIPTION	BY	DATE

© THE PLANS SET FORTH ON THIS SHEET ARE AND SHALL REMAIN THE PROPERTY OF ENCOMPASS ENGINEERING & SURVEYING

TODD MICHAEL MICOULIS
STATE OF WASHINGTON
40995
REGISTERED
PROFESSIONAL ENGINEER

TUSSO ENERGY, LLC
CAMAS SITE

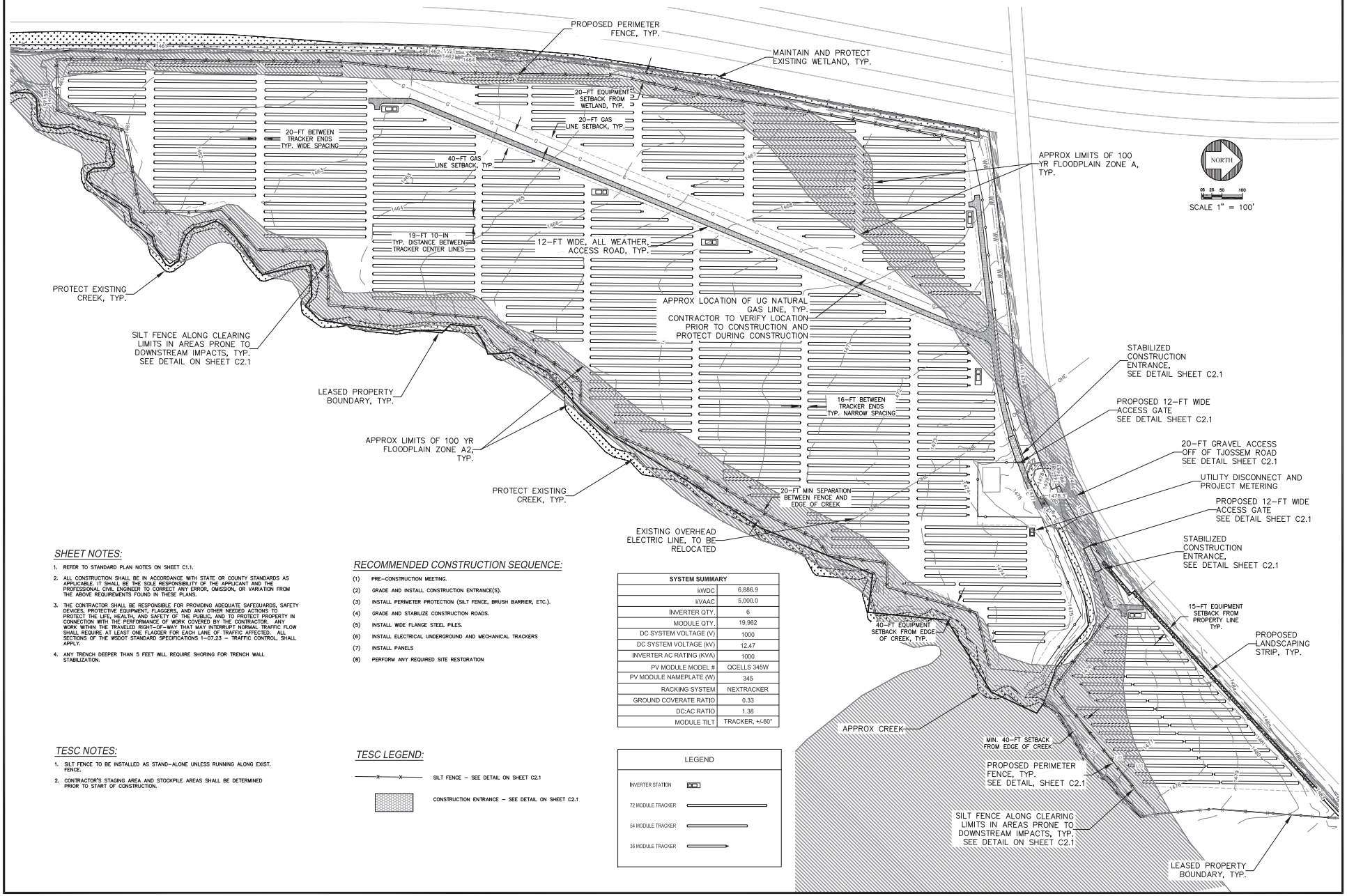
NOTES, LEGEND & ABBREVIATIONS

ENCOMPASS ENGINEERING & SURVEYING
Western Washington Division
165 NE Juniper Street, Suite 201 ■ Issaquah, WA 98027 ■ Phone: (425) 392-0250 ■ Fax: (425) 391-3055
Eastern Washington Division
407 Southwater Blvd. ■ Ste Elum, WA 98922 ■ Phone: (509) 674-7433 ■ Fax: (509) 674-7419

JOB NO.	17017
DATE	Sept. 27 2017
SCALE	AS SHOWN
DESIGNED	SF
DRAWN	SF
CHECKED	TML
APPROVED	TML
SHEET	C1.1

TUUSSO ENERGY - CAMAS SITE

A PORTION OF THE SE 1/4 OF SECTION 18 AND THE NE 1/4 OF SECTION 19, T. 17 N., R. 19 E. W.M.
KITTATAS COUNTY, STATE OF WASHINGTON



SHEET NOTES:

1. REFER TO STANDARD PLAN NOTES ON SHEET C1.1.
2. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH STATE OR COUNTY STANDARDS AS APPLICABLE. IT SHALL BE THE SOLE RESPONSIBILITY OF THE APPLICANT AND THE PROFESSIONAL CIVIL ENGINEER TO CORRECT ANY ERROR, OMISSION, OR VARIATION FROM THE ABOVE REQUIREMENTS FOUND IN THESE PLANS.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ADEQUATE SAFEGUARDS, SAFETY DEVICES, PROTECTIVE EQUIPMENT, FLAGGERS, AND ANY OTHER NEEDED ACTIONS TO PROTECT THE LIFE, HEALTH, AND SAFETY OF THE PUBLIC, AND TO PROTECT PROPERTY IN CONNECTION WITH THE PERFORMANCE OF WORK COVERED BY THE CONTRACTOR. ANY WORK WITHIN THE TRAVELED RIGHT-OF-WAY THAT MAY INTERRUPT NORMAL TRAFFIC FLOW SHALL REQUIRE AT LEAST ONE FLAGGER FOR EACH LANE OF TRAFFIC AFFECTED. ALL SECTIONS OF THE WSDOT STANDARD SPECIFICATIONS 1-07.23 - TRAFFIC CONTROL, SHALL APPLY.
4. ANY TRENCH DEEPER THAN 5 FEET WILL REQUIRE SHORING FOR TRENCH WALL STABILIZATION.

RECOMMENDED CONSTRUCTION SEQUENCE:

(1) PRE-CONSTRUCTION MEETING.
(2) GRADE AND INSTALL CONSTRUCTION ENTRANCE(S).
(3) INSTALL PERIMETER PROTECTION (SILT FENCE, BRUSH BARRIER, ETC.).
(4) GRADE AND STABILIZE CONSTRUCTION ROADS.
(5) INSTALL WIDE FLANGE STEEL PILES.
(6) INSTALL ELECTRICAL UNDERGROUND AND MECHANICAL TRACKERS
(7) INSTALL PANELS
(8) PERFORM ANY REQUIRED SITE RESTORATION

SYSTEM SUMMARY	
kWDC	6,886.9
kVAAC	5,000.0
INVERTER QTY.	6
MODULE QTY.	19,962
DC SYSTEM VOLTAGE (V)	1000
DC SYSTEM VOLTAGE (kV)	12.47
INVERTER AC RATING (KVA)	1000
PV MODULE MODEL #	QCELLS 345W
PV MODULE NAMEPLATE (W)	345
RACKING SYSTEM	NEXTRACKER
GROUND COVERATE RATIO	0.33
DC:AC RATIO	1.38
MODULE TILT	TRACKER, +/-60°

TESC NOTES:

1. SILT FENCE TO BE INSTALLED AS STAND-ALONE UNLESS RUNNING ALONG EXIST. FENCE.
2. CONTRACTOR'S STAGING AREA AND STOCKPILE AREAS SHALL BE DETERMINED PRIOR TO START OF CONSTRUCTION.

TESC LEGEND:

SILT FENCE - SEE DETAIL ON SHEET C2.1

CONSTRUCTION ENTRANCE - SEE DETAIL ON SHEET C2.1

LEGEND
INVERTER STATION
72 MODULE TRACKER
54 MODULE TRACKER
36 MODULE TRACKER

REVISIONS

DESCRIPTION	BY	DATE

© THE PLANS SET FORTH ON THIS SHEET ARE, AND SHALL REMAIN THE PROPERTY OF ENCOMPASS ENGINEERING & SURVEYING

TODD MICHOULIS WOOD — STATE OF WASHINGTON — 46995 — REGISTERED PROFESSIONAL ENGINEER

TUUSSO ENERGY, LLC
CAMAS SITE

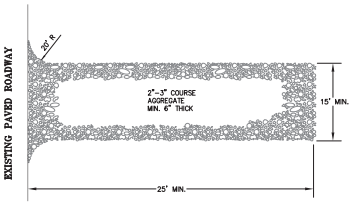
TESC, GRADING, AND DRAINAGE PLAN

Encompass ENGINEERING & SURVEYING
165 NE Juniper Street, Suite 201 • Issaquah, WA 98027 • Phone: (425) 392-0250 • Fax: (425) 391-3055
Western Washington Division
407 Southeast Blvd. • Ste Elum, WA 98922 • Phone: (509) 674-7433 • Fax: (509) 674-7419
Eastern Washington Division

JOB NO.	17017
DATE	Sept. 27 2017
SCALE	AS SHOWN
DESIGNED	SF
DRAWN	SF
CHECKED	TML
APPROVED	TML
SHEET	C2.0

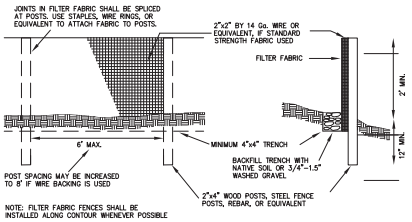
TUUSSO ENERGY - CAMAS SITE

A PORTION OF THE SE 1/4 OF SECTION 18 AND THE NE 1/4 OF SECTION 19, T. 17 N., R. 19 E. W.M.
KITTATAS COUNTY, STATE OF WASHINGTON

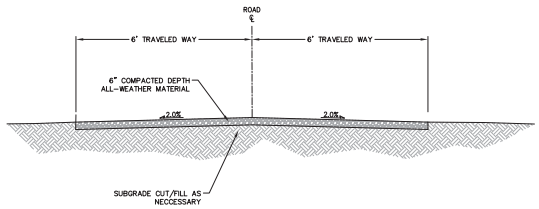


NOTES:
1. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION THAT WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY. THIS MAY REQUIRE TOP DRESSING, REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT.
2. WHEN NECESSARY, WHEELS SHALL BE CLEANED PRIOR TO ENTRANCE ONTO PUBLIC RIGHT-OF-WAY.
3. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH CRUSHED STONE THAT DRAINS INTO AN APPROVED SEDIMENT TRAP OR SEDIMENT BASIN.

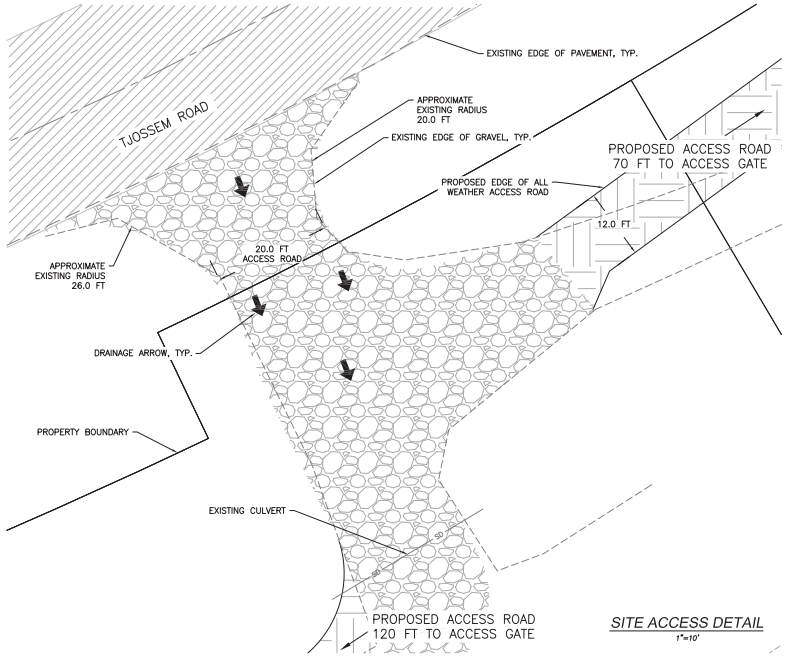
ROCK CONSTRUCTION ENTRANCE
N.T.S.



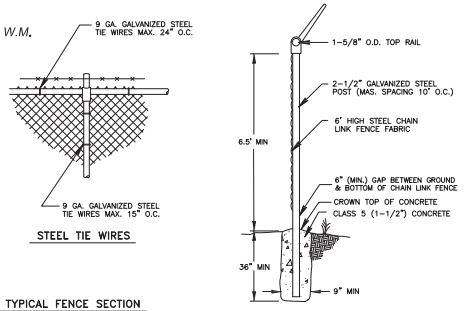
SILT FENCE DETAIL
N.T.S.



TYPICAL ALL-WEATHER ACCESS ROAD SECTION
N.T.S.



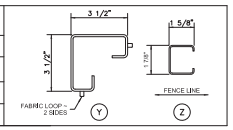
SITE ACCESS DETAIL
1"=10'

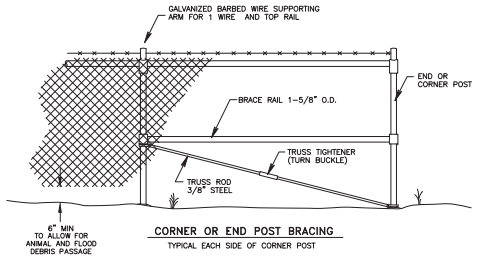


STEEL TIE WIRES

TYPICAL FENCE SECTION

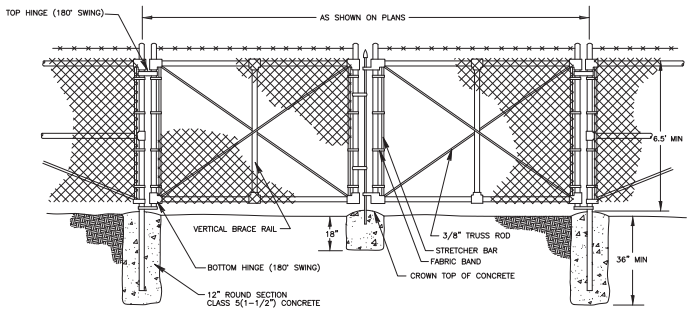
POST AND RAIL SPECIFICATIONS			
POST	PIPE	ROLL FORMED	
	NOM. SIZE (SCH. 40) I.D.	SECTION	WEIGHT (lb/ft)
END, CORNER, OR PULL POST	2 1/2" DIAM.	Y	5.10
LINE OR BRACE POST	2" DIAM.	Z	1.85





CORNER OR END POST BRACING
TYPICAL EACH SIDE OF CORNER POST

CHAIN LINK FENCE DETAIL
N.T.S.



CHAIN LINK FENCE GATE DETAIL
N.T.S.

REVISIONS

DESCRIPTION	BY	DATE

© THE PLANS SET FORTH ON THIS SHEET ARE, AND SHALL REMAIN THE PROPERTY OF ENCOMPASS ENGINEERING & SURVEYING

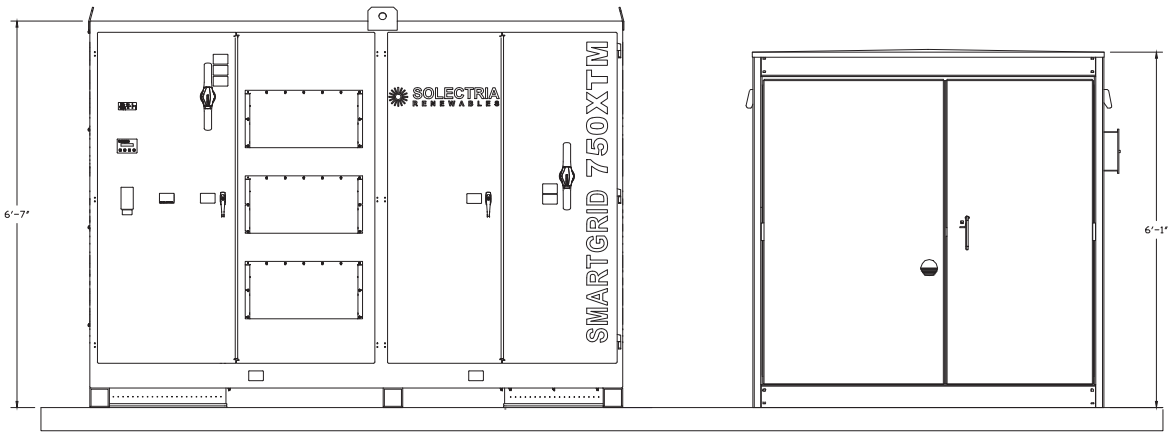
TODD MICHOULIS WOOD
STATE OF WASHINGTON
46995
REGISTERED
PROFESSIONAL ENGINEER

TUUSSO ENERGY, LLC
CAMAS SITE

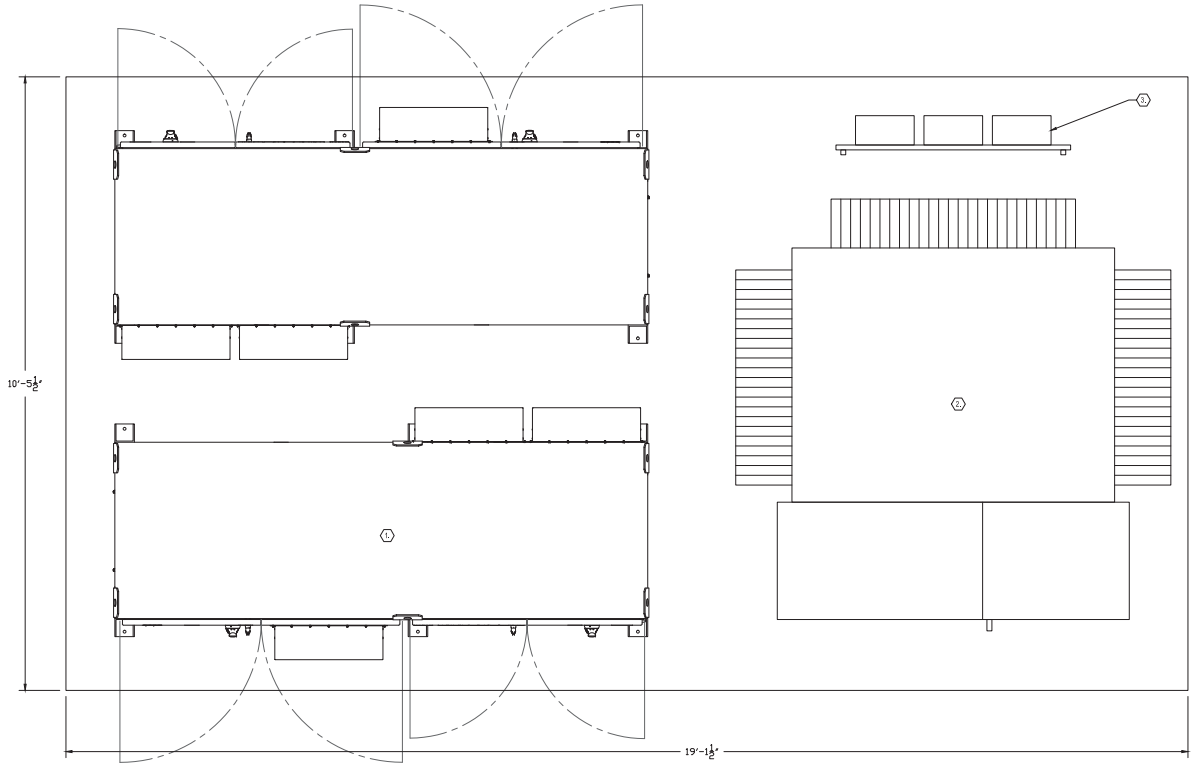
TESC DETAILS AND STANDARD DETAILS

Encompass
ENGINEERING & SURVEYING
165 NE Juniper Street, Suite 201 • Issaquah, WA 98027 • Phone: (425) 392-0250 • Fax: (425) 391-3055
Western Washington Division
407 Southeast Blvd. • Cle Elum, WA 98922 • Phone: (509) 674-7433 • Fax: (509) 674-7419
Eastern Washington Division

JOB NO.	17017
DATE	Sept. 27 2017
SCALE	AS SHOWN
DESIGNED	SF
DRAWN	SF
CHECKED	TML
APPROVED	TML
SHEET	C2.1



A 1500 kVA BLOCK ELEVATION
SCALE: 1"=1'



B 1500 kVA BLOCK LAYOUT
SCALE: 1"= 1'

NOTES:
1. NONE.

KEYED NOTES:
1. SOLECTRIA SGI 750KVA INVERTER
2. 1500KVA 15KV TRANSFORMER
3. COMMUNICATION RACK

TUUSSO ENERGY

MaxPV ENGINEERING DEVELOPMENT
3101 POLYGON // SACRAMENTO, CA
WWW.MAXPVENGINEERING.COM

REV. NO.	DATE	DESCRIPTION	BY	CHK.	APR.
A	08-09-17	FOR PLAN REVIEW	LB	–	–

OWNER: TUUSSO ENERGY

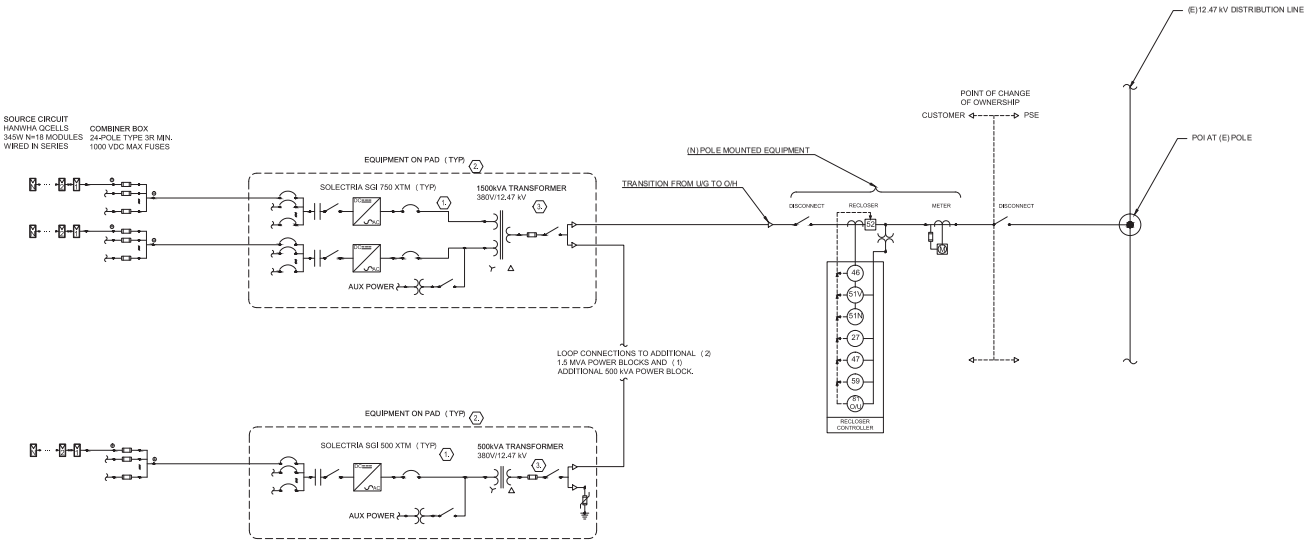
PROJECT SITE: CAMAS SOLAR PROJECT

DRAWING: EQUIPMENT PAD DETAILS

DRAWING NO. E-401

THIS PRINT IS NOT TO BE USED FOR CONSTRUCTION UNLESS NOTED AND SIGNED OK FOR CONSTRUCTION ABOVE LAST REVISION.

THE INFORMATION CONTAINED IN THESE DRAWINGS ARE CONFIDENTIAL AND ARE INTENDED FOR THE DESCRIBED PROJECT ONLY.



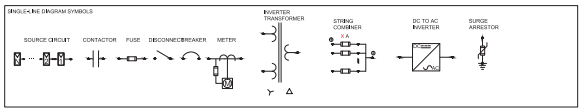
NOTES:

1. NONE.

KEYED NOTES:

1. **PV POWER CONDITIONING SYSTEM:** IEEE 929 AND IEEE 1547 COMPLIANT- 1000VDC MAX INPUT VOLTAGE. INVERTER EQUIPPED WITH INTEGRATED DC CIRCUIT BREAKER COMBINER.
2. EQUIPMENT PAD WITH INVERTER(S), STEP UP TRANSFORMER, AND COMMUNICATION EQUIPMENT.
3. TRANSFORMER SPECIFICATIONS TBD. VERIFY WITH INVERTER MFR & PSE FOR FINAL TRANFORMER CONFIGURATION.

SINGLE-LINE DIAGRAM SYMBOLS



THE INFORMATION CONTAINED IN THESE DRAWINGS ARE CONFIDENTIAL AND ARE INTENDED FOR THE DESCRIBED PROJECT ONLY.

TUUSSO ENERGY

MaxPV ENGINEERING DEVELOPMENT

3231 POLY DRIVE // SACRAMENTO, CA
WWW.MAXPVENGINEERING.COM

REV. NO.	DATE	DESCRIPTION	BY	CHK.	APP.
A	08-09-17	FOR PLAN REVIEW	LB	–	–

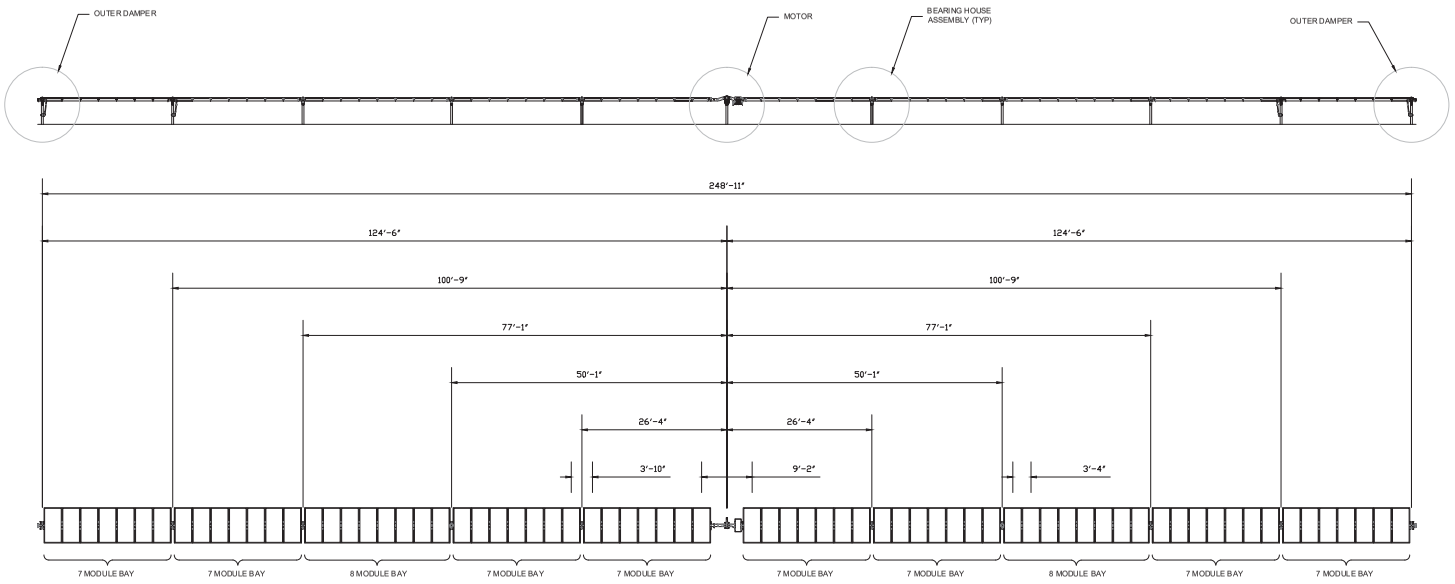
OWNER: TUUSSO ENERGY

PROJECT SITE: CAMAS SOLAR PROJECT

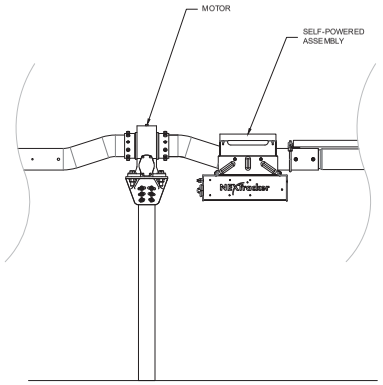
DRAWING: SINGLE LINE DIAGRAM

DRAWING NO. E-601

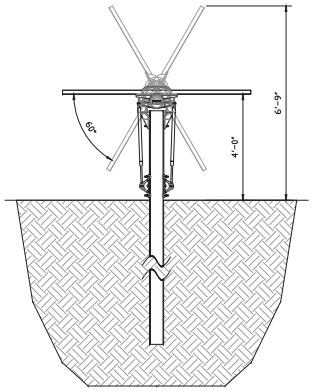
THIS PRINT IS NOT TO BE USED FOR CONSTRUCTION UNLESS NOTED AND SIGNED OK FOR CONSTRUCTION ABOVE LAST REVISION.



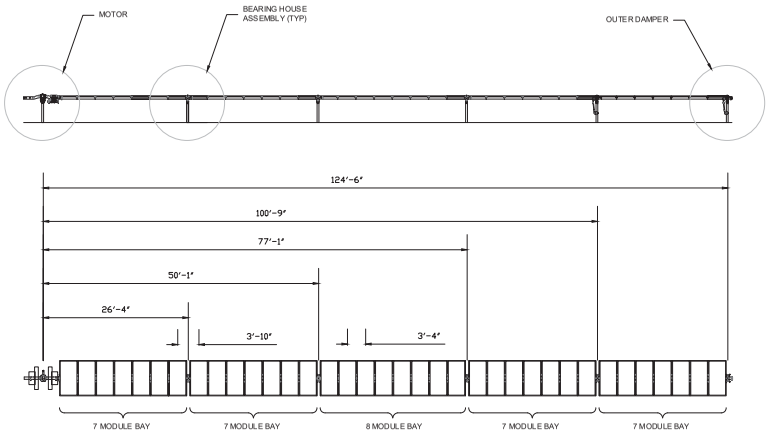
A 72 MODULE TRACKER



B MOTOR PILE DETAIL



C TRACKER PROFILE



D 36 MODULE TRACKER

THE INFORMATION CONTAINED IN THESE DRAWINGS ARE CONFIDENTIAL AND ARE INTENDED FOR THE DESCRIBED PROJECT ONLY.

NOTES:

1. NONE.

KEYED NOTES:

1. NONE.

TUUSSO ENERGY

MaxPV ENGINEERING DEVELOPMENT

320 PROVIDIAN // SACRAMENTO, CA
WWW.MAXPVENGINEERING.COM

REV. NO.	DATE	DESCRIPTION	BY	CHK.	APR.
A	08-09-17	FOR PLAN REVIEW	LB	–	–

OWNER: TUUSSO ENERGY

PROJECT SITE: CAMAS SOLAR PROJECT

DRAWING: TRACKER ELEVATIONS

DRAWING NO. E-701

THIS PRINT IS NOT TO BE USED FOR CONSTRUCTION UNLESS NOTED AND SIGNED OK FOR CONSTRUCTION ABOVE LAST REVISION.



The Q.ANTUM solar module Q.PLUS L-G4.2 with power classes up to 345 Wp is the strongest module of its type on the market globally. Powered by 72 Q CELLS solar cells Q.PLUS L-G4.2 was specially designed for large solar power plants to reduce BOS costs. Only Q CELLS offers German engineering quality with our unique triple Yield Security.



LOW ELECTRICITY GENERATION COSTS
Higher yield per surface area and lower BOS costs thanks to higher power classes and an efficiency rate of up to 17.6 %.

INNOVATIVE ALL-WEATHER TECHNOLOGY
Optimal yields, whatever the weather with excellent low-light and temperature behavior.

ENDURING HIGH PERFORMANCE
Long-term yield security with Anti-PID Technology[1], Hot-Spot-Protect and Traceable Quality Tra.Q™.

EXTREME WEATHER RATING
High-tech aluminum alloy frame, certified for high snow (5400 Pa) and wind loads (2400 Pa).

A RELIABLE INVESTMENT
Inclusive 12-year product warranty and 25-year linear performance guarantee[2].

THE IDEAL SOLUTION FOR:

Engineered in Germany

Q CELLS



Our most amazing tracker yet.

In our mission to make solar a mainstream energy source, NEXTracker has engineered the most intelligent and flexible tracking technology yet. Using sustainable design methods with outcomes that benefit people and the planet, we bring you: NX Horizon™.

NX Horizon (formerly referred to as the Self-Powered Tracker or SPT), brings self-contained motor power to each row, eliminating power wiring and trenching. Our advanced horizontal tracker has the widest rotational range available, lowest O&M costs, and requires far less power to operate than other trackers. By offering more powerful systems at a greater value, NEXTracker enables greater deployment of renewable energy worldwide.

NX Horizon key features and benefits include:

– Self-powered system with smart performance communications: Self-contained units on each row include a dedicated PV panel toprovide power to the controller which drives themotor and hosts intelligent control electronics to position each tracker. With smart communications built in, NX Horizon systems can be accessed remotely, providing customers with a granular view to optimize tracker performance, operations and maintenance.

– Independent balanced rows with 120 degree rotational range: Each NX Horizon row has its own controlled motor with rotational range that delivers up to 2% more energy than typical linked row trackers. These agile, independent rows stow in less than 90 seconds to reduce wind forces on the array, protecting the PV modules in harsh environments. NX Horizon solar trackers also have a mechanically balanced row design that align PV panels with the tracker's axis of rotation – which greatly reduces row torque, using less energy from the motor to track throughout the day.

– Self-grounded system with theft-proof fasteners: NX Horizon is the world's first horizontal tracker with an entirely self-grounded design. This means no separate bonding hardware is required. You save on material and associated costs by eliminating grounding washers, braided straps, bare copper wire, and grounding rods. What's more, we've designed our own fasteners that can only be removed with special tools – deterring PV theft.

YASKAWA SOLECTRIA SOLAR



SGI 500XTM
SGI 750XTM

FEATURES
- Compliant with NEC 2014 690.11 & 690.12 arc-fault and rapid shutdown requirements when coupled with ARCCOM combiner
- 98% CEC efficiency
- 1000 VDC
- Parallel power stages
- Fuse and breaker subcombiner options
- Modbus communications
- User-interactive LCD

OPTIONS
- Stainless steel enclosure
- Web-based monitoring
- Built-in cellular connectivity
- AC breaker with shunt trip
- Revenue-grade metering
- Air filters
- Uptime guarantee

OPTIONS FOR UTILITIES
- Real power curtailment
- Reactive power control
- Voltage ride through
- Frequency ride through
- Controlled ramp rates
- DRES-ready
- Rule 21 compliant

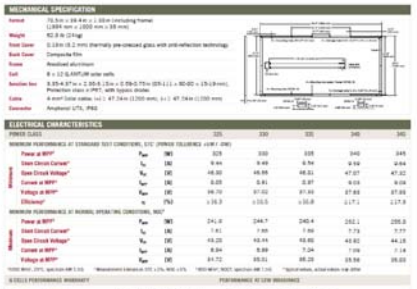
SOLECTRIA.COM

1000VDC UTILITY-SCALE INVERTERS

The only 1000VDC inverter available that is compliant with NEC 2014 690.11 & 690.12 arc-fault and rapid shutdown requirements, Yaskawa – Solectria Solar's SMARTGRID series inverters are optimized for high efficiency, reliability, and economy. Available in two power classes, 500 kW and 750 kW, these inverters are designed for direct connection to an external transformer for large commercial or utility-scale applications. They are robust, outdoor rated inverters that can be configured as 1 or 1.5 MW Solar Stations. Available utility-scale options include advanced grid management features such as voltage and frequency ride through, reactive power control, real power curtailment and power factor control. Listed to 1000 VDC with 98% CEC weighted efficiency, the SGI 500/750XTM inverters set a new standard for large scale power conversion.



ETL



MECHANICAL SPECIFICATION

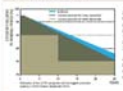
Format	70.9 in × 39.4 in × 1.18 in (including frame) (1,804 mm × 1,000 mm × 30 mm)
Weight	42.8 lb (19 kg)
Front Cover	0.13 in (3.2 mm) thermally pre-stressed glass with anti-reflection technology
Back Cover	Composite film
Frame	Anodized aluminum
Cell	6 × 12 Q.ANTUM solar cells
Junction box	3.35–4.37 in × 2.36–3.15 in × 0.59–0.75 in (85–111 × 60–80 × 15–19 mm); Protection class II (IP67, with bypass diodes)
Cable	4 mm² Solar cable; (+) ≥ 47.24 in (1,200 mm), (–) ≥ 47.24 in (1,200 mm)
Connector	Amphenol UTX, PV4

ELECTRICAL CHARACTERISTICS

POWER CLASS	325	330	335	340	345
MINIMUM PERFORMANCE AT STANDARD TEST CONDITIONS, STC (POWER TOLERANCE +5W / -0W)					
Power at MPP*	P_{MPP} [W]	325	330	335	340	345
Short Circuit Current*	I_{SC} [A]	9.44	9.49	9.54	9.59	9.64
Open Circuit Voltage*	V_{OC} [V]	46.50	46.66	46.81	47.07	47.32
Current at MPP*	I_{MPP} [A]	8.85	8.91	8.97	9.03	9.09
Voltage at MPP*	V_{MPP} [V]	36.70	37.02	37.36	37.66	37.93
Efficiency*	η [%]	≥ 16.3	≥ 16.5	≥ 16.8	≥ 17.1	≥ 17.3
MINIMUM PERFORMANCE AT NORMAL OPERATING CONDITIONS, NOCT						
Power at MPP*	P_{MPP} [W]	241.8	244.7	248.4	252.1	255.8
Short Circuit Current*	I_{SC} [A]	7.61	7.65	7.69	7.73	7.77
Open Circuit Voltage*	V_{OC} [V]	43.28	43.44	43.60	43.82	44.08
Current at MPP*	I_{MPP} [A]	8.04	8.09	8.14	8.19	8.24
Voltage at MPP*	V_{MPP} [V]	34.72	34.91	35.15	35.56	35.83

*STC (25°C, spectrum AM 1.5G) ±5% ±5W; *NOCT 800 W/m², NOCT, spectrum AM 1.5G; *Typical values, actual values may differ

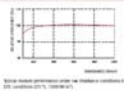
Q CELLS PERFORMANCE WARRANTY



At least 97% of nominal power during first year. Thereafter max. 0.6% degradation per year. At least 92% of nominal power up to 10 years. At least 83% of nominal power up to 25 years.

All data within measurement tolerances. Full warranties in accordance with the warranty terms of the Q CELLS sales organization of your respective country.

PERFORMANCE AT LOW IRRADIANCE



Typical module performance under low irradiance conditions in comparison to STC conditions (25°C, 1000W/m²)

TEMPERATURE COEFFICIENTS

Temperature Coefficient of I_{SC}	α	[%/K]	+0.04	Temperature Coefficient of V_{OC}	β	[%/K]	-0.29
Temperature Coefficient of P_{MPP}	γ	[%/K]	-0.40	Nomin. Operating Cell Temperature	NOCT	[°C]	113 ± 5.4 (43 ± 3°C)

PROPERTIES FOR SYSTEM DESIGN

Maximum System Voltage V_{SYS}	[V]	1000 (IEC) / 1000 (UL)	Safety Class	II
Maximum Series Fuse Rating	[A DC]	15	Fire Rating	C (IEC) / TYPE 1 (UL)
Design load, push (DL)*	[lbs/ft²]	75 (3600 Pa)	Permitted module temperature on continuous duty	-40°F up to +185°F (-40°C up to +85°C)
Design load, pull (DL)*	[lbs/ft²]	55 (2400 Pa)	* safety factor of 1.5 included, see installation manual	

QUALIFICATIONS AND CERTIFICATES

IEC 61215 (Ed. 2); IEC 61730 (Ed. 1; Application class A). This data sheet complies with DIN EN 50380.

cULus; CE; IEC

PACKAGING INFORMATION

Number of Modules per Pallet	26
Number of Pallets per 53' Container	30
Number of Pallets per 40' Container	22
Pallet Dimensions (L × W × H)	69.3 in × 45.3 in × 46.8 in (1769 × 1150 × 1190 mm)
Pallet Weight	1874 lbs (850 kg)

NOTE: Installation instructions must be followed. See the installation and operating manual or contact our technical service department for further information on approved installation and use of this product.

