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

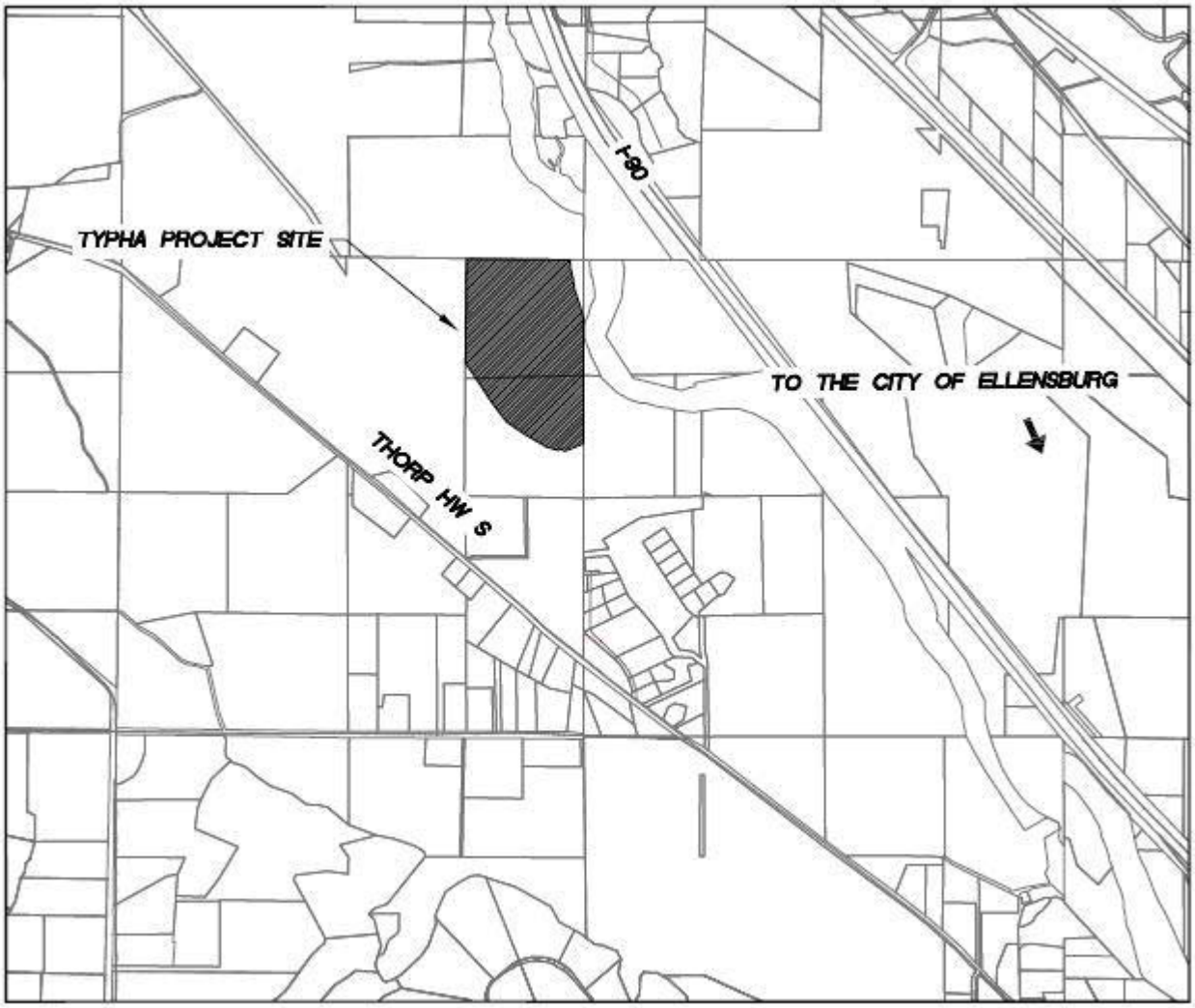
Table of Contents

List of Figures

Appendix

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.

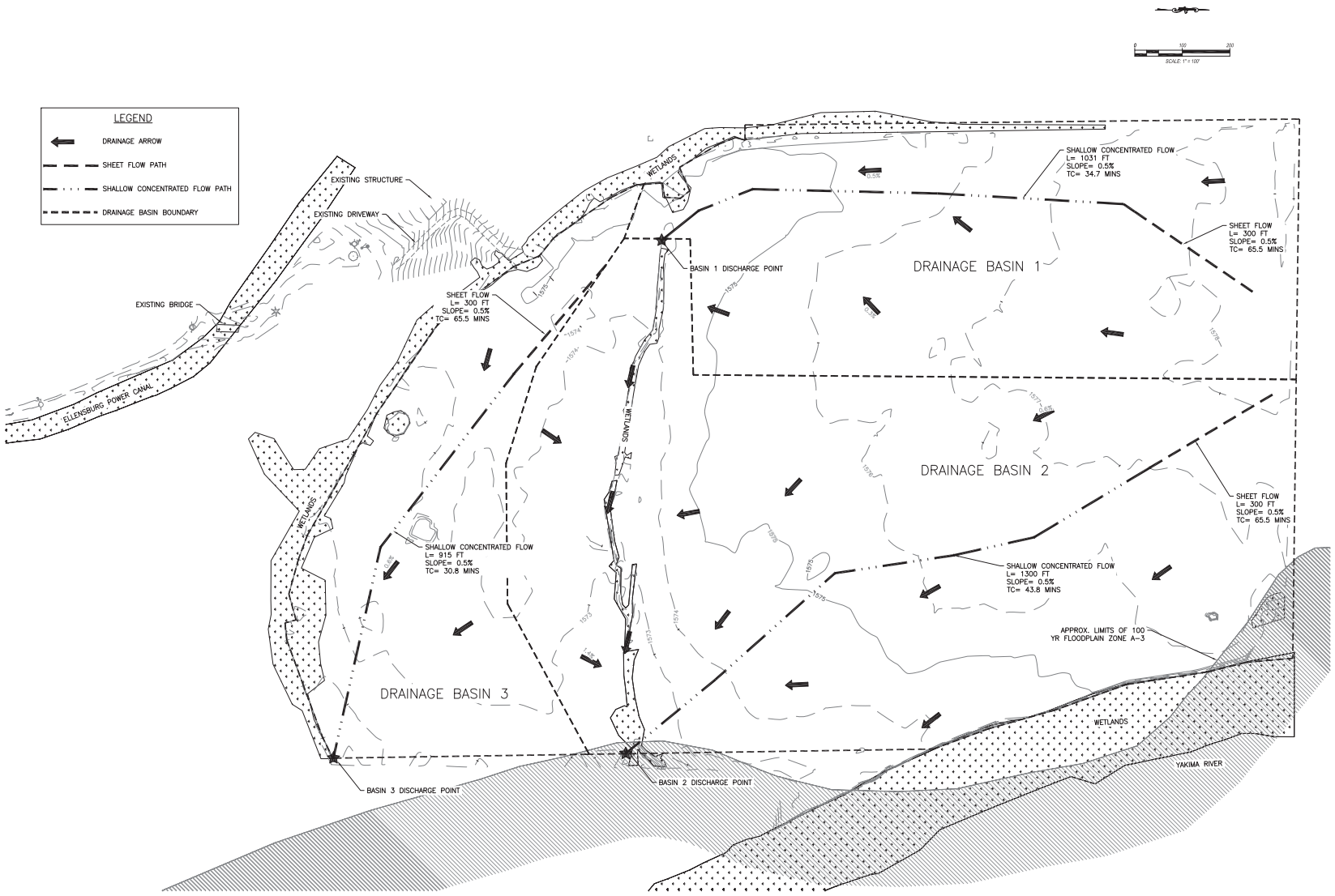
1. Preparation of a Stormwater Site Plan:
    - This can be seen in Figure 2- Proposed Drainage Basin Map, and will be included in the civil plans.
2. Construction Stormwater Pollution Prevention:
    - This will be included as part of the SWPPP submittal.
3. Source Control Pollution
    - The only potential 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