Hanwha Q CELLS America Inc.
300 Spectrum Center Drive, Suite 1250, Irvine, CA 92618, USA | TEL +1 949 748 59 96 | EMAIL inquiries@q-cells.com | WEB www.q-cells.us

Engineered in Germany

Q CELLS

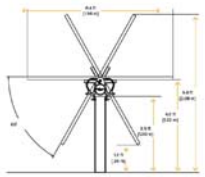
THE INFORMATION CONTAINED IN THESE DRAWINGS ARE CONFIDENTIAL AND ARE INTENDED FOR THE DESCRIBED PROJECT ONLY.

NX Horizon Specifications

Tracking Technology	Horizontal single-axis balanced-mass tracker with independently-driven rows
Tracking Range	Up to 120° (±60°)
Control System	1 Self-Powered Controller (SPC) per tracker; 1 Network Control Unit (NCU) per 100 SPCs
Communications	Wireless ZigBee® mesh network/SCADA; no communication wiring required
Drive System	One slew gear, 24 VDC motor and self-powered controller w/dedicated solar panel per row
DC Capacity	23 35k-Wp per tracker row, depending on panel type. Row length up to 90 panels.
System Voltage	1,500 volt or 1,500 volt
Power Consumption	No grid power required
Ground Coverage Ratio	Fully configurable by customer; typical range 33%-50%
Installation Method	Rapid field assembly, no welding required
Foundation Types	Compatible with all major foundation types (driven pier, concrete foundation, ground screw)
Standard Wind Design	100 mph/161 kph, 3 second gust per ASCE7 10; configurable for higher wind speeds
Safety Stowing	Automated wind and snow stowing with self-contained backup power; no external power required
Torsional Limiter	Included at each foundation/bearing for additional wind and snow load protection
Principal Materials	Galvanized and stainless steel
Grounding Method	Self-grounding structure; separate materials and labor not required
Compliance	Grounding/bonding: UL2703; structural design: ASCE7 10
Other Available Options	Snow and flood sensors
Warranty	10-years on structural components; 5-years on drive and control systems
Typical Dimensions	Height 2.1 m/6.8 ft @ 60°; Width 2.0 m/6.4 ft; Length 85 m/283 ft

Typical 72-cell c-Si configuration: 85 m row with 80 panels mounted in portrait:





NEXTracker
6200 Paseo Padre Parkway
Fremont, CA 94555 USA
+1 510 270 2500
nx@nextracker.com

© NEXTracker Inc. Contents subject to change without notice.

SPECIFICATIONS	SGI 500XTM	SGI 750XTM
DC Input		
Absolute Maximum Input Voltage	1000 VDC	
Max Power Input Voltage Range (MPPT)*	545-850 VDC	
Operating Voltage Range	545-1000 VDC	
Maximum Operating Input Current	941 A	1441 A
Maximum PV Power	710 kW	1052 kW
Strike Voltage	750 V	
AC Output		
Native Output Voltage	380 VAC, ± 3%	
AC Voltage Range	-12/+10%	
Continuous Output Power	500 kW	750 kW
Continuous Output Current	760 A	1140 A
Maximum Backfeed Current	0 A	
Nominal Output Frequency	60 Hz	
Output Frequency Range	57-63.5 Hz	
Power Factor	Adjustable - 0.8 to +0.8, factory set at 1	
Fault Current Contribution (1 Cycle RMS)	912 A	1368 A
Total Harmonic Distortion (THD) @ Rated Load	< 3%	
Efficiency		
Peak Efficiency	98.3%	
CEC Efficiency	98.0%	
Tare Loss	400 W	512 W
Subcombiner Options		
Fuses	4 to 16 positions, 300-400 A	
Breakers	4 to 15 positions, 125-350 A	
Temperature		
Ambient Temperature Range (full power)	-40°F to +122°F (-40°C to +50°C)	
Storage Temperature Range	-40°F to +122°F (-40°C to +50°C)	
Relative Humidity (non-condensing)	0-95%	
Data Monitoring		
Optional Subcombiner Board Monitoring	Integrated	
Optional Revenue Grade Monitoring	300 A	1000 A
Optional SolGate™ Sub-Array Monitoring (DC Current)	1 zone per protected input (up to 16 zones)	
Optional Cellular Communication	SolarGate AIR	
External Communication Interface	RS-485 SunSpec Modbus RTU	
Safety & Certifications		
Safety Listings & Certifications	UL 1741/1699, IEEE 1547/1547.1, IEC 62109-1/-2, IEC 62116, IEC 61727, IEC 62109-1, IEEE 1547.1	
Testing Agency	ETL	
Warranty		
Standard	5 years	
Optional	10, 15, 20 years; extended service agreement; uptime guarantee	
Dedicated External Transformer		
Dedicated External Transformer	Required, provided by customer to Solectria's specification	
Transformer Type	Self-cooled, step-up, pad mount	
Output Voltage	Typical: 2.4-34.5 kV, 3-Ph	
Enclosure		
dBA (Decibel) Rating	< 67 dBA @ 10 m	
DC Disconnect (integrated)	Standard	
AC Disconnect/Breaker (integrated)	Optional disconnect, breaker or breaker with shunt trip	
Dimensions (H × W × D)	82 in. x 108 in. x 41 in. (2083 mm x 2743 mm x 1041 mm)	
Mounting Set Back	120" (3048 mm) at 30° solar elevation	
Shipping Weight	3190 lbs (1446 kg)	3570 lbs (1620 kg)
Enclosure Rating	Type 3R	
Enclosure Finish	Polyester powder coated steel; optional 316 stainless steel	

YASKAWA SOLECTRIA SOLAR www.solectria.com | inverters@solectria.com | 978.683.9700

TUUSSO ENERGY

MaxPV ENGINEERING DEVELOPMENT
SOLUTIONS // SACRAMENTO, CA
WWW.MAXPVENGINEERING.COM

REV. NO.	DATE	DESCRIPTION	BY	CHK.	APR.
A	08-09-17	FOR PLAN REVIEW	LB	–	–

OWNER:
TUUSSO ENERGY

PROJECT SITE:
CAMAS SOLAR PROJECT

DRAWING:
MAJOR EQUIPMENT SPECIFICATIONS

DRAWING NO.
E-901

THIS PRINT IS NOT TO BE USED FOR CONSTRUCTION UNLESS NOTED AND SIGNED OK FOR CONSTRUCTION ABOVE LAST REVISION.

TUUSSO ENERGY - FUMARIA SITE

A PORTION OF THE SE ¼ OF SECTION 9, T. 18 N., R. 18 E., W.M.

KITTITAS COUNTY, STATE OF WASHINGTON



VICINITY MAP

N.T.S.

NORTH

SCALE 1" = 100'



SHEET INDEX:

TITLE	NO.
COVER SHEET & OVERALL SITE PLAN	C1.0
NOTES, LEGEND & ABBREVIATIONS	C1.1
TESC, GRADING, AND DRAINAGE PLAN	C2.0
TESC DETAILS AND STANDARD DETAILS	C2.1

NOTES:

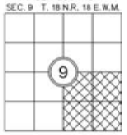
1. ALL CONSTRUCTION TECHNIQUES AND MATERIALS SHALL BE IN ACCORDANCE WITH THE CURRENT STATE OR COUNTY STANDARDS (AS APPLICABLE) AND AS SHOWN IN THESE PLANS.
2. BOUNDARY AND TOPOGRAPHIC SURVEY SHOWN HEREON WAS PREPARED BY ENCOMPASS ENGINEERING AND SURVEYING IN MAY 2017 UNDER DIRECT SUPERVISION OF DUSTIN PIERCE, PLS #55501.

PROPERTY INFORMATION:

APPLICANT:	TUUSSO ENERGY, LLC 500 YALE AVE SEATTLE, WA 98109
PARCEL NUMBER:	14033
PARCEL SIZE:	38.99 ACRES
TRACT 1A SIZE:	35.24 ACRES (SITE)
TRACT 2A SIZE:	3.75 ACRES
PROPERTY ADDRESS:	TBD ELLENSBURG, WA 98926
ZONE:	AGRICULTURAL
IRRIGATION DISTRICT:	KITTITAS RECLAMATION DISTRICT

INDEX LOCATION

SEC. 9 T. 18 N.R. 18 E.W.M.



811

Know what's below.
Call before you dig.

REVISIONS

DESCRIPTION	BY	DATE

© THE ALKAIRE SET FORM OR THIS SHEET ARE AND SHALL REMAIN THE PROPERTY OF ENCOMPASS ENGINEERING & SURVEYING

TUUSSO ENERGY, LLC

FUMARIA SITE

COVER SHEET & OVERALL SITE PLAN

Encompass
ENGINEERING & SURVEYING
Western Washington Division
165 NE Juniper Street, Suite 201 • Issaquah, WA 98027 • Phone: (425) 392-0250 • Fax: (425) 391-2055
Eastern Washington Division
107 Southwest Blvd. • Cle Elum, WA 98922 • Phone: (509) 674-7433 • Fax: (509) 674-7419

JOB NO.	17016
DATE	Sept. 27 2017
SCALE	AS SHOWN
DESIGNED	SF
DRAWN	SF
CHECKED	TML
APPROVED	TML
SHEET	C1.0

STANDARD PLAN NOTES:

1. ALL CONSTRUCTION TECHNIQUES AND MATERIALS SHALL BE IN ACCORDANCE WITH THE CURRENT STATE OR COUNTY STANDARDS AND AS SHOWN IN THESE PLANS.
2. A COPY OF THE APPROVED PLANS MUST BE ON SITE WHENEVER CONSTRUCTION IS IN PROGRESS.
3. THE CONTRACTOR SHALL OBTAIN ALL PERMITS REQUIRED FOR WORK THAT ARE NOT PROVIDED BY THE OWNER PRIOR TO START OF CONSTRUCTION.
4. PAVED OR SIMILAR ESTABLISHED SURFACES INCLUDING ROADWAYS, SIDEWALKS AND CURBS THAT ARE TO REMAIN BUT ARE DAMAGED BY NEW CONSTRUCTION SHALL BE REPAIRED AS REQUIRED BY THE INSPECTOR.
5. ALL SURVEYING AND STAKING OF IMPROVEMENTS SHALL BE APPROVED BY THE OWNER. CONTRACTOR SHALL COORDINATE AND VERIFY WITH THE OWNER PRIOR TO OBTAINING STAKING SERVICES.
6. THE CONTRACTOR SHALL NOTIFY THE KITTITAS COUNTY FIRE DISTRICT (509-386-1495) TWENTY-FOUR (24) HOURS IN ADVANCE OF ALL WATER SERVICE INTERRUPTIONS, HYDRANT SHUT-OFFS, AND STREET CLOSURES OR OTHER ACCESS BLOCKAGE. THE CONTRACTOR SHALL ALSO NOTIFY THE DISTRICT OF ALL NEW, RELOCATED, OR ELIMINATED HYDRANTS RESULTING FROM THIS WORK.
7. ALL LOCATIONS OF EXISTING UTILITIES SHOWN HEREON HAVE BEEN ESTABLISHED BY FIELD SURVEY OR OBTAINED FROM AVAILABLE RECORDS AND SHOULD THEREFORE BE CONSIDERED APPROXIMATE ONLY AND NOT NECESSARILY COMPLETE. IT IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR TO INDEPENDENTLY VERIFY THE ACCURACY OF ALL UTILITY LOCATIONS SHOWN AND TO FURTHER DISCOVER AND AVOID ANY OTHER UTILITIES NOT SHOWN HEREON WHICH MAY BE AFFECTED BY THE IMPLEMENTATION OF THIS PLAN.
8. THE CONTRACTOR SHALL LOCATE AND PROTECT ALL ACTIVE CASTINGS AND UTILITIES DURING CONSTRUCTION AND SHALL CONTACT THE UNDERGROUND UTILITIES LOCATOR SERVICE (1-800-424-5555 OR 811) AT LEAST 48 HOURS PRIOR TO CONSTRUCTION.
9. THE CONTRACTOR SHALL ADJUST ALL EXISTING MANHOLE RIMS, DRAINAGE STRUCTURE LIDS, VALVE BOXES AND UTILITY ACCESS STRUCTURES TO FINISH GRADE WITHIN AREAS AFFECTED BY THE PROPOSED IMPROVEMENTS.
10. THE CONTRACTOR SHALL PROVIDE FOR ALL COMPACTION TESTS REQUIRED BY THE INSPECTOR.
11. BACKFILL MATERIAL SHALL MEET STATE OR COUNTY STANDARDS.
12. INSPECTION AND ACCEPTANCE OF ALL WORK WILL BE ACCOMPLISHED BY THE DESIGNATED INSPECTOR. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE AND SCHEDULE APPROPRIATE INSPECTIONS, ALLOWING PROPER ADVANCE NOTICE. THE INSPECTOR MAY REQUIRE RECONSTRUCTION OF ITEMS THAT DO NOT MEET THE CONTRACT DOCUMENTS OR THAT WERE CONSTRUCTED WITHOUT INSPECTION.
13. THE CONTRACTOR SHALL PROVIDE AND MAINTAIN BEST MANAGEMENT PRACTICES AS SHOWN HEREIN TO INSURE THAT SEDIMENT-LADEN WATER DOES NOT ENTER THE WATER OF THE STATE. AS CONSTRUCTION PROGRESSES AND UNEXPECTED (SEASONAL) CONDITIONS DICTATE, ADDITIONAL BEST MANAGEMENT PRACTICES MAY BE REQUIRED. THEREFORE, DURING THE COURSE OF CONSTRUCTION IT SHALL BE THE OBLIGATION AND RESPONSIBILITY OF THE CONTRACTOR TO ADDRESS ANY NEW CONDITIONS THAT MAY BE CREATED BY HIS ACTIVITIES AND TO PROVIDE ADDITIONAL FACILITIES THAT MAY BE NEEDED TO PROTECT ADJACENT PROPERTIES.
14. THE CONTRACTOR SHALL KEEP ALL STREETS AND PUBLIC RIGHT-OF-WAY CLEAN AT ALL TIMES BY SWEEPING.
15. CONTRACTOR SHALL PROVIDE TRAFFIC CONTROL AS NECESSARY THROUGHOUT THE PROJECT. TRAFFIC CONTROL SHALL BE IN ACCORDANCE WITH THE MUTCD, STATE, AND/OR COUNTY STANDARDS.
16. CONTRACTOR SHALL NOT MAKE ANY REVISIONS IN THE FIELD WITHOUT PRIOR WRITTEN APPROVAL BY THE ENGINEER.
17. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ADEQUATE SAFEGUARDS, SAFETY DEVICES, PROTECTIVE EQUIPMENT, FLAGGERS, AND ANY OTHER NEEDED ACTIONS TO PROTECT THE LIFE, HEALTH, AND SAFETY OF THE PUBLIC, AND TO PROTECT PROPERTY IN CONNECTION WITH THE PERFORMANCE OF WORK COVERED BY THE CONTRACTOR. ANY WORK WITHIN THE TRAVELED RIGHT-OF-WAY THAT MAY INTERRUPT NORMAL TRAFFIC FLOW SHALL REQUIRE AT LEAST ONE FLAGGER FOR EACH LANE OF TRAFFIC AFFECTED. ALL SECTIONS OF THE WSDOT STANDARD SPECIFICATIONS 1-07.23 – TRAFFIC CONTROL, SHALL APPLY.
18. ANY TRENCH DEEPER THAN 5 FEET WILL REQUIRE SHORING FOR TRENCH WALL STABILIZATION.

GENERAL TESC NOTES:

1. APPROVAL OF THIS TEMPORARY EROSION AND SEDIMENTATION CONTROL (TESC) PLAN DOES NOT CONSTITUTE AN APPROVAL OF PERMANENT ROAD OR DRAINAGE DESIGN (E.G. SIZE AND LOCATION OF ROADS, PIPES, RESTRICTORS, CHANNELS, RETENTION FACILITIES, UTILITIES, ETC.).
2. THE IMPLEMENTATION OF THESE TESC PLANS AND THE CONSTRUCTION, MAINTENANCE, REPLACEMENT, AND UPGRADING OF THESE TESC FACILITIES IS THE RESPONSIBILITY OF THE APPLICANT OR A TESC SUPERVISOR UNTIL ALL CONSTRUCTION IS APPROVED.
3. THE BOUNDARIES OF THE CLEARING LIMITS SHOWN ON THIS PLAN SHALL BE CLEARLY FLAGGED BY A CONTINUOUS LENGTH OF SURVEY TAPE (OR FENCING, IF REQUIRED) PRIOR TO CONSTRUCTION. DURING THE CONSTRUCTION PERIOD, NO DISTURBANCE BEYOND THE CLEARING LIMITS SHALL BE PERMITTED. THE CLEARING LIMITS SHALL BE MAINTAINED BY THE APPLICANT/TESC SUPERVISOR FOR THE DURATION OF CONSTRUCTION.
4. THE TESC FACILITIES SHOWN ON THIS PLAN MUST BE CONSTRUCTED PRIOR TO OR IN CONJUNCTION WITH ALL CLEARING AND GRADING SO AS TO ENSURE THAT THE TRANSPORT OF SEDIMENT TO SURFACE WATERS, DRAINAGE SYSTEMS, AND ADJACENT PROPERTIES IS MINIMIZED.
5. THE TESC FACILITIES SHOWN ON THIS PLAN ARE THE MINIMUM REQUIREMENTS FOR ANTICIPATED SITE CONDITIONS. DURING THE CONSTRUCTION PERIOD, THESE TESC FACILITIES SHALL BE UPGRADED AS NEEDED FOR UNEXPECTED STORM EVENTS AND MODIFIED TO ACCOUNT FOR CHANGING SITE CONDITIONS (E.G. ADDITIONAL SUMP PUMPS, RELOCATION OF DITCHES AND SILT FENCES, ETC.).
6. ANY AREAS OF EXPOSED SOILS, INCLUDING ROADWAY EMBANKMENTS, THAT WILL NOT BE DISTURBED FOR TEN DAYS DURING THE WET SEASON OR FOURTEEN DAYS DURING THE DRY SEASON SHALL BE IMMEDIATELY STABILIZED WITH THE APPROVED TESC METHODS (E.G., SEEDING, MULCHING, PLASTIC COVERING, ETC.).
7. ANY AREA NEEDING TESC MEASURES, NOT REQUIRING IMMEDIATE ATTENTION, SHALL BE ADDRESSED WITHIN FIFTEEN (15) DAYS.
8. THE TESC FACILITIES ON INACTIVE SITES SHALL BE INSPECTED AND MAINTAINED A MINIMUM OF ONCE A MONTH OR WITHIN 48 HOURS FOLLOWING A STORM EVENT.
9. AT NO TIME SHALL MORE THAN ONE (1) FOOT OF SEDIMENT BE ALLOWED TO ACCUMULATE WITHIN A CATCH BASIN. ALL CATCH BASINS AND CONVEYANCE LINES SHALL BE CLEANED PRIOR TO PAVING. THE CLEANING OPERATION SHALL NOT FLUSH SEDIMENT-LADEN WATER INTO THE DOWNSTREAM SYSTEM.
10. STABILIZED CONSTRUCTION ENTRANCES AND ROADS SHALL BE INSTALLED AT THE BEGINNING OF CONSTRUCTION AND MAINTAINED FOR THE DURATION OF THE PROJECT. ADDITIONAL MEASURES, SUCH AS WASH PADS, MAY BE REQUIRED TO ENSURE THAT ALL PAVED AREAS ARE KEPT CLEAN FOR THE DURATION OF THE PROJECT.
11. ANY PERMANENT RETENTION/DETENTION FACILITY USED AS A TEMPORARY SETTLING BASIN SHALL BE MODIFIED WITH THE NECESSARY EROSION CONTROL MEASURES AND SHALL PROVIDE ADEQUATE STORAGE CAPACITY. IF THE PERMANENT FACILITY IS TO FUNCTION ULTIMATELY AS AN INFILTRATION SYSTEM, THE TEMPORARY FACILITY MUST BE GRADED SO THAT THE BOTTOM AND SIDES ARE AT LEAST ONE FOOT ABOVE THE FINAL GRADE OF THE PERMANENT FACILITY.
12. WHERE STRAW MULCH FOR TEMPORARY EROSION CONTROL IS REQUIRED, IT SHALL BE APPLIED AT A MINIMUM THICKNESS OF TWO INCHES

STANDARD GRADING NOTES:

1. ALL GRADING ACTIVITIES, INCLUDING EXCAVATION, BACKFILL AND COMPACTION, SHALL BE DONE IN ACCORDANCE WITH STATE OR COUNTY STANDARDS AS APPLICABLE.
2. WITHIN ANY AREAS TO RECEIVE STRUCTURAL FILL, PAVEMENTS OR HARDSCAPE, THE SUBGRADE SHALL BE SCARIFIED, MOISTURE CONDITIONED, AND COMPACTED TO AT LEAST 95% MAXIMUM DENSITY (ASTM D 1557).
3. CONTRACTOR SHALL OBTAIN AN APPROVAL BY THE GEOTECHNICAL ENGINEER PRIOR TO PROCEEDING WITH ANY OVEREXCAVATION. CONTRACTOR SHALL VERIFY THE AMOUNT OF OVEREXCAVATION WITH GEOTECHNICAL ENGINEER.
4. COMPACTION SHALL BE DONE PER STATE OR COUNTY STANDARDS AS APPLICABLE. SITE EXCAVATION AND/OR SUBGRADE PREPARATION SHALL BE COMPLETED BEFORE PLACING STRUCTURAL FILL. COMPACTION SHALL BE VERIFIED BY DENSITY TESTING.
5. ALL TEMPORARY CUT SLOPES SHALL NOT EXCEED 1.5H:1V. ALL PERMANENT CUT SLOPES SHALL NOT EXCEED 2H:1V OR AS SHOWN ON PLANS. ALL PERMANENT FILL SLOPES SHALL NOT EXCEED 2H:1V.
6. CONTRACTOR SHALL IMPLEMENT APPROPRIATE PROTECTION AND TRAFFIC CONTROL DURING CONSTRUCTION TO DIRECT TRUCK TRAFFIC.
7. ANY AND ALL FILL MATERIAL PLACED ON THE LOT SHALL BE COMPACTED AND A COMPACTION INSPECTION REPORT FOR THE COMPACTION AND BEARING CAPACITY OF THAT FILL MATERIAL SHALL BE PROVIDED TO THE STATE OR COUNTY AS APPLICABLE WITHIN 60 DAYS OF THE PLACEMENT OF THE FILL MATERIAL.
8. ALL EXCESS SOIL SHALL BE OFF-HAULED TO A LEGAL DISPOSAL SITE. NO EXCESS SOIL SHALL BE SPREAD ON THE SITE WITHOUT CLEARLY BEING SHOWN ON THE APPROVED GRADING PLAN.
9. ALL CUT AND FILL SLOPES AND ALL EXPOSED DIRT SHALL BE PLANTED, WATERED AND MAINTAINED UNTIL EFFECTIVE EROSION CONTROL HAS BEEN ESTABLISHED TO THE SATISFACTION OF THE STATE OR COUNTY AS APPLICABLE.
10. CONTRACTOR SHALL PROVIDE HIS/HER OWN EARTHWORK CALCULATIONS FOR ALL CUT AND FILL OPERATIONS.

ABBREVIATIONS:

AC – ASPHALT CONCRETE
ACP – ABESTOS CEMENT PIPE
ADD'L – ADDITIONAL
AD – AREA DRAIN
ADJ – ADJACENT
ANSI – AMERCIAN NATIONAL STANDARDS INSTITUTE
ALT – ALTERNATE
ALUM – ALUMINUM
APPROX – APPROXIMATE(LY)
ARCH – ARCHITECT(URAL)
AP – ANGLE POINT
ASPH – ASPHALT
ASSY – ASSEMBLY
ASTM – AMERICAN SOCIETY OF TESTING AND MATERIALS
AVE – AVENUE
BC – BACK OF CURB
BF – BLIND FLANGE
BLDG – BUILDING
BLDC – BUILDING CORNER
BLK – BLOCK
BLVD – BOULEVARD
BM – BENCHMARK
BNDY – BOUNDARY
BO – BLOW OFF
BOW – BOTTOM OF WALL (AT FINISHED GRADE)
BSBL – BUILDING SETBACK LINE
BVC – BEGINNING OF VERTICAL CURVE
BVCE – BEGIN VERTICAL CURVE ELEVATION
BVCS – BEGIN VERTICAL CURVE STATION
BW – BACK OF WALK
CB – CATCH BASIN
CF – CUBIC FEET (FOOT)
CIP – CAST IRON PIPE
CJ – CONSTRUCTION JOINT
CL – CLASS
C/L – CENTER LINE
CLR – CLEARENCE
CMP – CORRUGATED METAL PIPE
CO – CLEAN OUT
CONN – CONNECTION
CONT – CONTINUOUS (CONTINUED)
CONTR – CONTRACTOR
C, CONC – CONCRETE
CONST – CONSTRUCTION
CP – CONTROL POINT
CFS – CUBIC FEET PER SECOND
CTR – CENTER(ED)
CTV – CABLE TV
C&G – CURB AND GUTTER
CY – CUBIC YARD
DCVA – DOUBLE CHECK VALVE ASSEMBLY
DDCV – DOUBLE DETECTOR CHECK VALVE
DEPT. – DEPARTMENT
DET – DETAIL OR DETENTION
DIP – DUCTILE IRON PIPE
DIA(S) – DIAMETER
DIM – DIMENSION
DOT – DEPARTMENT OF TRANSPORTATION
DS – DOWN SPOUT
DWG – DRAWING
E – EAST(ING)
EA – EACH
EL – ELEVATION
ELEC – ELETRICAL
EP – EDGE OF PAVEMENT
EQUIV – EQUIVALENT
EVC – END OF VERTICAL CURVE
EVCE – END OF VERTICAL CURVE ELEVATION
EVCS – END OF VERTICAL CURVE STATION
EX, EXIST – EXISTING
FC – FACE OF CURB
FD – FLOOR DRAIN
FDC – FIRE DEPARTMENT CONNECTION
FFE – FINISH FLOOR ELEVATION
FH – FIRE HYDRANT
FL – FLANGED OR FLOW LINE
FLR – FLOOR
FS – FINISHED SURFACE
FT (') – FOOT (FEET)
FTG – FOOTING
G – GAS MAIN
GA – GAUGE
GALV – GALVANIZED
GB – GRADE BREAK
GM– GAS METER
GRD – GRADE
HB – HOSE BIBB
HDPE – HIGH DENSITY POLYETHYLENE
HORIZ (H) – HORIZONTAL
HT – HEIGHT
HYD – HYDRANT
ID – INSIDE DIAMETER
IE – INVERT ELEVATION
IN (") – INCHES
INV – INVERT
IRR – IRRIGATION WATER
L – LENGTH
LB, # – POUND(S)
LF – LINEAR FEET
LN – LANE
MAT'L – MATERIAL
MAX – MAXIMUM
MFR – MANUFACTURER
MH – MANHOLE
MIN – MINIMUM
MISC – MISCELLANEOUS
MJ – MECHANICAL JOINT
N – NORTH(ING)
NO (#) – NUMBER
N.T.S. – NOT TO SCALE
O.C. – ON CENTER
O.D. – OUTSIDE DIAMETER
O/W – OIL WATER
P – POWER
PC – POINT OF CURVATURE
PERF – PERFORATED
PI – POINT OF INTERSECTION
PIV – POST INDICTOR VALVE
PL – PROPERTY LINE
PP – POWER POLE
PROV – PROVIDED
PSF – POUNDS PER SQUARE FOOT
PSI – POUNDS PER SQUARE INCH
PT – POINT OF TANGENCY
PVC – POLYVINYL CHLORIDE
PVI – POINT OF VERTICAL INTERSECTION
PVMT – PAVEMENT
PVT – POINT OF VERTICAL TANGENT
QTY – QUANTITY
RAD (R) – RADIUS
RCP – REINFORCED CONCRETE PIPE
RD – ROAD
REF – REFERENCE
REINF – REINFORCED
REQ – REQUIRED
RET – RETAINING
ROW – RIGHT-OF-WAY
RR – RAILROAD
S – SOUTH
S, SL – SLOPE
SCH – SCHEDULE
SD – STORM DRAIN
SF – SQUARE FOOT
SHT – SHEET
SIM – SIMILAR
SPEC – SPECIFICATION(S)
SQ – SQUARE
SS – SANITARY SEWER
ST – STREET
STA – STATION
STD – STANDARD
STL – STEEL
T – TELEPHONE WIRE
TBM – TEMPORARY BENCH MARK
TC – TOP OF CURB
TEMP – TEMPORARY
TG/RIM – TOP OF GRATE/RIM
THRU – THROUGH
TOE – TOE OF WALL OR SLOPE
TOP – TOP OF WALL OR SLOPE
TOW – TOP OF WALL
TYP – TYPICAL
VC – VERTICAL CURVE
VOL – VOLUME
W – WEST
W/ – WITH
WM – WATER METER
W/O – WITHOUT
WQ – WATER QUALITY
WT – WEIGHT
WWF – WELDED WIRE FABRIC
WV – WATER VALVE
YD – YARD DRAIN

LEGEND

	EXISTING:	PROPOSED:
BOUNDARY LINE/RIGHT-OF-WAY		
LOT LINE		
STREET MONUMENT (IN CONCRETE)		
PROPERTY CORNER		
BENCHMARK/CONTROL POINT		
TEMPORARY BENCHMARK	TBM	TBM
EASEMENT LINE		
CENTERLINE		
CURB/GUTTER/SIDEWALK LINE		
EDGE OF PAVEMENT LINE		
CHAIN LINK FENCE LINE		
SIGN		
STREET LIGHT (ELECTROLIER)		
GRADE BREAK LINE		
CONTOUR LINE (MAJOR)	1650	1650
CONTOUR LINE (MINOR)	1651	1651
CATCH BASIN (TYPE 1)		
STORM DRAIN MANHOLE/CATCH BASIN TYPE 2		
STORM DRAIN LINE	SD	
CONTROL STRUCTURE		
RIP-RAP PAD		
SANITARY SEWER LINE	SS	
SANITARY SEWER CLEANOUT		
SANITARY SEWER MANHOLE		
WATERMAIN LINE	W	
GATE VALVE (MECHANICAL JOINT)		
GATE VALVE (FLANGE)		
WATER METER		
FIRE HYDRANT		
CAP		
GAS LINE	G	G
GAS VALVE		
UNDERGROUND ELECTRIC LINE	E	E
POWER POLE / UTILITY POLE		
GUY ANCHOR		
ELECTRICAL TRANSFORMER / VAULT	P	P
TELEPHONE VAULT/PEDESTAL	T	T
TELEPHONE MANHOLE	T	T
100-YR FLOODPLAIN HATCH		
CONCRETE HATCH		
GRAVEL HATCH		
ALL WEATHER ROAD HATCH (COMPACTED SOIL OR GRAVEL)		

CONTRACTOR RESPONSIBILITY:

CONTRACTOR AGREES THAT HE SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS, INCLUDING THE SAFETY OF ALL PERSONS AND PROPERTY, DURING THE COURSE OF CONSTRUCTION OF THIS PROJECT, AND THAT THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS. THE CONTRACTOR SHALL DEFEND, INDEMNIFY AND HOLD THE OWNER AND THE ENGINEER HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXCEPTING FOR LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE OWNER OR THE ENGINEER.

DISCREPANCIES:

IF THERE ARE ANY DISCREPANCIES BETWEEN DIMENSIONS IN DRAWINGS AND EXISTING CONDITIONS WHICH WILL AFFECT THE WORK, THE CONTRACTOR SHALL BRING SUCH DISCREPANCIES TO THE ATTENTION OF THE ENGINEER FOR ADJUSTMENT BEFORE PROCEEDING WITH THE WORK. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROPER FITTING OF ALL WORK AND FOR THE COORDINATION OF ALL TRADES, SUBCONTRACTORS, AND PERSONS ENGAGED UPON THIS CONTRACT.

REVISIONS		
DESCRIPTION	BY	DATE

© THE PLANS SET FORTH ON THIS SHEET ARE AND SHALL REMAIN THE PROPERTY OF ENCOMPASS ENGINEERING & SURVEYING

TODD MICHOULIS WOOD
STATE OF WASHINGTON
40995
REGISTERED
PROFESSIONAL ENGINEER

TUSSO ENERGY, LLC
FUMARIA SITE
NOTES, LEGEND & ABBREVIATIONS

Encompass
ENGINEERING & SURVEYING
165 NE Juniper Street, Suite 201 • Issaquah, WA 98027 • Phone: (425) 392-0250 • Fax: (425) 391-3055
Western Washington Division
407 Stellinator Blvd • Cle Elum, WA 98922 • Phone: (509) 674-7433 • Fax: (509) 674-7419
Eastern Washington Division

JOB NO.	17016
DATE	Sept. 27 2017
SCALE	AS SHOWN
DESIGNED	SF
DRAWN	SF
CHECKED	TML
APPROVED	TML
SHEET	C1.1

TUUSSO ENERGY - FUMARIA SITE

A PORTION OF THE SE ¼ OF SECTION 9, T. 18 N., R. 18 E., W.M.

KITTITAS COUNTY, STATE OF WASHINGTON

SYSTEM SUMMARY	
kWDC	5,961.6
kVAAC	5,000.0
INVERTER QTY.	5
MODULE QTY.	17,280
DC SYSTEM VOLTAGE (V)	1000
DC SYSTEM VOLTAGE (kV)	12.47
INVERTER AC RATING (KVA)	1000
PV MODULE MODEL #	QCELLS 345W
PV MODULE NAMEPLATE (W)	345
RACKING SYSTEM	NEXTRACKER
GROUND COVERATE RATIO	0.33
DC:AC RATIO	1.19
MODULE TILT	TRACKER, +/-60°

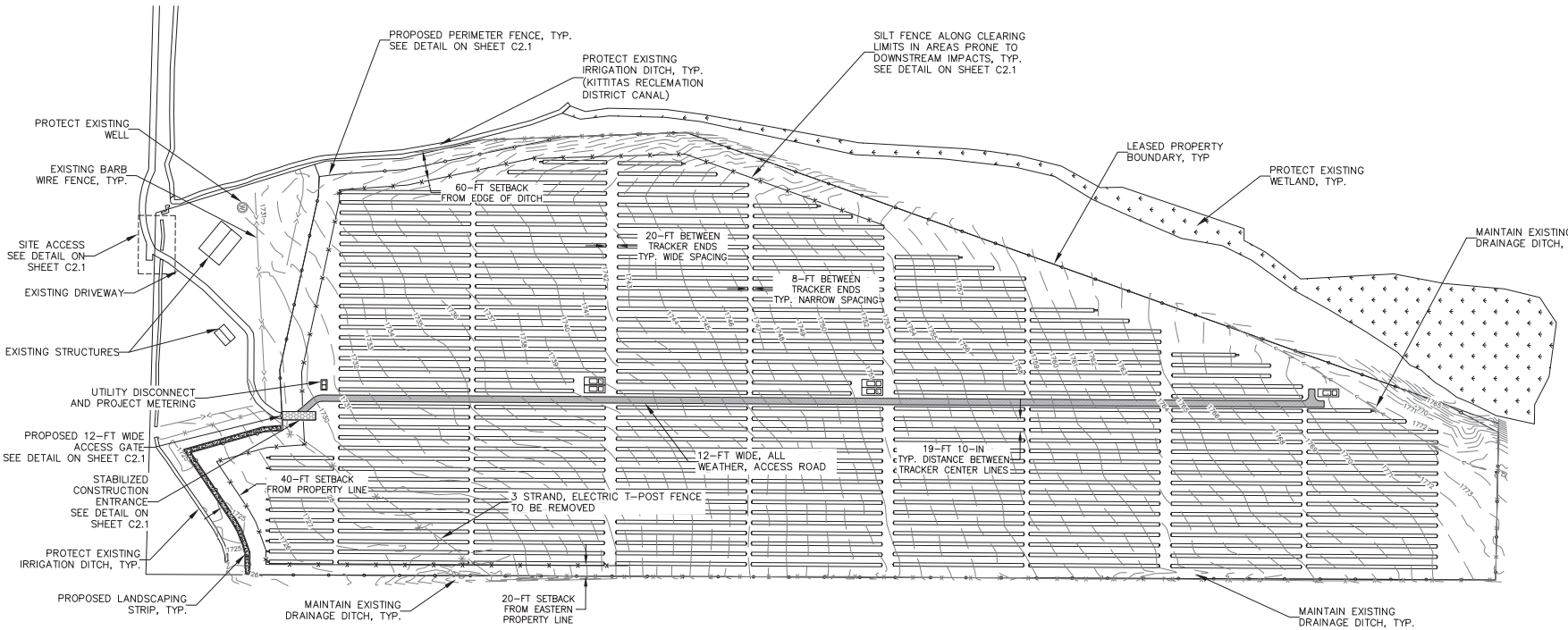
LEGEND

- INVERTER STATION
- 72 MODULE TRACKER
- 54 MODULE TRACKER
- 36 MODULE TRACKER

NORTH

05 25 50 100

SCALE 1" = 100'



SHEET NOTES:

1. REFER TO STANDARD PLAN NOTES ON SHEET C1.1.
2. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH STATE OR COUNTY STANDARDS AS APPLICABLE. IT SHALL BE THE SOLE RESPONSIBILITY OF THE APPLICANT AND THE PROFESSIONAL CIVIL ENGINEER TO CORRECT ANY ERROR, OMISSION, OR VARIATION FROM THE ABOVE REQUIREMENTS FOUND IN THESE PLANS.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ADEQUATE SAFEGUARDS, SAFETY DEVICES, PROTECTIVE EQUIPMENT, FLAGGERS, AND ANY OTHER NEEDED ACTIONS TO PROTECT THE LIFE, HEALTH, AND SAFETY OF THE PUBLIC, AND TO PROTECT PROPERTY IN CONNECTION WITH THE PERFORMANCE OF WORK COVERED BY THE CONTRACTOR. ANY WORK WITHIN THE TRAVELED RIGHT-OF-WAY THAT MAY INTERRUPT NORMAL TRAFFIC FLOW SHALL REQUIRE AT LEAST ONE FLAGGER FOR EACH LANE OF TRAFFIC AFFECTED. ALL SECTIONS OF THE WSDOT STANDARD SPECIFICATIONS 1-07.23 - TRAFFIC CONTROL, SHALL APPLY.
4. ANY TRENCH DEEPER THAN 5 FEET WILL REQUIRE SHORING FOR TRENCH WALL STABILIZATION.

TESC NOTES:

1. SILT FENCE TO BE INSTALLED AS STAND-ALONE UNLESS RUNNING ALONG EXIST. FENCE.
2. CONTRACTOR'S STAGING AREA AND STOCKPILE AREAS SHALL BE DETERMINED PRIOR TO START OF CONSTRUCTION.

RECOMMENDED CONSTRUCTION SEQUENCE:

(1) PRE-CONSTRUCTION MEETING.
(2) GRADE AND INSTALL CONSTRUCTION ENTRANCE(S).
(3) INSTALL PERIMETER PROTECTION (SILT FENCE, BRUSH BARRIER, ETC.).
(4) GRADE AND STABILIZE CONSTRUCTION ROADS.
(5) INSTALL WIDE FLANGE STEEL PILES.
(6) INSTALL ELECTRICAL UNDERGROUND AND MECHANICAL TRACKERS
(7) INSTALL PANELS
(8) PERFORM ANY REQUIRED SITE RESTORATION

TESC LEGEND:

- SILT FENCE - SEE DETAIL ON SHEET C2.1
- CONSTRUCTION ENTRANCE - SEE DETAIL ON SHEET C2.1

REVISIONS			
DESCRIPTION	BY	DATE	

© THE PLANS SET FORTH ON THIS SHEET ARE, AND SHALL REMAIN THE PROPERTY OF ENCOMPASS ENGINEERING & SURVEYING

TODD MICOULIS MCKENZIE STATE OF WASHINGTON 46995 REGISTERED PROFESSIONAL ENGINEER

TUSSO ENERGY, LLC
FUMARIA SITE
TESC, GRADING, AND DRAINAGE PLAN

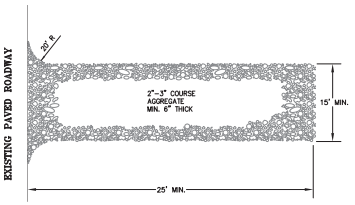
Encompass ENGINEERING & SURVEYING
Eastern Washington Division
165 NE Juniper Street, Suite 201 • Issaquah, WA 98027 • Phone: (425) 392-0250 • Fax: (425) 391-3055
Western Washington Division
407 Swiftwater Blvd. • Cle Elum, WA 98922 • Phone: (509) 674-7433 • Fax: (509) 674-7419

JOB NO.	17016
DATE	Sept. 27 2017
SCALE	AS SHOWN
DESIGNED	SF
DRAWN	SF
CHECKED	TML
APPROVED	TML
SHEET	C2.0

TUUSSO ENERGY - FUMARIA SITE

A PORTION OF THE SE ¼ OF SECTION 9, T. 18 N., R. 18 E., W.M.

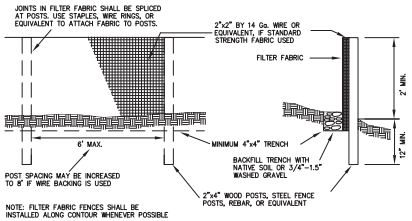
KITTITAS COUNTY, STATE OF WASHINGTON



NOTES:
1. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION THAT WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY. THIS MAY REQUIRE TOP DRESSING, REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT.
2. WHEN NECESSARY, WHEELS SHALL BE CLEANED PRIOR TO ENTRANCE ONTO PUBLIC RIGHT-OF-WAY.
3. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH CRUSHED STONE THAT DRAINS INTO AN APPROVED SEDIMENT TRAP OR SEDIMENT BASIN.

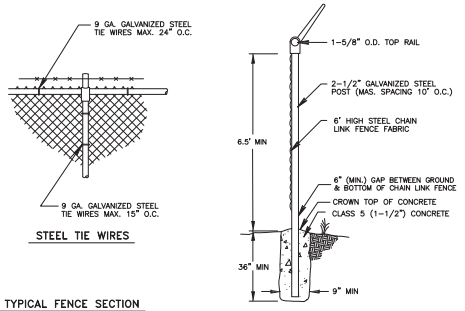
ROCK CONSTRUCTION ENTRANCE

N.T.S.



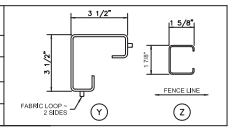
SILT FENCE DETAIL

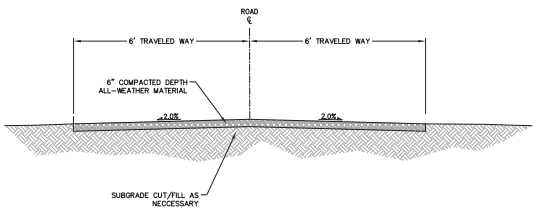
N.T.S.



TYPICAL FENCE SECTION

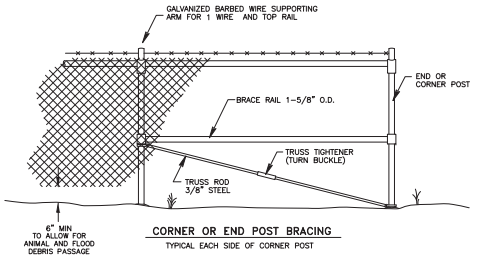
POST AND RAIL SPECIFICATIONS				
POST	PIPE		ROLL FORMED	
	NOM. SIZE (SCH. 40) I.D.		SECTION	WEIGHT (lb/ft)
END, CORNER, OR PULL POST	2 1/2" DIAM.		(Y)	5.10
LINE OR BRACE POST	2" DIAM.		(Z)	1.85





TYPICAL ALL-WEATHER ACCESS ROAD SECTION

N.T.S.

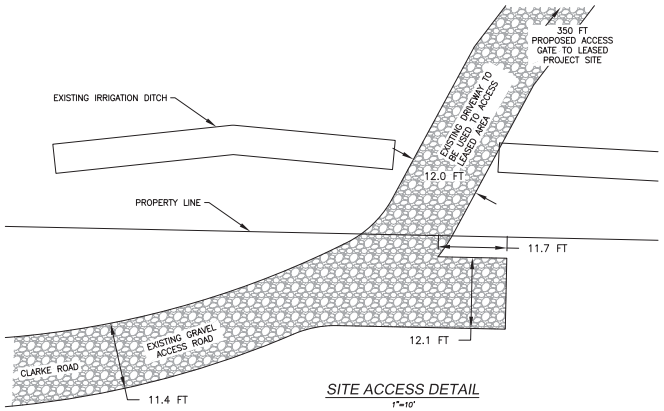


CORNER OR END POST BRACING

TYPICAL EACH SIDE OF CORNER POST

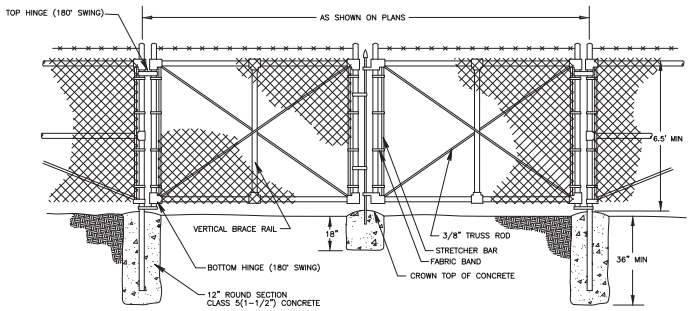
CHAIN LINK FENCE DETAIL

N.T.S.



SITE ACCESS DETAIL

1"=10'



CHAIN LINK FENCE GATE DETAIL

N.T.S.

REVISIONS

DESCRIPTION	BY	DATE

© THE PLANS SET FORTH ON THIS SHEET ARE, AND SHALL REMAIN THE PROPERTY OF ENCOMPASS ENGINEERING & SURVEYING

TODD MICHAEL MCCOULIS — STATE OF WASHINGTON — 46995 — REGISTERED PROFESSIONAL ENGINEER

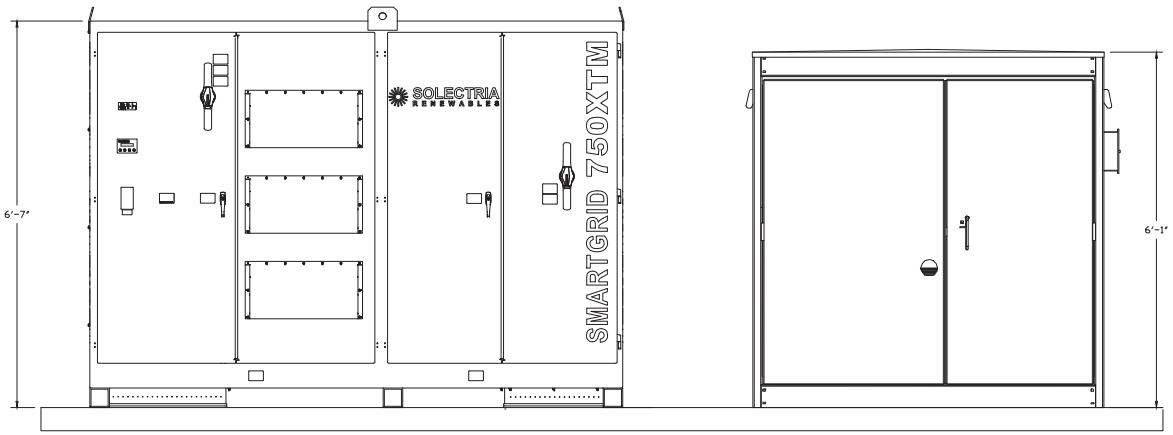
TUUSSO ENERGY, LLC

FUMARIA SITE

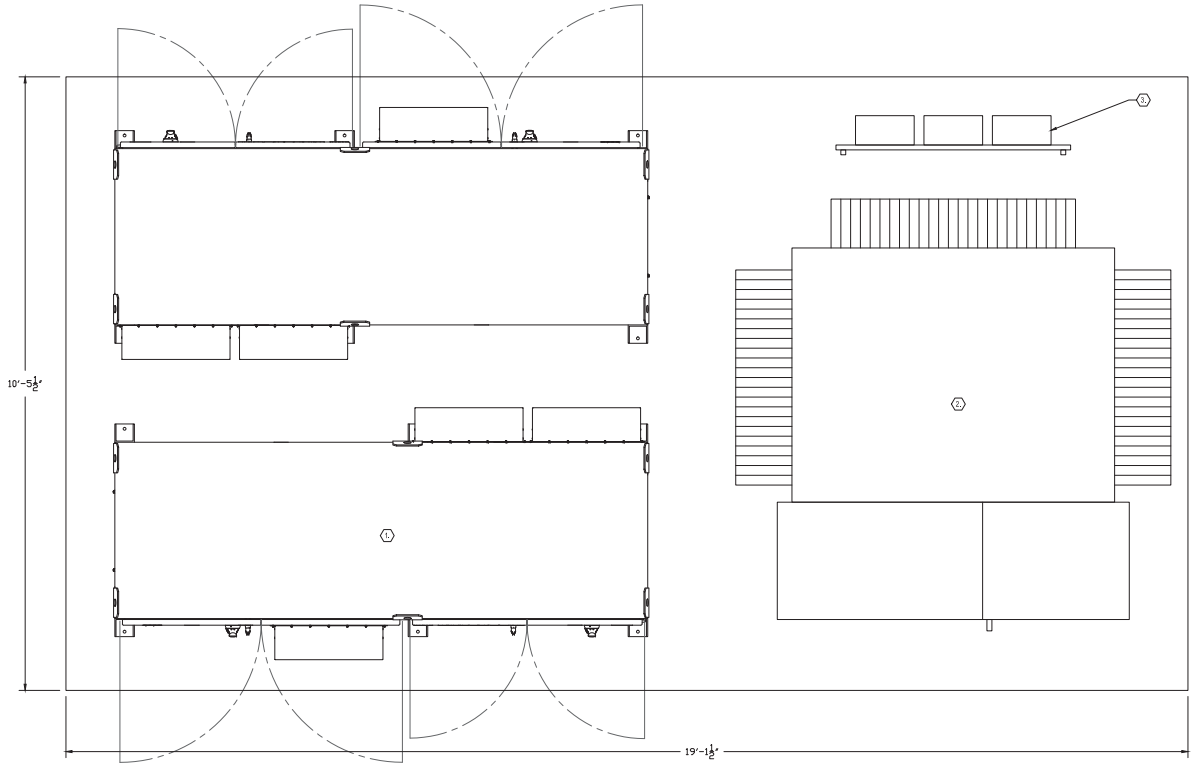
TESC DETAILS AND STANDARD DETAILS

Encompass
ENGINEERING & SURVEYING
163 NE Juniper Street, Suite 201 • Issaquah, WA 98027 • Phone: (425) 392-6250 • Fax: (425) 391-3055
Eastern Washington Division
107 Stellmon Road • Cle Elum, WA 98922 • Phone: (509) 674-7433 • Fax: (509) 674-7419

JOB NO.	17016
DATE	Sept. 27 2017
SCALE	AS SHOWN
DESIGNED	SF
DRAWN	SF
CHECKED	TML
APPROVED	TML
SHEET	C2.1



A 1500 kVA BLOCK ELEVATION
SCALE: 1"=1'



B 1500 kVA BLOCK LAYOUT
SCALE: 1"=1'

NOTES:
1. NONE.

KEYED NOTES:
1. SOLECTRIA SGI 750KVA INVERTER
2. 1500KVA 15KV TRANSFORMER
3. COMMUNICATION RACK

TUUSSO ENERGY

MaxPV ENGINEERING DEVELOPMENT
3231 POLYGON // SACRAMENTO, CA
WWW.MAXPVENGINEERING.COM

REV. NO.	DATE	DESCRIPTION	BY	CHK.	APR.
A	08-09-17	FOR PLAN REVIEW	LB	–	–

OWNER: TUUSSO ENERGY

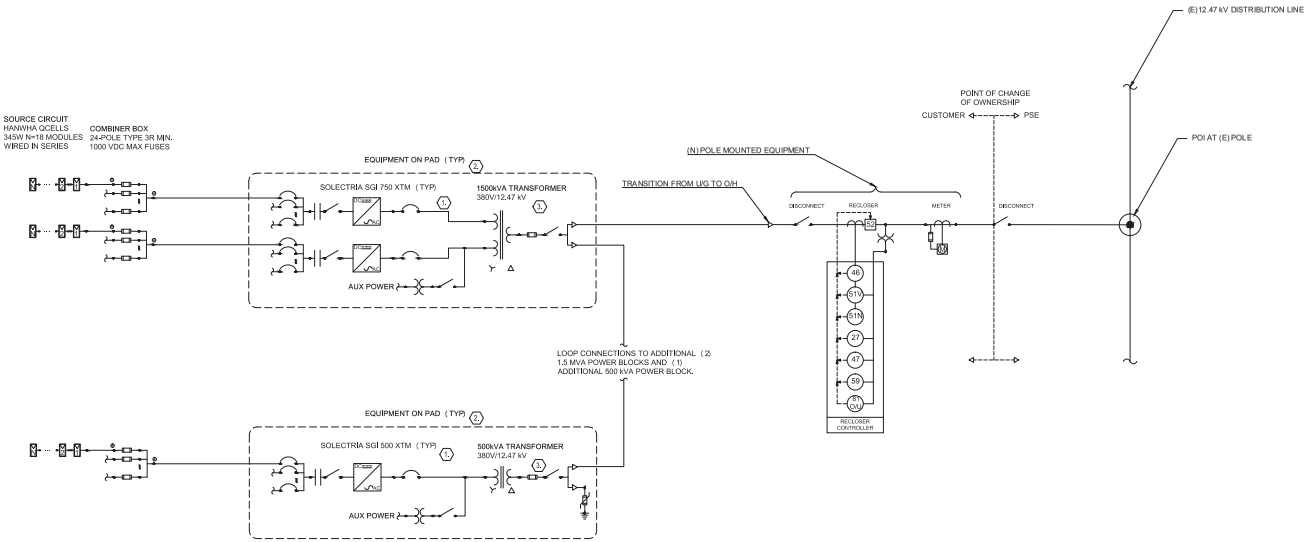
PROJECT SITE: FUMARIA SOLAR PROJECT

DRAWING: EQUIPMENT PAD DETAILS

DRAWING NO. E-401

THIS PRINT IS NOT TO BE USED FOR CONSTRUCTION UNLESS NOTED AND SIGNED OK FOR CONSTRUCTION ABOVE LAST REVISION.

THE INFORMATION CONTAINED IN THESE DRAWINGS ARE CONFIDENTIAL AND ARE INTENDED FOR THE DESCRIBED PROJECT ONLY.



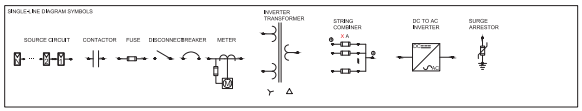
NOTES:

1. NONE.

KEYED NOTES:

1. **PV POWER CONDITIONING SYSTEM:** IEEE 929 AND IEEE 1547 COMPLIANT- 1000VDC MAX INPUT VOLTAGE. INVERTER EQUIPPED WITH INTEGRATED DC CIRCUIT BREAKER COMBINER.
2. EQUIPMENT PAD WITH INVERTER(S), STEP UP TRANSFORMER, AND COMMUNICATION EQUIPMENT.
3. TRANSFORMER SPECIFICATIONS TBD. VERIFY WITH INVERTER MFR & PSE FOR FINAL TRANFORMER CONFIGURATION.

SINGLE-LINE DIAGRAM SYMBOLS



THE INFORMATION CONTAINED IN THESE DRAWINGS ARE CONFIDENTIAL AND ARE INTENDED FOR THE DESCRIBED PROJECT ONLY.

TUUSSO ENERGY

MaxPV ENGINEERING DEVELOPMENT
925 POLYGON // SACRAMENTO, CA
WWW.MAXPVENGINEERING.COM

REV. NO.	DATE	DESCRIPTION	BY	CHK.	APR.
A	08-09-17	FOR PLAN REVIEW	LB	–	–

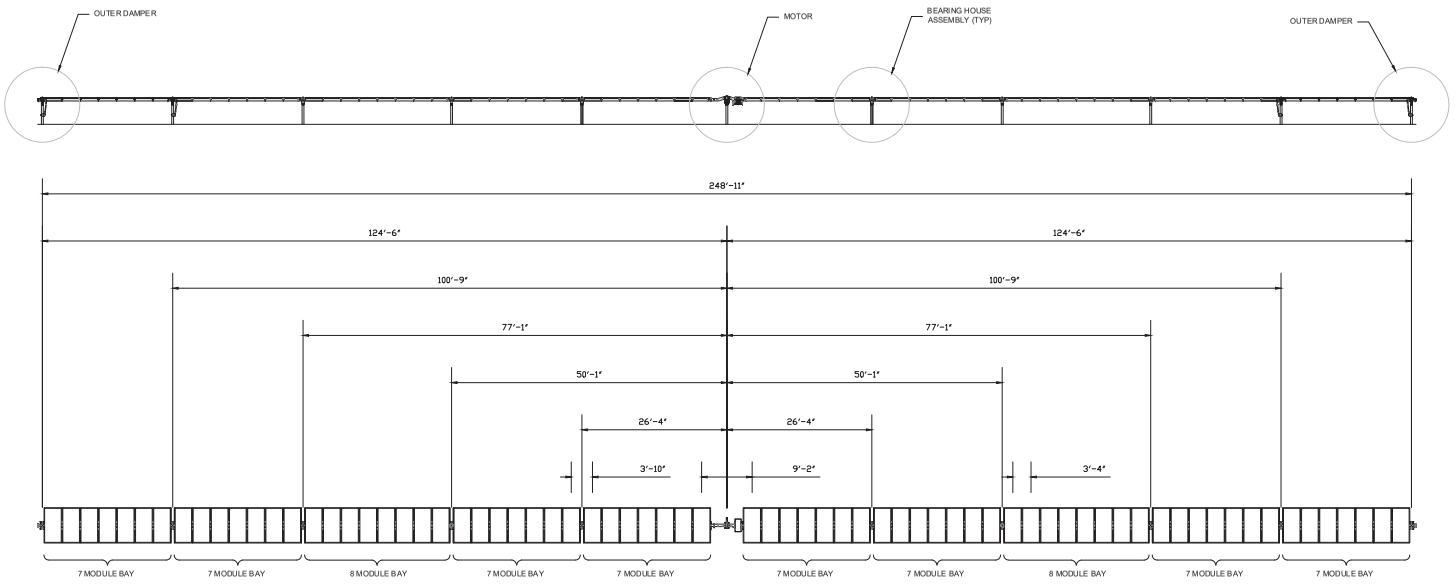
OWNER: TUUSSO ENERGY

PROJECT SITE: FUMARIA SOLAR PROJECT

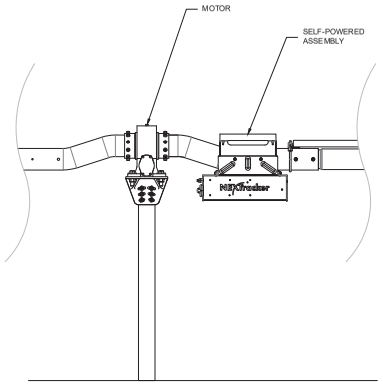
DRAWING: SINGLE LINE DIAGRAM

DRAWING NO. E-601

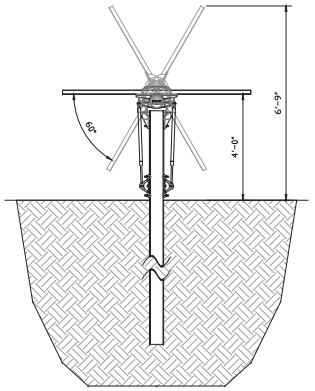
THIS PRINT IS NOT TO BE USED FOR CONSTRUCTION UNLESS NOTED AND SIGNED OK FOR CONSTRUCTION ABOVE LAST REVISION.



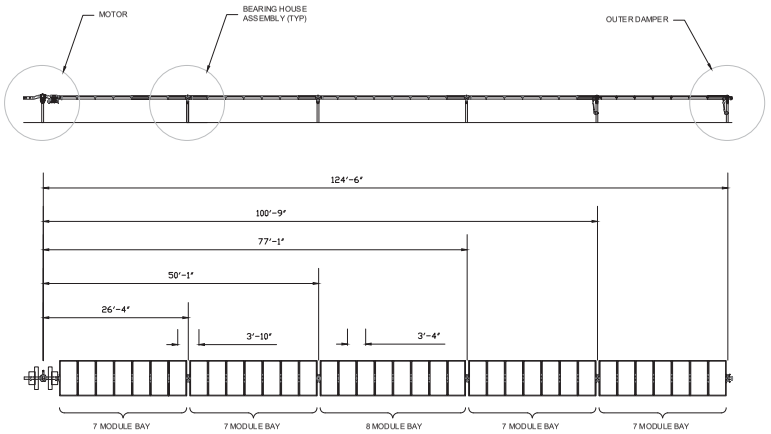
A 72 MODULE TRACKER



B MOTOR PILE DETAIL



C TRACKER PROFILE



D 36 MODULE TRACKER

THE INFORMATION CONTAINED IN THESE DRAWINGS ARE CONFIDENTIAL AND ARE INTENDED FOR THE DESCRIBED PROJECT ONLY.

NOTES:

1. NONE.

KEYED NOTES:

1. NONE.

TUUSSO ENERGY

MaxPV ENGINEERING DEVELOPMENT

320 PROVIDIAN // SACRAMENTO, CA
WWW.MAXPVENGINEERING.COM

REV. NO.	DATE	DESCRIPTION	BY	CHK.	APR.
A	08-09-17	FOR PLAN REVIEW	LB	–	–

OWNER: TUUSSO ENERGY

PROJECT SITE: FUMARIA SOLAR PROJECT

DRAWING: TRACKER ELEVATIONS

DRAWING NO. E-701

THIS PRINT IS NOT TO BE USED FOR CONSTRUCTION UNLESS NOTED AND SIGNED OK FOR CONSTRUCTION ABOVE LAST REVISION.



The Q.ANTUM solar module Q.PLUS L-G4.2 with power classes up to 345 Wp is the strongest module of its type on the market globally. Powered by 72 Q CELLS solar cells Q.PLUS L-G4.2 was specially designed for large solar power plants to reduce BOS costs. Only Q CELLS offers German engineering quality with our unique triple Yield Security.



LOW ELECTRICITY GENERATION COSTS
Higher yield per surface area and lower BOS costs thanks to higher power classes and an efficiency rate of up to 17.6 %.

INNOVATIVE ALL-WEATHER TECHNOLOGY
Optimal yields, whatever the weather with excellent low-light and temperature behavior.

ENDURING HIGH PERFORMANCE
Long-term yield security with Anti-PID Technology[1], Hot-Spot-Protect and Traceable Quality Tra.Q™.

EXTREME WEATHER RATING
High-tech aluminum alloy frame, certified for high snow (5400 Pa) and wind loads (2400 Pa).

A RELIABLE INVESTMENT
Inclusive 12-year product warranty and 25-year linear performance guarantee[2].

THE IDEAL SOLUTION FOR:

Engineered in Germany

Q CELLS



Our most amazing tracker yet.

In our mission to make solar a mainstream energy source, NEXTracker has engineered the most intelligent and flexible tracking technology yet. Using sustainable design methods with outcomes that benefit people and the planet, we bring you: NX Horizon™.

NX Horizon (formerly referred to as the Self-Powered Tracker or SPT), brings self-contained motor power to each row, eliminating power wiring and trenching. Our advanced horizontal tracker has the widest rotational range available, lowest O&M costs, and requires far less power to operate than other trackers. By offering more powerful systems at a greater value, NEXTracker enables greater deployment of renewable energy worldwide.

NX Horizon key features and benefits include:

– Self-powered system with smart performance communications: Self-contained units on each row include a dedicated PV panel to provide power to the controller which drives the motor and hosts intelligent control electronics to position each tracker. With smart communications built in, NX Horizon systems can be accessed remotely, providing customers with a granular view to optimize tracker performance, operations and maintenance.

– Independent balanced rows with 120 degree rotational range: Each NX Horizon row has its own controlled motor with rotational range that delivers up to 2% more energy than typical linked row trackers. These agile, independent rows stow in less than 90 seconds to reduce wind forces on the array, protecting the PV modules in harsh environments. NX Horizon solar trackers also have a mechanically balanced row design that align PV panels with the tracker's axis of rotation – which greatly reduces row torque, using less energy from the motor to track throughout the day.

– Self-grounded system with theft-proof fasteners: NX Horizon is the world's first horizontal tracker with an entirely self-grounded design. This means no separate bonding hardware is required. You save on material and associated costs by eliminating grounding washers, braided straps, bare copper wire, and grounding rods. What's more, we've designed our own fasteners that can only be removed with special tools – deterring PV theft.

YASKAWA SOLECTRIA SOLAR



SGI 500XTM
SGI 750XTM

FEATURES
- Compliant with NEC 2014 690.11 & 690.12 arc-fault and rapid shutdown requirements when coupled with ARCCOM combiner
- 98% CEC efficiency
- 1000 VDC
- Parallel power stages
- Fuse and breaker subcombiner options
- Modbus communications
- User-interactive LCD

OPTIONS
- Stainless steel enclosure
- Web-based monitoring
- Built-in cellular connectivity
- AC breaker with shunt trip
- Revenue grade metering
- Air filters
- Uptime guarantee

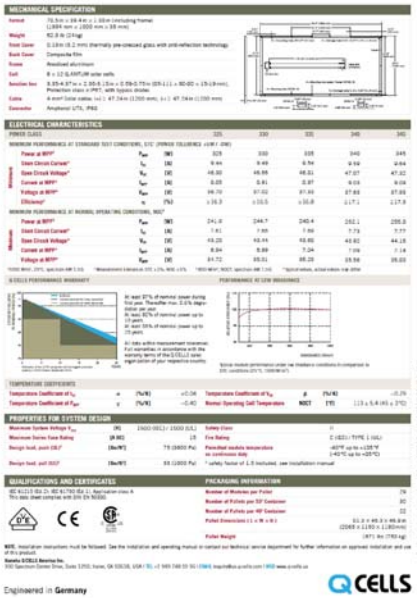
OPTIONS FOR UTILITIES
- Real power curtailment
- Reactive power control
- Voltage ride through
- Frequency ride through
- Controlled ramp rates
- DNP3 Serial
- Rule 21 compliant

SOLECTRIA.COM

1000VDC UTILITY-SCALE INVERTERS

The only 1000VDC inverter available that is compliant with NEC 2014 690.11 & 690.12 arc-fault and rapid shutdown requirements, Yaskawa – Solectria Solar's SMARTGRID series inverters are optimized for high efficiency, reliability, and economy. Available in two power classes, 500 kW and 750 kW, these inverters are designed for direct connection to an external transformer for large commercial or utility-scale applications. They are robust, outdoor rated inverters that can be configured as 1 or 1.5 MW Solar Stations. Available utility-scale options include advanced grid management features such as voltage and frequency ride through, reactive power control, real power curtailment and power factor control. Listed to 1000 VDC with 98% CEC weighted efficiency, the SGI 500/750XTM inverters set a new standard for large scale power conversion.





MECHANICAL SPECIFICATION

ELECTRICAL CHARACTERISTICS

PROPERTIES FOR SYSTEM DESIGN

QUALIFICATIONS AND CERTIFICATES

PACKAGING INFORMATION

Engineered in Germany

Q CELLS

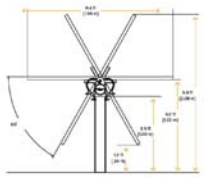
THE INFORMATION CONTAINED IN THESE DRAWINGS ARE CONFIDENTIAL AND ARE INTENDED FOR THE DESCRIBED PROJECT ONLY.

NX Horizon Specifications

Tracking Technology	Horizontal single-axis balanced-mass tracker with independently-driven rows
Tracking Range	Up to 120° (±60°)
Control System	1 Self-Powered Controller (SPC) per tracker; 1 Network Control Unit (NCU) per 100 SPCs
Communications	Wireless ZigBee® mesh network/SCADA; no communication wiring required
Drive System	One slew gear, 24 VDC motor and self-powered controller w/dedicated solar panel per row
DC Capacity	23 35k/m per tracker row, depending on panel type. Row length up to 90 panels.
System Voltage	1,500 volt or 1,500 volt
Power Consumption	No grid power required
Ground Coverage Ratio	Fully configurable by customer; typical range 33%-50%
Installation Method	Rapid field assembly, no welding required
Foundation Types	Compatible with all major foundation types (driven pier, concrete foundation, ground screw)
Standard Wind Design	100 mph/161 kph, 3 second gust per ASCE7 10; configurable for higher wind speeds
Safety Stowing	Automated wind and snow stowing with self-contained backup power; no external power required
Torsional Limiter	Included at each foundation/bearing for additional wind and snow load protection
Principal Materials	Galvanized and stainless steel
Grounding Method	Self-grounding structure; separate materials and labor not required
Compliance	Grounding/bonding: UL2703; structural design: ASCE7 10
Other Available Options	Snow and flood sensors
Warranty	10-years on structural components; 5-years on drive and control systems
Typical Dimensions	Height 2.1 m/6.8 ft @ 60°; Width 2.0 m/6.4 ft; Length 85 m/283 ft

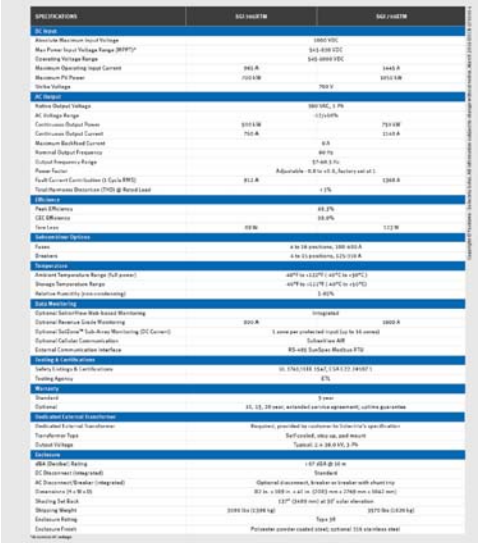
Typical 72-cell c-Si configuration: 85 m row with 80 panels mounted in portrait:





NEXTracker
6200 Paseo Padre Parkway
Fremont, CA 94555 USA
+1 510 270 2500
nextracker.com

© NEXTracker Inc. Contents subject to change without notice.



SPECIFICATIONS

	SGI 500XTM	SGI 750XTM
DC Input		
Absolute Maximum Input Voltage	1000 VDC	
Max Power Input Voltage Range (MPPT)*	545-850 VDC	
Operating Voltage Range	545-1000 VDC	
Maximum Operating Input Current	941 A	1441 A
Maximum PV Power	700 kW	1072 kW
Strike Voltage	750 V	
AC Output		
Native Output Voltage	380 VAC, ± 3%	
AC Voltage Range	-12/+10%	
Continuous Output Power	500 kW	750 kW
Continuous Output Current	760 A	1140 A
Maximum Backfeed Current	0 A	
Nominal Output Frequency	60 Hz	
Output Frequency Range	57-63.5 Hz	
Power Factor	Adjustable - 0.8 to +0.8, factory set at 1	
Fault Current Contribution (1 Cycle RMS)	912 A	1368 A
Total Harmonic Distortion (THD) @ Rated Load	< 3%	
Efficiency		
Peak Efficiency	98.3%	
CEC Efficiency	98.0%	
Tare Loss	400 W	512 W
Subcombiner Options		
Fuses	4 to 16 positions, 300-400 A	
Breakers	4 to 15 positions, 125-350 A	
Temperature		
Ambient Temperature Range (full power)	-40°F to +122°F (-40°C to +50°C)	
Storage Temperature Range	-40°F to +122°F (-40°C to +50°C)	
Relative Humidity (non-condensing)	0-95%	
Data Monitoring		
Optional Subcombiner Web-based Monitoring	Integrated	
Optional Revenue Grade Monitoring	300 A	1800 A
Optional SolGate™ Sub-Array Monitoring (DC Current)	1 zone per protected input (up to 16 zones)	
Optional Cellular Communication	SolarGate AIR	
External Communication Interface	RS-485 SunSpec Modbus RTU	
Safety & Certifications		
Safety Listings & Certifications	UL 1741/IEEE 1547, CSA C22.2#107.1	
Testing Agency	ETL	
Warranty		
Standard	5 years	
Optional	10, 15, 20 years; extended service agreement; uptime guarantee	
Dedicated External Transformer		
Dedicated External Transformer	Required, provided by customer to Solectria's specification	
Transformer Type	Self-cooled, step-up, pad mount	
Output Voltage	Typical: 2.4-34.5 kV, 3-Ph	
Enclosure		
dBA (Decibel) Rating	< 67 dBA @ 10 m	
DC Disconnect (integrated)	Standard	
AC Disconnect/Breaker (integrated)	Optional disconnect, breaker or breaker with shunt trip	
Dimensions (H x W x D)	82 in. x 108 in. x 41 in. (2083 mm x 2743 mm x 1041 mm)	
Mounting Set Back	120" (3048 mm) at 30° solar elevation	
Shipping Weight	3090 lbs (1398 kg)	3570 lbs (1620 kg)
Enclosure Rating	Type 3R	
Enclosure Finish	Polyester powder coated steel; optional 316 stainless steel	

YASKAWA SOLECTRIA SOLAR www.solectria.com | inverters@solectria.com | 978.683.9700

TUUSSO ENERGY

MaxPV ENGINEERING DEVELOPMENT
SOLPROVIDER // SACRAMENTO, CA
WWW.MAXPVENGINEERING.COM

REV. NO.	DATE	DESCRIPTION	BY	CHK.	APR.
A	08-09-17	FOR PLAN REVIEW	LB	–	–

OWNER: TUUSSO ENERGY

PROJECT SITE: FUMARIA SOLAR PROJECT

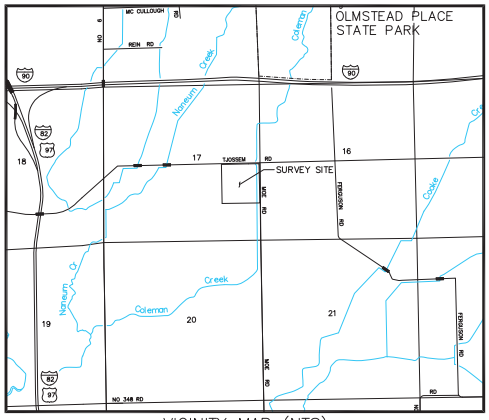
DRAWING: MAJOR EQUIPMENT SPECIFICATIONS

DRAWING NO. E-901

THIS PRINT IS NOT TO BE USED FOR CONSTRUCTION UNLESS NOTED AND SIGNED OK FOR CONSTRUCTION ABOVE LAST REVISION.

TUUSSO ENERGY - PENSTEMON SITE

A PORTION OF THE NE 1/4 OF THE SE 1/4 OF SECTION 17, T. 17 N., R. 19 E., W.M.
KITTATAS COUNTY, STATE OF WASHINGTON



VICINITY MAP (NTS)



NORTH

0 5 25 50 100

SCALE 1" = 100'

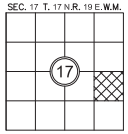
NOTES:

1. ALL CONSTRUCTION TECHNIQUES AND MATERIALS SHALL BE IN ACCORDANCE WITH THE CURRENT STATE OR COUNTY STANDARDS (AS APPLICABLE) AND AS SHOWN IN THESE PLANS.
2. BOUNDARY AND TOPOGRAPHIC SURVEY SHOWN HEREON WAS PREPARED BY ENCOMPASS ENGINEERING AND SURVEYING IN MAY 2017 UNDER DIRECT SUPERVISION OF DUSTIN PIERCE, PLS #55503.

PROPERTY INFORMATION:

APPLICANT:	TUUSSO ENERGY, LLC 500 YALE AVE N. SEATTLE, WA 98109
PARCEL NUMBER:	840233
PARCEL SIZE:	39.38 ACRES
PROPERTY ADDRESS:	TBD, ELLENSBURG, WA 98926
ZONE:	COMMERCIAL AGRICULTURAL
IRRIGATION DISTRICT:	ELLENSBURG WATER

INDEX LOCATION
SEC. 17 T. 17 N.R. 19 E.W.M.



811
Know what's **below.**
Call before you dig.

SHEET INDEX:

TITLE	NO.
COVER SHEET & OVERALL SITE PLAN	C1.0
NOTES, LEGEND & ABBREVIATIONS	C1.1
TESC, GRADING, AND DRAINAGE PLAN	C2.0
TESC DETAILS AND STANDARD DETAILS	C2.1

REVISIONS		
DESCRIPTION	BY	DATE

© THE PLANS SET FORTH ON THIS SHEET ARE, AND SHALL REMAIN THE PROPERTY OF ENCOMPASS ENGINEERING & SURVEYING

TODD MCROULIS RICHARD
STATE OF WASHINGTON
48965
REGISTERED
PROFESSIONAL ENGINEER

TUUSSO ENERGY, LLC
PENSTEMON SITE
COVER SHEET & OVERALL SITE PLAN

Encompass
ENGINEERING & SURVEYING
Western Washington Division
165 NE Juniper Street, Suite 201 • Issaquah, WA 98027 • Phone: (425) 392-0250 • Fax: (425) 391-3055
Eastern Washington Division
407 Southwest Blvd. • Cle Elum, WA 98922 • Phone: (509) 674-7433 • Fax: (509) 674-7419

JOB NO.	17020
DATE	Sept. 27 2017
SCALE	AS SHOWN
DESIGNED	SF
DRAWN	SF
CHECKED	TML
APPROVED	TML
SHEET	C1.0

STANDARD PLAN NOTES:

1. ALL CONSTRUCTION TECHNIQUES AND MATERIALS SHALL BE IN ACCORDANCE WITH THE CURRENT STATE OR COUNTY STANDARDS AND AS SHOWN IN THESE PLANS.
2. A COPY OF THE APPROVED PLANS MUST BE ON SITE WHENEVER CONSTRUCTION IS IN PROGRESS.
3. THE CONTRACTOR SHALL OBTAIN ALL PERMITS REQUIRED FOR WORK THAT ARE NOT PROVIDED BY THE OWNER PRIOR TO START OF CONSTRUCTION.
4. PAVED OR SIMILAR ESTABLISHED SURFACES INCLUDING ROADWAYS, SIDEWALKS AND CURBS THAT ARE TO REMAIN BUT ARE DAMAGED BY NEW CONSTRUCTION SHALL BE REPAIRED AS REQUIRED BY THE INSPECTOR.
5. ALL SURVEYING AND STAKING OF IMPROVEMENTS SHALL BE APPROVED BY THE OWNER. CONTRACTOR SHALL COORDINATE AND VERIFY WITH THE OWNER PRIOR TO OBTAINING STAKING SERVICES.
6. THE CONTRACTOR SHALL NOTIFY THE KITTITAS COUNTY FIRE DISTRICT (509-386-1495) TWENTY-FOUR (24) HOURS IN ADVANCE OF ALL WATER SERVICE INTERRUPTIONS, HYDRANT SHUT-OFFS, AND STREET CLOSURES OR OTHER ACCESS BLOCKAGE. THE CONTRACTOR SHALL ALSO NOTIFY THE DISTRICT OF ALL NEW, RELOCATED, OR ELIMINATED HYDRANTS RESULTING FROM THIS WORK.
7. ALL LOCATIONS OF EXISTING UTILITIES SHOWN HEREON HAVE BEEN ESTABLISHED BY FIELD SURVEY OR OBTAINED FROM AVAILABLE RECORDS AND SHOULD THEREFORE BE CONSIDERED APPROXIMATE ONLY AND NOT NECESSARILY COMPLETE. IT IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR TO INDEPENDENTLY VERIFY THE ACCURACY OF ALL UTILITY LOCATIONS SHOWN AND TO FURTHER DISCOVER AND AVOID ANY OTHER UTILITIES NOT SHOWN HEREON WHICH MAY BE AFFECTED BY THE IMPLEMENTATION OF THIS PLAN.
8. THE CONTRACTOR SHALL LOCATE AND PROTECT ALL ACTIVE CASTINGS AND UTILITIES DURING CONSTRUCTION AND SHALL CONTACT THE UNDERGROUND UTILITIES LOCATOR SERVICE (1-800-424-5555 OR 811) AT LEAST 48 HOURS PRIOR TO CONSTRUCTION.
9. THE CONTRACTOR SHALL ADJUST ALL EXISTING MANHOLE RIMS, DRAINAGE STRUCTURE LIDS, VALVE BOXES AND UTILITY ACCESS STRUCTURES TO FINISH GRADE WITHIN AREAS AFFECTED BY THE PROPOSED IMPROVEMENTS.
10. THE CONTRACTOR SHALL PROVIDE FOR ALL COMPACTION TESTS REQUIRED BY THE INSPECTOR.
11. BACKFILL MATERIAL SHALL MEET STATE OR COUNTY STANDARDS.
12. INSPECTION AND ACCEPTANCE OF ALL WORK WILL BE ACCOMPLISHED BY THE DESIGNATED INSPECTOR. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE AND SCHEDULE APPROPRIATE INSPECTIONS, ALLOWING PROPER ADVANCE NOTICE. THE INSPECTOR MAY REQUIRE RECONSTRUCTION OF ITEMS THAT DO NOT MEET THE CONTRACT DOCUMENTS OR THAT WERE CONSTRUCTED WITHOUT INSPECTION.
13. THE CONTRACTOR SHALL PROVIDE AND MAINTAIN BEST MANAGEMENT PRACTICES AS SHOWN HEREIN TO INSURE THAT SEDIMENT-LADEN WATER DOES NOT ENTER THE WATER OF THE STATE. AS CONSTRUCTION PROGRESSES AND UNEXPECTED (SEASONAL) CONDITIONS DICTATE, ADDITIONAL BEST MANAGEMENT PRACTICES MAY BE REQUIRED. THEREFORE, DURING THE COURSE OF CONSTRUCTION IT SHALL BE THE OBLIGATION AND RESPONSIBILITY OF THE CONTRACTOR TO ADDRESS ANY NEW CONDITIONS THAT MAY BE CREATED BY HIS ACTIVITIES AND TO PROVIDE ADDITIONAL FACILITIES THAT MAY BE NEEDED TO PROTECT ADJACENT PROPERTIES.
14. THE CONTRACTOR SHALL KEEP ALL STREETS AND PUBLIC RIGHT-OF-WAY CLEAN AT ALL TIMES BY SWEEPING.
15. CONTRACTOR SHALL PROVIDE TRAFFIC CONTROL AS NECESSARY THROUGHOUT THE PROJECT. TRAFFIC CONTROL SHALL BE IN ACCORDANCE WITH THE MUTCD, STATE, AND/OR COUNTY STANDARDS.
16. CONTRACTOR SHALL NOT MAKE ANY REVISIONS IN THE FIELD WITHOUT PRIOR WRITTEN APPROVAL BY THE ENGINEER.
17. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ADEQUATE SAFEGUARDS, SAFETY DEVICES, PROTECTIVE EQUIPMENT, FLAGGERS, AND ANY OTHER NEEDED ACTIONS TO PROTECT THE LIFE, HEALTH, AND SAFETY OF THE PUBLIC, AND TO PROTECT PROPERTY IN CONNECTION WITH THE PERFORMANCE OF WORK COVERED BY THE CONTRACTOR. ANY WORK WITHIN THE TRAVELED RIGHT-OF-WAY THAT MAY INTERRUPT NORMAL TRAFFIC FLOW SHALL REQUIRE AT LEAST ONE FLAGGER FOR EACH LANE OF TRAFFIC AFFECTED. ALL SECTIONS OF THE WSDOT STANDARD SPECIFICATIONS 1-07.23 – TRAFFIC CONTROL, SHALL APPLY.
18. ANY TRENCH DEEPER THAN 5 FEET WILL REQUIRE SHORING FOR TRENCH WALL STABILIZATION.