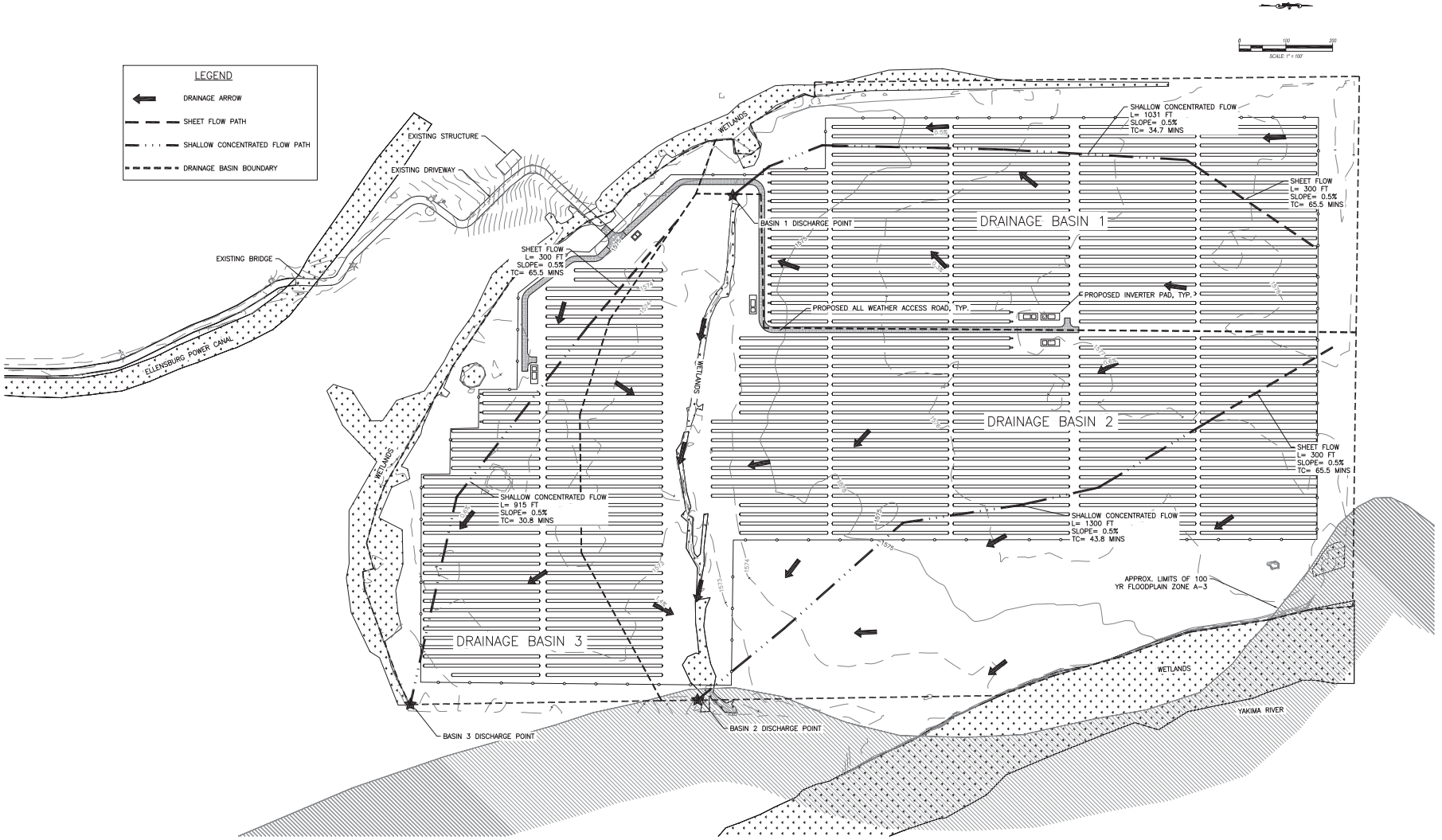
TUUSSO ENERGY, LLC
TYPHA SITE
EXISTING DRAINAGE CONDITIONS

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

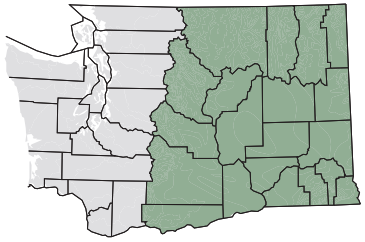
Component Percent Cutoff: None Specified

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)