GENERAL TESC NOTES:

1. APPROVAL OF THIS TEMPORARY EROSION AND SEDIMENTATION CONTROL (TESC) PLAN DOES NOT CONSTITUTE AN APPROVAL OF PERMANENT ROAD OR DRAINAGE DESIGN (E.G. SIZE AND LOCATION OF ROADS, PIPES, RESTRICTORS, CHANNELS, RETENTION FACILITIES, UTILITIES, ETC.).
2. THE IMPLEMENTATION OF THESE TESC PLANS AND THE CONSTRUCTION, MAINTENANCE, REPLACEMENT, AND UPGRADING OF THESE TESC FACILITIES IS THE RESPONSIBILITY OF THE APPLICANT OR A TESC SUPERVISOR UNTIL ALL CONSTRUCTION IS APPROVED.
3. THE BOUNDARIES OF THE CLEARING LIMITS SHOWN ON THIS PLAN SHALL BE CLEARLY FLAGGED BY A CONTINUOUS LENGTH OF SURVEY TAPE (OR FENCING, IF REQUIRED) PRIOR TO CONSTRUCTION. DURING THE CONSTRUCTION PERIOD, NO DISTURBANCE BEYOND THE CLEARING LIMITS SHALL BE PERMITTED. THE CLEARING LIMITS SHALL BE MAINTAINED BY THE APPLICANT/TESC SUPERVISOR FOR THE DURATION OF CONSTRUCTION.
4. THE TESC FACILITIES SHOWN ON THIS PLAN MUST BE CONSTRUCTED PRIOR TO OR IN CONJUNCTION WITH ALL CLEARING AND GRADING SO AS TO ENSURE THAT THE TRANSPORT OF SEDIMENT TO SURFACE WATERS, DRAINAGE SYSTEMS, AND ADJACENT PROPERTIES IS MINIMIZED.
5. THE TESC FACILITIES SHOWN ON THIS PLAN ARE THE MINIMUM REQUIREMENTS FOR ANTICIPATED SITE CONDITIONS. DURING THE CONSTRUCTION PERIOD, THESE TESC FACILITIES SHALL BE UPGRADED AS NEEDED FOR UNEXPECTED STORM EVENTS AND MODIFIED TO ACCOUNT FOR CHANGING SITE CONDITIONS (E.G. ADDITIONAL SUMP PUMPS, RELOCATION OF DITCHES AND SILT FENCES, ETC.).
6. ANY AREAS OF EXPOSED SOILS, INCLUDING ROADWAY EMBANKMENTS, THAT WILL NOT BE DISTURBED FOR TEN DAYS DURING THE WET SEASON OR FOURTEEN DAYS DURING THE DRY SEASON SHALL BE IMMEDIATELY STABILIZED WITH THE APPROVED TESC METHODS (E.G., SEEDING, MULCHING, PLASTIC COVERING, ETC.).
7. ANY AREA NEEDING TESC MEASURES, NOT REQUIRING IMMEDIATE ATTENTION, SHALL BE ADDRESSED WITHIN FIFTEEN (15) DAYS.
8. THE TESC FACILITIES ON INACTIVE SITES SHALL BE INSPECTED AND MAINTAINED A MINIMUM OF ONCE A MONTH OR WITHIN 48 HOURS FOLLOWING A STORM EVENT.
9. AT NO TIME SHALL MORE THAN ONE (1) FOOT OF SEDIMENT BE ALLOWED TO ACCUMULATE WITHIN A CATCH BASIN. ALL CATCH BASINS AND CONVEYANCE LINES SHALL BE CLEANED PRIOR TO PAVING. THE CLEANING OPERATION SHALL NOT FLUSH SEDIMENT-LADEN WATER INTO THE DOWNSTREAM SYSTEM.
10. STABILIZED CONSTRUCTION ENTRANCES AND ROADS SHALL BE INSTALLED AT THE BEGINNING OF CONSTRUCTION AND MAINTAINED FOR THE DURATION OF THE PROJECT. ADDITIONAL MEASURES, SUCH AS WASH PADS, MAY BE REQUIRED TO ENSURE THAT ALL PAVED AREAS ARE KEPT CLEAN FOR THE DURATION OF THE PROJECT.
11. ANY PERMANENT RETENTION/DETENTION FACILITY USED AS A TEMPORARY SETTLING BASIN SHALL BE MODIFIED WITH THE NECESSARY EROSION CONTROL MEASURES AND SHALL PROVIDE ADEQUATE STORAGE CAPACITY. IF THE PERMANENT FACILITY IS TO FUNCTION ULTIMATELY AS AN INFILTRATION SYSTEM, THE TEMPORARY FACILITY MUST BE GRADED SO THAT THE BOTTOM AND SIDES ARE AT LEAST ONE FOOT ABOVE THE FINAL GRADE OF THE PERMANENT FACILITY.
12. WHERE STRAW MULCH FOR TEMPORARY EROSION CONTROL IS REQUIRED, IT SHALL BE APPLIED AT A MINIMUM THICKNESS OF TWO INCHES

STANDARD GRADING NOTES:

1. ALL GRADING ACTIVITIES, INCLUDING EXCAVATION, BACKFILL AND COMPACTION, SHALL BE DONE IN ACCORDANCE WITH STATE OR COUNTY STANDARDS AS APPLICABLE.
2. WITHIN ANY AREAS TO RECEIVE STRUCTURAL FILL, PAVEMENTS OR HARDSCAPE, THE SUBGRADE SHALL BE SCARIFIED, MOISTURE CONDITIONED, AND COMPACTED TO AT LEAST 95% MAXIMUM DENSITY (ASTM D 1557).
3. CONTRACTOR SHALL OBTAIN AN APPROVAL BY THE GEOTECHNICAL ENGINEER PRIOR TO PROCEEDING WITH ANY OVEREXCAVATION. CONTRACTOR SHALL VERIFY THE AMOUNT OF OVEREXCAVATION WITH GEOTECHNICAL ENGINEER.
4. COMPACTION SHALL BE DONE PER STATE OR COUNTY STANDARDS AS APPLICABLE. SITE EXCAVATION AND/OR SUBGRADE PREPARATION SHALL BE COMPLETED BEFORE PLACING STRUCTURAL FILL. COMPACTION SHALL BE VERIFIED BY DENSITY TESTING.
5. ALL TEMPORARY CUT SLOPES SHALL NOT EXCEED 1.5H:1V. ALL PERMANENT CUT SLOPES SHALL NOT EXCEED 2H:1V OR AS SHOWN ON PLANS. ALL PERMANENT FILL SLOPES SHALL NOT EXCEED 2H:1V.
6. CONTRACTOR SHALL IMPLEMENT APPROPRIATE PROTECTION AND TRAFFIC CONTROL DURING CONSTRUCTION TO DIRECT TRUCK TRAFFIC.
7. ANY AND ALL FILL MATERIAL PLACED ON THE LOT SHALL BE COMPACTED AND A COMPACTION INSPECTION REPORT FOR THE COMPACTION AND BEARING CAPACITY OF THAT FILL MATERIAL SHALL BE PROVIDED TO THE STATE OR COUNTY AS APPLICABLE WITHIN 60 DAYS OF THE PLACEMENT OF THE FILL MATERIAL.
8. ALL EXCESS SOIL SHALL BE OFF-HAULED TO A LEGAL DISPOSAL SITE. NO EXCESS SOIL SHALL BE SPREAD ON THE SITE WITHOUT CLEARLY BEING SHOWN ON THE APPROVED GRADING PLAN.
9. ALL CUT AND FILL SLOPES AND ALL EXPOSED DIRT SHALL BE PLANTED, WATERED AND MAINTAINED UNTIL EFFECTIVE EROSION CONTROL HAS BEEN ESTABLISHED TO THE SATISFACTION OF THE STATE OR COUNTY AS APPLICABLE.
10. CONTRACTOR SHALL PROVIDE HIS/HER OWN EARTHWORK CALCULATIONS FOR ALL CUT AND FILL OPERATIONS.

ABBREVIATIONS:

AC – ASPHALT CONCRETE
ACP – ABESTOS CEMENT PIPE
ADD'L – ADDITIONAL
AD – AREA DRAIN
ADJ – ADJACENT
ANSI – AMERCIAN NATIONAL STANDARDS INSTITUTE
ALT – ALTERNATE
ALUM – ALUMINUM
APPROX – APPROXIMATE(LY)
ARCH – ARCHITECT(URAL)
AP – ANGLE POINT
ASPH – ASPHALT
ASSY – ASSEMBLY
ASTM – AMERICAN SOCIETY OF TESTING AND MATERIALS
AVE – AVENUE
BC – BACK OF CURB
BF – BLIND FLANGE
BLDG – BUILDING
BLDC – BUILDING CORNER
BLK – BLOCK
BLVD – BOULEVARD
BM – BENCHMARK
BNDY – BOUNDARY
BO – BLOW OFF
BOW – BOTTOM OF WALL (AT FINISHED GRADE)
BSBL – BUILDING SETBACK LINE
BVC – BEGINNING OF VERTICAL CURVE
BVCE – BEGIN VERTICAL CURVE ELEVATION
BVCS – BEGIN VERTICAL CURVE STATION
BW – BACK OF WALK
CB – CATCH BASIN
CF – CUBIC FEET (FOOT)
CIP – CAST IRON PIPE
CJ – CONSTRUCTION JOINT
CL – CLASS
C/L – CENTER LINE
CLR – CLEARENCE
CMP – CORRUGATED METAL PIPE
CO – CLEAN OUT
CONN – CONNECTION
CONT – CONTINUOUS (CONTINUED)
CONTR – CONTRACTOR
C, CONC – CONCRETE
CONST – CONSTRUCTION
CP – CONTROL POINT
CFS – CUBIC FEET PER SECOND
CTR – CENTER(ED)
CTV – CABLE TV
C&G – CURB AND GUTTER
CY – CUBIC YARD
DCVA – DOUBLE CHECK VALVE ASSEMBLY
DDCV – DOUBLE DETECTOR CHECK VALVE
DEPT. – DEPARTMENT
DET – DETAIL OR DETENTION
DIP – DUCTILE IRON PIPE
DIA(S) – DIAMETER
DIM – DIMENSION
DOT – DEPARTMENT OF TRANSPORTATION
DS – DOWN SPOUT
DWG – DRAWING
E – EAST(ING)
EA – EACH
EL – ELEVATION
ELEC – ELETRICAL
EP – EDGE OF PAVEMENT
EQUIV – EQUIVALENT
EVC – END OF VERTICAL CURVE
EVCE – END OF VERTICAL CURVE ELEVATION
EVCS – END OF VERTICAL CURVE STATION
EX, EXIST – EXISTING
FC – FACE OF CURB
FD – FLOOR DRAIN
FDC – FIRE DEPARTMENT CONNECTION
FFE – FINISH FLOOR ELEVATION
FH – FIRE HYDRANT
FL – FLANGED OR FLOW LINE
FLR – FLOOR
FS – FINISHED SURFACE
FT (') – FOOT (FEET)
FTG – FOOTING
G – GAS MAIN
GA – GAUGE
GALV – GALVANIZED
GB – GRADE BREAK
GM– GAS METER
GRD – GRADE
HB – HOSE BIBB
HDPE – HIGH DENSITY POLYETHYLENE
HORIZ (H) – HORIZONTAL
HT – HEIGHT
HYD – HYDRANT
ID – INSIDE DIAMETER
IE – INVERT ELEVATION
IN (") – INCHES
INV – INVERT
IRR – IRRIGATION WATER
L – LENGTH
LB, # – POUND(S)
LF – LINEAR FEET
LN – LANE
MAT'L – MATERIAL
MAX – MAXIMUM
MFR – MANUFACTURER
MH – MANHOLE
MIN – MINIMUM
MISC – MISCELLANEOUS
MJ – MECHANICAL JOINT
N – NORTH(ING)
NO (#) – NUMBER
N.T.S. – NOT TO SCALE
O.C. – ON CENTER
O.D. – OUTSIDE DIAMETER
O/W – OIL WATER
P – POWER
PC – POINT OF CURVATURE
PERF – PERFORATED
PI – POINT OF INTERSECTION
PIV – POST INDICTOR VALVE
PL – PROPERTY LINE
PP – POWER POLE
PROV – PROVIDED
PSF – POUNDS PER SQUARE FOOT
PSI – POUNDS PER SQUARE INCH
PT – POINT OF TANGENCY
PVC – POLYVINYL CHLORIDE
PVI – POINT OF VERTICAL INTERSECTION
PVMT – PAVEMENT
PVT – POINT OF VERTICAL TANGENT
QTY – QUANTITY
RAD (R) – RADIUS
RCP – REINFORCED CONCRETE PIPE
RD – ROAD
REF – REFERENCE
REINF – REINFORCED
REQ – REQUIRED
RET – RETAINING
ROW – RIGHT-OF-WAY
RR – RAILROAD
S – SOUTH
S, SL – SLOPE
SCH – SCHEDULE
SD – STORM DRAIN
SF – SQUARE FOOT
SHT – SHEET
SIM – SIMILAR
SPEC – SPECIFICATION(S)
SQ – SQUARE
SS – SANITARY SEWER
ST – STREET
STA – STATION
STD – STANDARD
STL – STEEL
T – TELEPHONE WIRE
TBM – TEMPORARY BENCH MARK
TC – TOP OF CURB
TEMP – TEMPORARY
TG/RIM – TOP OF GRATE/RIM
THRU – THROUGH
TOE – TOE OF WALL OR SLOPE
TOP – TOP OF WALL OR SLOPE
TOW – TOP OF WALL
TYP – TYPICAL
VC – VERTICAL CURVE
VOL – VOLUME
W – WEST
W/ – WITH
WM – WATER METER
W/O – WITHOUT
WQ – WATER QUALITY
WT – WEIGHT
WWF – WELDED WIRE FABRIC
WV – WATER VALVE
YD – YARD DRAIN

LEGEND

	EXISTING:	PROPOSED:
BOUNDARY LINE/RIGHT-OF-WAY		
LOT LINE		
STREET MONUMENT (IN CONCRETE)		
PROPERTY CORNER		
BENCHMARK/CONTROL POINT		
TEMPORARY BENCHMARK	TBM	TBM
EASEMENT LINE		
CENTERLINE		
CURB/GUTTER/SIDEWALK LINE		
EDGE OF PAVEMENT LINE		
CHAIN LINK FENCE LINE		
SIGN		
STREET LIGHT (ELECTROLIER)		
GRADE BREAK LINE		
CONTOUR LINE (MAJOR)	1650	1650
CONTOUR LINE (MINOR)	1651	1651
CATCH BASIN (TYPE 1)		
STORM DRAIN MANHOLE/CATCH BASIN TYPE 2		
STORM DRAIN LINE	SD	
CONTROL STRUCTURE		
RIP-RAP PAD		
SANITARY SEWER LINE	SS	
SANITARY SEWER CLEANOUT		
SANITARY SEWER MANHOLE		
WATERMAIN LINE	W	
GATE VALVE (MECHANICAL JOINT)		
GATE VALVE (FLANGE)		
WATER METER		
FIRE HYDRANT		
CAP		
GAS LINE	G	G
GAS VALVE		
UNDERGROUND ELECTRIC LINE	E	E
POWER POLE / UTILITY POLE		
GUY ANCHOR		
ELECTRICAL TRANSFORMER / VAULT	P	P
TELEPHONE VAULT/PEDESTAL	T	T
TELEPHONE MANHOLE	T	T
100 YR FLOODPLAIN HATCH		
CONCRETE HATCH		
GRAVEL HATCH		
ALL WEATHER ROAD HATCH (COMPACTED SOIL OR GRAVEL)		
PROPOSED LANDSCAPING STRIP		

CONTRACTOR RESPONSIBILITY:

CONTRACTOR AGREES THAT HE SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS, INCLUDING THE SAFETY OF ALL PERSONS AND PROPERTY, DURING THE COURSE OF CONSTRUCTION OF THIS PROJECT, AND THAT THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS. THE CONTRACTOR SHALL DEFEND, INDEMNIFY AND HOLD THE OWNER AND THE ENGINEER HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXCEPTING FOR LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE OWNER OR THE ENGINEER.

DISCREPANCIES:

IF THERE ARE ANY DISCREPANCIES BETWEEN DIMENSIONS IN DRAWINGS AND EXISTING CONDITIONS WHICH WILL AFFECT THE WORK, THE CONTRACTOR SHALL BRING SUCH DISCREPANCIES TO THE ATTENTION OF THE ENGINEER FOR ADJUSTMENT BEFORE PROCEEDING WITH THE WORK. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROPER FITTING OF ALL WORK AND FOR THE COORDINATION OF ALL TRADES, SUBCONTRACTORS, AND PERSONS ENGAGED UPON THIS CONTRACT.

REVISIONS		
DESCRIPTION	BY	DATE

© THE PLANS SET FORTH ON THIS SHEET ARE AND SHALL REMAIN THE PROPERTY OF ENCOMPASS ENGINEERING & SURVEYING

TODD MCDOULIS RECORD
STATE OF WASHINGTON
24995
REGISTERED
PROFESSIONAL ENGINEER

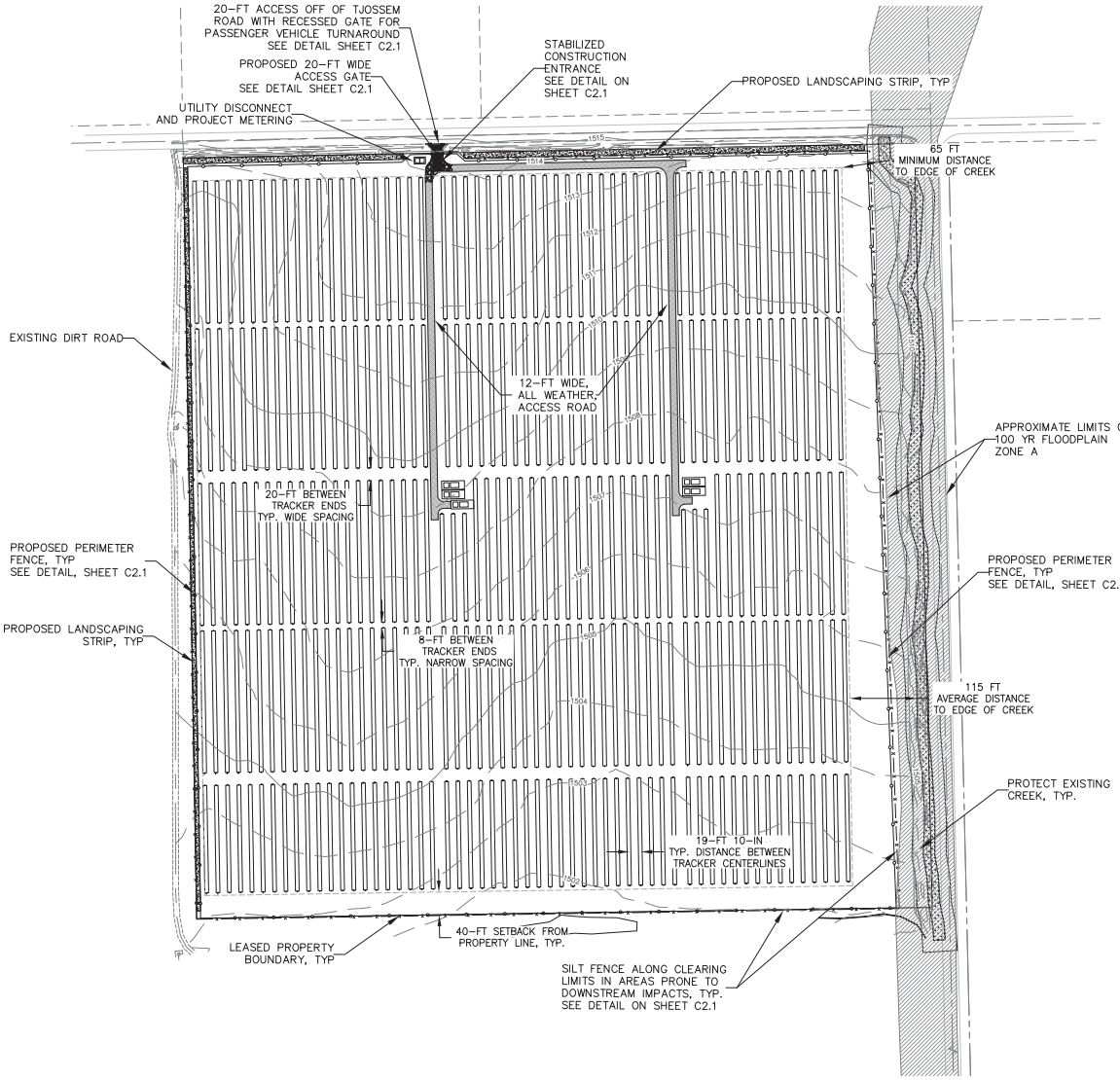
TUSSO ENERGY, LLC
PENSTEMON SITE
NOTES, LEGEND & ABBREVIATIONS

ENCOMPASS ENGINEERING & SURVEYING
Western Washington Division
165 NE Juniper Street, Suite 201 • Issaquah, WA 98027 • Phone: (425) 392-0250 • Fax: (425) 391-3055
Eastern Washington Division
407 Southwater Blvd. • Ste Elum, WA 98922 • Phone: (509) 674-7433 • Fax: (509) 674-7419

JOB NO.	17020
DATE	Sept. 27 2017
SCALE	AS SHOWN
DESIGNED	SF
DRAWN	SF
CHECKED	TML
APPROVED	TML
SHEET	C1.1

TUUSSO ENERGY - PENSTEMON SITE

A PORTION OF THE NE 1/4 OF THE SE 1/4 OF SECTION 17, T. 17 N., R. 19 E., W.M.
KITTATAS COUNTY, STATE OF WASHINGTON



SHEET NOTES:

1. REFER TO STANDARD PLAN NOTES ON SHEET C1.1.
2. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH STATE OR COUNTY STANDARDS AS APPLICABLE. IT SHALL BE THE SOLE RESPONSIBILITY OF THE APPLICANT AND THE PROFESSIONAL CIVIL ENGINEER TO CORRECT ANY ERROR, OMISSION, OR VARIATION FROM THE ABOVE REQUIREMENTS FOUND IN THESE PLANS.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ADEQUATE SAFEGUARDS, SAFETY DEVICES, PROTECTIVE EQUIPMENT, FLAGGERS, AND ANY OTHER NEEDED ACTIONS TO PROTECT THE LIFE, HEALTH, AND SAFETY OF THE PUBLIC, AND TO PROTECT PROPERTY IN CONNECTION WITH THE PERFORMANCE OF WORK COVERED BY THE CONTRACTOR. ANY WORK WITHIN THE TRAVELED RIGHT–OF–WAY THAT MAY INTERRUPT NORMAL TRAFFIC FLOW SHALL REQUIRE AT LEAST ONE FLAGGER FOR EACH LANE OF TRAFFIC AFFECTED. ALL SECTIONS OF THE WSDOT STANDARD SPECIFICATIONS 1–07.23 – TRAFFIC CONTROL, SHALL APPLY.
4. ANY TRENCH DEEPER THAN 5 FEET WILL REQUIRE SHORING FOR TRENCH WALL STABILIZATION.

TESC NOTES:

1. SILT FENCE TO BE INSTALLED AS STAND–ALONE UNLESS RUNNING ALONG EXIST. FENCE.
2. CONTRACTOR'S STAGING AREA AND STOCKPILE AREAS SHALL BE DETERMINED PRIOR TO START OF CONSTRUCTION.

RECOMMENDED CONSTRUCTION SEQUENCE:

(1) PRE–CONSTRUCTION MEETING.
(2) GRADE AND INSTALL CONSTRUCTION ENTRANCE(S).
(3) INSTALL PERIMETER PROTECTION (SILT FENCE, BRUSH BARRIER, ETC.).
(4) GRADE AND STABILIZE CONSTRUCTION ROADS.
(5) INSTALL WIDE FLANGE STEEL PILES.
(6) INSTALL ELECTRICAL UNDERGROUND AND MECHANICAL TRACKERS
(7) INSTALL PANELS
(8) PERFORM ANY REQUIRED SITE RESTORATION

LEGEND

INVERTER STATION	
72 MODULE TRACKER	
54 MODULE TRACKER	
36 MODULE TRACKER	

SYSTEM SUMMARY	
kWDC	6,588.8
kVAAC	5,000.0
INVERTER QTY.	5
MODULE QTY.	19,098
DC SYSTEM VOLTAGE (V)	1000
DC SYSTEM VOLTAGE (kV)	12.47
INVERTER AC RATING (KVA)	1000
PV MODULE MODEL #	QCELLS 345W
PV MODULE NAMEPLATE (W)	345
RACKING SYSTEM	NEXTRACKER
GROUND COVERATE RATIO	0.33
DC:AC RATIO	1.32
MODULE TILT	TRACKER, +/-60°

TESC LEGEND:

SILT FENCE – SEE DETAIL ON SHEET C2.1

CONSTRUCTION ENTRANCE – SEE DETAIL ON SHEET C2.1

REVISIONS		
DESCRIPTION	BY	DATE

© THE PLANS SET FORTH ON THIS SHEET ARE, AND SHALL REMAIN THE PROPERTY OF ENCOMPASS ENGINEERING & SURVEYING

TODD MICROULIS HOWARD
STATE OF WASHINGTON
48995
REGISTERED PROFESSIONAL ENGINEER

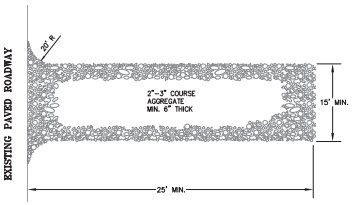
TUUSSO ENERGY, LLC
PENSTEMON SITE
TESC, GRADING, AND DRAINAGE PLAN

Encompass
ENGINEERING & SURVEYING
Western Washington Division
165 NE Juniper Street, Suite 201 • Issaquah, WA 98027 • Phone: (425) 392-0250 • Fax: (425) 391-3055
Eastern Washington Division
407 Southwater Blvd. • Ste Elum, WA 98937 • Phone: (509) 674-7433 • Fax: (509) 674-7419

JOB NO.	17020
DATE	Sept. 27 2017
SCALE	AS SHOWN
DESIGNED	SF
DRAWN	SF
CHECKED	TML
APPROVED	TML
SHEET	C2.0

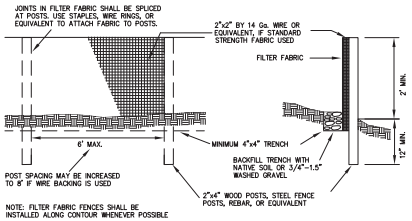
TUUSSO ENERGY - PENSTEMON SITE

A PORTION OF THE NE 1/4 OF THE SE 1/4 OF SECTION 17, T. 17 N., R. 19 E., W.M.
KITTATAS COUNTY, STATE OF WASHINGTON

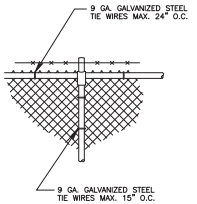


NOTES:
1. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION THAT WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY. THIS MAY REQUIRE TOP DRESSING, REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT.
2. WHEN NECESSARY, WHEELS SHALL BE CLEANED PRIOR TO ENTRANCE ONTO PUBLIC RIGHT-OF-WAY.
3. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH CRUSHED STONE THAT DRAINS INTO AN APPROVED SEDIMENT TRAP OR SEDIMENT BASIN.

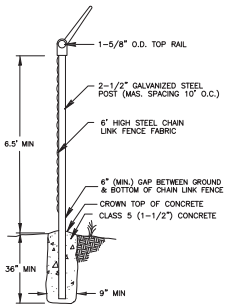
ROCK CONSTRUCTION ENTRANCE
N.T.S.



SILT FENCE DETAIL
N.T.S.

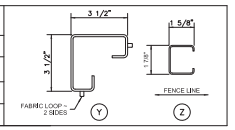


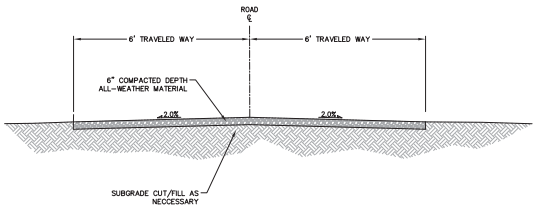
STEEL TIE WIRES



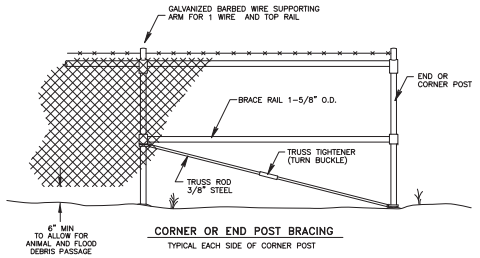
TYPICAL FENCE SECTION

POST AND RAIL SPECIFICATIONS			
POST	PIPE	ROLL FORMED	
	NOM. SIZE (SCH. 40) I.D.	SECTION	WEIGHT (lb/ft)
END, CORNER, OR PULL POST	2 1/2" DIAM.	Y	5.10
LINE OR BRACE POST	2" DIAM.	Z	1.85



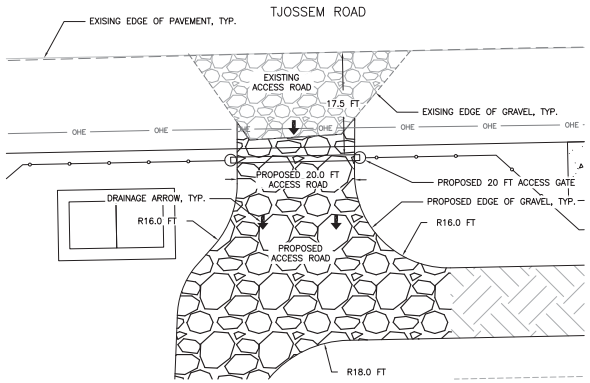


TYPICAL ALL-WEATHER ACCESS ROAD SECTION
N.T.S.

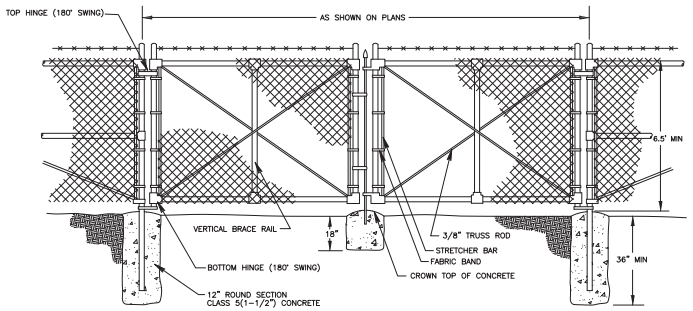


CORNER OR END POST BRACING
TYPICAL EACH SIDE OF CORNER POST

CHAIN LINK FENCE DETAIL
N.T.S.



SITE ACCESS DETAIL
1"=10'



CHAIN LINK FENCE GATE DETAIL
N.T.S.

REVISIONS

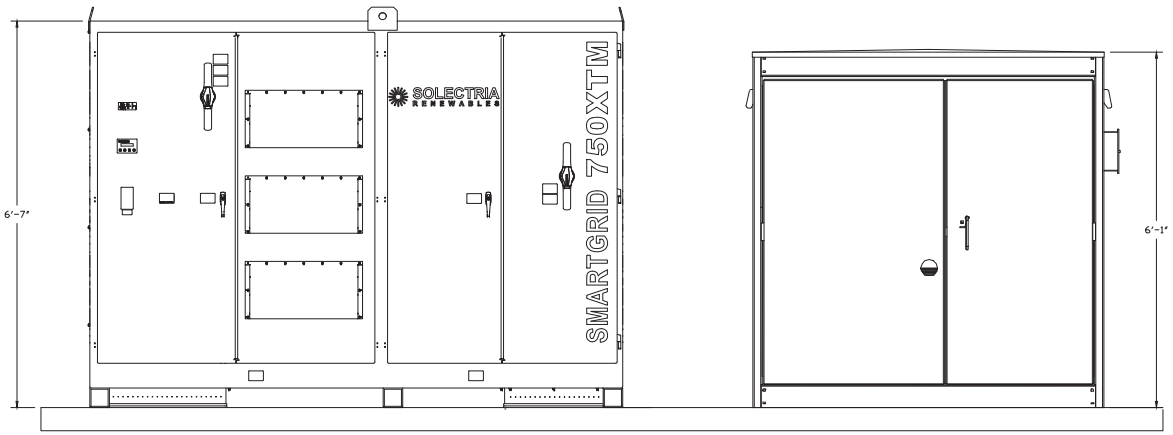
DESCRIPTION	BY	DATE

© THE PLANS SET FORTH ON THIS SHEET ARE, AND SHALL REMAIN THE PROPERTY OF ENCOMPASS ENGINEERING & SURVEYING

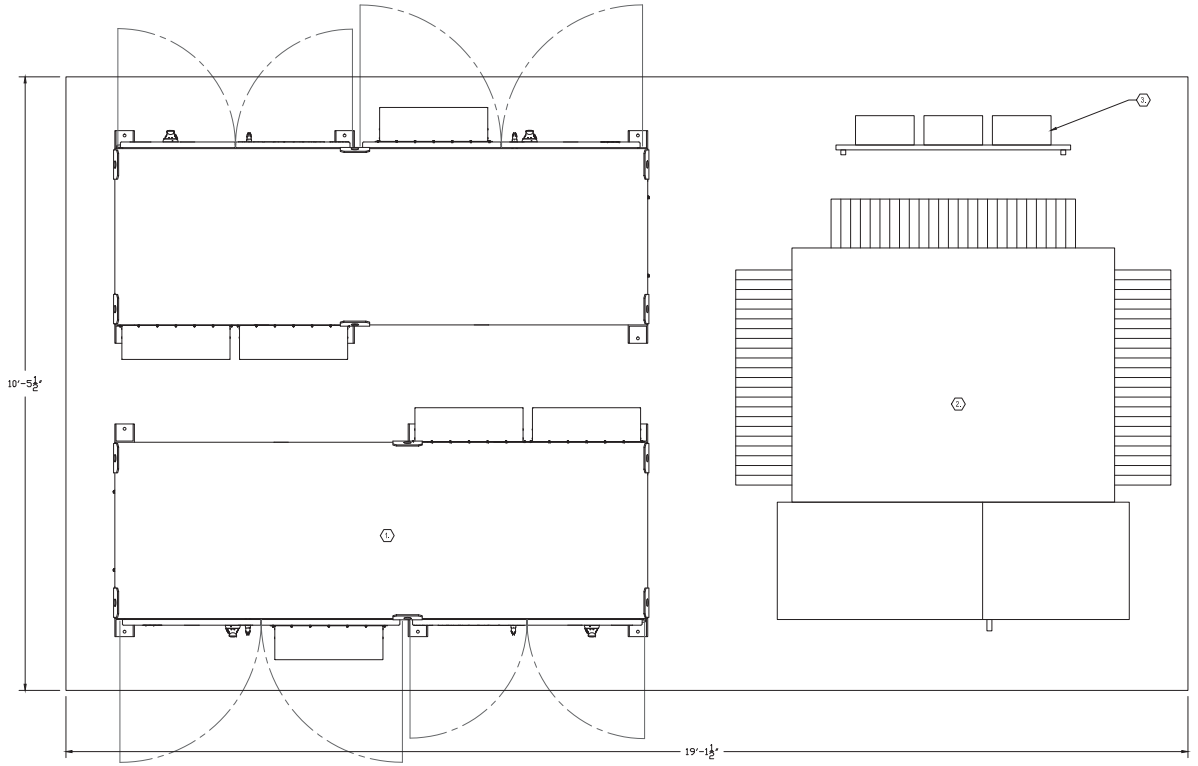
TUSSO ENERGY, LLC
PENSTEMON SITE
TESC DETAILS AND STANDARD DETAILS

Encompass ENGINEERING & SURVEYING
165 NE Juniper Street, Suite 201 • Issaquah, WA 98027 • Phone: (425) 392-0250 • Fax: (425) 391-3055 Western Washington Division
407 Southeast Blvd. • Ste Elum, WA 98922 • Phone: (509) 674-7433 • Fax: (509) 674-7419 Eastern Washington Division

JOB NO.	17020
DATE	Sept. 27 2017
SCALE	AS SHOWN
DESIGNED	SF
DRAWN	SF
CHECKED	TML
APPROVED	TML
SHEET	C2.1



A 1500 kVA BLOCK ELEVATION
SCALE: 1"=1'



B 1500 kVA BLOCK LAYOUT
SCALE: 1"= 1'

NOTES:
1. NONE.

KEYED NOTES:
1. SOLECTRIA SGI 750KVA INVERTER
2. 1500KVA 15KV TRANSFORMER
3. COMMUNICATION RACK

TUUSSO ENERGY

MaxPV ENGINEERING DEVELOPMENT
3101 PROSPECTOR // SACRAMENTO, CA
WWW.MAXPVENGINEERING.COM

REV. NO.	DATE	DESCRIPTION	BY	CHK.	APR.
A	08-09-17	FOR PLAN REVIEW	LB	–	–

OWNER: TUUSSO ENERGY

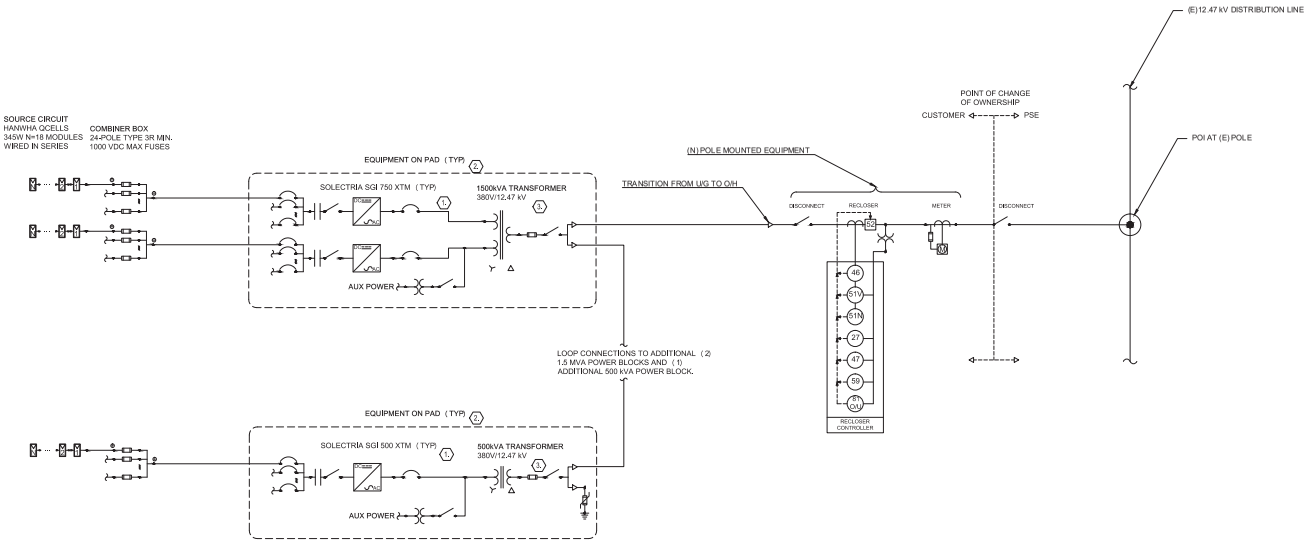
PROJECT SITE: PENSTEMON SOLAR PROJECT

DRAWING: EQUIPMENT PAD DETAILS

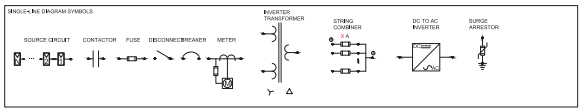
DRAWING NO. E-401

THIS PRINT IS NOT TO BE USED FOR CONSTRUCTION UNLESS NOTED AND SIGNED OK FOR CONSTRUCTION ABOVE LAST REVISION.

THE INFORMATION CONTAINED IN THESE DRAWINGS ARE CONFIDENTIAL AND ARE INTENDED FOR THE DESCRIBED PROJECT ONLY.



SINGLE-LINE DIAGRAM SYMBOLS



THE INFORMATION CONTAINED IN THESE DRAWINGS ARE CONFIDENTIAL AND ARE INTENDED FOR THE DESCRIBED PROJECT ONLY.

NOTES:

1. NONE.

KEYED NOTES:

1. **PV POWER CONDITIONING SYSTEM:** IEEE 929 AND IEEE 1547 COMPLIANT- 1000VDC MAX INPUT VOLTAGE. INVERTER EQUIPPED WITH INTEGRATED DC CIRCUIT BREAKER COMBINER.
2. EQUIPMENT PAD WITH INVERTER(S), STEP UP TRANSFORMER, AND COMMUNICATION EQUIPMENT.
3. TRANSFORMER SPECIFICATIONS TBD. VERIFY WITH INVERTER MFR & PSE FOR FINAL TRANFORMER CONFIGURATION.

TUUSSO ENERGY

MaxPV ENGINEERING DEVELOPMENT
925.PEDYGON // SACRAMENTO, CA
WWW.MAXPVENGINEERING.COM

REV. NO.	DATE	DESCRIPTION	BY	CHK.	APR.
A	08-09-17	FOR PLAN REVIEW	LB	–	–

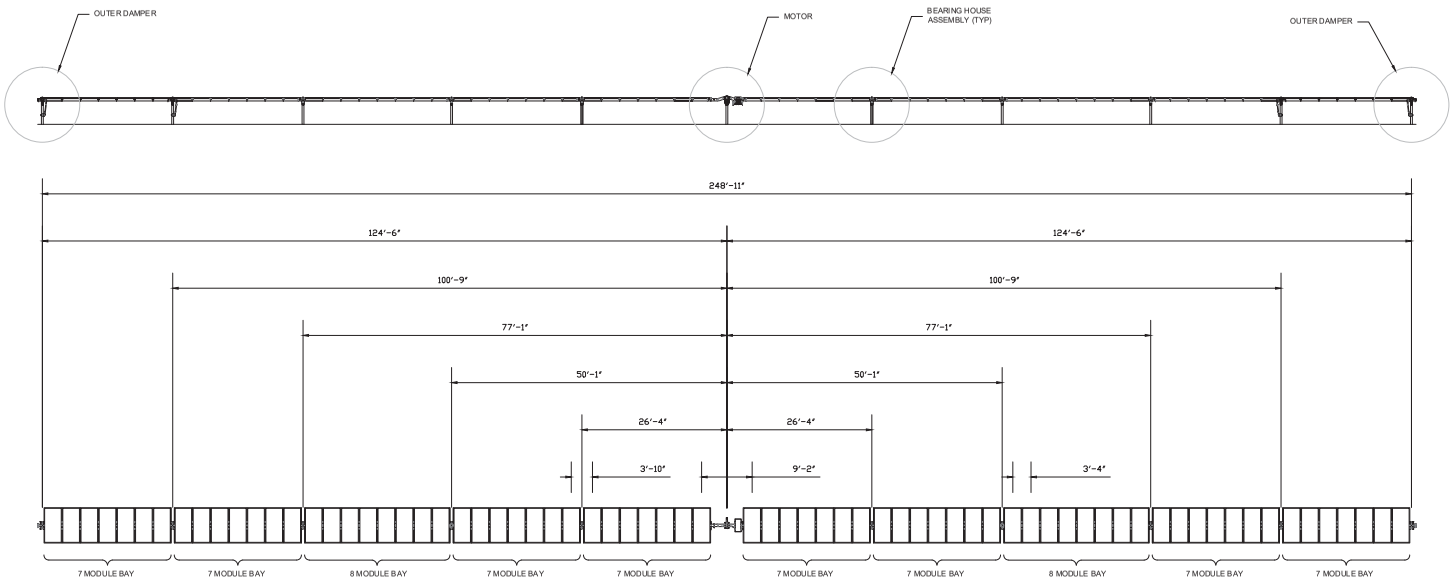
OWNER: TUUSSO ENERGY

PROJECT SITE: PENSTEMON SOLAR PROJECT

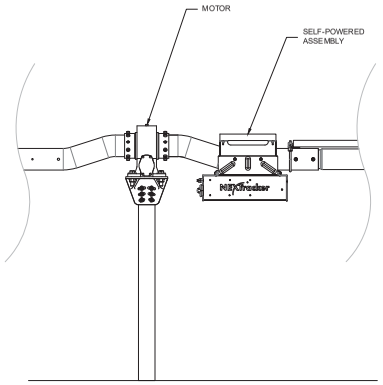
DRAWING: SINGLE LINE DIAGRAM

DRAWING NO. E-601

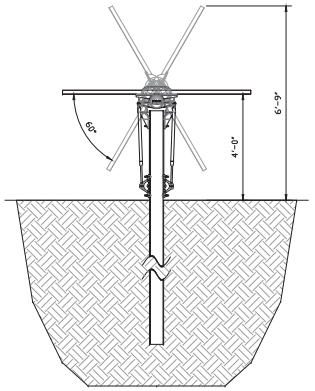
THIS PRINT IS NOT TO BE USED FOR CONSTRUCTION UNLESS NOTED AND SIGNED OK FOR CONSTRUCTION ABOVE LAST REVISION.



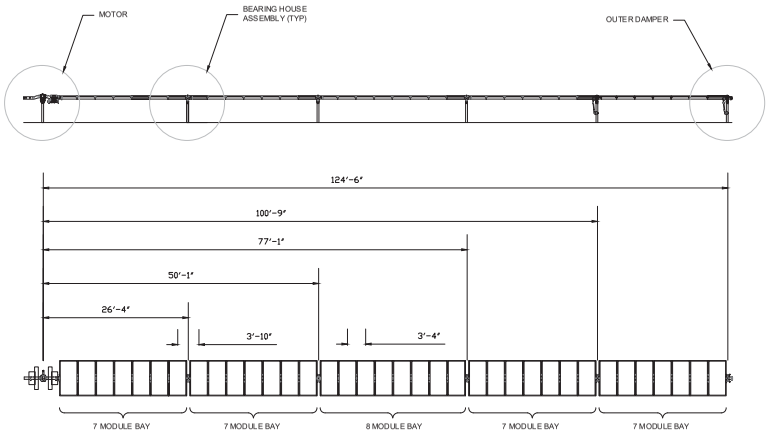
A 72 MODULE TRACKER



B MOTOR PILE DETAIL



C TRACKER PROFILE



D 36 MODULE TRACKER

THE INFORMATION CONTAINED IN THESE DRAWINGS ARE CONFIDENTIAL AND ARE INTENDED FOR THE DESCRIBED PROJECT ONLY.

NOTES:

1. NONE.

KEYED NOTES:

1. NONE.

TUUSSO ENERGY

MaxPV ENGINEERING DEVELOPMENT

320 PROVIDIAN // SACRAMENTO, CA
WWW.MAXPVENGINEERING.COM

REV. NO.	DATE	DESCRIPTION	BY	CHK.	APR.
A	08-09-17	FOR PLAN REVIEW	LB	–	–

OWNER: TUUSSO ENERGY

PROJECT SITE: PENSTEMON SOLAR PROJECT

DRAWING: TRACKER ELEVATIONS

DRAWING NO. E-701

THIS PRINT IS NOT TO BE USED FOR CONSTRUCTION UNLESS NOTED AND SIGNED OK FOR CONSTRUCTION ABOVE LAST REVISION.



The Q.ANTUM solar module Q.PLUS L-G4.2 with power classes up to 345 Wp is the strongest module of its type on the market globally. Powered by 72 Q CELLS solar cells Q.PLUS L-G4.2 was specially designed for large solar power plants to reduce BOS costs. Only Q CELLS offers German engineering quality with our unique triple Yield Security.



LOW ELECTRICITY GENERATION COSTS
Higher yield per surface area and lower BOS costs thanks to higher power classes and an efficiency rate of up to 17.6 %.

INNOVATIVE ALL-WEATHER TECHNOLOGY
Optimal yields, whatever the weather with excellent low-light and temperature behavior.

ENDURING HIGH PERFORMANCE
Long-term yield security with Anti-PID Technology[1], Hot-Spot-Protect and Traceable Quality Tra.Q™.

EXTREME WEATHER RATING
High-tech aluminum alloy frame, certified for high snow (5400 Pa) and wind loads (2400 Pa).

A RELIABLE INVESTMENT
Inclusive 12-year product warranty and 25-year linear performance guarantee[2].

THE IDEAL SOLUTION FOR:

Engineered in Germany

Q CELLS



Our most amazing tracker yet.

In our mission to make solar a mainstream energy source, NEXTracker has engineered the most intelligent and flexible tracking technology yet. Using sustainable design methods with outcomes that benefit people and the planet, we bring you: NX Horizon™.

NX Horizon (formerly referred to as the Self-Powered Tracker or SPT), brings self-contained motor power to each row, eliminating power wiring and trenching. Our advanced horizontal tracker has the widest rotational range available, lowest O&M costs, and requires far less power to operate than other trackers. By offering more powerful systems at a greater value, NEXTracker enables greater deployment of renewable energy worldwide.

NX Horizon key features and benefits include:

– Self-powered system with smart performance communications: Self-contained units on each row include a dedicated PV panel toprovide power to the controller which drives themotor and hosts intelligent control electronics to position each tracker. With smart communications built in, NX Horizon systems can be accessed remotely, providing customers with a granular view to optimize tracker performance, operations and maintenance.

– Independent balanced rows with 120 degree rotational range: Each NX Horizon row has its own controlled motor with rotational range that delivers up to 2% more energy than typical linked row trackers. These agile, independent rows stow in less than 90 seconds to reduce wind forces on the array, protecting the PV modules in harsh environments. NX Horizon solar trackers also have a mechanically balanced row design that align PV panels with the tracker's axis of rotation – which greatly reduces row torque, using less energy from the motor to track throughout the day.

– Self-grounded system with theft-proof fasteners: NX Horizon is the world's first horizontal tracker with an entirely self-grounded design. This means no separate bonding hardware is required. You save on material and associated costs by eliminating grounding washers, braided straps, bare copper wire, and grounding rods. What's more, we've designed our own fasteners that can only be removed with special tools – deterring PV theft.

YASKAWA SOLECTRIA SOLAR



SGI 500XTM
SGI 750XTM

FEATURES
- Compliant with NEC 2014 690.11 & 690.12 arc-fault and rapid shutdown requirements when coupled with ARCCOM combiner
- 98% CEC efficiency
- 1000 VDC
- Parallel power stages
- Fuse and breaker subcombiner options
- Modbus communications
- User-interactive LCD

OPTIONS
- Stainless steel enclosure
- Web-based monitoring
- Built-in cellular connectivity
- AC breaker with shunt trip
- Revenue grade metering
- Air filters
- Uptime guarantee

OPTIONS FOR UTILITIES
- Real power curtailment
- Reactive power control
- Voltage ride through
- Frequency ride through
- Controlled ramp rates
- DRED-ready
- Rule 21 compliant

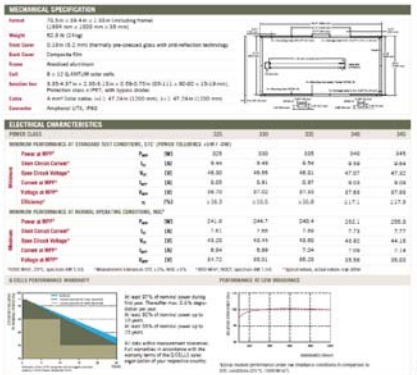
SOLECTRIA.COM

1000VDC UTILITY-SCALE INVERTERS

The only 1000VDC inverter available that is compliant with NEC 2014 690.11 & 690.12 arc-fault and rapid shutdown requirements, Yaskawa – Solectria Solar's SMARTGRID series inverters are optimized for high efficiency, reliability, and economy. Available in two power classes, 500 kW and 750 kW, these inverters are designed for direct connection to an external transformer for large commercial or utility-scale applications. They are robust, outdoor rated inverters that can be configured as 1 or 1.5 MW Solar Stations. Available utility-scale options include advanced grid management features such as voltage and frequency ride through, reactive power control, real power curtailment and power factor control. Listed to 1000 VDC with 98% CEC weighted efficiency, the SGI 500/750XTM inverters set a new standard for large scale power conversion.



ETL



MECHANICAL SPECIFICATION

ELECTRICAL CHARACTERISTICS

PROPERTIES FOR SYSTEM DESIGN

QUALIFICATIONS AND CERTIFICATES

PACKAGING INFORMATION

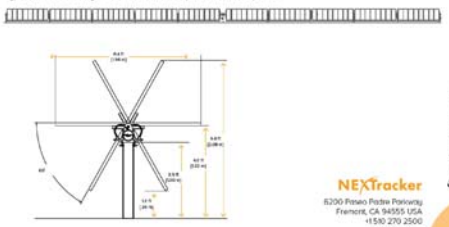
Engineered in Germany

Q CELLS

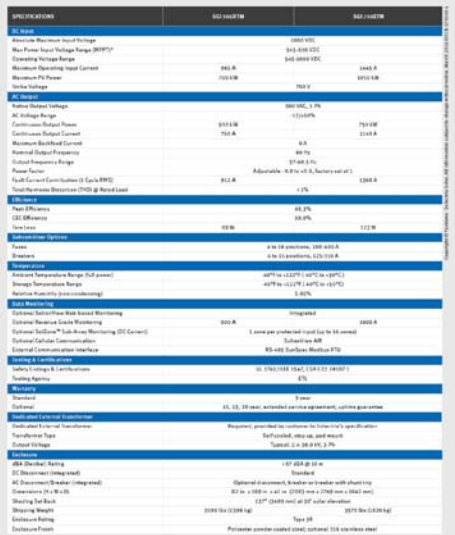
NX Horizon Specifications

Tracking Technology	Horizontal single-axis balanced-mass tracker with independently-driven rows
Tracking Range	Up to 120° (±60°)
Control System	1 Self-Powered Controller (SPC) per tracker; 1 Network Control Unit (NCU) per 100 SPCs
Communications	Wireless ZigBee® mesh network/SCADA; no communication wiring required
Drive System	One slew gear, 24 VDC motor and self-powered controller w/dedicated solar panel per row
DC Capacity	23 35kW/m per tracker row, depending on panel type. Row length up to 90 panels.
System Voltage	1,500 volt or 1,500 volt
Power Consumption	No grid power required
Ground Coverage Ratio	Fully configurable by customer; typical range 33%-50%
Installation Method	Rapid field assembly, no welding required
Foundation Types	Compatible with all major foundation types (driven pier, concrete foundation, ground screw)
Standard Wind Design	100 mph/161 kph, 3 second gust per ASCE7 10; configurable for higher wind speeds
Safety Stowing	Automated wind and snow stowing with self-contained backup power; no external power required
Torsional Limiter	Included at each foundation/bearing for additional wind and snow load protection
Principal Materials	Galvanized and stainless steel
Grounding Method	Self-grounding structure; separate materials and labor not required
Compliance	Grounding/bonding: UL2703; structural design: ASCE7 10
Other Available Options	Snow and flood sensors
Warranty	10-years on structural components; 5-years on drive and control systems
Typical Dimensions	Height 2.1 m/6.8 ft @ 60°; Width 2.0 m/6.4 ft; Length 85 m/283 ft

Typical 72-cell c-Si configuration: 85 m row with 80 panels mounted in portrait:



NEXTracker
6200 Paseo Padre Parkway
Fremont, CA 94555 USA
+1 510 270 2500
nextracker.com



SPECIFICATIONS

	SGI 500XTM	SGI 750XTM
DC Input		
Absolute Maximum Input Voltage	1000 VDC	
Max Power Input Voltage Range (MPPT)*	545-850 VDC	
Operating Voltage Range	545-1000 VDC	
Maximum Operating Input Current	940 A	1440 A
Maximum PV Power	700 kW	1072 kW
Strike Voltage	750 V	
AC Output		
Native Output Voltage	380 VAC, ± 3%	
AC Voltage Range	-12/+10%	
Continuous Output Power	500 kW	750 kW
Continuous Output Current	760 A	1140 A
Maximum Backfeed Current	0 A	
Nominal Output Frequency	60 Hz	
Output Frequency Range	57-63.5 Hz	
Power Factor	Adjustable - 0.8 to +0.8, factory set at 1	
Fault Current Contribution (1 Cycle RMS)	912 A	1368 A
Total Harmonic Distortion (THD) @ Rated Load	< 3%	
Efficiency		
Peak Efficiency	98.3%	
CEC Efficiency	98.0%	
Tare Loss	400 W	512 W
Subcombiner Options		
Fuses	4 to 16 positions, 300-400 A	
Breakers	4 to 15 positions, 125-350 A	
Temperature		
Ambient Temperature Range (full power)	-40°F to +122°F (-40°C to +50°C)	
Storage Temperature Range	-40°F to +122°F (-40°C to +50°C)	
Relative Humidity (non-condensing)	0-95%	
Data Monitoring		
Optional Subcombiner Based Monitoring	Integrated	
Optional Revenue Grade Monitoring	300 A	1800 A
Optional SolGate™ Sub-Array Monitoring (DC Current)	1 zone per protected input (up to 16 zones)	
Optional Cellular Communication	SolarGate AIR	
External Communication Interface	RS-485 SunSpec Modbus RTU	
Safety & Certifications		
Safety Listings & Certifications	UL 1741/IEEE 1547, CSA C22.2#107.1	
Testing Agency	ETL	
Warranty		
Standard	5 year	
Optional	10, 15, 20 year, extended service agreement, uptime guarantee	
Dedicated External Transformer		
Dedicated External Transformer	Required, provided by customer to Solectria's specification	
Transformer Type	Self-cooled, step-up, pad mount	
Output Voltage	Typical: 2.4-34.5 kV, 3-Ph	
Enclosure		
dBA (Decibel) Rating	< 67 dBA @ 10 m	
DC Disconnect (integrated)	Standard	
AC Disconnect/Breaker (integrated)	Optional disconnect, breaker or breaker with shunt trip	
Dimensions (H x W x D)	82 in. x 108 in. x 41 in. (2083 mm x 2743 mm x 1041 mm)	
Shipping Set Back	12" (3048 mm) at 10° solar elevation	
Shipping Weight	3190 lbs (1446 kg)	3570 lbs (1620 kg)
Enclosure Rating	Type 3R	
Enclosure Finish	Polyester powder coated steel; optional 316 stainless steel	

YASKAWA SOLECTRIA SOLAR www.solectria.com | inverters@solectria.com | 978.683.9700

TUUSSO ENERGY

MaxPV ENGINEERING DEVELOPMENT
SOLAR POWER // SACRAMENTO, CA
WWW.MAXPVENGINEERING.COM

REV. NO.	DATE	DESCRIPTION	BY	CHK.	APR.
A	08-09-17	FOR PLAN REVIEW	LB	–	–

OWNER:
TUUSSO ENERGY

PROJECT SITE: PENSTEMON SOLAR PROJECT

DRAWING:
MAJOR EQUIPMENT SPECIFICATIONS

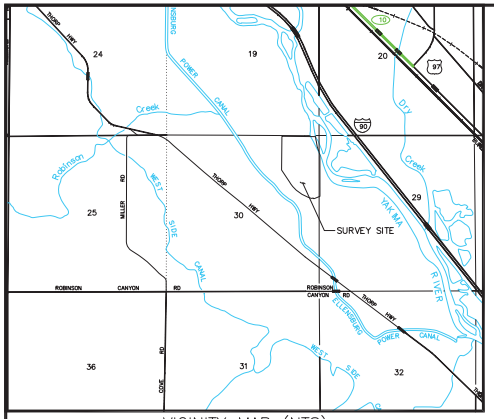
DRAWING NO.
E-901

THE INFORMATION CONTAINED IN THESE DRAWINGS ARE CONFIDENTIAL AND ARE INTENDED FOR THE DESCRIBED PROJECT ONLY.

THIS PRINT IS NOT TO BE USED FOR CONSTRUCTION UNLESS NOTED AND SIGNED OK FOR CONSTRUCTION ABOVE LAST REVISION.

TUUSSO ENERGY - TYPHA SITE

A PORTION OF THE EAST 1/2 OF THE NE 1/4 OF SECTION 30, T. 18 N., R. 18 E., W.M.
KITTITAS COUNTY, STATE OF WASHINGTON

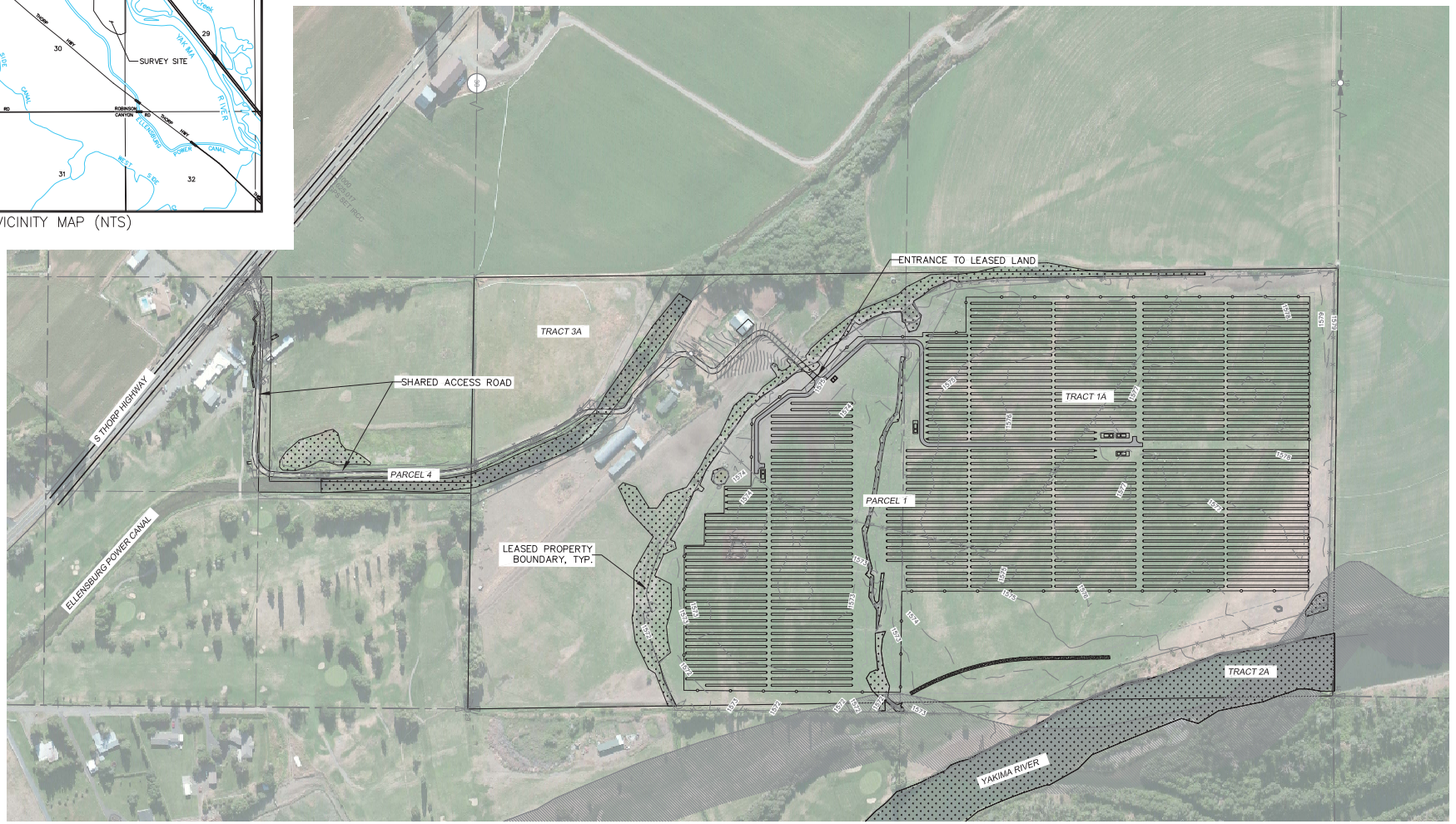


VICINITY MAP (NTS)

NORTH

0 8 37.5 75 150

SCALE 1" = 150'



SHEET INDEX:

TITLE	NO.
COVER SHEET & OVERALL SITE PLAN	C1.0
NOTES, LEGEND & ABBREVIATIONS	C1.1
TESC. GRADING, AND DRAINAGE PLAN	C2.0
TESC DETAILS AND STANDARD DETAILS	C2.1

NOTES:

1. ALL CONSTRUCTION TECHNIQUES AND MATERIALS SHALL BE IN ACCORDANCE WITH THE CURRENT STATE OR COUNTY STANDARDS (AS APPLICABLE) AND AS SHOWN IN THESE PLANS.
2. BOUNDARY AND TOPOGRAPHIC SURVEY SHOWN HEREON WAS PREPARED BY ENCOMPASS ENGINEERING AND SURVEYING IN MAY 2017 UNDER DIRECT SUPERVISION OF DUSTIN PIERCE, PLS #45503.

PROPERTY INFORMATION:

APPLICANT:	TUUSSO ENERGY, LLC 500 YALE AVE N SEATTLE, WA 98109
PARCEL NUMBERS:	712633, 752633, 802633
PARCEL 1 SIZE:	80.44 ACRES
TRACT 1A SIZE:	54.29 ACRES (LEASED)
TRACT 2A SIZE:	1.85 ACRES (LEASED)
TRACT 3A SIZE:	24.30 ACRES (NOT LEASED)
PARCEL 4 SIZE:	0.97 ACRES (NOT LEASED)
PROPERTY ADDRESS:	TBD, ELLENSBURG, WA 98926
ZONE:	COMMERCIAL AGRICULTURAL
IRRIGATION DISTRICT:	WEST SIDE, PACKWOOD

INDEX LOCATION
SEC. 30 T. 18 N.R. 18 E. W.M.



811
Know what's below.
Call before you dig.

REVISIONS			
DESCRIPTION	BY	DATE	

© THE PLANS SET FORTH ON THIS SHEET ARE AND SHALL REMAIN THE PROPERTY OF ENCOMPASS ENGINEERING & SURVEYING

TODD MICOULIS HOWARD
STATE OF WASHINGTON
22005
REGISTERED PROFESSIONAL ENGINEER

TUUSSO ENERGY, LLC
TYPHA SITE

COVER SHEET AND OVERALL SITE PLAN

Encompass
ENGINEERING & SURVEYING
Western Washington Division
165 NE Juniper Street, Suite 201 • Issaquah, WA 98027 • Phone: (425) 392-0250 • Fax: (425) 391-3055
Eastern Washington Division
407 Swiftwater Blvd. • Cle Elum, WA 98922 • Phone: (509) 674-7433 • Fax: (509) 674-7419

JOB NO.	17019
DATE	Sept. 27 2017
SCALE	AS SHOWN
DESIGNED	SF
DRAWN	SF
CHECKED	TML
APPROVED	TML
SHEET	C1.0

STANDARD PLAN NOTES:

1. ALL CONSTRUCTION TECHNIQUES AND MATERIALS SHALL BE IN ACCORDANCE WITH THE CURRENT STATE OR COUNTY STANDARDS AND AS SHOWN IN THESE PLANS.
2. A COPY OF THE APPROVED PLANS MUST BE ON SITE WHENEVER CONSTRUCTION IS IN PROGRESS.
3. THE CONTRACTOR SHALL OBTAIN ALL PERMITS REQUIRED FOR WORK THAT ARE NOT PROVIDED BY THE OWNER PRIOR TO START OF CONSTRUCTION.
4. PAVED OR SIMILAR ESTABLISHED SURFACES INCLUDING ROADWAYS, SIDEWALKS AND CURBS THAT ARE TO REMAIN BUT ARE DAMAGED BY NEW CONSTRUCTION SHALL BE REPAIRED AS REQUIRED BY THE INSPECTOR.
5. ALL SURVEYING AND STAKING OF IMPROVEMENTS SHALL BE APPROVED BY THE OWNER. CONTRACTOR SHALL COORDINATE AND VERIFY WITH THE OWNER PRIOR TO OBTAINING STAKING SERVICES.
6. THE CONTRACTOR SHALL NOTIFY THE KITTITAS COUNTY FIRE DISTRICT (509-386-1495) TWENTY-FOUR (24) HOURS IN ADVANCE OF ALL WATER SERVICE INTERRUPTIONS, HYDRANT SHUT-OFFS, AND STREET CLOSURES OR OTHER ACCESS BLOCKAGE. THE CONTRACTOR SHALL ALSO NOTIFY THE DISTRICT OF ALL NEW, RELOCATED, OR ELIMINATED HYDRANTS RESULTING FROM THIS WORK.
7. ALL LOCATIONS OF EXISTING UTILITIES SHOWN HEREON HAVE BEEN ESTABLISHED BY FIELD SURVEY OR OBTAINED FROM AVAILABLE RECORDS AND SHOULD THEREFORE BE CONSIDERED APPROXIMATE ONLY AND NOT NECESSARILY COMPLETE. IT IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR TO INDEPENDENTLY VERIFY THE ACCURACY OF ALL UTILITY LOCATIONS SHOWN AND TO FURTHER DISCOVER AND AVOID ANY OTHER UTILITIES NOT SHOWN HEREON WHICH MAY BE AFFECTED BY THE IMPLEMENTATION OF THIS PLAN.
8. THE CONTRACTOR SHALL LOCATE AND PROTECT ALL ACTIVE CASTINGS AND UTILITIES DURING CONSTRUCTION AND SHALL CONTACT THE UNDERGROUND UTILITIES LOCATOR SERVICE (1-800-424-5555 OR 811) AT LEAST 48 HOURS PRIOR TO CONSTRUCTION.
9. THE CONTRACTOR SHALL ADJUST ALL EXISTING MANHOLE RIMS, DRAINAGE STRUCTURE LIDS, VALVE BOXES AND UTILITY ACCESS STRUCTURES TO FINISH GRADE WITHIN AREAS AFFECTED BY THE PROPOSED IMPROVEMENTS.
10. THE CONTRACTOR SHALL PROVIDE FOR ALL COMPACTION TESTS REQUIRED BY THE INSPECTOR.
11. BACKFILL MATERIAL SHALL MEET STATE OR COUNTY STANDARDS.
12. INSPECTION AND ACCEPTANCE OF ALL WORK WILL BE ACCOMPLISHED BY THE DESIGNATED INSPECTOR. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE AND SCHEDULE APPROPRIATE INSPECTIONS, ALLOWING PROPER ADVANCE NOTICE. THE INSPECTOR MAY REQUIRE RECONSTRUCTION OF ITEMS THAT DO NOT MEET THE CONTRACT DOCUMENTS OR THAT WERE CONSTRUCTED WITHOUT INSPECTION.
13. THE CONTRACTOR SHALL PROVIDE AND MAINTAIN BEST MANAGEMENT PRACTICES AS SHOWN HEREIN TO INSURE THAT SEDIMENT-LADEN WATER DOES NOT ENTER THE WATER OF THE STATE. AS CONSTRUCTION PROGRESSES AND UNEXPECTED (SEASONAL) CONDITIONS DICTATE, ADDITIONAL BEST MANAGEMENT PRACTICES MAY BE REQUIRED. THEREFORE, DURING THE COURSE OF CONSTRUCTION IT SHALL BE THE OBLIGATION AND RESPONSIBILITY OF THE CONTRACTOR TO ADDRESS ANY NEW CONDITIONS THAT MAY BE CREATED BY HIS ACTIVITIES AND TO PROVIDE ADDITIONAL FACILITIES THAT MAY BE NEEDED TO PROTECT ADJACENT PROPERTIES.
14. THE CONTRACTOR SHALL KEEP ALL STREETS AND PUBLIC RIGHT-OF-WAY CLEAN AT ALL TIMES BY SWEEPING.
15. CONTRACTOR SHALL PROVIDE TRAFFIC CONTROL AS NECESSARY THROUGHOUT THE PROJECT. TRAFFIC CONTROL SHALL BE IN ACCORDANCE WITH THE MUTCD, STATE, AND/OR COUNTY STANDARDS.
16. CONTRACTOR SHALL NOT MAKE ANY REVISIONS IN THE FIELD WITHOUT PRIOR WRITTEN APPROVAL BY THE ENGINEER.
17. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ADEQUATE SAFEGUARDS, SAFETY DEVICES, PROTECTIVE EQUIPMENT, FLAGGERS, AND ANY OTHER NEEDED ACTIONS TO PROTECT THE LIFE, HEALTH, AND SAFETY OF THE PUBLIC, AND TO PROTECT PROPERTY IN CONNECTION WITH THE PERFORMANCE OF WORK COVERED BY THE CONTRACTOR. ANY WORK WITHIN THE TRAVELED RIGHT-OF-WAY THAT MAY INTERRUPT NORMAL TRAFFIC FLOW SHALL REQUIRE AT LEAST ONE FLAGGER FOR EACH LANE OF TRAFFIC AFFECTED. ALL SECTIONS OF THE WSDOT STANDARD SPECIFICATIONS 1-07.23 – TRAFFIC CONTROL, SHALL APPLY.
18. ANY TRENCH DEEPER THAN 5 FEET WILL REQUIRE SHORING FOR TRENCH WALL STABILIZATION.

GENERAL TESC NOTES:

1. APPROVAL OF THIS TEMPORARY EROSION AND SEDIMENTATION CONTROL (TESC) PLAN DOES NOT CONSTITUTE AN APPROVAL OF PERMANENT ROAD OR DRAINAGE DESIGN (E.G. SIZE AND LOCATION OF ROADS, PIPES, RESTRICTORS, CHANNELS, RETENTION FACILITIES, UTILITIES, ETC.).
2. THE IMPLEMENTATION OF THESE TESC PLANS AND THE CONSTRUCTION, MAINTENANCE, REPLACEMENT, AND UPGRADING OF THESE TESC FACILITIES IS THE RESPONSIBILITY OF THE APPLICANT OR A TESC SUPERVISOR UNTIL ALL CONSTRUCTION IS APPROVED.
3. THE BOUNDARIES OF THE CLEARING LIMITS SHOWN ON THIS PLAN SHALL BE CLEARLY FLAGGED BY A CONTINUOUS LENGTH OF SURVEY TAPE (OR FENCING, IF REQUIRED) PRIOR TO CONSTRUCTION. DURING THE CONSTRUCTION PERIOD, NO DISTURBANCE BEYOND THE CLEARING LIMITS SHALL BE PERMITTED. THE CLEARING LIMITS SHALL BE MAINTAINED BY THE APPLICANT/TESC SUPERVISOR FOR THE DURATION OF CONSTRUCTION.
4. THE TESC FACILITIES SHOWN ON THIS PLAN MUST BE CONSTRUCTED PRIOR TO OR IN CONJUNCTION WITH ALL CLEARING AND GRADING SO AS TO ENSURE THAT THE TRANSPORT OF SEDIMENT TO SURFACE WATERS, DRAINAGE SYSTEMS, AND ADJACENT PROPERTIES IS MINIMIZED.
5. THE TESC FACILITIES SHOWN ON THIS PLAN ARE THE MINIMUM REQUIREMENTS FOR ANTICIPATED SITE CONDITIONS. DURING THE CONSTRUCTION PERIOD, THESE TESC FACILITIES SHALL BE UPGRADED AS NEEDED FOR UNEXPECTED STORM EVENTS AND MODIFIED TO ACCOUNT FOR CHANGING SITE CONDITIONS (E.G. ADDITIONAL SUMP PUMPS, RELOCATION OF DITCHES AND SILT FENCES, ETC.).
6. ANY AREAS OF EXPOSED SOILS, INCLUDING ROADWAY EMBANKMENTS, THAT WILL NOT BE DISTURBED FOR TEN DAYS DURING THE WET SEASON OR FOURTEEN DAYS DURING THE DRY SEASON SHALL BE IMMEDIATELY STABILIZED WITH THE APPROVED TESC METHODS (E.G., SEEDING, MULCHING, PLASTIC COVERING, ETC.).
7. ANY AREA NEEDING TESC MEASURES, NOT REQUIRING IMMEDIATE ATTENTION, SHALL BE ADDRESSED WITHIN FIFTEEN (15) DAYS.
8. THE TESC FACILITIES ON INACTIVE SITES SHALL BE INSPECTED AND MAINTAINED A MINIMUM OF ONCE A MONTH OR WITHIN 48 HOURS FOLLOWING A STORM EVENT.
9. AT NO TIME SHALL MORE THAN ONE (1) FOOT OF SEDIMENT BE ALLOWED TO ACCUMULATE WITHIN A CATCH BASIN. ALL CATCH BASINS AND CONVEYANCE LINES SHALL BE CLEANED PRIOR TO PAVING. THE CLEANING OPERATION SHALL NOT FLUSH SEDIMENT-LADEN WATER INTO THE DOWNSTREAM SYSTEM.
10. STABILIZED CONSTRUCTION ENTRANCES AND ROADS SHALL BE INSTALLED AT THE BEGINNING OF CONSTRUCTION AND MAINTAINED FOR THE DURATION OF THE PROJECT. ADDITIONAL MEASURES, SUCH AS WASH PADS, MAY BE REQUIRED TO ENSURE THAT ALL PAVED AREAS ARE KEPT CLEAN FOR THE DURATION OF THE PROJECT.
11. ANY PERMANENT RETENTION/DETENTION FACILITY USED AS A TEMPORARY SETTLING BASIN SHALL BE MODIFIED WITH THE NECESSARY EROSION CONTROL MEASURES AND SHALL PROVIDE ADEQUATE STORAGE CAPACITY. IF THE PERMANENT FACILITY IS TO FUNCTION ULTIMATELY AS AN INFILTRATION SYSTEM, THE TEMPORARY FACILITY MUST BE GRADED SO THAT THE BOTTOM AND SIDES ARE AT LEAST ONE FOOT ABOVE THE FINAL GRADE OF THE PERMANENT FACILITY.
12. WHERE STRAW MULCH FOR TEMPORARY EROSION CONTROL IS REQUIRED, IT SHALL BE APPLIED AT A MINIMUM THICKNESS OF TWO INCHES

STANDARD GRADING NOTES:

1. ALL GRADING ACTIVITIES, INCLUDING EXCAVATION, BACKFILL AND COMPACTION, SHALL BE DONE IN ACCORDANCE WITH STATE OR COUNTY STANDARDS AS APPLICABLE.
2. WITHIN ANY AREAS TO RECEIVE STRUCTURAL FILL, PAVEMENTS OR HARDSCAPE, THE SUBGRADE SHALL BE SCARIFIED, MOISTURE CONDITIONED, AND COMPACTED TO AT LEAST 95% MAXIMUM DENSITY (ASTM D 1557).
3. CONTRACTOR SHALL OBTAIN AN APPROVAL BY THE GEOTECHNICAL ENGINEER PRIOR TO PROCEEDING WITH ANY OVEREXCAVATION. CONTRACTOR SHALL VERIFY THE AMOUNT OF OVEREXCAVATION WITH GEOTECHNICAL ENGINEER.
4. COMPACTION SHALL BE DONE PER STATE OR COUNTY STANDARDS AS APPLICABLE. SITE EXCAVATION AND/OR SUBGRADE PREPARATION SHALL BE COMPLETED BEFORE PLACING STRUCTURAL FILL. COMPACTION SHALL BE VERIFIED BY DENSITY TESTING.
5. ALL TEMPORARY CUT SLOPES SHALL NOT EXCEED 1.5H:1V. ALL PERMANENT CUT SLOPES SHALL NOT EXCEED 2H:1V OR AS SHOWN ON PLANS. ALL PERMANENT FILL SLOPES SHALL NOT EXCEED 2H:1V.
6. CONTRACTOR SHALL IMPLEMENT APPROPRIATE PROTECTION AND TRAFFIC CONTROL DURING CONSTRUCTION TO DIRECT TRUCK TRAFFIC.
7. ANY AND ALL FILL MATERIAL PLACED ON THE LOT SHALL BE COMPACTED AND A COMPACTION INSPECTION REPORT FOR THE COMPACTION AND BEARING CAPACITY OF THAT FILL MATERIAL SHALL BE PROVIDED TO THE STATE OR COUNTY AS APPLICABLE WITHIN 60 DAYS OF THE PLACEMENT OF THE FILL MATERIAL.
8. ALL EXCESS SOIL SHALL BE OFF-HAULED TO A LEGAL DISPOSAL SITE. NO EXCESS SOIL SHALL BE SPREAD ON THE SITE WITHOUT CLEARLY BEING SHOWN ON THE APPROVED GRADING PLAN.
9. ALL CUT AND FILL SLOPES AND ALL EXPOSED DIRT SHALL BE PLANTED, WATERED AND MAINTAINED UNTIL EFFECTIVE EROSION CONTROL HAS BEEN ESTABLISHED TO THE SATISFACTION OF THE STATE OR COUNTY AS APPLICABLE.
10. CONTRACTOR SHALL PROVIDE HIS/HER OWN EARTHWORK CALCULATIONS FOR ALL CUT AND FILL OPERATIONS.