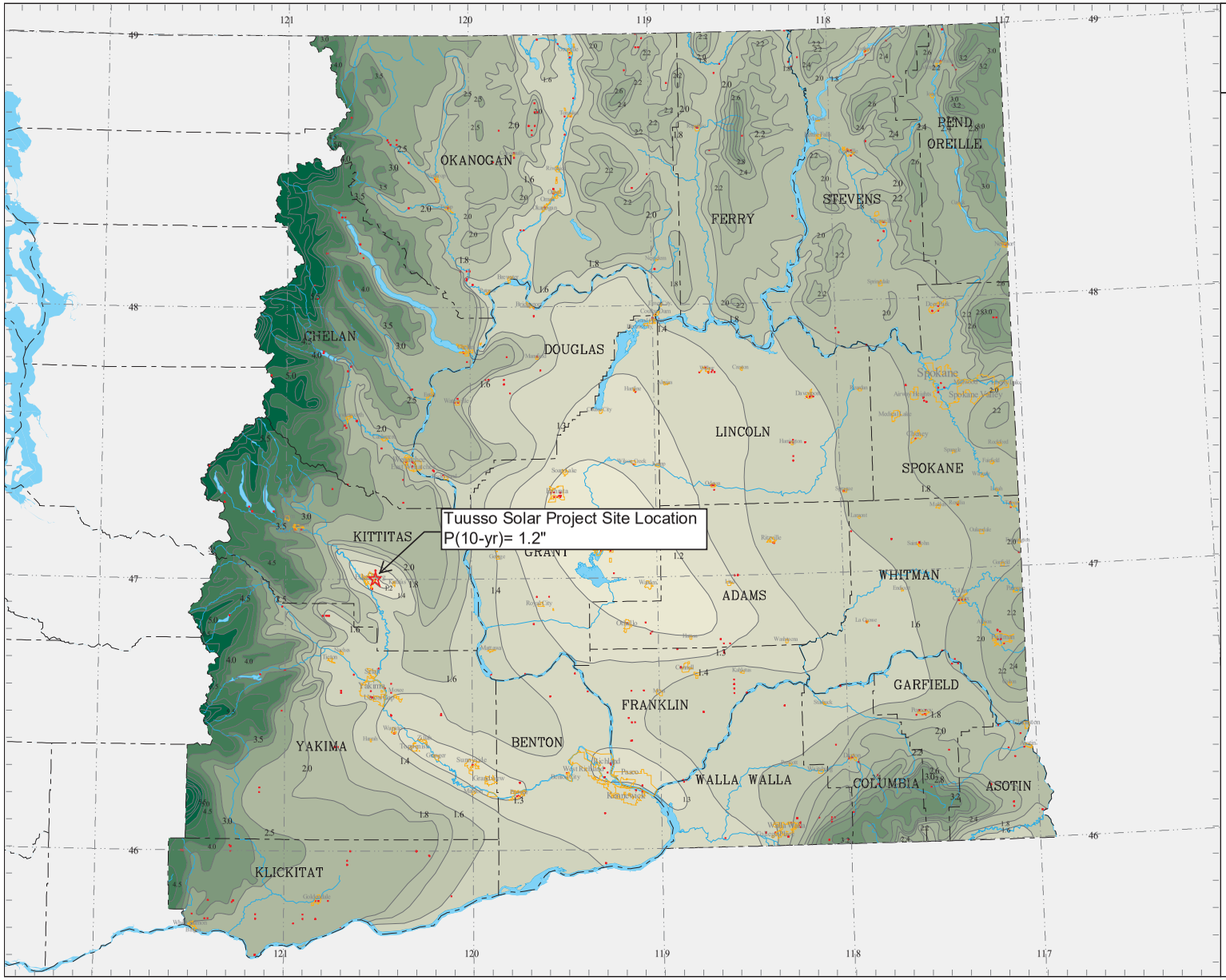
N

Scale 1:1,600,000
Miles
0 16.5 33

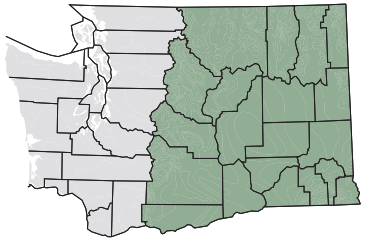
Water Quality Program

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

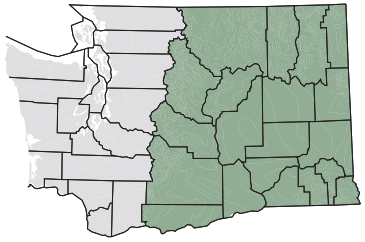
Scale 1:1,600,000
Miles
0 16.5 33

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)

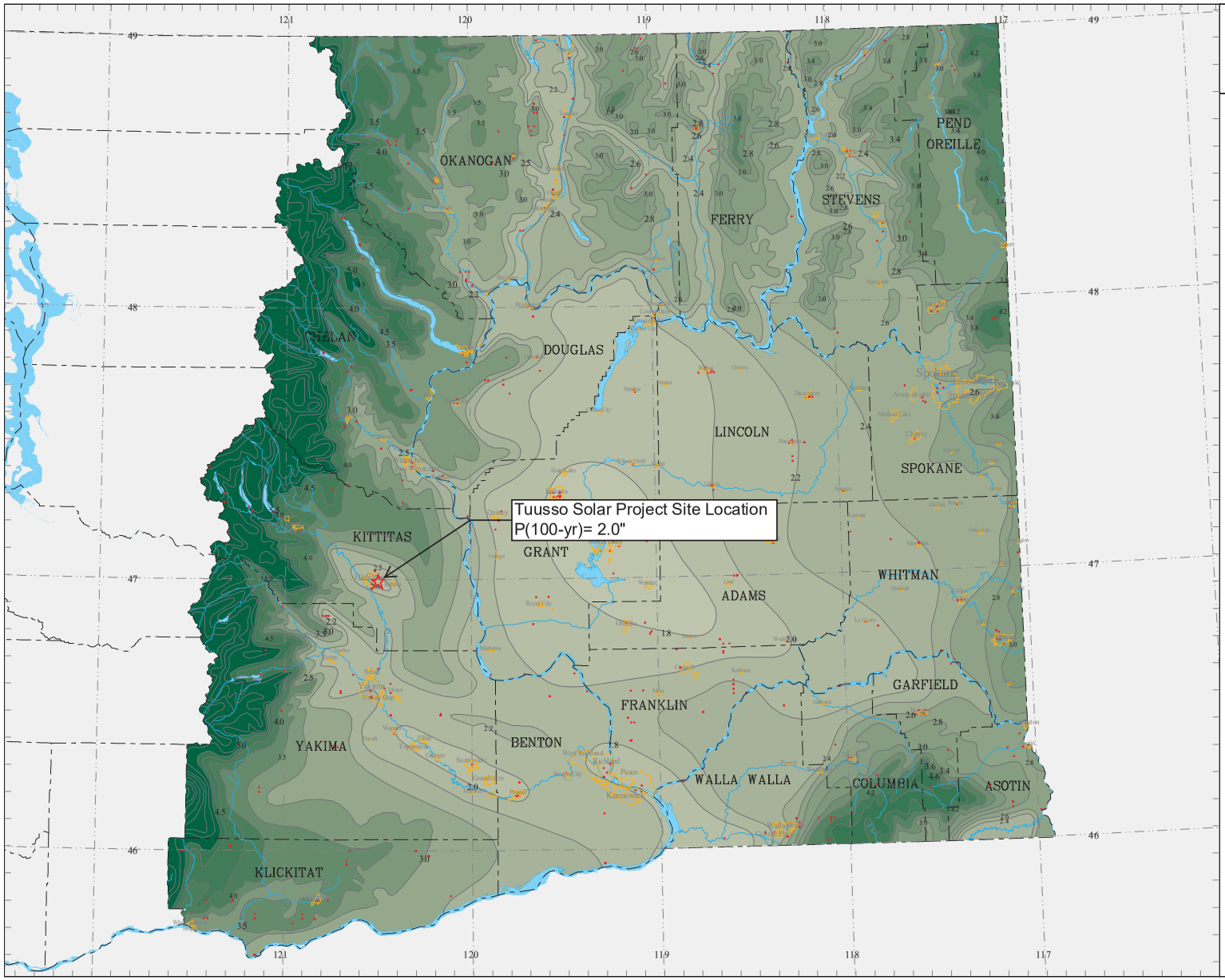
N

Scale 1:1,600,000
Miles
0 16.5 33

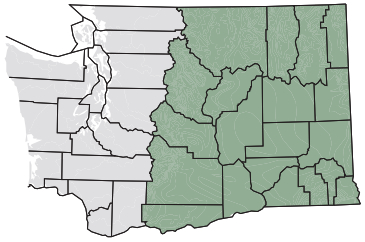
Water Quality Program

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

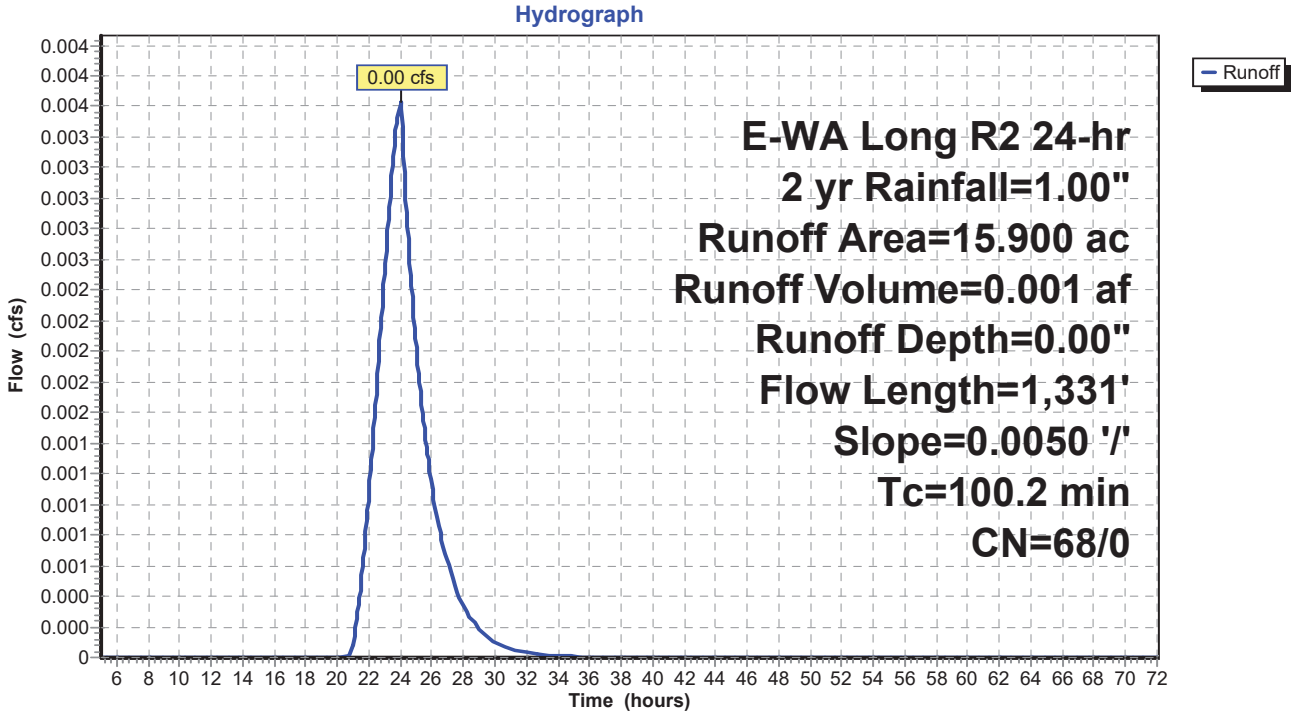
Runoff = 0.00 cfs @ 23.99 hrs, Volume= 0.001 af, Depth= 0.00"

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

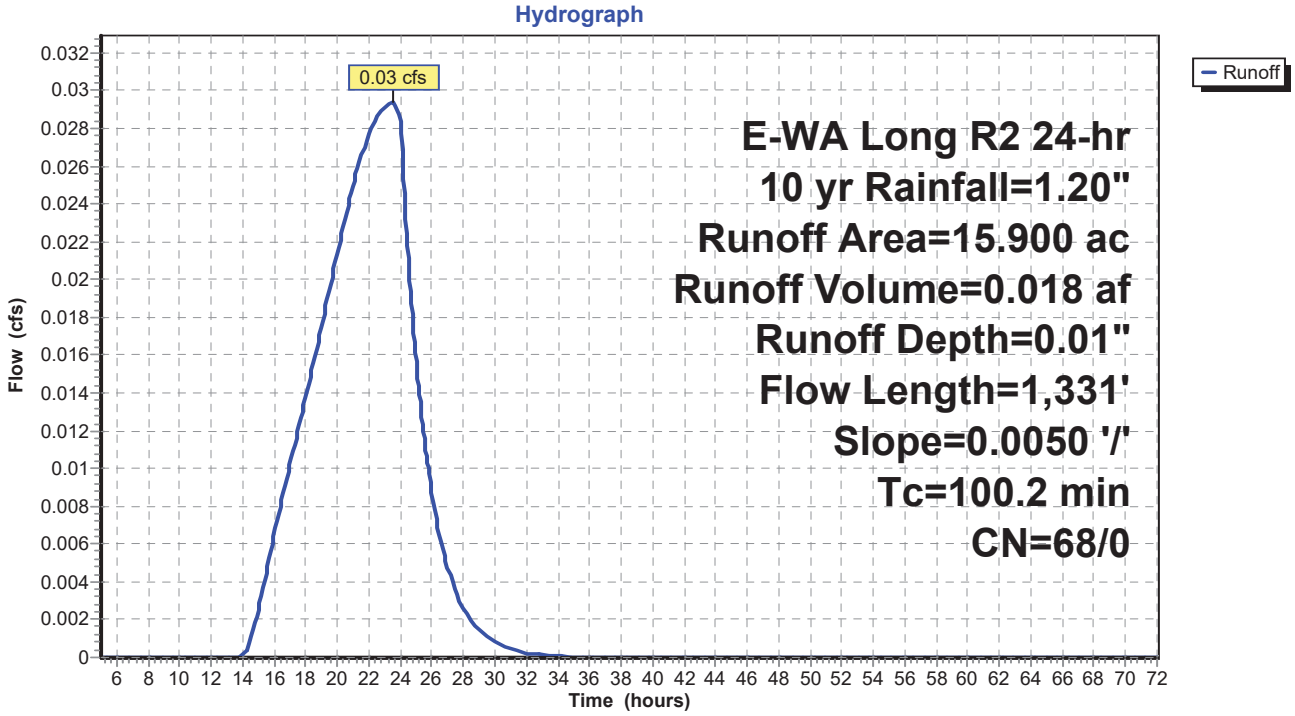
Runoff = 0.03 cfs @ 23.53 hrs, Volume= 0.018 af, Depth= 0.01"

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

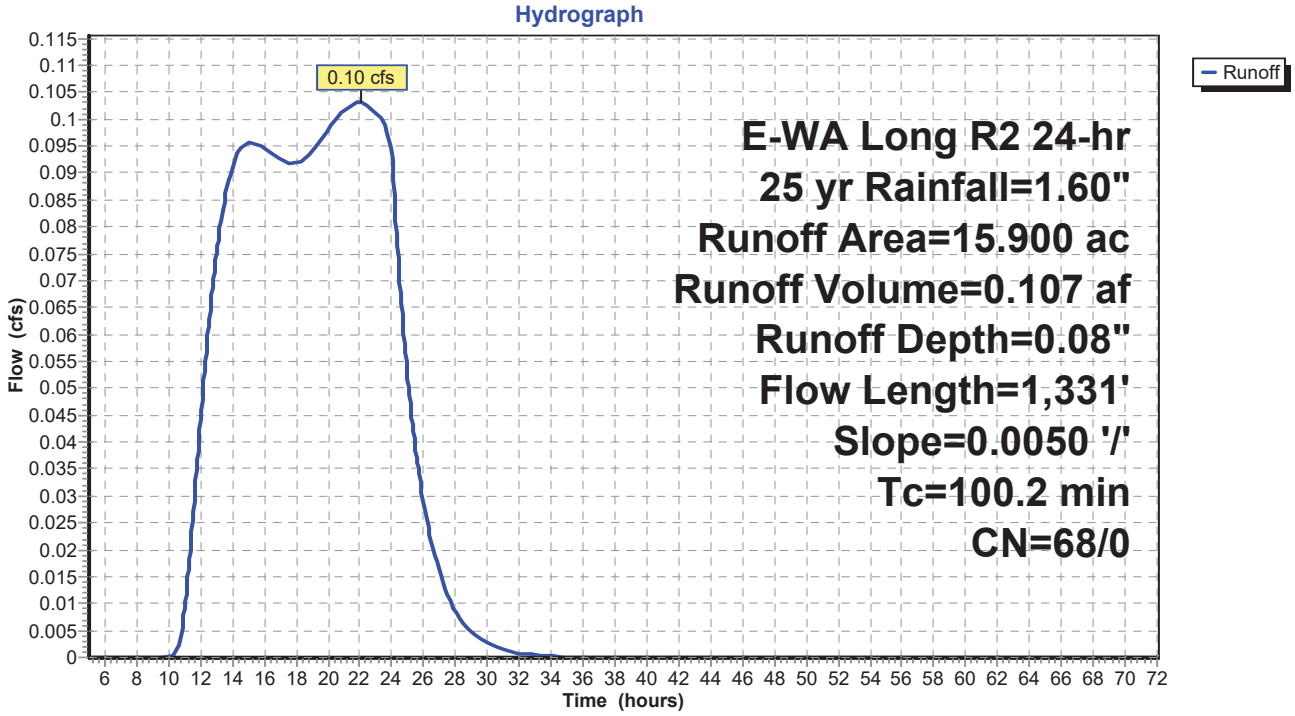
Runoff = 0.10 cfs @ 22.01 hrs, Volume= 0.107 af, Depth= 0.08"