ABBREVIATIONS:

AC – ASPHALT CONCRETE
ACP – ASBESTOS CEMENT PIPE
ADD'L – ADDITIONAL
AD – AREA DRAIN
ADJ – ADJACENT
ANSI – AMERCIAN NATIONAL STANDARDS INSTITUTE
ALT – ALTERNATE
ALUM – ALUMINUM
APPROX – APPROXIMATE(LY)
ARCH – ARCHITECT(URAL)
AP – ANGLE POINT
ASPH – ASPHALT
ASSY – ASSEMBLY
ASTM – AMERICAN SOCIETY OF TESTING AND MATERIALS
AVE – AVENUE
BC – BACK OF CURB
BF – BLIND FLANGE
BLDG – BUILDING
BLDC – BUILDING CORNER
BLK – BLOCK
BLVD – BOULEVARD
BM – BENCHMARK
BNDY – BOUNDARY
BO – BLOW OFF
BOW – BOTTOM OF WALL (AT FINISHED GRADE)
BSBL – BUILDING SETBACK LINE
BVC – BEGINNING OF VERTICAL CURVE
BVCE – BEGIN VERTICAL CURVE ELEVATION
BVCS – BEGIN VERTICAL CURVE STATION
BW – BACK OF WALK
CB – CATCH BASIN
CF – CUBIC FEET (FOOT)
CIP – CAST IRON PIPE
CJ – CONSTRUCTION JOINT
CL – CLASS
C/L – CENTER LINE
CLR – CLEARENCE
CMP – CORRUGATED METAL PIPE
CO – CLEAN OUT
CONN – CONNECTION
CONT – CONTINUOUS (CONTINUED)
CONTR – CONTRACTOR
C, CONC – CONCRETE
CONST – CONSTRUCTION
CP – CONTROL POINT
CFS – CUBIC FEET PER SECOND
CTR – CENTER(ED)
CTV – CABLE TV
C&G – CURB AND GUTTER
CY – CUBIC YARD
DCVA – DOUBLE CHECK VALVE ASSEMBLY
DDCV – DOUBLE DETECTOR CHECK VALVE
DEPT. – DEPARTMENT
DET – DETAIL OR DETENTION
DIP – DUCTILE IRON PIPE
DIA(S) – DIAMETER
DIM – DIMENSION
DOT – DEPARTMENT OF TRANSPORTATION
DS – DOWN SPOUT
DWG – DRAWING
E – EAST(ING)
EA – EACH
EL – ELEVATION
ELEC – ELETRICAL
EP – EDGE OF PAVEMENT
EQUIV – EQUIVALENT
EVC – END OF VERTICAL CURVE
EVCE – END OF VERTICAL CURVE ELEVATION
EVCS – END OF VERTICAL CURVE STATION
EX, EXIST – EXISTING
FC – FACE OF CURB
FD – FLOOR DRAIN
FDC – FIRE DEPARTMENT CONNECTION
FFE – FINISH FLOOR ELEVATION
FH – FIRE HYDRANT
FL – FLANGED OR FLOW LINE
FLR – FLOOR
FS – FINISHED SURFACE
FT (') – FOOT (FEET)
FTG – FOOTING
G – GAS MAIN
GA – GAUGE
GALV – GALVANIZED
GB – GRADE BREAK
GM– GAS METER
GRD – GRADE
HB – HOSE BIBB
HDPE – HIGH DENSITY POLYETHYLENE
HORIZ (H) – HORIZONTAL
HT – HEIGHT
HYD – HYDRANT
ID – INSIDE DIAMETER
IE – INVERT ELEVATION
IN (") – INCHES
INV – INVERT
IRR – IRRIGATION WATER
L – LENGTH
LB, # – POUND(S)
LF – LINEAR FEET
LN – LANE
MAT'L – MATERIAL
MAX – MAXIMUM
MFR – MANUFACTURER
MH – MANHOLE
MIN – MINIMUM
MISC – MISCELLANEOUS
MJ – MECHANICAL JOINT
N – NORTH(ING)
NO (#) – NUMBER
N.T.S. – NOT TO SCALE
O.C. – ON CENTER
O.D. – OUTSIDE DIAMETER
O/W – OIL WATER
P – POWER
PC – POINT OF CURVATURE
PERF – PERFORATED
PI – POINT OF INTERSECTION
PIV – POST INDICTOR VALVE
PL – PROPERTY LINE
PP – POWER POLE
PROV – PROVIDED
PSF – POUNDS PER SQUARE FOOT
PSI – POUNDS PER SQUARE INCH
PT – POINT OF TANGENCY
PVC – POLYVINYL CHLORIDE
PVI – POINT OF VERTICAL INTERSECTION
PVMT – PAVEMENT
PVT – POINT OF VERTICAL TANGENT
QTY – QUANTITY
RAD (R) – RADIUS
RCP – REINFORCED CONCRETE PIPE
RD – ROAD
REF – REFERENCE
REINF – REINFORCED
REQ – REQUIRED
RET – RETAINING
ROW – RIGHT-OF-WAY
RR – RAILROAD
S – SOUTH
S, SL – SLOPE
SCH – SCHEDULE
SD – STORM DRAIN
SF – SQUARE FOOT
SHT – SHEET
SIM – SIMILAR
SPEC – SPECIFICATION(S)
SQ – SQUARE
SS – SANITARY SEWER
ST – STREET
STA – STATION
STD – STANDARD
STL – STEEL
T – TELEPHONE WIRE
TBM – TEMPORARY BENCH MARK
TC – TOP OF CURB
TEMP – TEMPORARY
TG/RIM – TOP OF GRATE/RIM
THRU – THROUGH
TOE – TOE OF WALL OR SLOPE
TOP – TOP OF WALL OR SLOPE
TOW – TOP OF WALL
TYP – TYPICAL
VC – VERTICAL CURVE
VOL – VOLUME
W – WEST
W/ – WITH
WM – WATER METER
W/O – WITHOUT
WQ – WATER QUALITY
WT – WEIGHT
WWF – WELDED WIRE FABRIC
WV – WATER VALVE
YD – YARD DRAIN

LEGEND

	EXISTING:	PROPOSED:
BOUNDARY LINE/RIGHT-OF-WAY		
LOT LINE		
STREET MONUMENT (IN CONCRETE)		
PROPERTY CORNER		
BENCHMARK/CONTROL POINT		
TEMPORARY BENCHMARK	TBM	TBM
EASEMENT LINE		
CENTERLINE		
CURB/GUTTER/SIDEWALK LINE		
EDGE OF PAVEMENT LINE		
CHAIN LINK FENCE LINE		
SIGN		
STREET LIGHT (ELECTROLIER)		
GRADE BREAK LINE		
CONTOUR LINE (MAJOR)	1650	1650
CONTOUR LINE (MINOR)	1651	1651
CATCH BASIN (TYPE 1)		
STORM DRAIN MANHOLE/CATCH BASIN TYPE 2		
STORM DRAIN LINE	SD	
CONTROL STRUCTURE		
RIP-RAP PAD		
SANITARY SEWER LINE	SS	
SANITARY SEWER CLEANOUT		
SANITARY SEWER MANHOLE		
WATERMAIN LINE	W	
GATE VALVE (MECHANICAL JOINT)		
GATE VALVE (FLANGE)		
WATER METER		
FIRE HYDRANT		
CAP		
GAS LINE	G	G
GAS VALVE		
UNDERGROUND ELECTRIC LINE	E	E
POWER POLE / UTILITY POLE		
GUY ANCHOR		
ELECTRICAL TRANSFORMER / VAULT	P	P
TELEPHONE VAULT/PEDESTAL	T	T
TELEPHONE MANHOLE	T	T
100 YR FLOODPLAIN HATCH		
CONCRETE HATCH		
GRAVEL HATCH		
ALL WEATHER ROAD HATCH (COMPACTED SOIL OR GRAVEL)		
PROPOSED LANDSCAPING STRIP		

CONTRACTOR RESPONSIBILITY:

CONTRACTOR AGREES THAT HE SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS, INCLUDING THE SAFETY OF ALL PERSONS AND PROPERTY, DURING THE COURSE OF CONSTRUCTION OF THIS PROJECT, AND THAT THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS. THE CONTRACTOR SHALL DEFEND, INDEMNIFY AND HOLD THE OWNER AND THE ENGINEER HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXCEPTING FOR LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE OWNER OR THE ENGINEER.

DISCREPANCIES:

IF THERE ARE ANY DISCREPANCIES BETWEEN DIMENSIONS IN DRAWINGS AND EXISTING CONDITIONS WHICH WILL AFFECT THE WORK, THE CONTRACTOR SHALL BRING SUCH DISCREPANCIES TO THE ATTENTION OF THE ENGINEER FOR ADJUSTMENT BEFORE PROCEEDING WITH THE WORK. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROPER FITTING OF ALL WORK AND FOR THE COORDINATION OF ALL TRADES, SUBCONTRACTORS, AND PERSONS ENGAGED UPON THIS CONTRACT.

REVISIONS		
DESCRIPTION	BY	DATE

© THE PLANS SET FORTH ON THIS SHEET ARE AND SHALL REMAIN THE PROPERTY OF ENCOMPASS ENGINEERING & SURVEYING

TODD MICHOULIS HOWARD
STATE OF WASHINGTON
21995
REGISTERED
PROFESSIONAL ENGINEER

TUSSO ENERGY, LLC
TYPHA SITE

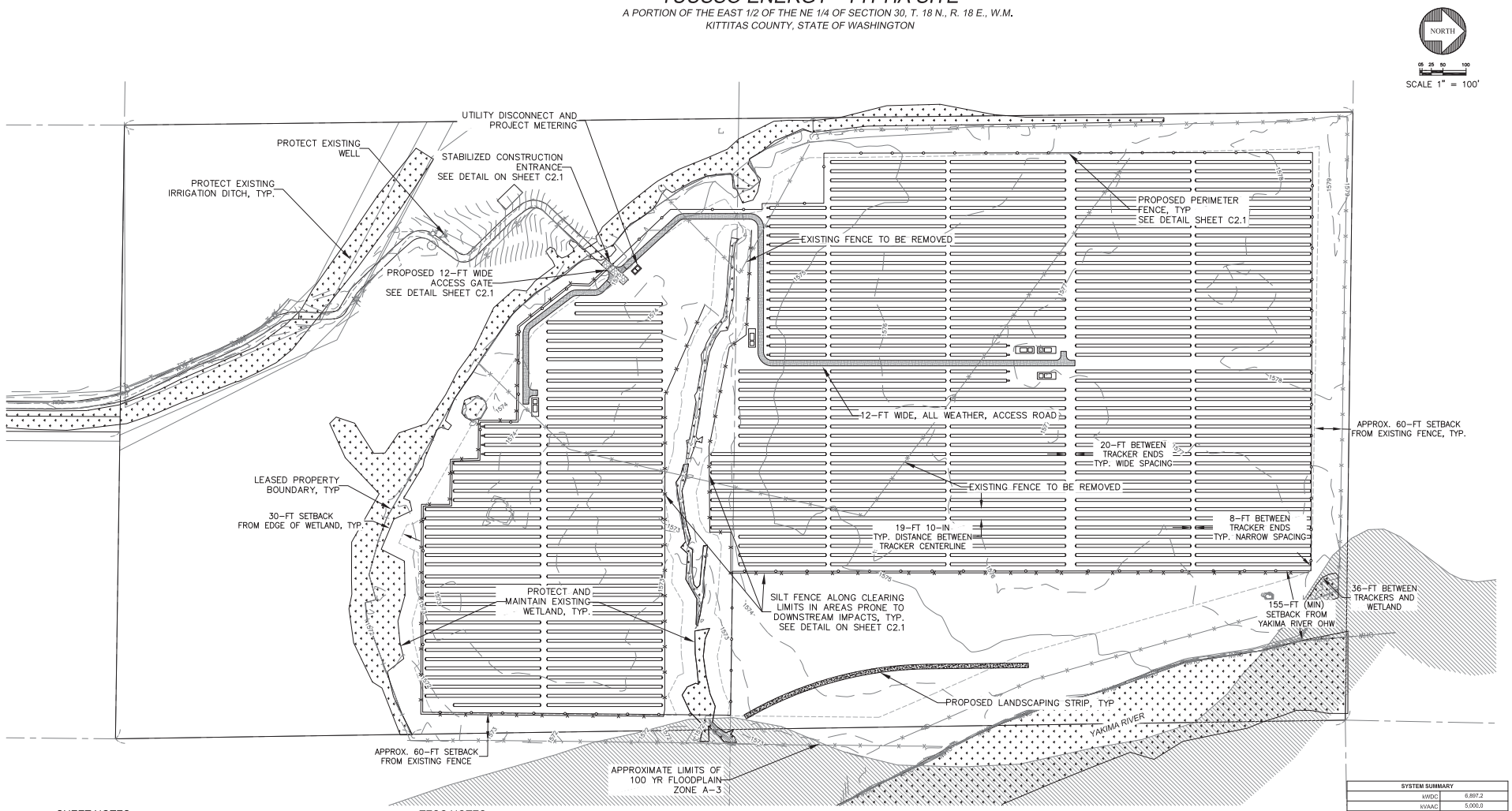
NOTES, LEGEND & ABBREVIATIONS

Encompass
ENGINEERING & SURVEYING
Western Washington Division
165 NE Juniper Street, Suite 201 • Issaquah, WA 98027 • Phone: (425) 392-0250 • Fax: (425) 391-3055
Eastern Washington Division
407 Stellhorse Blvd • Cle Elum, WA 98922 • Phone: (509) 674-7433 • Fax: (509) 674-7419

JOB NO.	17019
DATE	Sept. 27 2017
SCALE	AS SHOWN
DESIGNED	SF
DRAWN	SF
CHECKED	TML
APPROVED	TML
SHEET	C1.1

TUUSSO ENERGY - TYPHA SITE

A PORTION OF THE EAST 1/2 OF THE NE 1/4 OF SECTION 30, T. 18 N., R. 18 E., W.M.
KITTITAS COUNTY, STATE OF WASHINGTON



SHEET NOTES:

1. REFER TO STANDARD PLAN NOTES ON SHEET C1.1.
2. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH STATE OR COUNTY STANDARDS AS APPLICABLE. IT SHALL BE THE SOLE RESPONSIBILITY OF THE APPLICANT AND THE PROFESSIONAL CIVIL ENGINEER TO CORRECT ANY ERROR, OMISSION, OR VARIATION FROM THE ABOVE REQUIREMENTS FOUND IN THESE PLANS.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ADEQUATE SAFEGUARDS, SAFETY DEVICES, PROTECTIVE EQUIPMENT, FLAGGERS, AND ANY OTHER NEEDED ACTIONS TO PROTECT THE LIFE, HEALTH, AND SAFETY OF THE PUBLIC, AND TO PROTECT PROPERTY IN CONNECTION WITH THE PERFORMANCE OF WORK COVERED BY THE CONTRACTOR. ANY WORK WITHIN THE TRAVELED RIGHT-OF-WAY THAT MAY INTERRUPT NORMAL TRAFFIC FLOW SHALL REQUIRE AT LEAST ONE FLAGGER FOR EACH LANE OF TRAFFIC AFFECTED. ALL SECTIONS OF THE WSDOT STANDARD SPECIFICATIONS 1-07.23 - TRAFFIC CONTROL, SHALL APPLY.
4. ANY TRENCH DEEPER THAN 5 FEET WILL REQUIRE SHORING FOR TRENCH WALL STABILIZATION.

TESC NOTES:

1. SILT FENCE TO BE INSTALLED AS STAND-ALONE UNLESS RUNNING ALONG EXIST. FENCE.
2. CONTRACTOR'S STAGING AREA AND STOCKPILE AREAS SHALL BE DETERMINED PRIOR TO START OF CONSTRUCTION.

TESC LEGEND:

SILT FENCE - SEE DETAIL ON SHEET C2.1

CONSTRUCTION ENTRANCE - SEE DETAIL ON SHEET C2.1

RECOMMENDED CONSTRUCTION SEQUENCE:

(1) PRE-CONSTRUCTION MEETING.
(2) GRADE AND INSTALL CONSTRUCTION ENTRANCE(S).
(3) INSTALL PERIMETER PROTECTION (SILT FENCE, BRUSH BARRIER, ETC.).
(4) GRADE AND STABILIZE CONSTRUCTION ROADS.
(5) INSTALL WIDE FLANGE STEEL PILES.
(6) INSTALL ELECTRICAL UNDERGROUND AND MECHANICAL TRACKERS
(7) INSTALL PANELS
(8) PERFORM ANY REQUIRED SITE RESTORATION

LEGEND

- INVERTER STATION
- 72 MODULE TRACKER
- 54 MODULE TRACKER
- 36 MODULE TRACKER

SYSTEM SUMMARY	
kWDC	6,897.2
kVAAC	5,000.0
INVERTER QTY.	5
MODULE QTY.	19,992
DC SYSTEM VOLTAGE (V)	1000
DC SYSTEM VOLTAGE (kV)	12.47
INVERTER AC RATING (KVA)	1000
PV MODULE MODEL #	QCELLS 345W
PV MODULE NAMEPLATE (W)	345
RACKING SYSTEM	NEXTRACKER
GROUND COVERAGE RATIO	0.33
DC:AC RATIO	1.38
MODULE TILT	TRACKER, +/-60°
NORTH AREA	
kWDC	5,133.6
kVAAC	4,000.0
DC:AC RATIO	1.28
INVERTER QTY.	4
SOUTH AREA	
kWDC	1,763.6
kVAAC	1,000.0
DC:AC RATIO	1.76
INVERTER QTY.	1

REVISIONS

DESCRIPTION	BY	DATE

© THE PLANS SET FORTH ON THIS SHEET ARE, AND SHALL REMAIN THE PROPERTY OF ENCOMPASS ENGINEERING & SURVEYING

TODD MICROULIS HOWARD
STATE OF WASHINGTON
22995
REGISTERED
PROFESSIONAL ENGINEER

TUUSSO ENERGY, LLC
TYPHA SITE

TESC, GRADING, AND DRAINAGE PLAN

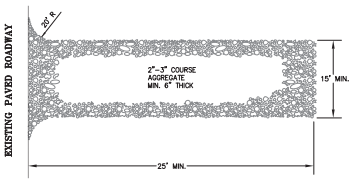
Encompass
ENGINEERING & SURVEYING
Western Washington Division
165 NE Juniper Street, Suite 201 ▪ Issaquah, WA 98027 ▪ Phone: (425) 392-0250 ▪ Fax: (425) 391-3055
Eastern Washington Division
407 Swiftwater Blvd. ▪ Cle Elum, WA 98922 ▪ Phone: (509) 674-7433 ▪ Fax: (509) 674-7419

JOB NO.	17019
DATE	Sept. 27 2017
SCALE	AS SHOWN
DESIGNED	SF
DRAWN	SF
CHECKED	TML
APPROVED	TML
SHEET	C2.0

TUUSSO ENERGY - TYPHA SITE

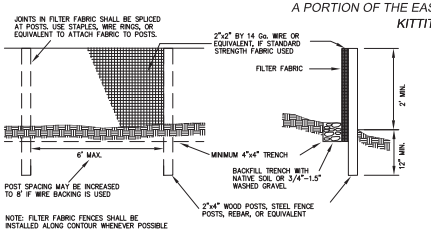
A PORTION OF THE EAST 1/2 OF THE NE 1/4 OF SECTION 30, T. 18 N., R. 18 E., W.M.

KITTITAS COUNTY, STATE OF WASHINGTON

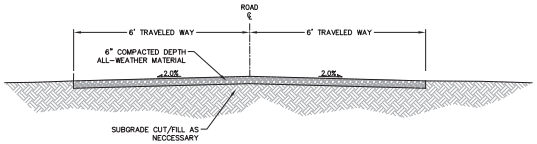


NOTES:
1. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION THAT WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS–OF–WAY. THIS MAY REQUIRE TOP DRESSING, REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT.
2. WHEN NECESSARY, WHEELS SHALL BE CLEANED PRIOR TO ENTRANCE ONTO PUBLIC RIGHT–OF–WAY.
3. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH CRUSHED STONE THAT DRAINS INTO AN APPROVED SEDIMENT TRAP OR SEDIMENT BASIN.

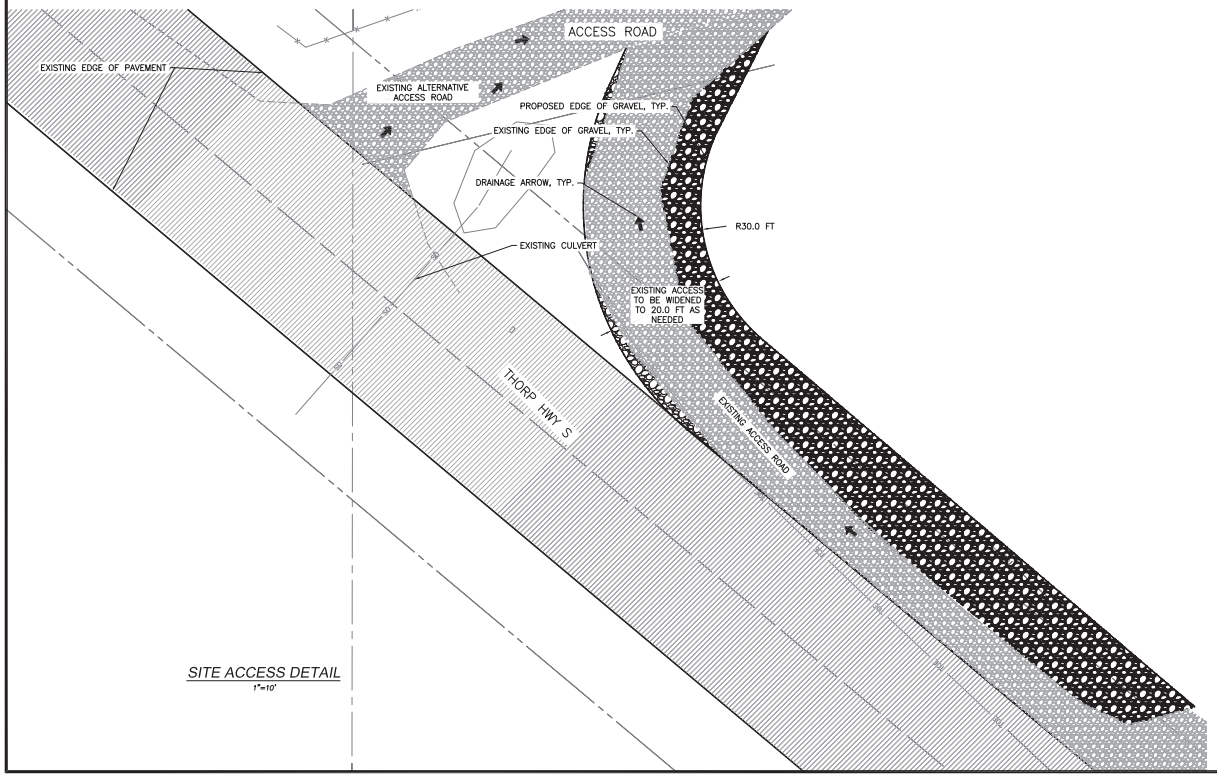
ROCK CONSTRUCTION ENTRANCE
N.T.S.



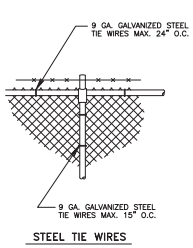
SILT FENCE DETAIL
N.T.S.



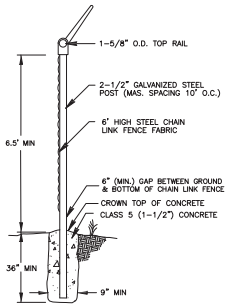
TYPICAL ALL-WEATHER ACCESS ROAD SECTION
N.T.S.



SITE ACCESS DETAIL
1"=10'

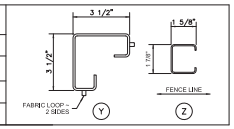


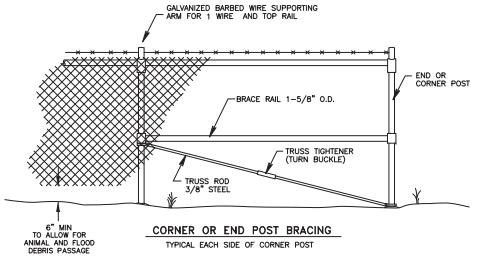
STEEL TIE WIRES



TYPICAL FENCE SECTION

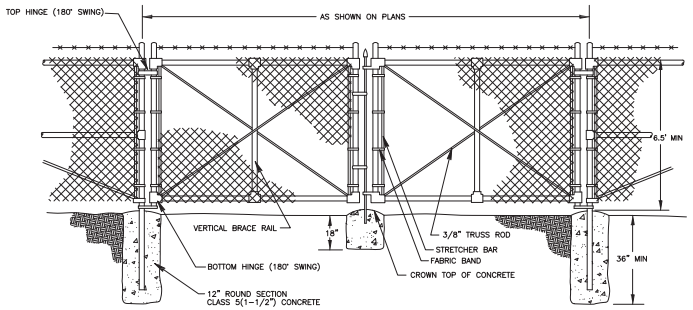
POST AND RAIL SPECIFICATIONS			
POST	PIPE NOM. SIZE (SCH. 40) I.D.	ROLL FORMED SECTION	ROLL FORMED WEIGHT (lb/ft)
END, CORNER, OR PULL POST	2 1/2" DIAM.	Y	5.10
LINE OR BRACE POST	2" DIAM.	Z	1.85





CORNER OR END POST BRACING
TYPICAL EACH SIDE OF CORNER POST

CHAIN LINK FENCE DETAIL
N.T.S.



CHAIN LINK FENCE GATE DETAIL
N.T.S.

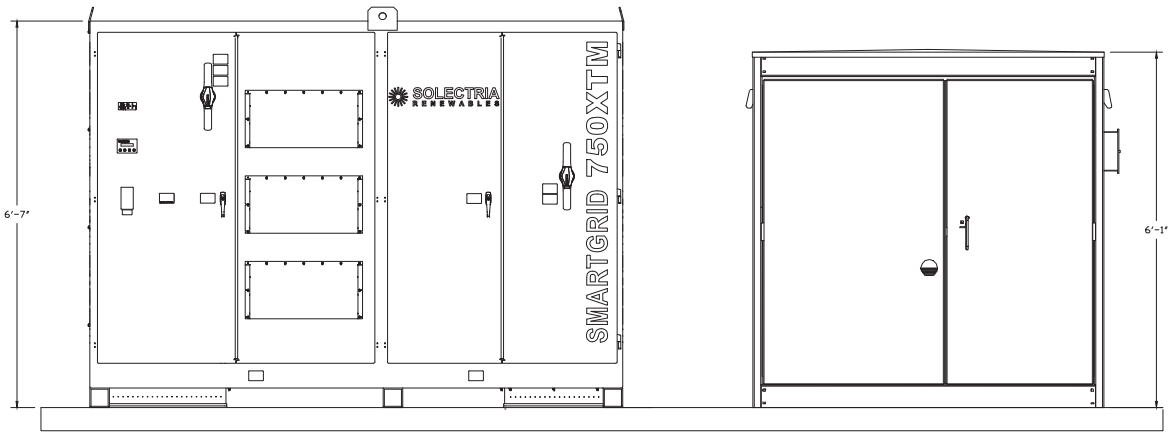
REVISIONS		
DESCRIPTION	BY	DATE

© THE PLANS SET FORTH ON THIS SHEET ARE AND SHALL REMAIN THE PROPERTY OF ENCOMPASS ENGINEERING & SURVEYING

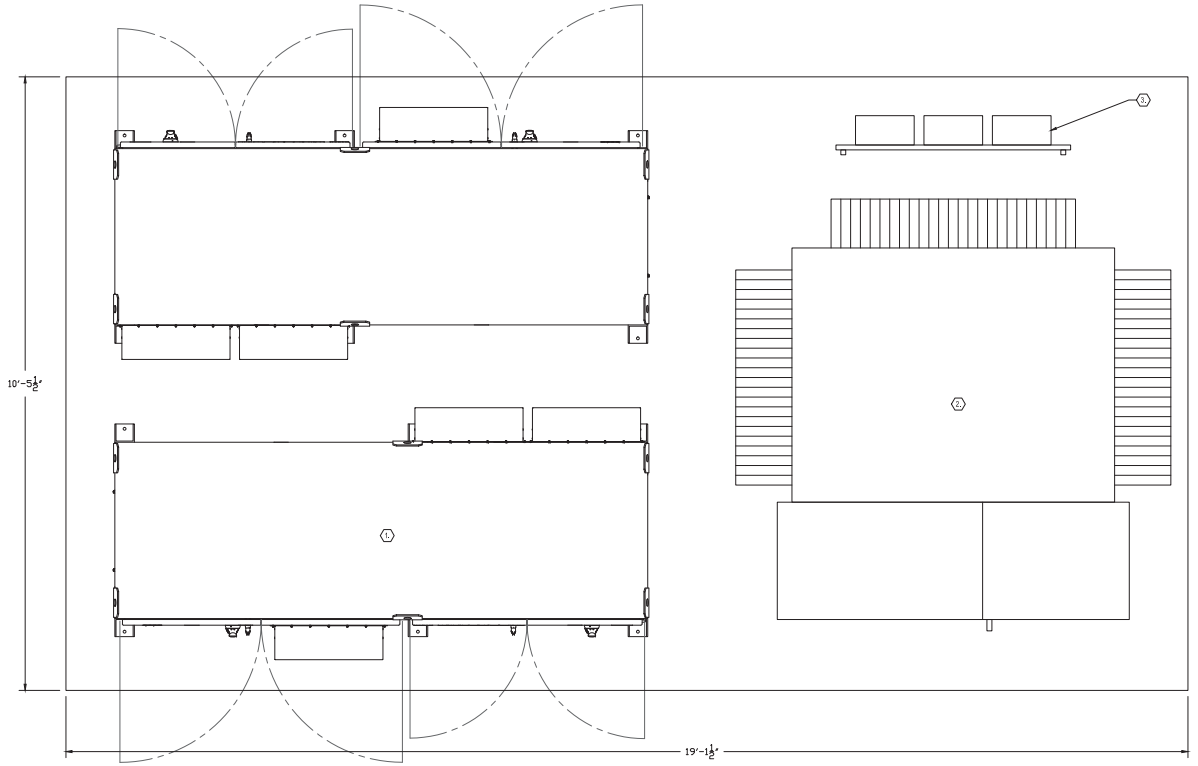
TUUSSO ENERGY, LLC
TYPHA SITE
TESC DETAILS

Encompass
ENGINEERING & SURVEYING
Western Washington Division
165 NE Juniper Street, Suite 201 • Issaquah, WA 98027 • Phone: (425) 392-0250 • Fax: (425) 391-3055
Eastern Washington Division
407 Southwest Blvd. • Ste Elum, WA 98922 • Phone: (509) 674-7433 • Fax: (509) 674-7419

JOB NO.	17019
DATE	Sept. 27 2017
SCALE	AS SHOWN
DESIGNED	SF
DRAWN	SF
CHECKED	TML
APPROVED	TML
SHEET	C2.1



A 1500 kVA BLOCK ELEVATION
SCALE: 1"=1'



B 1500 kVA BLOCK LAYOUT
SCALE: 1"= 1'

NOTES:
1. NONE.

KEYED NOTES:
1. SOLECTRIA SGI 750KVA INVERTER
2. 1500KVA 15KV TRANSFORMER
3. COMMUNICATION RACK

TUUSSO ENERGY

MaxPV ENGINEERING DEVELOPMENT
3231 POLYGON // SACRAMENTO, CA
WWW.MAXPVENGINEERING.COM

REV. NO.	DATE	DESCRIPTION	BY	CHK.	APR.
A	08-09-17	FOR PLAN REVIEW	LB	–	–

OWNER: TUUSSO ENERGY

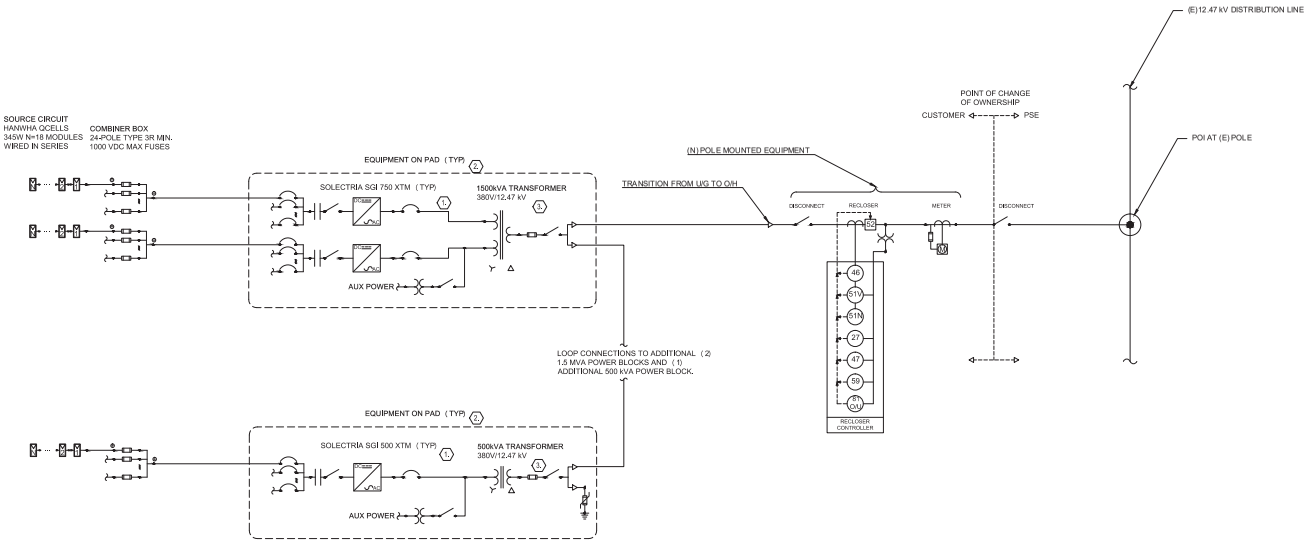
PROJECT SITE: TYPHA SOLAR PROJECT

DRAWING: EQUIPMENT PAD DETAILS

DRAWING NO. E-401

THIS PRINT IS NOT TO BE USED FOR CONSTRUCTION UNLESS NOTED AND SIGNED OK FOR CONSTRUCTION ABOVE LAST REVISION.

THE INFORMATION CONTAINED IN THESE DRAWINGS ARE CONFIDENTIAL AND ARE INTENDED FOR THE DESCRIBED PROJECT ONLY.



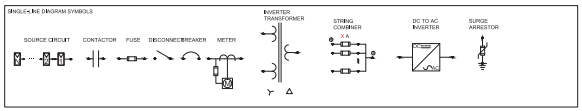
NOTES:

1. NONE.

KEYED NOTES:

1. **PV POWER CONDITIONING SYSTEM:** IEEE 929 AND IEEE 1547 COMPLIANT- 1000VDC MAX INPUT VOLTAGE. INVERTER EQUIPPED WITH INTEGRATED DC CIRCUIT BREAKER COMBINER.
2. EQUIPMENT PAD WITH INVERTER(S), STEP UP TRANSFORMER, AND COMMUNICATION EQUIPMENT.
3. TRANSFORMER SPECIFICATIONS TBD. VERIFY WITH INVERTER MFR & PSE FOR FINAL TRANFORMER CONFIGURATION.

SINGLE-LINE DIAGRAM SYMBOLS



THE INFORMATION CONTAINED IN THESE DRAWINGS ARE CONFIDENTIAL AND ARE INTENDED FOR THE DESCRIBED PROJECT ONLY.

TUUSSO ENERGY

MaxPV ENGINEERING DEVELOPMENT

3231 POLY DRIVE // SACRAMENTO, CA
WWW.MAXPVENGINEERING.COM

REV. NO.	DATE	DESCRIPTION	BY	CHK.	APP.
A	08-09-17	FOR PLAN REVIEW	LB	–	–

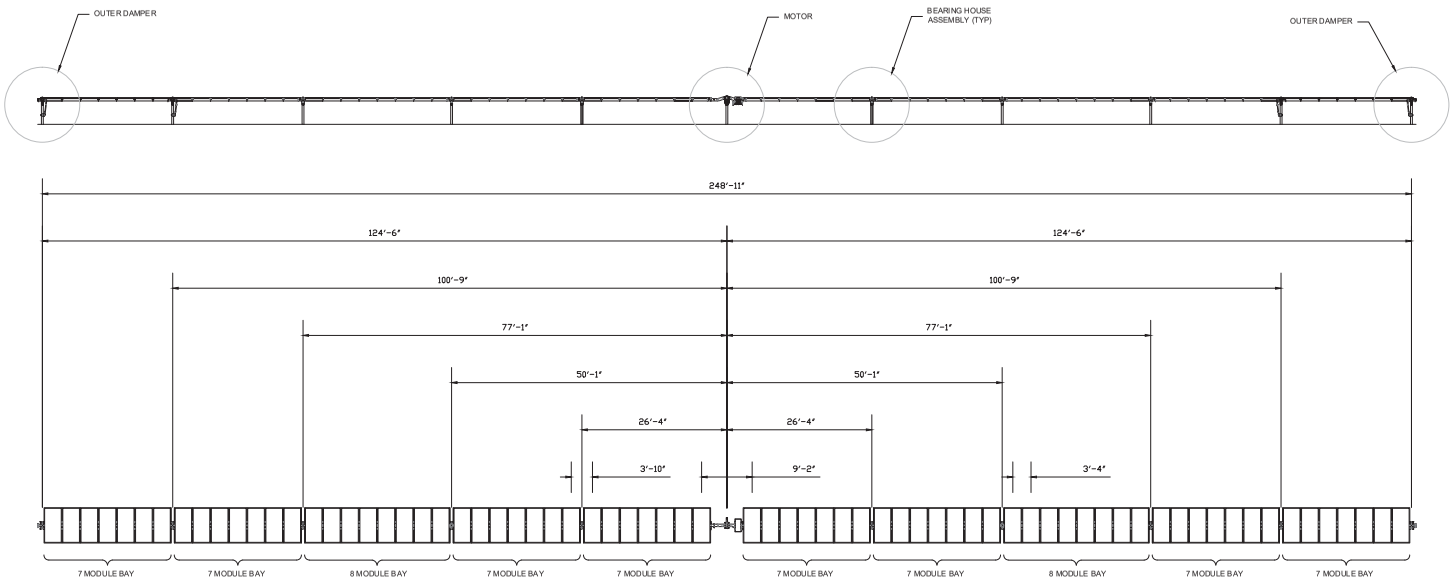
OWNER: TUUSSO ENERGY

PROJECT SITE: TYPHA SOLAR PROJECT

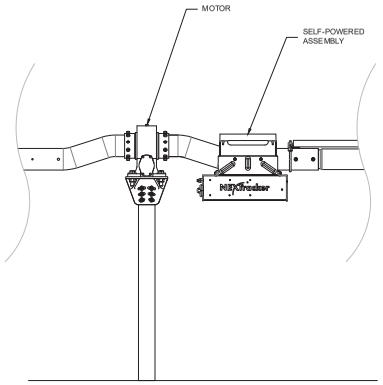
DRAWING: SINGLE LINE DIAGRAM

DRAWING NO. E-601

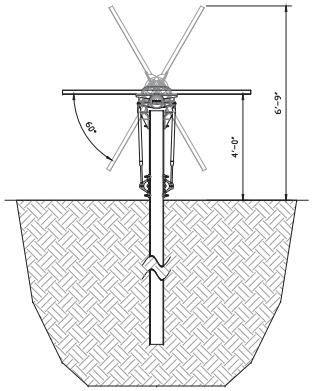
THIS PRINT IS NOT TO BE USED FOR CONSTRUCTION UNLESS NOTED AND SIGNED OK FOR CONSTRUCTION ABOVE LAST REVISION.