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

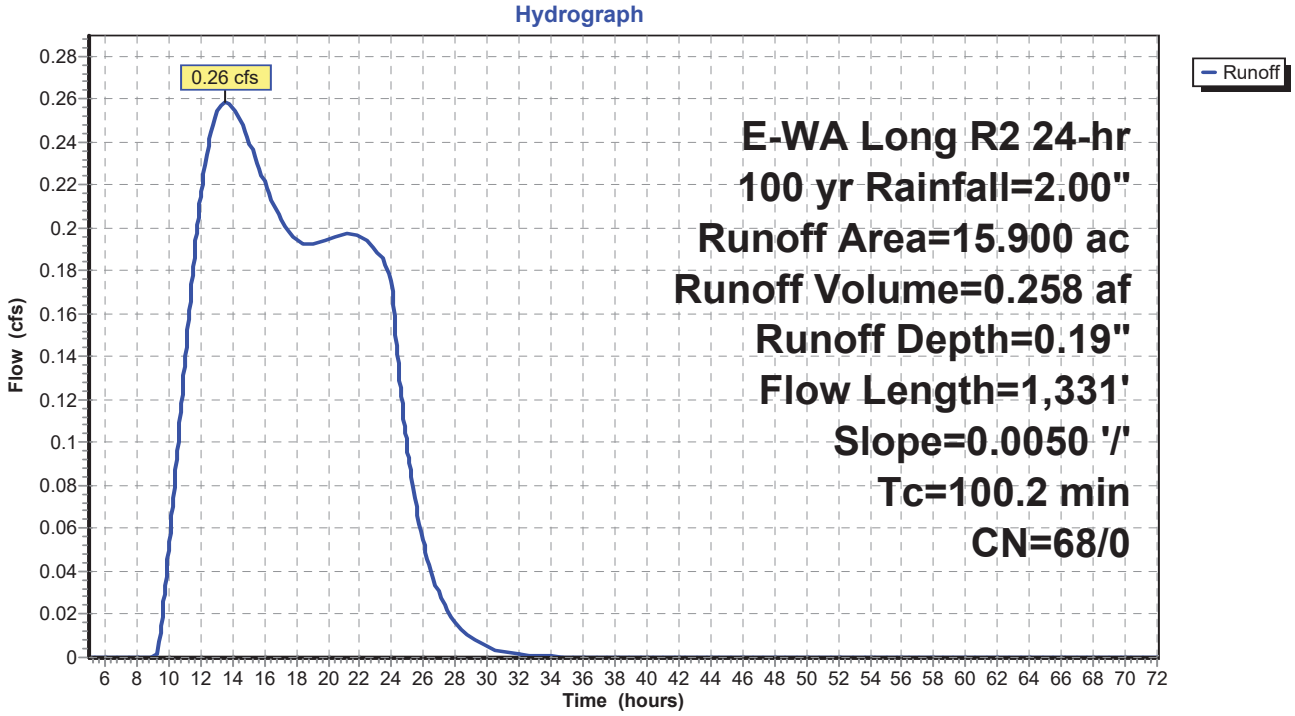
Runoff = 0.26 cfs @ 13.59 hrs, Volume= 0.258 af, Depth= 0.19"

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

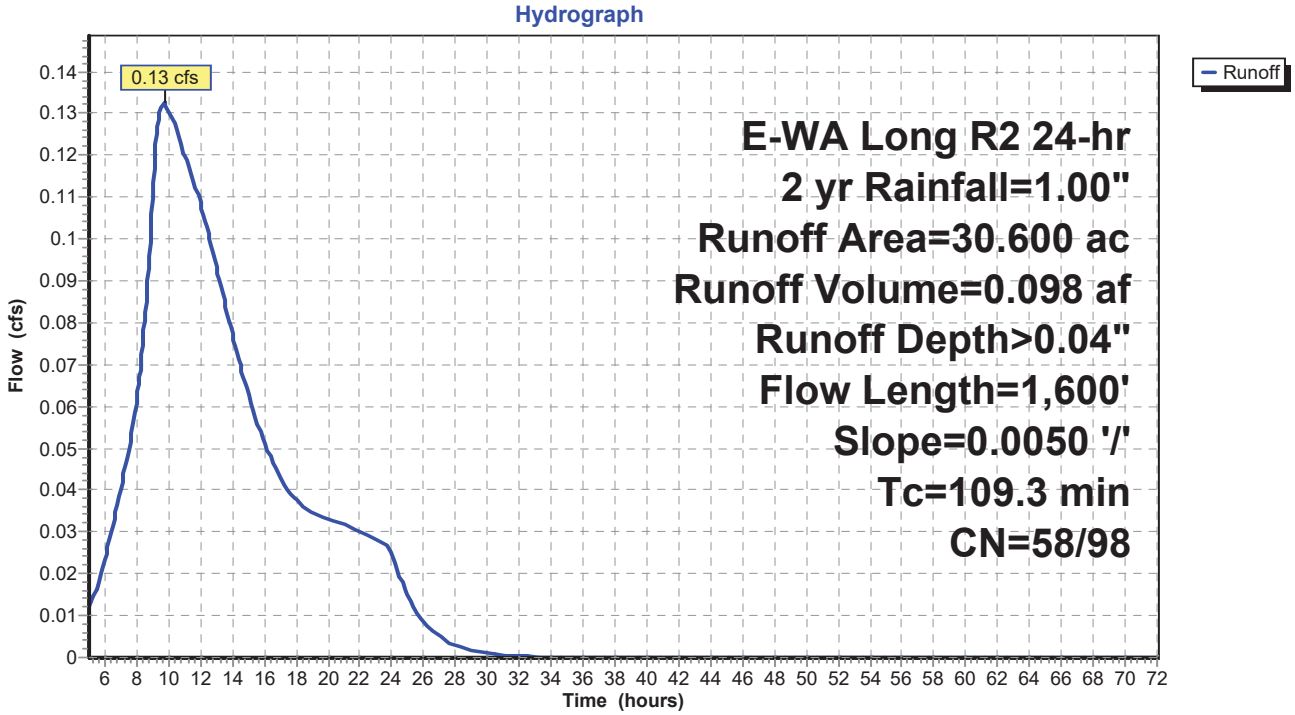
Runoff = 0.13 cfs @ 9.72 hrs, Volume= 0.098 af, Depth> 0.04"

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

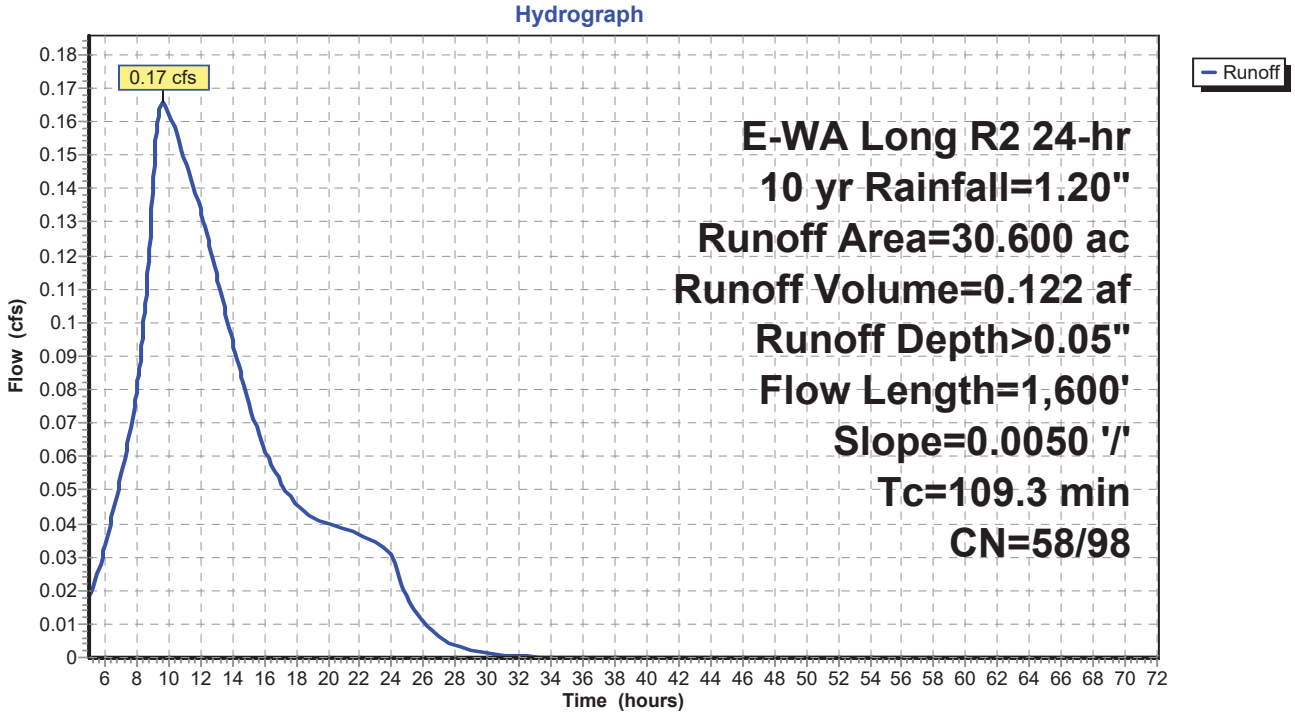
Runoff = 0.17 cfs @ 9.69 hrs, Volume= 0.122 af, Depth> 0.05"