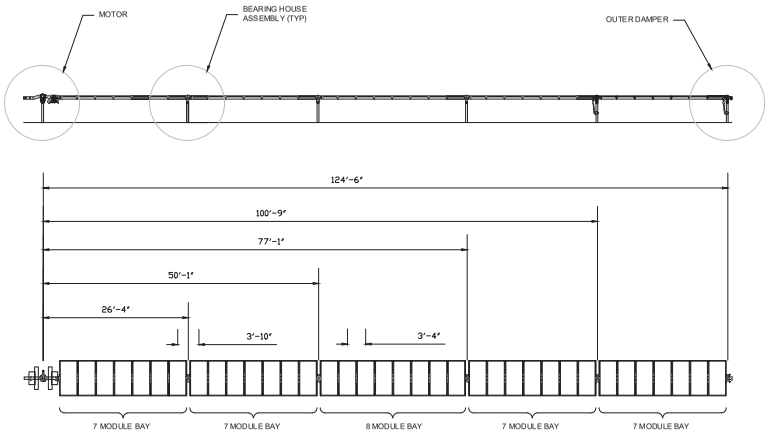
A 72 MODULE TRACKER



B MOTOR PILE DETAIL



C TRACKER PROFILE



D 36 MODULE TRACKER

THE INFORMATION CONTAINED IN THESE DRAWINGS ARE CONFIDENTIAL AND ARE INTENDED FOR THE DESCRIBED PROJECT ONLY.

NOTES:

1. NONE.

KEYED NOTES:

1. NONE.

TUUSSO ENERGY

MaxPV ENGINEERING DEVELOPMENT

320 PIOTOSON // SACRAMENTO, CA
WWW.MAXPVENGINEERING.COM

REV. NO.	DATE	DESCRIPTION	BY	CHK.	APR.
A	08-09-17	FOR PLAN REVIEW	LB	–	–

OWNER: TUUSSO ENERGY

PROJECT SITE: TYPHA SOLAR PROJECT

DRAWING: TRACKER ELEVATIONS

DRAWING NO. E-701

THIS PRINT IS NOT TO BE USED FOR CONSTRUCTION UNLESS NOTED AND SIGNED OK FOR CONSTRUCTION ABOVE LAST REVISION.



The Q.ANTUM solar module Q.PLUS L-G4.2 with power classes up to 345 Wp is the strongest module of its type on the market globally. Powered by 72 Q CELLS solar cells Q.PLUS L-G4.2 was specially designed for large solar power plants to reduce BOS costs. Only Q CELLS offers German engineering quality with our unique triple Yield Security.



LOW ELECTRICITY GENERATION COSTS
Higher yield per surface area and lower BOS costs thanks to higher power classes and an efficiency rate of up to 17.6 %.

INNOVATIVE ALL-WEATHER TECHNOLOGY
Optimal yields, whatever the weather with excellent low-light and temperature behavior.

ENDURING HIGH PERFORMANCE
Long-term yield security with Anti-PID Technology[1], Hot-Spot-Protect and Traceable Quality Tra.Q™.

EXTREME WEATHER RATING
High-tech aluminum alloy frame, certified for high snow (5400 Pa) and wind loads (2400 Pa).

A RELIABLE INVESTMENT
Inclusive 12-year product warranty and 25-year linear performance guarantee[2].

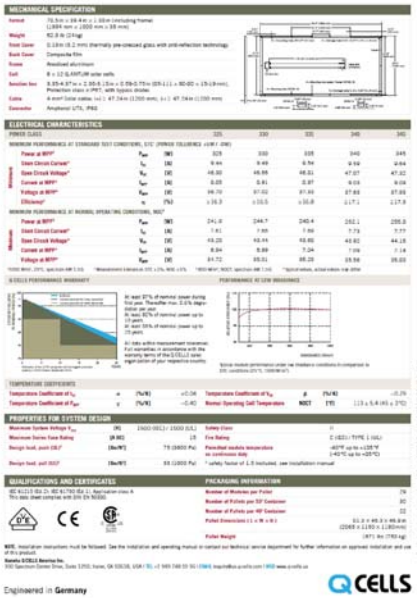
THE IDEAL SOLUTION FOR:

Engineered in Germany

Q CELLS

[1] APT test conditions: Cells at -1500V against grounded, with conductive metal foil covered module surface, 25°C, 168h

[2] See data sheet on rear for further information.





Our most amazing tracker yet.

In our mission to make solar a mainstream energy source, NEXTracker has engineered the most intelligent and flexible tracking technology yet. Using sustainable design methods with outcomes that benefit people and the planet, we bring you: NX Horizon™.

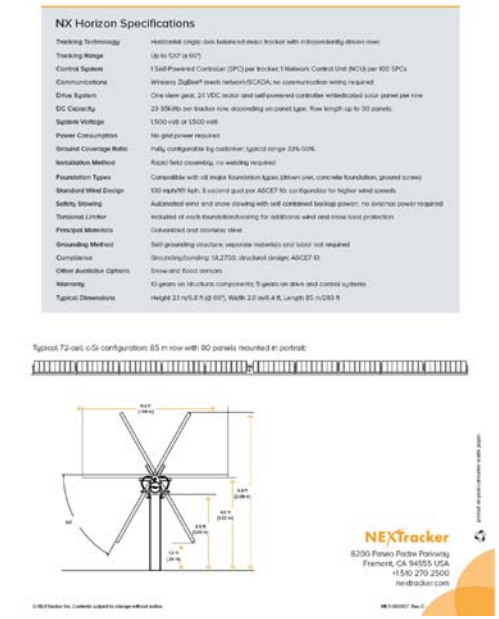
NX Horizon (formerly referred to as the Self-Powered Tracker or SPT), brings self-contained motor power to each row, eliminating power wiring and trenching. Our advanced horizontal tracker has the widest rotational range available, lowest O&M costs, and requires far less power to operate than other trackers. By offering more powerful systems at a greater value, NEXTracker enables greater deployment of renewable energy worldwide.

NX Horizon key features and benefits include:

– Self-powered system with smart performance communications: Self-contained units on each row include a dedicated PV panel toprovide power to the controller which drives themotor and hosts intelligent control electronics to position each tracker. With smart communications built in, NX Horizon systems can be accessed remotely, providing customers with a granular view to optimize tracker performance, operations and maintenance.

– Independent balanced rows with 120 degree rotational range: Each NX Horizon row has its own controlled motor with rotational range that delivers up to 2% more energy than typical linked row trackers. These agile, independent rows slow in less than 90 seconds to reduce wind forces on the array, protecting the PV modules in harsh environments. NX Horizon solar trackers also have a mechanically balanced row design that align PV panels with the tracker's axis of rotation – which greatly reduces row torque, using less energy from the motor to track throughout the day.

– Self-grounded system with theft-proof fasteners: NX Horizon is the world's first horizontal tracker with an entirely self-grounded design. This means no separate bonding hardware is required. You save on material and associated costs by eliminating grounding washers, braided straps, bare copper wire, and grounding rods. What's more, we've designed our own fasteners that can only be removed with special tools – deterring PV theft.



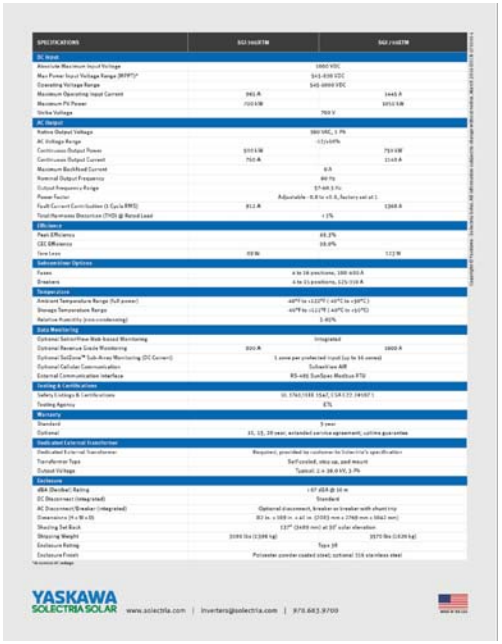
NX Horizon Specifications

Tracking Technology	Horizontal single-axis balanced-mass tracker with independently-driven rows
Tracking Range	Up to 120° (±60°)
Control System	1 Self-Powered Controller (SPC) per tracker; 1 Network Control Unit (NCU) per 100 SPCs
Communications	Wireless ZigBee® mesh network/SCADA; no communication wiring required
Drive System	One slew gear, 24 VDC motor and self-powered controller w/dedicated solar panel per row
DC Capacity	23 35kWp per tracker row, depending on panel type. Row length up to 90 panels.
System Voltage	1,500 volt or 1,500 volt
Power Consumption	No grid power required
Ground Coverage Ratio	Fully configurable by customer; typical range 33%-50%
Installation Method	Rapid field assembly, no welding required
Foundation Types	Compatible with all major foundation types (driven pier, concrete foundation, ground screw)
Standard Wind Design	100 mph/161 kph, 3 second gust per ASCE7 10; configurable for higher wind speeds
Safety Stowing	Automated wind and snow stowing with self-contained backup power; no external power required
Torsional Limiter	Included at each foundationdriving for additional wind and snow load protection
Principal Materials	Galvanized and stainless steel
Grounding Method	Self-grounding structure; separate materials and labor not required
Compliance	Grounding/bonding: UL2703; structural design: ASCE7 10
Other Available Options	Snow and flood sensors
Warranty	10-years on structural components; 5-years on drive and control systems
Typical Dimensions	Height 2.1 m/6.8 ft @ 60°; Width 2.0 m/6.4 ft, Length 85 m/283 ft

Typical 72-cell c-Si configuration: 85 m row with 80 panels mounted in portrait:

NEXTracker
6200 Paseo Padre Parkway
Fremont, CA 94555 USA
+1510 270 2500
nextracker.com





TUUSSO ENERGY

MaxPV ENGINEERING DEVELOPMENT
SOLAR PV DESIGN // SACRAMENTO, CA
WWW.MAXPVENGINEERING.COM

REV. NO.	DATE	DESCRIPTION	BY	CHK.	APR.
A	08-09-17	FOR PLAN REVIEW	LB	–	–

OWNER:
TUUSSO ENERGY

PROJECT SITE:
TYPHA SOLAR PROJECT

DRAWING:
MAJOR EQUIPMENT SPECIFICATIONS

DRAWING NO.
E-901

THE INFORMATION CONTAINED IN THESE DRAWINGS ARE CONFIDENTIAL AND ARE INTENDED FOR THE DESCRIBED PROJECT ONLY.

THIS PRINT IS NOT TO BE USED FOR CONSTRUCTION UNLESS NOTED AND SIGNED OK FOR CONSTRUCTION ABOVE LAST REVISION.

TUUSSO ENERGY - URTICA SITE

A PORTION OF THE SW 1/4 SECTION 10, T. 17 N., R. 18 E., W.M.
KITTATAS COUNTY, STATE OF WASHINGTON

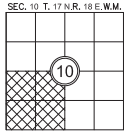


NORTH

SCALE 1" = 100'

811
Know what's **below.** **Call** before you dig.

INDEX LOCATION
SEC. 10 T. 17 N.R. 18 E.W.M.



NOTES:

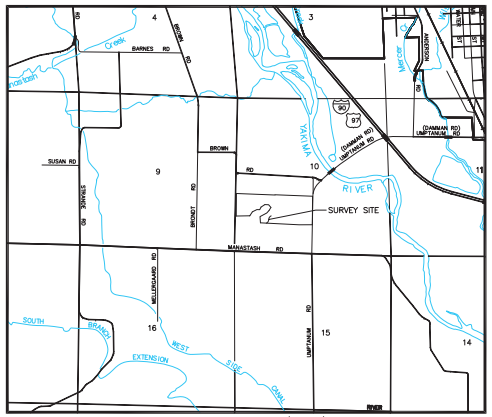
1. ALL CONSTRUCTION TECHNIQUES AND MATERIALS SHALL BE IN ACCORDANCE WITH THE CURRENT STATE OR COUNTY STANDARDS (AS APPLICABLE) AND AS SHOWN IN THESE PLANS.
2. BOUNDARY AND TOPOGRAPHIC SURVEY SHOWN HEREON WAS PREPARED BY ENCOMPASS ENGINEERING AND SURVEYING IN MAY 2017 UNDER DIRECT SUPERVISION OF DUSTIN PIERCE, PLS #55503.

PROPERTY INFORMATION:

APPLICANT:	TUUSSO ENERGY, LLC 500 YALE AVE N SEATTLE, WA 98109
PARCEL NUMBERS:	808533, 869436, 879436, 889436, 950243, 950244, 950245, 950246, 950247, 950248
PARCEL SIZE:	98.17 ACRES
TRACT 1A SIZE:	51.49 ACRES
TRACT 2A SIZE:	46.68 ACRES (NOT LEASED)
PROPERTY ADDRESS:	TBD, ELLENSBURG, WA 98926
ZONE:	AGRICULTURAL
IRRIGATION DISTRICT:	WEST SIDE

SHEET INDEX:

TITLE	NO.
COVER SHEET & OVERALL SITE PLAN	C1.0
NOTES, LEGEND & ABBREVIATIONS	C1.1
TESC, GRADING, AND DRAINAGE PLAN	C2.0
TESC DETAILS AND STANDARD DETAILS	C2.1



VICINITY MAP (NTS)

REVISIONS		
DESCRIPTION	BY	DATE

© THE PLANS SET FORTH ON THIS SHEET ARE AND SHALL REMAIN THE PROPERTY OF ENCOMPASS ENGINEERING & SURVEYING

TODD MICHAEL HOWARD
STATE OF WASHINGTON
18965
REGISTERED
PROFESSIONAL ENGINEER

TUUSSO ENERGY, LLC
URTICA SITE

COVER SHEET & OVERALL SITE PLAN

Encompass
ENGINEERING & SURVEYING
165 NE Juniper Street, Suite 201 • Issaquah, WA 98027 • Phone: (425) 392-0250 • Fax: (425) 391-3055
Western Washington Division
407 Southeast Blvd. • Ste Elum, WA 98922 • Phone: (509) 674-7433 • Fax: (509) 674-7419
Eastern Washington Division

JOB NO.	17018
DATE	Sept. 27 2017
SCALE	AS SHOWN
DESIGNED	SF
DRAWN	SF
CHECKED	TML
APPROVED	TML
SHEET	C1.0

STANDARD PLAN NOTES:

1. ALL CONSTRUCTION TECHNIQUES AND MATERIALS SHALL BE IN ACCORDANCE WITH THE CURRENT STATE OR COUNTY STANDARDS AND AS SHOWN IN THESE PLANS.
2. A COPY OF THE APPROVED PLANS MUST BE ON SITE WHENEVER CONSTRUCTION IS IN PROGRESS.
3. THE CONTRACTOR SHALL OBTAIN ALL PERMITS REQUIRED FOR WORK THAT ARE NOT PROVIDED BY THE OWNER PRIOR TO START OF CONSTRUCTION.
4. PAVED OR SIMILAR ESTABLISHED SURFACES INCLUDING ROADWAYS, SIDEWALKS AND CURBS THAT ARE TO REMAIN BUT ARE DAMAGED BY NEW CONSTRUCTION SHALL BE REPAIRED AS REQUIRED BY THE INSPECTOR.
5. ALL SURVEYING AND STAKING OF IMPROVEMENTS SHALL BE APPROVED BY THE OWNER. CONTRACTOR SHALL COORDINATE AND VERIFY WITH THE OWNER PRIOR TO OBTAINING STAKING SERVICES.
6. THE CONTRACTOR SHALL NOTIFY THE KITTITAS COUNTY FIRE DISTRICT (509-386-1495) TWENTY-FOUR (24) HOURS IN ADVANCE OF ALL WATER SERVICE INTERRUPTIONS, HYDRANT SHUT-OFFS, AND STREET CLOSURES OR OTHER ACCESS BLOCKAGE. THE CONTRACTOR SHALL ALSO NOTIFY THE DISTRICT OF ALL NEW, RELOCATED, OR ELIMINATED HYDRANTS RESULTING FROM THIS WORK.
7. ALL LOCATIONS OF EXISTING UTILITIES SHOWN HEREON HAVE BEEN ESTABLISHED BY FIELD SURVEY OR OBTAINED FROM AVAILABLE RECORDS AND SHOULD THEREFORE BE CONSIDERED APPROXIMATE ONLY AND NOT NECESSARILY COMPLETE. IT IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR TO INDEPENDENTLY VERIFY THE ACCURACY OF ALL UTILITY LOCATIONS SHOWN AND TO FURTHER DISCOVER AND AVOID ANY OTHER UTILITIES NOT SHOWN HEREON WHICH MAY BE AFFECTED BY THE IMPLEMENTATION OF THIS PLAN.
8. THE CONTRACTOR SHALL LOCATE AND PROTECT ALL ACTIVE CASTINGS AND UTILITIES DURING CONSTRUCTION AND SHALL CONTACT THE UNDERGROUND UTILITIES LOCATOR SERVICE (1-800-424-5555 OR 811) AT LEAST 48 HOURS PRIOR TO CONSTRUCTION.
9. THE CONTRACTOR SHALL ADJUST ALL EXISTING MANHOLE RIMS, DRAINAGE STRUCTURE LIDS, VALVE BOXES AND UTILITY ACCESS STRUCTURES TO FINISH GRADE WITHIN AREAS AFFECTED BY THE PROPOSED IMPROVEMENTS.
10. THE CONTRACTOR SHALL PROVIDE FOR ALL COMPACTION TESTS REQUIRED BY THE INSPECTOR.
11. BACKFILL MATERIAL SHALL MEET STATE OR COUNTY STANDARDS.
12. INSPECTION AND ACCEPTANCE OF ALL WORK WILL BE ACCOMPLISHED BY THE DESIGNATED INSPECTOR. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE AND SCHEDULE APPROPRIATE INSPECTIONS, ALLOWING PROPER ADVANCE NOTICE. THE INSPECTOR MAY REQUIRE RECONSTRUCTION OF ITEMS THAT DO NOT MEET THE CONTRACT DOCUMENTS OR THAT WERE CONSTRUCTED WITHOUT INSPECTION.
13. THE CONTRACTOR SHALL PROVIDE AND MAINTAIN BEST MANAGEMENT PRACTICES AS SHOWN HEREIN TO INSURE THAT SEDIMENT-LADEN WATER DOES NOT ENTER THE WATER OF THE STATE. AS CONSTRUCTION PROGRESSES AND UNEXPECTED (SEASONAL) CONDITIONS DICTATE, ADDITIONAL BEST MANAGEMENT PRACTICES MAY BE REQUIRED. THEREFORE, DURING THE COURSE OF CONSTRUCTION IT SHALL BE THE OBLIGATION AND RESPONSIBILITY OF THE CONTRACTOR TO ADDRESS ANY NEW CONDITIONS THAT MAY BE CREATED BY HIS ACTIVITIES AND TO PROVIDE ADDITIONAL FACILITIES THAT MAY BE NEEDED TO PROTECT ADJACENT PROPERTIES.
14. THE CONTRACTOR SHALL KEEP ALL STREETS AND PUBLIC RIGHT-OF-WAY CLEAN AT ALL TIMES BY SWEEPING.
15. CONTRACTOR SHALL PROVIDE TRAFFIC CONTROL AS NECESSARY THROUGHOUT THE PROJECT. TRAFFIC CONTROL SHALL BE IN ACCORDANCE WITH THE MUTCD, STATE, AND/OR COUNTY STANDARDS.
16. CONTRACTOR SHALL NOT MAKE ANY REVISIONS IN THE FIELD WITHOUT PRIOR WRITTEN APPROVAL BY THE ENGINEER.
17. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ADEQUATE SAFEGUARDS, SAFETY DEVICES, PROTECTIVE EQUIPMENT, FLAGGERS, AND ANY OTHER NEEDED ACTIONS TO PROTECT THE LIFE, HEALTH, AND SAFETY OF THE PUBLIC, AND TO PROTECT PROPERTY IN CONNECTION WITH THE PERFORMANCE OF WORK COVERED BY THE CONTRACTOR. ANY WORK WITHIN THE TRAVELED RIGHT-OF-WAY THAT MAY INTERRUPT NORMAL TRAFFIC FLOW SHALL REQUIRE AT LEAST ONE FLAGGER FOR EACH LANE OF TRAFFIC AFFECTED. ALL SECTIONS OF THE WSDOT STANDARD SPECIFICATIONS 1-07.23 – TRAFFIC CONTROL, SHALL APPLY.
18. ANY TRENCH DEEPER THAN 5 FEET WILL REQUIRE SHORING FOR TRENCH WALL STABILIZATION.

GENERAL TESC NOTES:

1. APPROVAL OF THIS TEMPORARY EROSION AND SEDIMENTATION CONTROL (TESC) PLAN DOES NOT CONSTITUTE AN APPROVAL OF PERMANENT ROAD OR DRAINAGE DESIGN (E.G. SIZE AND LOCATION OF ROADS, PIPES, RESTRICTORS, CHANNELS, RETENTION FACILITIES, UTILITIES, ETC.).
2. THE IMPLEMENTATION OF THESE TESC PLANS AND THE CONSTRUCTION, MAINTENANCE, REPLACEMENT, AND UPGRADING OF THESE TESC FACILITIES IS THE RESPONSIBILITY OF THE APPLICANT OR A TESC SUPERVISOR UNTIL ALL CONSTRUCTION IS APPROVED.
3. THE BOUNDARIES OF THE CLEARING LIMITS SHOWN ON THIS PLAN SHALL BE CLEARLY FLAGGED BY A CONTINUOUS LENGTH OF SURVEY TAPE (OR FENCING, IF REQUIRED) PRIOR TO CONSTRUCTION. DURING THE CONSTRUCTION PERIOD, NO DISTURBANCE BEYOND THE CLEARING LIMITS SHALL BE PERMITTED. THE CLEARING LIMITS SHALL BE MAINTAINED BY THE APPLICANT/TESC SUPERVISOR FOR THE DURATION OF CONSTRUCTION.
4. THE TESC FACILITIES SHOWN ON THIS PLAN MUST BE CONSTRUCTED PRIOR TO OR IN CONJUNCTION WITH ALL CLEARING AND GRADING SO AS TO ENSURE THAT THE TRANSPORT OF SEDIMENT TO SURFACE WATERS, DRAINAGE SYSTEMS, AND ADJACENT PROPERTIES IS MINIMIZED.
5. THE TESC FACILITIES SHOWN ON THIS PLAN ARE THE MINIMUM REQUIREMENTS FOR ANTICIPATED SITE CONDITIONS. DURING THE CONSTRUCTION PERIOD, THESE TESC FACILITIES SHALL BE UPGRADED AS NEEDED FOR UNEXPECTED STORM EVENTS AND MODIFIED TO ACCOUNT FOR CHANGING SITE CONDITIONS (E.G. ADDITIONAL SUMP PUMPS, RELOCATION OF DITCHES AND SILT FENCES, ETC.).
6. ANY AREAS OF EXPOSED SOILS, INCLUDING ROADWAY EMBANKMENTS, THAT WILL NOT BE DISTURBED FOR TEN DAYS DURING THE WET SEASON OR FOURTEEN DAYS DURING THE DRY SEASON SHALL BE IMMEDIATELY STABILIZED WITH THE APPROVED TESC METHODS (E.G., SEEDING, MULCHING, PLASTIC COVERING, ETC.).
7. ANY AREA NEEDING TESC MEASURES, NOT REQUIRING IMMEDIATE ATTENTION, SHALL BE ADDRESSED WITHIN FIFTEEN (15) DAYS.
8. THE TESC FACILITIES ON INACTIVE SITES SHALL BE INSPECTED AND MAINTAINED A MINIMUM OF ONCE A MONTH OR WITHIN 48 HOURS FOLLOWING A STORM EVENT.
9. AT NO TIME SHALL MORE THAN ONE (1) FOOT OF SEDIMENT BE ALLOWED TO ACCUMULATE WITHIN A CATCH BASIN. ALL CATCH BASINS AND CONVEYANCE LINES SHALL BE CLEANED PRIOR TO PAVING. THE CLEANING OPERATION SHALL NOT FLUSH SEDIMENT-LADEN WATER INTO THE DOWNSTREAM SYSTEM.
10. STABILIZED CONSTRUCTION ENTRANCES AND ROADS SHALL BE INSTALLED AT THE BEGINNING OF CONSTRUCTION AND MAINTAINED FOR THE DURATION OF THE PROJECT. ADDITIONAL MEASURES, SUCH AS WASH PADS, MAY BE REQUIRED TO ENSURE THAT ALL PAVED AREAS ARE KEPT CLEAN FOR THE DURATION OF THE PROJECT.
11. ANY PERMANENT RETENTION/DETENTION FACILITY USED AS A TEMPORARY SETTLING BASIN SHALL BE MODIFIED WITH THE NECESSARY EROSION CONTROL MEASURES AND SHALL PROVIDE ADEQUATE STORAGE CAPACITY. IF THE PERMANENT FACILITY IS TO FUNCTION ULTIMATELY AS AN INFILTRATION SYSTEM, THE TEMPORARY FACILITY MUST BE GRADED SO THAT THE BOTTOM AND SIDES ARE AT LEAST ONE FOOT ABOVE THE FINAL GRADE OF THE PERMANENT FACILITY.
12. WHERE STRAW MULCH FOR TEMPORARY EROSION CONTROL IS REQUIRED, IT SHALL BE APPLIED AT A MINIMUM THICKNESS OF TWO INCHES

STANDARD GRADING NOTES:

1. ALL GRADING ACTIVITIES, INCLUDING EXCAVATION, BACKFILL AND COMPACTION, SHALL BE DONE IN ACCORDANCE WITH STATE OR COUNTY STANDARDS AS APPLICABLE.
2. WITHIN ANY AREAS TO RECEIVE STRUCTURAL FILL, PAVEMENTS OR HARDSCAPE, THE SUBGRADE SHALL BE SCARIFIED, MOISTURE CONDITIONED, AND COMPACTED TO AT LEAST 95% MAXIMUM DENSITY (ASTM D 1557).
3. CONTRACTOR SHALL OBTAIN AN APPROVAL BY THE GEOTECHNICAL ENGINEER PRIOR TO PROCEEDING WITH ANY OVEREXCAVATION. CONTRACTOR SHALL VERIFY THE AMOUNT OF OVEREXCAVATION WITH GEOTECHNICAL ENGINEER.
4. COMPACTION SHALL BE DONE PER STATE OR COUNTY STANDARDS AS APPLICABLE. SITE EXCAVATION AND/OR SUBGRADE PREPARATION SHALL BE COMPLETED BEFORE PLACING STRUCTURAL FILL. COMPACTION SHALL BE VERIFIED BY DENSITY TESTING.
5. ALL TEMPORARY CUT SLOPES SHALL NOT EXCEED 1.5H:1V. ALL PERMANENT CUT SLOPES SHALL NOT EXCEED 2H:1V OR AS SHOWN ON PLANS. ALL PERMANENT FILL SLOPES SHALL NOT EXCEED 2H:1V.
6. CONTRACTOR SHALL IMPLEMENT APPROPRIATE PROTECTION AND TRAFFIC CONTROL DURING CONSTRUCTION TO DIRECT TRUCK TRAFFIC.
7. ANY AND ALL FILL MATERIAL PLACED ON THE LOT SHALL BE COMPACTED AND A COMPACTION INSPECTION REPORT FOR THE COMPACTION AND BEARING CAPACITY OF THAT FILL MATERIAL SHALL BE PROVIDED TO THE STATE OR COUNTY AS APPLICABLE WITHIN 60 DAYS OF THE PLACEMENT OF THE FILL MATERIAL.
8. ALL EXCESS SOIL SHALL BE OFF-HAULED TO A LEGAL DISPOSAL SITE. NO EXCESS SOIL SHALL BE SPREAD ON THE SITE WITHOUT CLEARLY BEING SHOWN ON THE APPROVED GRADING PLAN.
9. ALL CUT AND FILL SLOPES AND ALL EXPOSED DIRT SHALL BE PLANTED, WATERED AND MAINTAINED UNTIL EFFECTIVE EROSION CONTROL HAS BEEN ESTABLISHED TO THE SATISFACTION OF THE STATE OR COUNTY AS APPLICABLE.
10. CONTRACTOR SHALL PROVIDE HIS/HER OWN EARTHWORK CALCULATIONS FOR ALL CUT AND FILL OPERATIONS.

ABBREVIATIONS:

AC – ASPHALT CONCRETE
ACP – ABESTOS CEMENT PIPE
ADD'L – ADDITIONAL
AD – AREA DRAIN
ADJ – ADJACENT
ANSI – AMERCIAN NATIONAL STANDARDS INSTITUTE
ALT – ALTERNATE
ALUM – ALUMINUM
APPROX – APPROXIMATE(LY)
ARCH – ARCHITECT(URAL)
AP – ANGLE POINT
ASPH – ASPHALT
ASSY – ASSEMBLY
ASTM – AMERICAN SOCIETY OF TESTING AND MATERIALS
AVE – AVENUE
BC – BACK OF CURB
BF – BLIND FLANGE
BLDG – BUILDING
BLDC – BUILDING CORNER
BLK – BLOCK
BLVD – BOULEVARD
BM – BENCHMARK
BNDY – BOUNDARY
BO – BLOW OFF
BOW – BOTTOM OF WALL (AT FINISHED GRADE)
BSBL – BUILDING SETBACK LINE
BVC – BEGINNING OF VERTICAL CURVE
BVCE – BEGIN VERTICAL CURVE ELEVATION
BVCS – BEGIN VERTICAL CURVE STATION
BW – BACK OF WALK
CB – CATCH BASIN
CF – CUBIC FEET (FOOT)
CIP – CAST IRON PIPE
CJ – CONSTRUCTION JOINT
CL – CLASS
C/L – CENTER LINE
CLR – CLEARENCE
CMP – CORRUGATED METAL PIPE
CO – CLEAN OUT
CONN – CONNECTION
CONT – CONTINUOUS (CONTINUED)
CONTR – CONTRACTOR
C, CONC – CONCRETE
CONST – CONSTRUCTION
CP – CONTROL POINT
CFS – CUBIC FEET PER SECOND
CTR – CENTER(ED)
CTV – CABLE TV
C&G – CURB AND GUTTER
CY – CUBIC YARD
DCVA – DOUBLE CHECK VALVE ASSEMBLY
DDCV – DOUBLE DETECTOR CHECK VALVE
DEPT. – DEPARTMENT
DET – DETAIL OR DETENTION
DIP – DUCTILE IRON PIPE
DIA(S) – DIAMETER
DIM – DIMENSION
DOT – DEPARTMENT OF TRANSPORTATION
DS – DOWN SPOUT
DWG – DRAWING
E – EAST(ING)
EA – EACH
EL – ELEVATION
ELEC – ELETRICAL
EP – EDGE OF PAVEMENT
EQUIV – EQUIVALENT
EVC – END OF VERTICAL CURVE
EVCE – END OF VERTICAL CURVE ELEVATION
EVCS – END OF VERTICAL CURVE STATION
EX, EXIST – EXISTING
FC – FACE OF CURB
FD – FLOOR DRAIN
FDC – FIRE DEPARTMENT CONNECTION
FFE – FINISH FLOOR ELEVATION
FH – FIRE HYDRANT
FL – FLANGED OR FLOW LINE
FLR – FLOOR
FS – FINISHED SURFACE
FT (') – FOOT (FEET)
FTG – FOOTING
G – GAS MAIN
GA – GAUGE
GALV – GALVANIZED
GB – GRADE BREAK
GM– GAS METER
GRD – GRADE
HB – HOSE BIBB
HDPE – HIGH DENSITY POLYETHYLENE
HORIZ (H) – HORIZONTAL
HT – HEIGHT
HYD – HYDRANT
ID – INSIDE DIAMETER
IE – INVERT ELEVATION
IN (") – INCHES
INV – INVERT
IRR – IRRIGATION WATER
L – LENGTH
LB, # – POUND(S)
LF – LINEAR FEET
LN – LANE
MAT'L – MATERIAL
MAX – MAXIMUM
MFR – MANUFACTURER
MH – MANHOLE
MIN – MINIMUM
MISC – MISCELLANEOUS
MJ – MECHANICAL JOINT
N – NORTH(ING)
NO (#) – NUMBER
N.T.S. – NOT TO SCALE
O.C. – ON CENTER
O.D. – OUTSIDE DIAMETER
O/W – OIL WATER
P – POWER
PC – POINT OF CURVATURE
PERF – PERFORATED
PI – POINT OF INTERSECTION
PIV – POST INDICTOR VALVE
PL – PROPERTY LINE
PP – POWER POLE
PROV – PROVIDED
PSF – POUNDS PER SQUARE FOOT
PSI – POUNDS PER SQUARE INCH
PT – POINT OF TANGENCY
PVC – POLYVINYL CHLORIDE
PVI – POINT OF VERTICAL INTERSECTION
PVMT – PAVEMENT
PVT – POINT OF VERTICAL TANGENT
QTY – QUANTITY
RAD (R) – RADIUS
RCP – REINFORCED CONCRETE PIPE
RD – ROAD
REF – REFERENCE
REINF – REINFORCED
REQ – REQUIRED
RET – RETAINING
ROW – RIGHT-OF-WAY
RR – RAILROAD
S – SOUTH
S, SL – SLOPE
SCH – SCHEDULE
SD – STORM DRAIN
SF – SQUARE FOOT
SHT – SHEET
SIM – SIMILAR
SPEC – SPECIFICATION(S)
SQ – SQUARE
SS – SANITARY SEWER
ST – STREET
STA – STATION
STD – STANDARD
STL – STEEL
T – TELEPHONE WIRE
TBM – TEMPORARY BENCH MARK
TC – TOP OF CURB
TEMP – TEMPORARY
TG/RIM – TOP OF GRATE/RIM
THRU – THROUGH
TOE – TOE OF WALL OR SLOPE
TOP – TOP OF WALL OR SLOPE
TOW – TOP OF WALL
TYP – TYPICAL
VC – VERTICAL CURVE
VOL – VOLUME
W – WEST
W/ – WITH
WM – WATER METER
W/O – WITHOUT
WQ – WATER QUALITY
WT – WEIGHT
WWF – WELDED WIRE FABRIC
WV – WATER VALVE
YD – YARD DRAIN

LEGEND

	EXISTING:	PROPOSED:
BOUNDARY LINE/RIGHT-OF-WAY		
LOT LINE		
STREET MONUMENT (IN CONCRETE)		
PROPERTY CORNER		
BENCHMARK/CONTROL POINT		
TEMPORARY BENCHMARK	TBM	TBM
EASEMENT LINE		
CENTERLINE		
CURB/GUTTER/SIDEWALK LINE		
EDGE OF PAVEMENT LINE		
CHAIN LINK FENCE LINE		
SIGN		
STREET LIGHT (ELECTROLIER)		
GRADE BREAK LINE		
CONTOUR LINE (MAJOR)	1650	1650
CONTOUR LINE (MINOR)	1651	1651
CATCH BASIN (TYPE 1)		
STORM DRAIN MANHOLE/CATCH BASIN TYPE 2	SD	SD
STORM DRAIN LINE		
CONTROL STRUCTURE		
RIP-RAP PAD		
SANITARY SEWER LINE	SS	SS
SANITARY SEWER CLEANOUT		
SANITARY SEWER MANHOLE		
WATERMAIN LINE	W	W
GATE VALVE (MECHANICAL JOINT)		
GATE VALVE (FLANGE)		
WATER METER		
FIRE HYDRANT		
CAP		
GAS LINE	G	G
GAS VALVE		
UNDERGROUND ELECTRIC LINE	E	E
POWER POLE / UTILITY POLE		
GUY ANCHOR		
ELECTRICAL TRANSFORMER / VAULT	P	P
TELEPHONE VAULT/PEDESTAL	T	T
TELEPHONE MANHOLE	T	T
100 YR FLOODPLAIN HATCH		
CONCRETE HATCH		
GRAVEL HATCH		
ALL WEATHER ROAD HATCH (COMPACTED SOIL OR GRAVEL)		
PROPOSED LANDSCAPING STRIP		

CONTRACTOR RESPONSIBILITY:

CONTRACTOR AGREES THAT HE SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS, INCLUDING THE SAFETY OF ALL PERSONS AND PROPERTY, DURING THE COURSE OF CONSTRUCTION OF THIS PROJECT, AND THAT THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS. THE CONTRACTOR SHALL DEFEND, INDEMNIFY AND HOLD THE OWNER AND THE ENGINEER HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXCEPTING FOR LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE OWNER OR THE ENGINEER.

DISCREPANCIES:

IF THERE ARE ANY DISCREPANCIES BETWEEN DIMENSIONS IN DRAWINGS AND EXISTING CONDITIONS WHICH WILL AFFECT THE WORK, THE CONTRACTOR SHALL BRING SUCH DISCREPANCIES TO THE ATTENTION OF THE ENGINEER FOR ADJUSTMENT BEFORE PROCEEDING WITH THE WORK. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROPER FITTING OF ALL WORK AND FOR THE COORDINATION OF ALL TRADES, SUBCONTRACTORS, AND PERSONS ENGAGED UPON THIS CONTRACT.