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

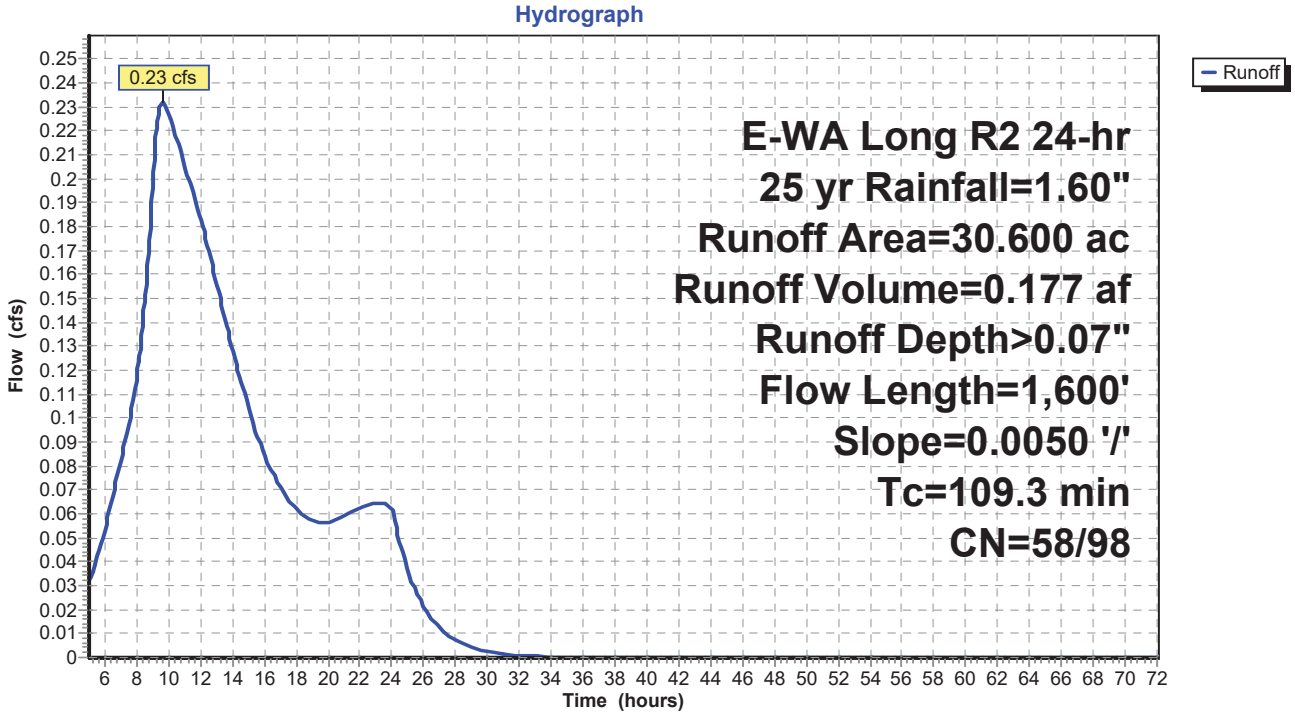
Runoff = 0.23 cfs @ 9.64 hrs, Volume= 0.177 af, Depth> 0.07"

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

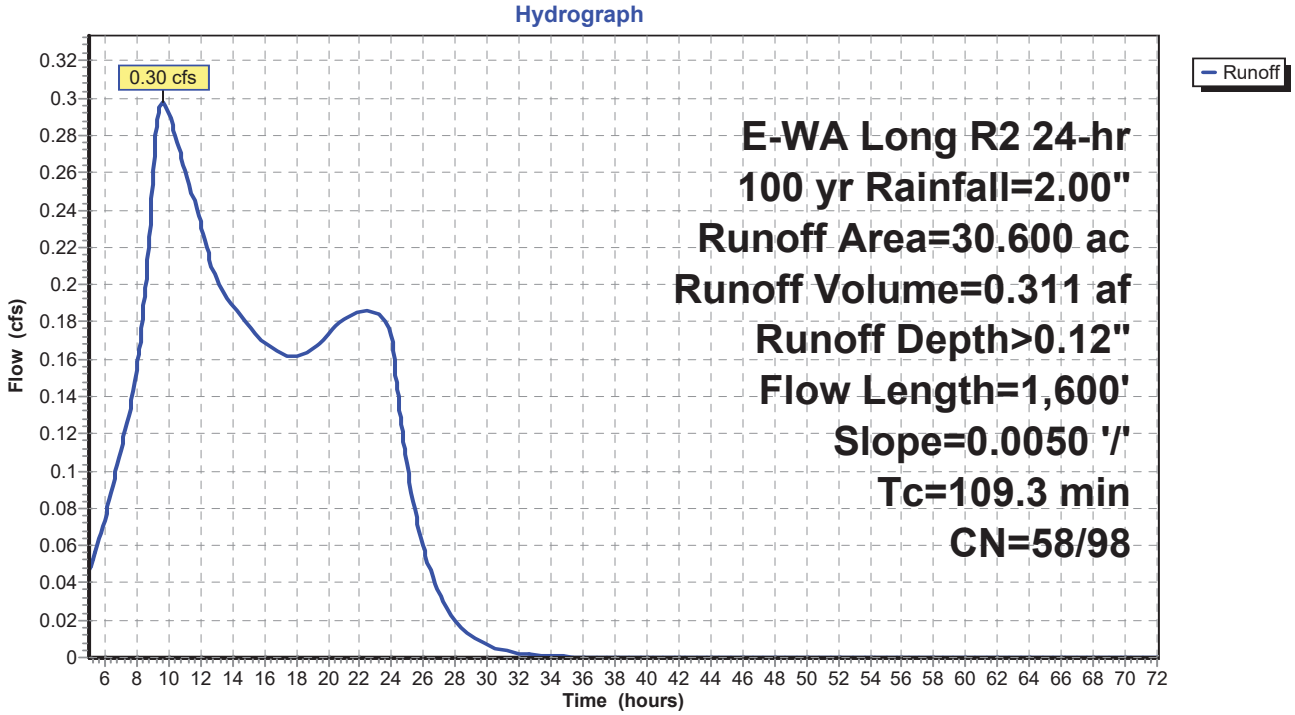
Runoff = 0.30 cfs @ 9.62 hrs, Volume= 0.311 af, Depth> 0.12"

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

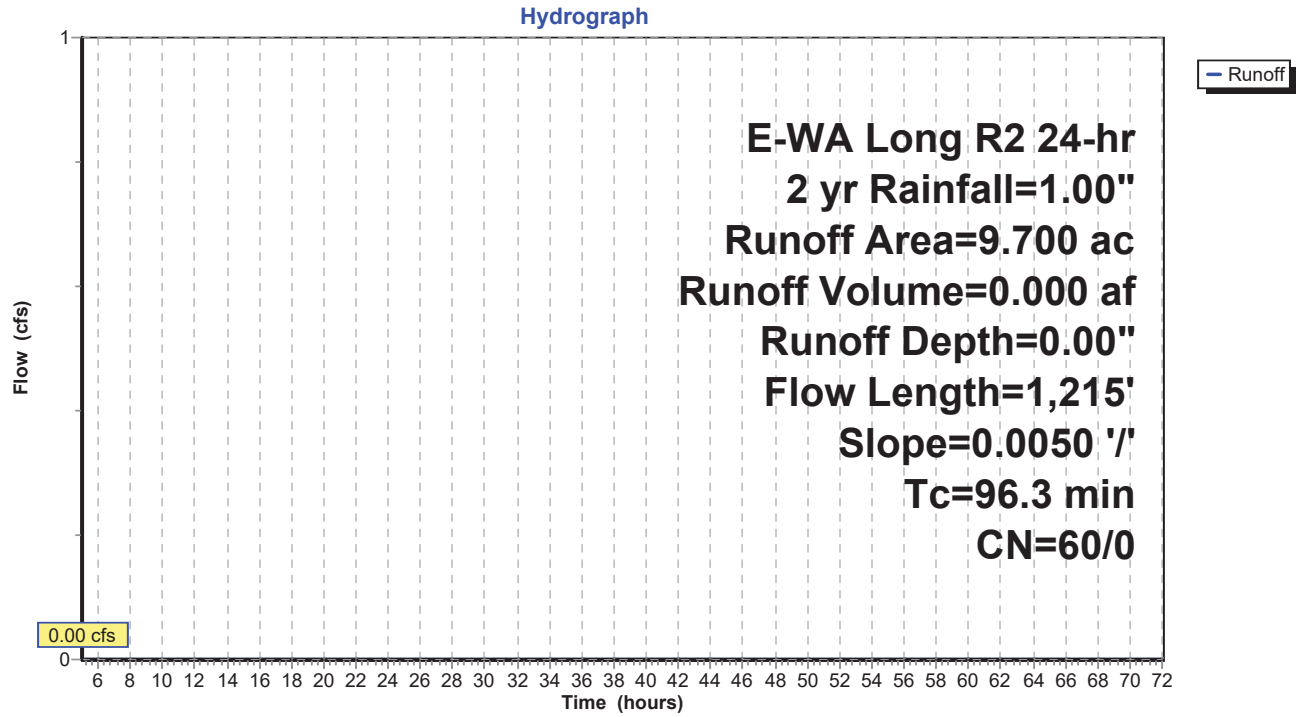
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

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

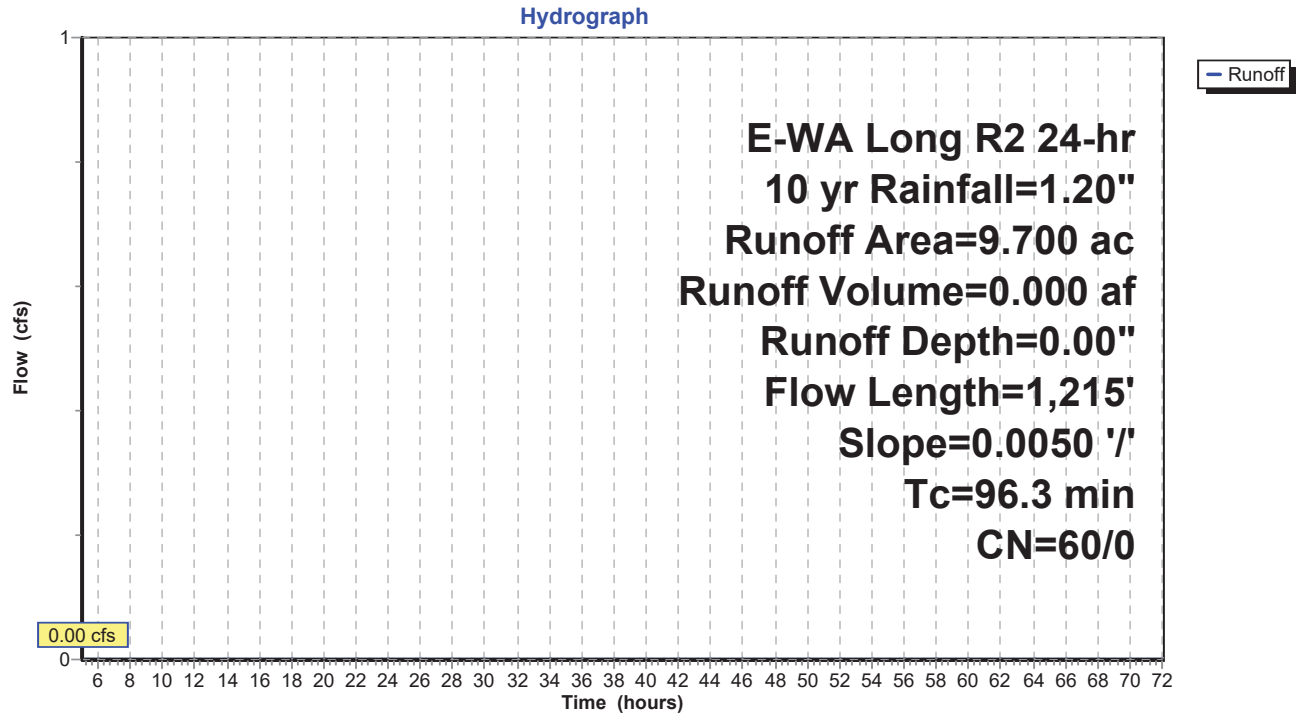
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

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

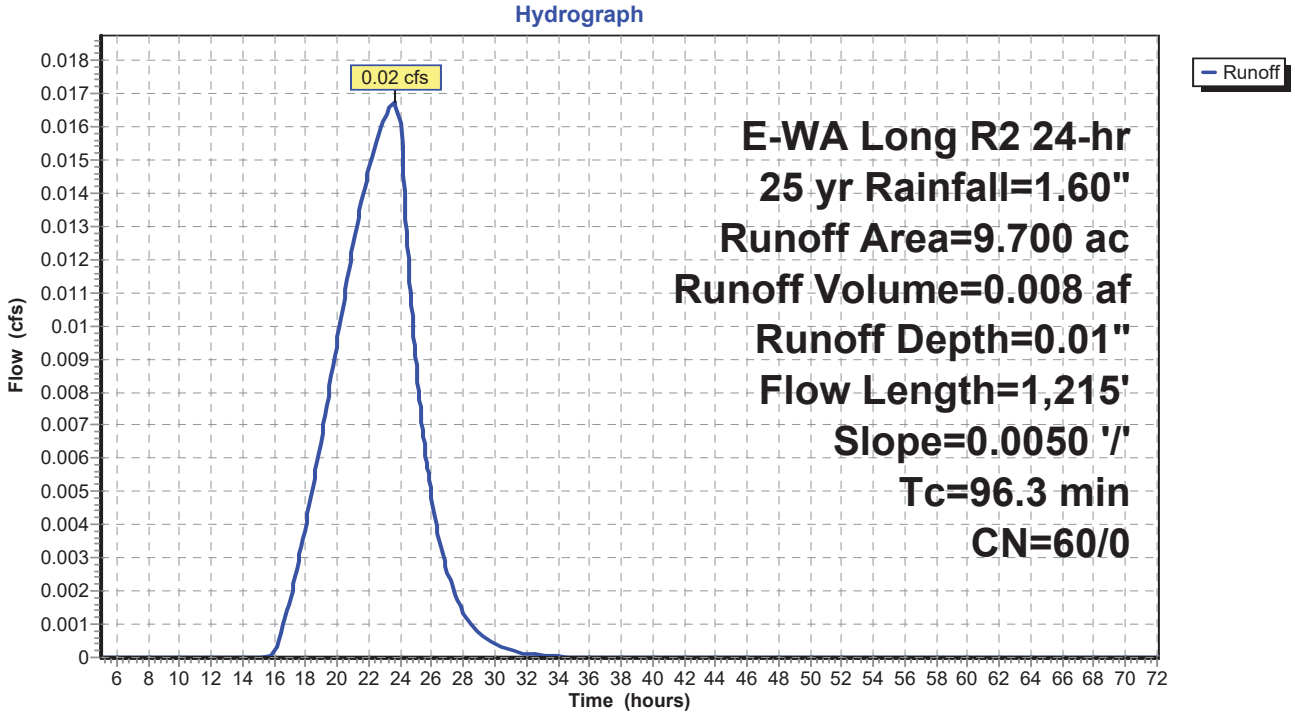
Runoff = 0.02 cfs @ 23.62 hrs, Volume= 0.008 af, Depth= 0.01"