REVISIONS		
DESCRIPTION	BY	DATE

© THE PLANS SET FORTH ON THIS SHEET ARE AND SHALL REMAIN THE PROPERTY OF ENCOMPASS ENGINEERING & SURVEYING

TODD MCROULIS HAMMOND
STATE OF WASHINGTON
22995
REGISTERED
PROFESSIONAL ENGINEER

TUUSSO ENERGY, LLC
URTICA SITE

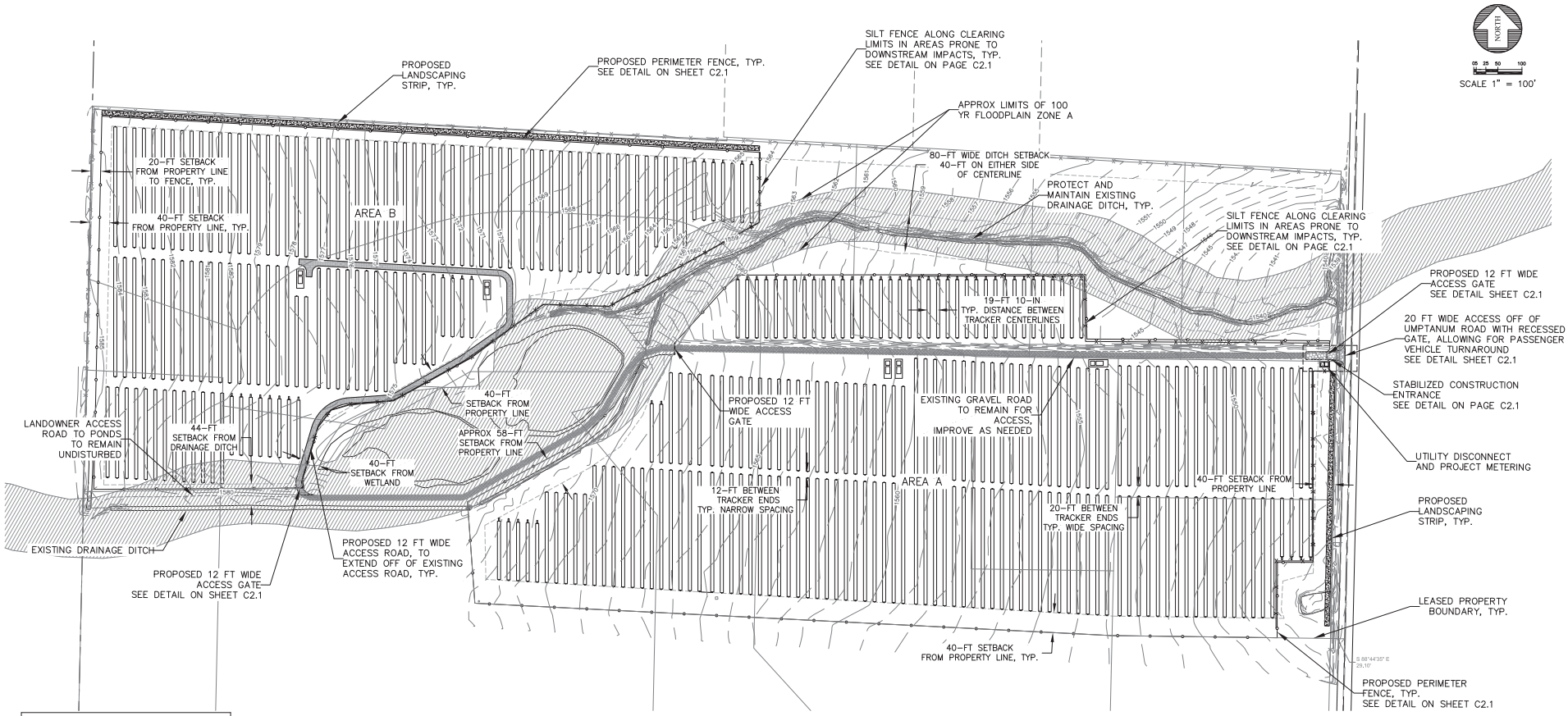
NOTES, LEGEND & ABBREVIATIONS

ENCOMPASS ENGINEERING & SURVEYING
Western Washington Division
165 NE Juniper Street, Suite 201 ■ Issaquah, WA 98027 ■ (425) 392-0250 ■ Fax: (425) 391-3055
Eastern Washington Division
407 Southwest Blvd. ■ Ste Elum, WA 98922 ■ Phone: (509) 674-7433 ■ Fax: (509) 674-7419

JOB NO.	17018
DATE	Sept. 27 2017
SCALE	AS SHOWN
DESIGNED	SF
DRAWN	SF
CHECKED	TML
APPROVED	TML
SHEET	C1.1

TUUSSO ENERGY - URTICA SITE

A PORTION OF THE SW 1/4 SECTION 10, T. 17 N., R. 18 E., W.M.
KITTITAS COUNTY, STATE OF WASHINGTON



SYSTEM SUMMARY	
kWDC	6,706.8
kVAAC	5,000.0
INVERTER QTY.	6
MODULE QTY.	19,440
DC SYSTEM VOLTAGE (V)	1000
DC SYSTEM VOLTAGE (kV)	12.47
INVERTER AC RATING (KVA)	1000
PV MODULE MODEL #	QCELLS 345W
PV MODULE NAMEPLATE (W)	345
RACKING SYSTEM	NEXTRACKER
GROUND COVERATE RATIO	0.33
DC:AC RATIO	1.34
MODULE TILT	TRACKER, +/-60°
AREA A	
kWDC	3,962.0
kVAAC	3,000.0
DC:AC RATIO	1.32
MODULE QTY.	11,484.0
AREA B	
kWDC	2,744.8
kVAAC	2,000.0
DC:AC RATIO	1.37
MODULE QTY.	7,956.0

LEGEND

- INVERTER STATION
- 72 MODULE TRACKER
- 54 MODULE TRACKER
- 36 MODULE TRACKER

SHEET NOTES:

1. REFER TO STANDARD PLAN NOTES ON SHEET C1.1.
2. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH STATE OR COUNTY STANDARDS AS APPLICABLE. IT SHALL BE THE SOLE RESPONSIBILITY OF THE APPLICANT AND THE PROFESSIONAL CIVIL ENGINEER TO CORRECT ANY ERROR, OMISSION, OR VARIATION FROM THE ABOVE REQUIREMENTS FOUND IN THESE PLANS.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ADEQUATE SAFEGUARDS, SAFETY DEVICES, PROTECTIVE EQUIPMENT, FLAGGERS, AND ANY OTHER NEEDED ACTIONS TO PROTECT THE LIFE, HEALTH, AND SAFETY OF THE PUBLIC, AND TO PROTECT PROPERTY IN CONNECTION WITH THE PERFORMANCE OF WORK COVERED BY THE CONTRACTOR. ANY WORK WITHIN THE TRAVELED RIGHT-OF-WAY THAT MAY INTERRUPT NORMAL TRAFFIC FLOW SHALL REQUIRE AT LEAST ONE FLAGGER FOR EACH LANE OF TRAFFIC AFFECTED. ALL SECTIONS OF THE WSDOT STANDARD SPECIFICATIONS 1-07.23 – TRAFFIC CONTROL, SHALL APPLY.
4. ANY TRENCH DEEPER THAN 5 FEET WILL REQUIRE SHORING FOR TRENCH WALL STABILIZATION.

TESC NOTES:

1. SILT FENCE TO BE INSTALLED AS STAND-ALONE UNLESS RUNNING ALONG EXIST. FENCE.
2. CONTRACTOR'S STAGING AREA AND STOCKPILE AREAS SHALL BE DETERMINED PRIOR TO START OF CONSTRUCTION.

RECOMMENDED CONSTRUCTION SEQUENCE:

(1) PRE-CONSTRUCTION MEETING.
(2) GRADE AND INSTALL CONSTRUCTION ENTRANCE(S).
(3) INSTALL PERIMETER PROTECTION (SILT FENCE, BRUSH BARRIER, ETC.).
(4) GRADE AND STABILIZE CONSTRUCTION ROADS.
(5) INSTALL WIDE FLANGE STEEL PILES.
(6) INSTALL ELECTRICAL UNDERGROUND AND MECHANICAL TRACKERS
(7) INSTALL PANELS
(8) PERFORM ANY REQUIRED SITE RESTORATION

TESC LEGEND:

- SILT FENCE – SEE DETAIL ON SHEET C2.1
- CONSTRUCTION ENTRANCE – SEE DETAIL ON SHEET C2.1

REVISIONS		
DESCRIPTION	BY	DATE

© THE PLANS SET FORTH ON THIS SHEET ARE, AND SHALL REMAIN THE PROPERTY OF ENCOMPASS ENGINEERING & SURVEYING

TODD MICHOULIS HOWARD
STATE OF WASHINGTON
22995
REGISTERED PROFESSIONAL ENGINEER

TUUSSO ENERGY, LLC
URTICA SITE

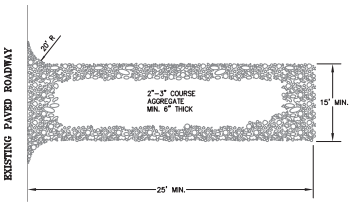
TESC, GRADING, AND DRAINAGE PLAN

Encompass
ENGINEERING & SURVEYING
165 NE Juniper Street, Suite 201 • Issaquah, WA 98027 • Phone: (425) 392-0250 • Fax: (425) 391-3055
Western Washington Division
407 Southeast Blvd. • Ste Elum, WA 98922 • Phone: (509) 674-7433 • Fax: (509) 674-7419
Eastern Washington Division

JOB NO.	17018
DATE	Sept. 27 2017
SCALE	AS SHOWN
DESIGNED	SF
DRAWN	SF
CHECKED	TML
APPROVED	TML
SHEET	C2.0

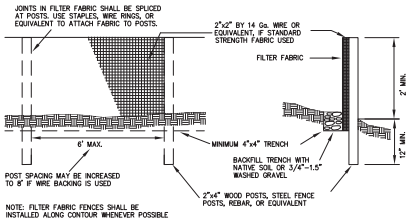
TUUSSO ENERGY - URTICA SITE

A PORTION OF THE SW 1/4 SECTION 10, T. 17 N., R. 18 E., W.M.
KITTATAS COUNTY, STATE OF WASHINGTON

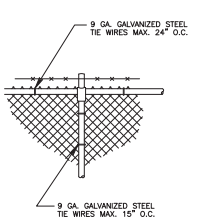


NOTES:
1. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION THAT WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY. THIS MAY REQUIRE TOP DRESSING, REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT.
2. WHEN NECESSARY, WHEELS SHALL BE CLEANED PRIOR TO ENTRANCE ONTO PUBLIC RIGHT-OF-WAY.
3. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH CRUSHED STONE THAT DRAINS INTO AN APPROVED SEDIMENT TRAP OR SEDIMENT BASIN.

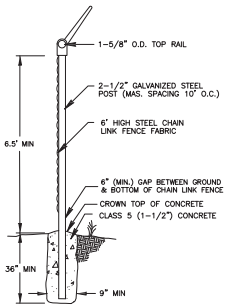
ROCK CONSTRUCTION ENTRANCE
N.T.S.



SILT FENCE DETAIL
N.T.S.

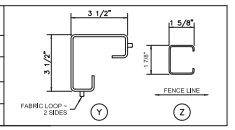


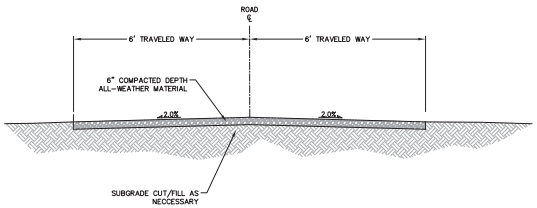
STEEL TIE WIRES



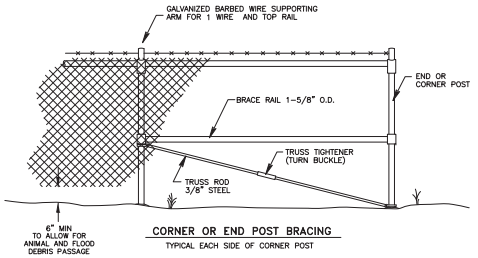
TYPICAL FENCE SECTION

POST AND RAIL SPECIFICATIONS			
POST	PIPE	ROLL FORMED	
	NOM. SIZE (SCH. 40) I.D.	SECTION	WEIGHT (lb/ft)
END, CORNER, OR PULL POST	2 1/2" DIAM.	(Y)	5.10
LINE OR BRACE POST	2" DIAM.	(Z)	1.85



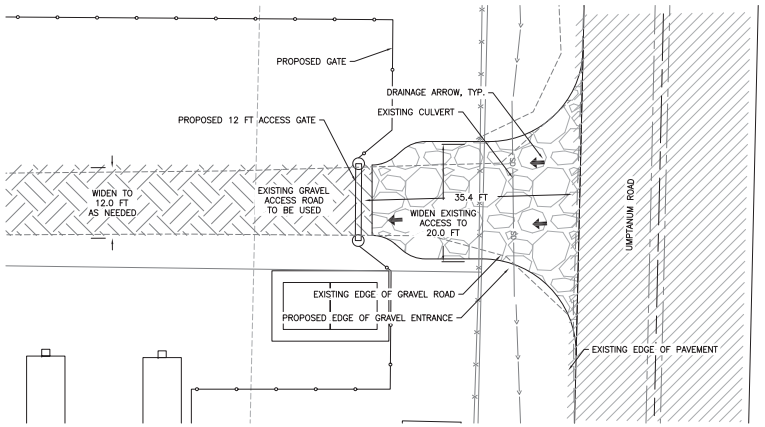


TYPICAL ALL-WEATHER ACCESS ROAD SECTION
N.T.S.

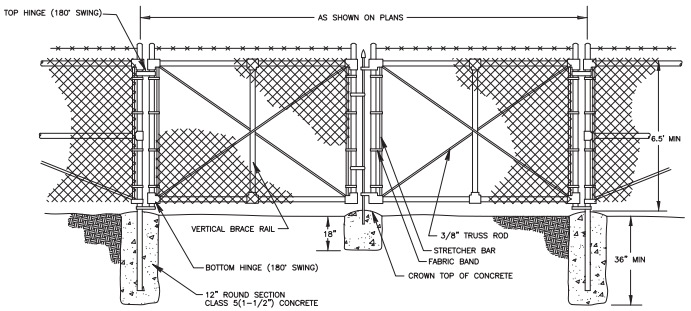


CORNER OR END POST BRACING
TYPICAL EACH SIDE OF CORNER POST

CHAIN LINK FENCE DETAIL
N.T.S.



SITE ACCESS DETAIL
1"=10'



CHAIN LINK FENCE GATE DETAIL
N.T.S.

REVISIONS

DESCRIPTION	BY	DATE

© THE PLANS SET FORTH ON THIS SHEET ARE, AND SHALL REMAIN THE PROPERTY OF ENCOMPASS ENGINEERING & SURVEYING

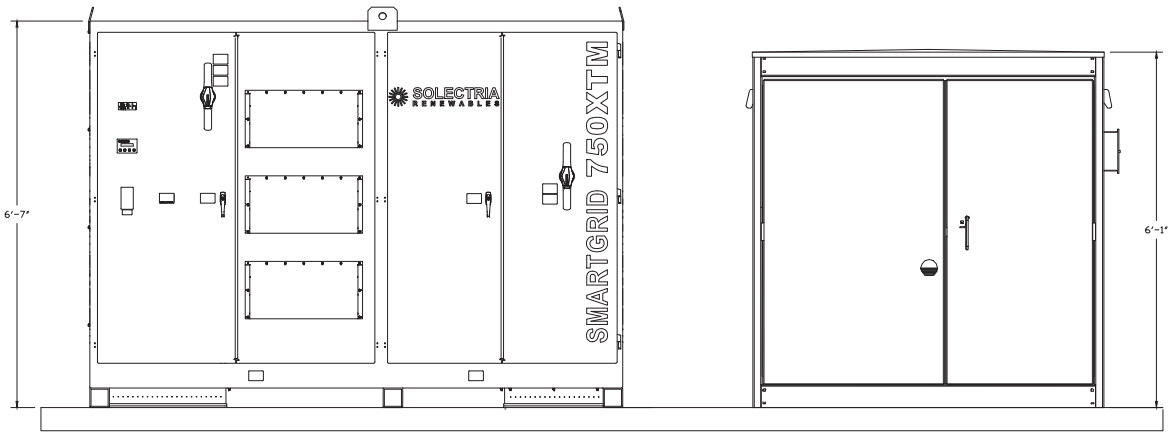
TODD MCDOULIS RICHARD
STATE OF WASHINGTON
22995
REGISTERED
PROFESSIONAL ENGINEER

TUUSSO ENERGY, LLC
URTICA SITE

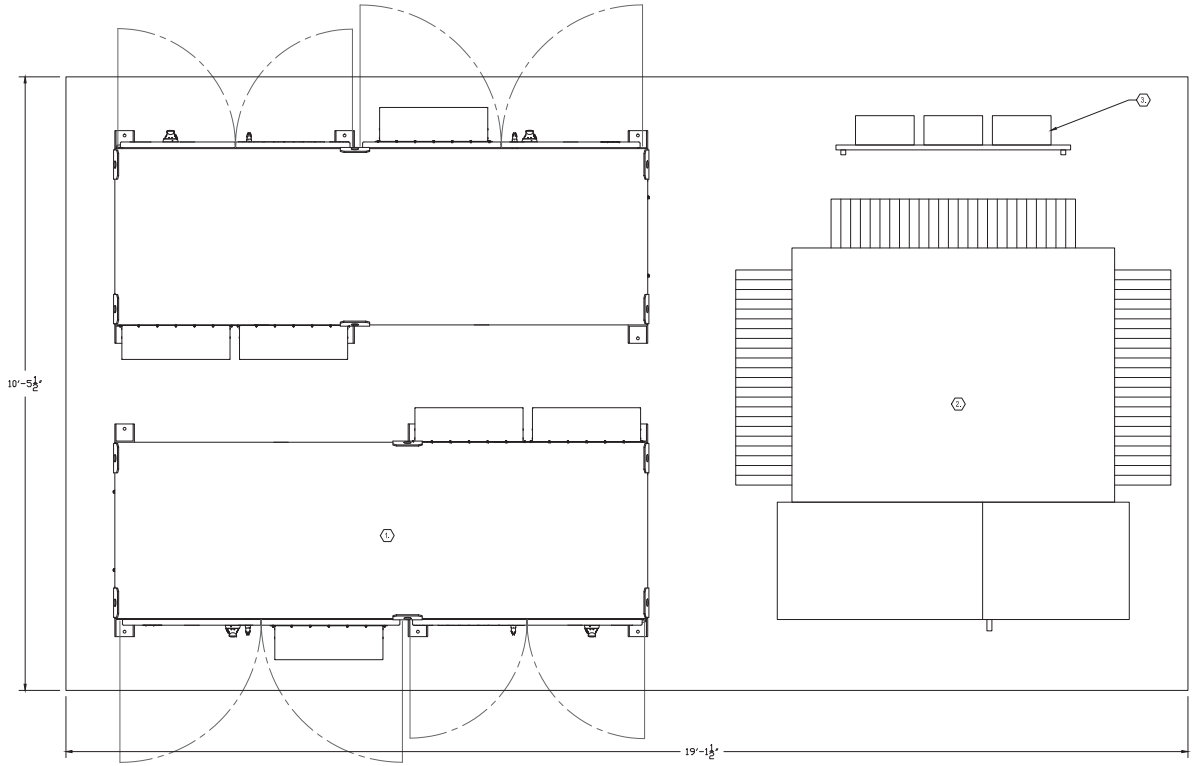
TESC DETAILS AND STANDARD DETAILS

Encompass
ENGINEERING & SURVEYING
165 NE Juniper Street, Suite 201 • Issaquah, WA 98027 • Phone: (425) 392-0250 • Fax: (425) 391-3055
Western Washington Division
407 Southwater Blvd. • Ste Elum, WA 98922 • Phone: (509) 674-7433 • Fax: (509) 674-7419
Eastern Washington Division

JOB NO.	17018
DATE	Sept. 27 2017
SCALE	AS SHOWN
DESIGNED	SF
DRAWN	SF
CHECKED	TML
APPROVED	TML
SHEET	C2.1



A 1500 kVA BLOCK ELEVATION
SCALE: 1"=1'



B 1500 kVA BLOCK LAYOUT
SCALE: 1"= 1'

NOTES:
1. NONE.

KEYED NOTES:
1. SOLECTRIA SGI 750KVA INVERTER
2. 1500KVA 15KV TRANSFORMER
3. COMMUNICATION RACK

TUUSSO ENERGY

MaxPV ENGINEERING DEVELOPMENT
3101 POLYGON // SACRAMENTO, CA
WWW.MAXPVENGINEERING.COM

REV. NO.	DATE	DESCRIPTION	BY	CHK.	APR.
A	08-09-17	FOR PLAN REVIEW	LB	–	–

OWNER: TUUSSO ENERGY

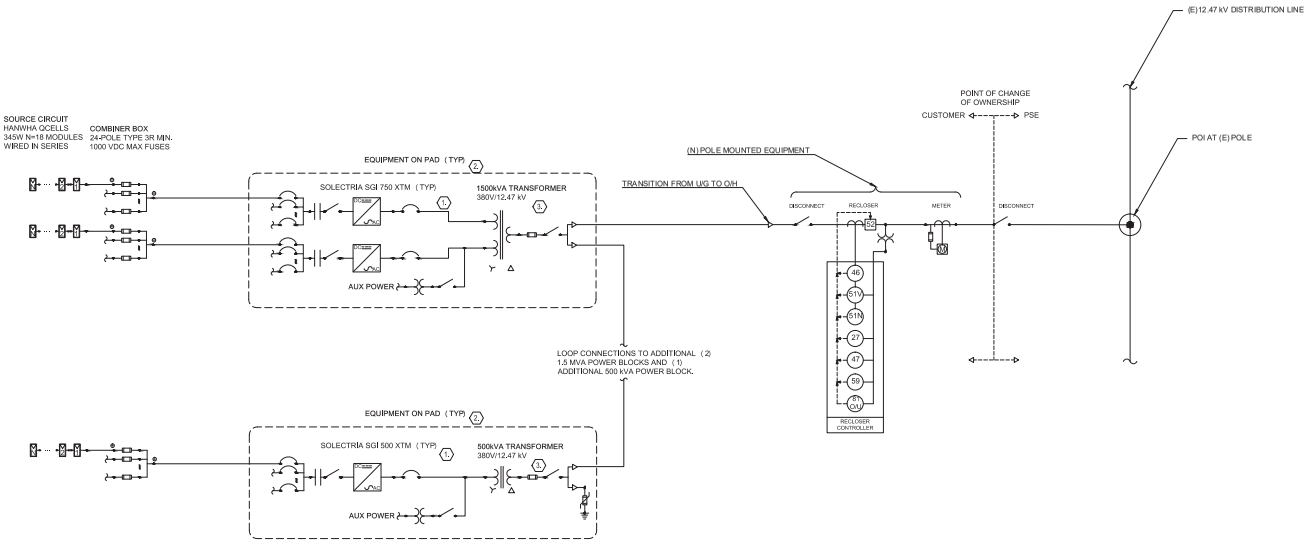
PROJECT SITE: URTICA SOLAR PROJECT

DRAWING: EQUIPMENT PAD DETAILS

DRAWING NO. E-401

THIS PRINT IS NOT TO BE USED FOR CONSTRUCTION UNLESS NOTED AND SIGNED OK FOR CONSTRUCTION ABOVE LAST REVISION.

THE INFORMATION CONTAINED IN THESE DRAWINGS ARE CONFIDENTIAL AND ARE INTENDED FOR THE DESCRIBED PROJECT ONLY.



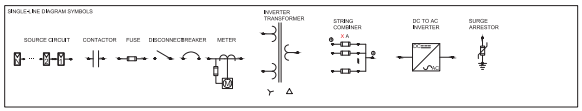
NOTES:

1. NONE.

KEYED NOTES:

1. **PV POWER CONDITIONING SYSTEM:** IEEE 929 AND IEEE 1547 COMPLIANT- 1000VDC MAX INPUT VOLTAGE. INVERTER EQUIPPED WITH INTEGRATED DC CIRCUIT BREAKER COMBINER.
2. EQUIPMENT PAD WITH INVERTER(S), STEP UP TRANSFORMER, AND COMMUNICATION EQUIPMENT.
3. TRANSFORMER SPECIFICATIONS TBD. VERIFY WITH INVERTER MFR & PSE FOR FINAL TRANFORMER CONFIGURATION.

SINGLE-LINE DIAGRAM SYMBOLS



THE INFORMATION CONTAINED IN THESE DRAWINGS ARE CONFIDENTIAL AND ARE INTENDED FOR THE DESCRIBED PROJECT ONLY.

TUUSSO ENERGY

MaxPV ENGINEERING DEVELOPMENT

3221 POLYGON // SACRAMENTO, CA
WWW.MAXPVENGINEERING.COM

REV. NO.	DATE	DESCRIPTION	BY	CHK.	APR.
A	08-09-17	FOR PLAN REVIEW	LB	–	–

OWNER: TUUSSO ENERGY

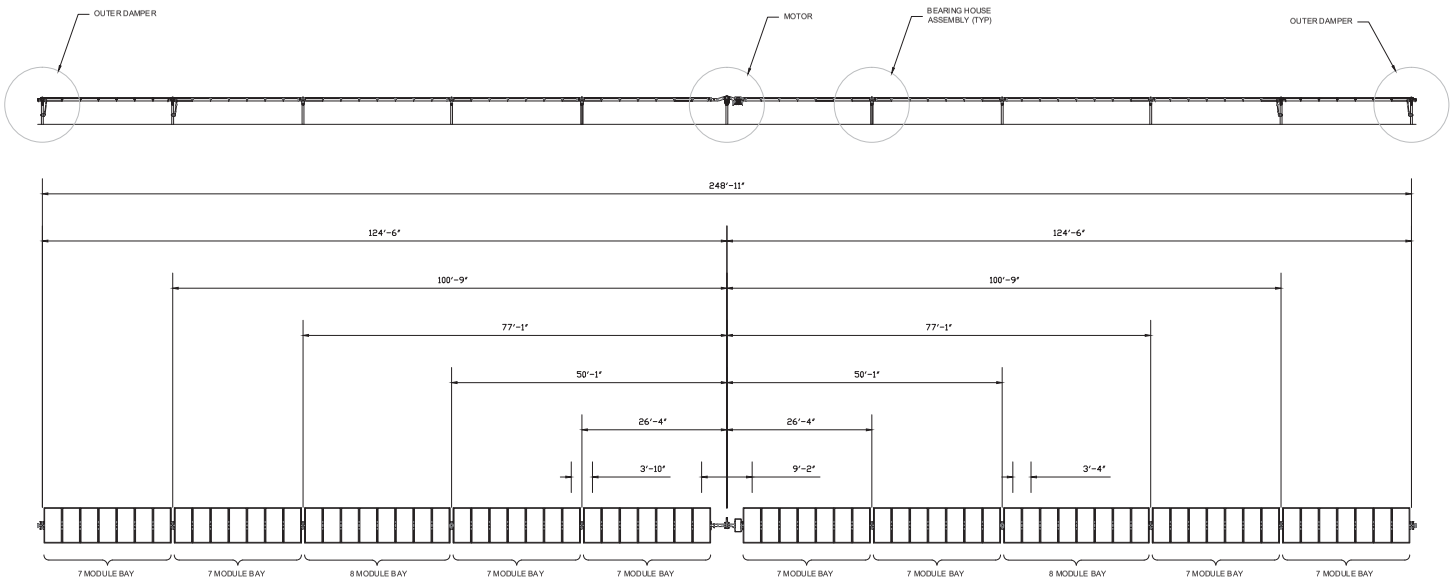
PROJECT SITE: URTICA SOLAR PROJECT

DRAWING: SINGLE LINE DIAGRAM

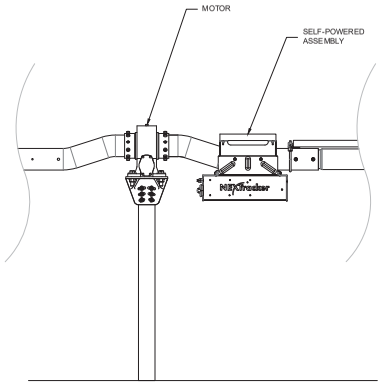
DRAWING NO.

E-601

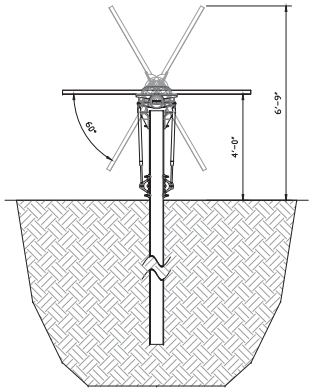
THIS PRINT IS NOT TO BE USED FOR CONSTRUCTION UNLESS NOTED AND SIGNED OK FOR CONSTRUCTION ABOVE LAST REVISION.



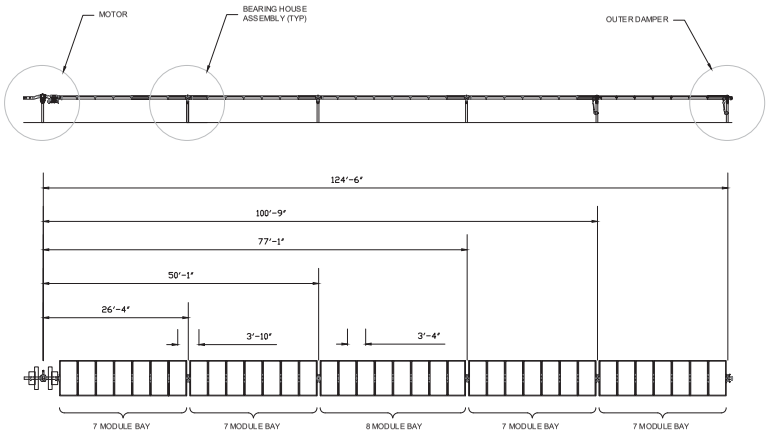
A 72 MODULE TRACKER



B MOTOR PILE DETAIL



C TRACKER PROFILE



D 36 MODULE TRACKER

THE INFORMATION CONTAINED IN THESE DRAWINGS ARE CONFIDENTIAL AND ARE INTENDED FOR THE DESCRIBED PROJECT ONLY.

NOTES:

1. NONE.

KEYED NOTES:

1. NONE.

TUUSSO ENERGY

MaxPV ENGINEERING DEVELOPMENT

320 PROVIDIAN // SACRAMENTO, CA
WWW.MAXPVENGINEERING.COM

REV. NO.	DATE	DESCRIPTION	BY	CHK.	APR.
A	08-09-17	FOR PLAN REVIEW	LB	–	–

OWNER: TUUSSO ENERGY

PROJECT SITE: URTICA SOLAR PROJECT

DRAWING: TRACKER ELEVATIONS

DRAWING NO. E-701

THIS PRINT IS NOT TO BE USED FOR CONSTRUCTION UNLESS NOTED AND SIGNED OK FOR CONSTRUCTION ABOVE LAST REVISION.



The Q.ANTUM solar module Q.PLUS L-G4.2 with power classes up to 345 Wp is the strongest module of its type on the market globally. Powered by 72 Q CELLS solar cells Q.PLUS L-G4.2 was specially designed for large solar power plants to reduce BOS costs. Only Q CELLS offers German engineering quality with our unique triple Yield Security.



LOW ELECTRICITY GENERATION COSTS
Higher yield per surface area and lower BOS costs thanks to higher power classes and an efficiency rate of up to 17.6 %.

INNOVATIVE ALL-WEATHER TECHNOLOGY
Optimal yields, whatever the weather with excellent low-light and temperature behavior.

ENDURING HIGH PERFORMANCE
Long-term yield security with Anti-PID Technology[1], Hot-Spot-Protect and Traceable Quality Tra.Q™.

EXTREME WEATHER RATING
High-tech aluminum alloy frame, certified for high snow (5400 Pa) and wind loads (2400 Pa).

A RELIABLE INVESTMENT
Inclusive 12-year product warranty and 25-year linear performance guarantee[2].

THE IDEAL SOLUTION FOR:

Engineered in Germany

Q CELLS

[1] APT test conditions: Cells at -1500V against ground, with conductive metal foil covered module surface, 25°C, 168h
[2] See data sheet on rear for further information.



Our most amazing tracker yet.

In our mission to make solar a mainstream energy source, NEXTracker has engineered the most intelligent and flexible tracking technology yet. Using sustainable design methods with outcomes that benefit people and the planet, we bring you: NX Horizon™.

NX Horizon (formerly referred to as the Self-Powered Tracker or SPT), brings self-contained motor power to each row, eliminating power wiring and trenching. Our advanced horizontal tracker has the widest rotational range available, lowest O&M costs, and requires far less power to operate than other trackers. By offering more powerful systems at a greater value, NEXTracker enables greater deployment of renewable energy worldwide.

NX Horizon key features and benefits include:

– Self-powered system with smart performance communications: Self-contained units on each row include a dedicated PV panel to provide power to the controller which drives the motor and hosts intelligent control electronics to position each tracker. With smart communications built in, NX Horizon systems can be accessed remotely, providing customers with a granular view to optimize tracker performance, operations and maintenance.

– Independent balanced rows with 120 degree rotational range: Each NX Horizon row has its own controlled motor with rotational range that delivers up to 2% more energy than typical linked row trackers. These agile, independent rows slow in less than 90 seconds to reduce wind forces on the array, protecting the PV modules in harsh environments. NX Horizon solar trackers also have a mechanically balanced row design that align PV panels with the tracker's axis of rotation – which greatly reduces row torque, using less energy from the motor to track throughout the day.

– Self-grounded system with theft-proof fasteners: NX Horizon is the world's first horizontal tracker with an entirely self-grounded design. This means no separate bonding hardware is required. You save on material and associated costs by eliminating grounding washers, braided straps, bare copper wire, and grounding rods. What's more, we've designed our own fasteners that can only be removed with special tools – deterring PV theft.

YASKAWA SOLECTRIA SOLAR



SGI 500XTM
SGI 750XTM

FEATURES
- Compliant with NEC 2014 690.11 & 690.12 arc-fault and rapid shutdown requirements when coupled with ARCCOM combiner
- 98% CEC efficiency
- 1000 VDC
- Parallel power stages
- Fuse and breaker subcombiner options
- Modbus communications
- User-interactive LCD

OPTIONS
- Stainless steel enclosure
- Web-based monitoring
- Built-in cellular connectivity
- AC breaker with shunt trip
- Revenue grade metering
- Air filters
- Uptime guarantee

OPTIONS FOR UTILITIES
- Real power curtailment
- Reactive power control
- Voltage ride through
- Frequency ride through
- Controlled ramp rates
- DNP3 Serial
- Rule 21 compliant

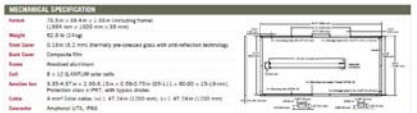
SOLECTRIA.COM

1000VDC UTILITY-SCALE INVERTERS

The only 1000VDC inverter available that is compliant with NEC 2014 690.11 & 690.12 arc-fault and rapid shutdown requirements, Yaskawa – Solectria Solar's SMARTGRID series inverters are optimized for high efficiency, reliability, and economy. Available in two power classes, 500 kW and 750 kW, these inverters are designed for direct connection to an external transformer for large commercial or utility-scale applications. They are robust, outdoor rated inverters that can be configured as 1 or 1.5 MW Solar Stations. Available utility-scale options include advanced grid management features such as voltage and frequency ride through, reactive power control, real power curtailment and power factor control. Listed to 1000 VDC with 98% CEC weighted efficiency, the SGI 500/750XTM inverters set a new standard for large scale power conversion.



ETL



MECHANICAL SPECIFICATION

ELECTRICAL CHARACTERISTICS

PROPERTIES FOR SYSTEM DESIGN

QUALIFICATIONS AND CERTIFICATES

PACKAGING INFORMATION

Engineered in Germany

Q CELLS

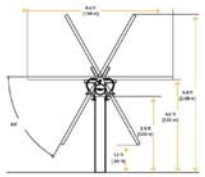
THE INFORMATION CONTAINED IN THESE DRAWINGS ARE CONFIDENTIAL AND ARE INTENDED FOR THE DESCRIBED PROJECT ONLY.

NX Horizon Specifications

Tracking Technology	Horizontal single-axis balanced-mass tracker with independently-driven rows
Tracking Range	Up to 120° (±60°)
Control System	1 Self-Powered Controller (SPC) per tracker; 1 Network Control Unit (NCU) per 100 SPCs
Communications	Wireless ZigBee® mesh network/SCADA; no communication wiring required
Drive System	One slew gear, 24 VDC motor and self-powered controller w/dedicated solar panel per row
DC Capacity	23 35kWp per tracker row, depending on panel type. Row length up to 90 panels.
System Voltage	1,500 volt or 1,500 volt
Power Consumption	No grid power required
Ground Coverage Ratio	Fully configurable by customer; typical range 33%-50%
Installation Method	Rapid field assembly, no welding required
Foundation Types	Compatible with all major foundation types (driven pier, concrete foundation, ground screw)
Standard Wind Design	100 mph/161 kph, 3 second gust per ASCE7 10; configurable for higher wind speeds
Safety Stowing	Automated wind and snow stowing with self-contained backup power; no external power required
Torsional Limiter	Included at each foundation/bearing for additional wind and snow load protection
Principal Materials	Galvanized and stainless steel
Grounding Method	Self-grounding structure; separate materials and labor not required
Compliance	Grounding/bonding: UL2703; structural design: ASCE7 10
Other Available Options	Snow and flood sensors
Warranty	10-years on structural components; 5-years on drive and control systems
Typical Dimensions	Height 2.1 m/6.8 ft @ 60°; Width 2.0 m/6.4 ft; Length 85 m/283 ft

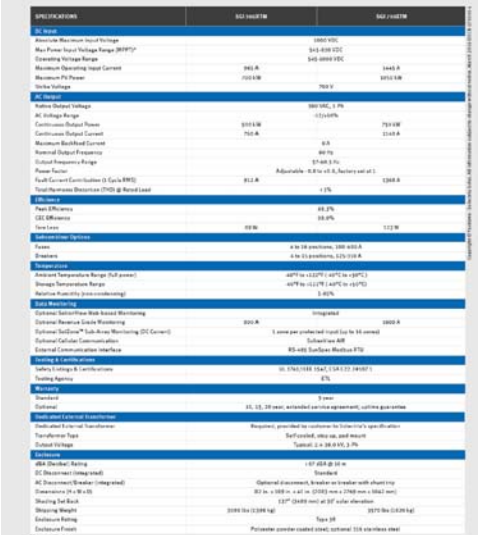
Typical 72-cell c-Si configuration: 85 m row with 80 panels mounted in portrait:





NEXTracker
6200 Paseo Padre Parkway
Fremont, CA 94555 USA
+1 510 270 2500
nextracker.com

© NEXTracker Inc. Contents subject to change without notice.



SPECIFICATIONS	SGI 500XTM	SGI 750XTM
DC Input		
Absolute Maximum Input Voltage	1000 VDC	
Max Power Input Voltage Range (MPPT)*	545-850 VDC	
Operating Voltage Range	545-1000 VDC	
Maximum Operating Input Current	941 A	1441 A
Maximum PV Power	700 kW	1072 kW
Strike Voltage	700 V	
AC Output		
Native Output Voltage	480 VAC, ± 3%	
AC Voltage Range	-12/+10%	
Continuous Output Power	500 kW	750 kW
Continuous Output Current	760 A	1140 A
Maximum Backfeed Current	0 A	
Nominal Output Frequency	60 Hz	
Output Frequency Range	57-63.5 Hz	
Power Factor	Adjustable - 0.8 to +0.8, factory set at 1	
Fault Current Contribution (1 Cycle RMS)	912 A	1368 A
Total Harmonic Distortion (THD) @ Rated Load	< 3%	
Efficiency		
Peak Efficiency	98.3%	
CEC Efficiency	98.0%	
Tare Loss	400 W	512 W
Subcombiner Options		
Fuses	4 to 16 positions, 300-400 A	
Breakers	4 to 15 positions, 125-250 A	
Temperature		
Ambient Temperature Range (full power)	-40°F to +122°F (-40°C to +50°C)	
Storage Temperature Range	-40°F to +122°F (-40°C to +50°C)	
Relative Humidity (non-condensing)	0-95%	
Data Monitoring		
Optional Solar+Plus Web-based Monitoring	Integrated	
Optional Revenue Grade Monitoring	300 A	1800 A
Optional SolGate™ Sub-Array Monitoring (DC Current)	1 zone per protected input (up to 16 zones)	
Optional Cellular Communication	Sybase Verizon 4LTE	
External Communication Interface	RS-485 SunSpec Modbus RTU	
Safety & Certifications		
Safety Listings & Certifications	UL 1741/1699, IEEE 1547.1/2003, 1699B-1	
Testing Agency	ETL	
Warranty		
Standard	5 years	
Optional	10, 15, 20 years, extended service agreement, uptime guarantee	
Dedicated External Transformer		
Dedicated External Transformer	Required, provided by customer to Solectria's specification	
Transformer Type	Self-cooled, step-up, pad mount	
Output Voltage	Typical: 2.4-34.5 kV, 3-Ph	
Enclosure		
dBA (Decibel) Rating	< 67 dBA @ 10 m	
DC Disconnect (integrated)	Standard	
AC Disconnect/Breaker (integrated)	Optional disconnect, breaker or breaker with shunt trip	
Dimensions (H x W x D)	82 in. x 108 in. x 41 in. (2083 mm x 2743 mm x 1041 mm)	
Shipping Set Back	137" (3480 mm) at 10° solar elevation	
Shipping Weight	3090 lbs (1398 kg)	3570 lbs (1620 kg)
Enclosure Rating	Type 3R	
Enclosure Finish	Polyester powder coated steel; optional 316 stainless steel	

YASKAWA SOLECTRIA SOLAR www.solectria.com | inverters@solectria.com | 978.683.9700

TUUSSO ENERGY

MaxPV ENGINEERING DEVELOPMENT
SOLPOWER // SACRAMENTO, CA
WWW.MAXPVENGINEERING.COM

REV. NO.	DATE	DESCRIPTION	BY	CHK.	APR.
A	08-09-17	FOR PLAN REVIEW	LB	–	–

OWNER:
TUUSSO ENERGY

PROJECT SITE:
URTICA SOLAR PROJECT

DRAWING:
MAJOR EQUIPMENT SPECIFICATIONS

DRAWING NO.
E-901

THIS PRINT IS NOT TO BE USED FOR CONSTRUCTION UNLESS NOTED AND SIGNED OK FOR CONSTRUCTION ABOVE LAST REVISION.