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

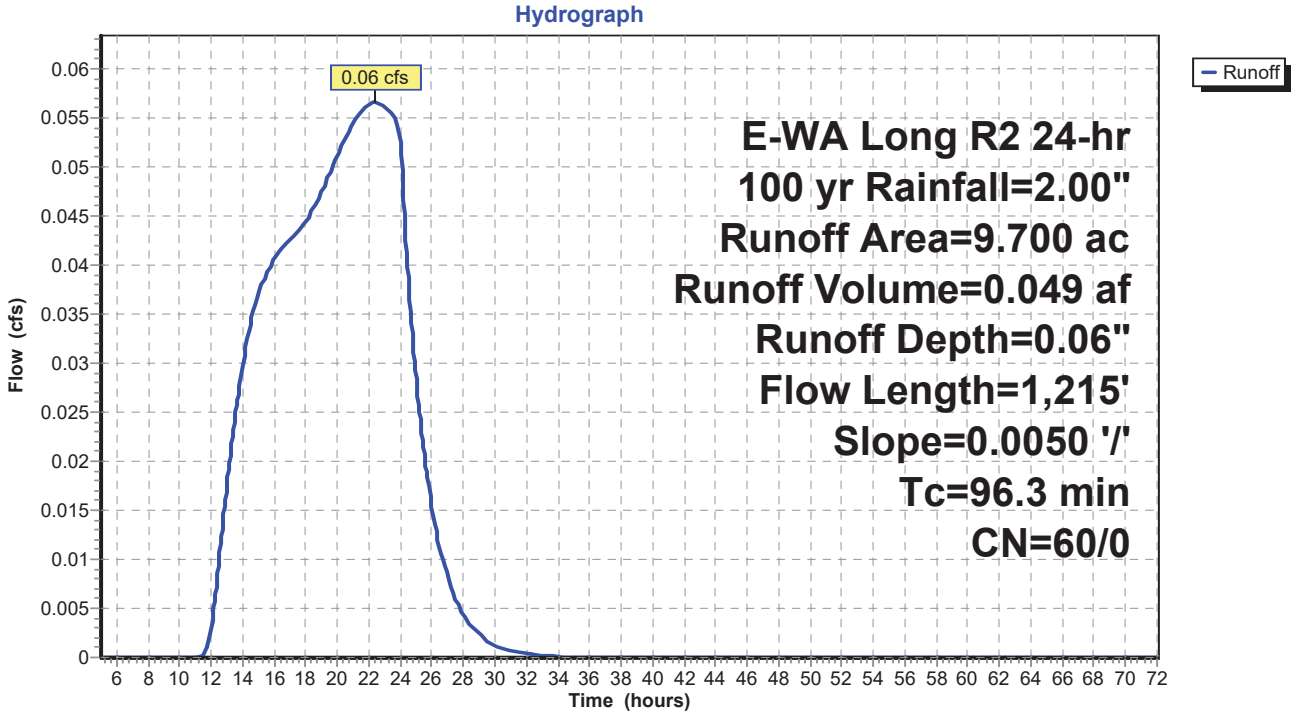
Runoff = 0.06 cfs @ 22.34 hrs, Volume= 0.049 af, Depth= 0.06"

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

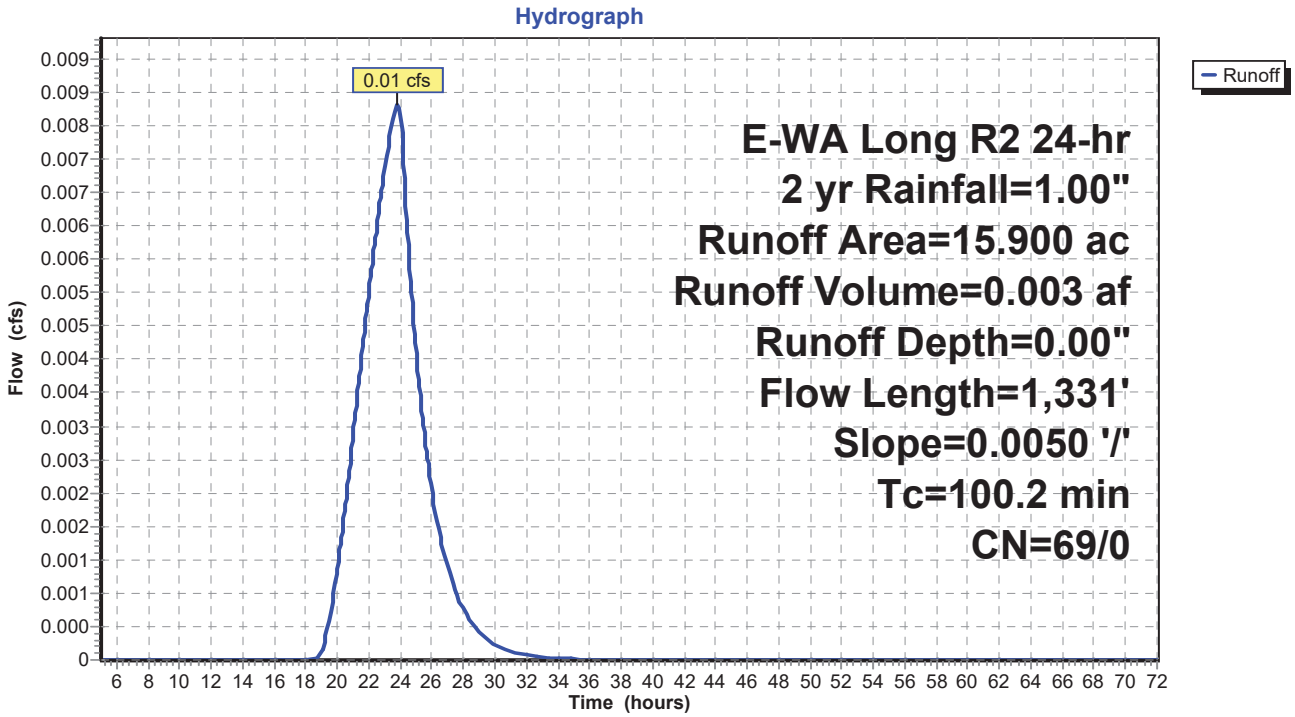
Runoff = 0.01 cfs @ 23.84 hrs, Volume= 0.003 af, Depth= 0.00"

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

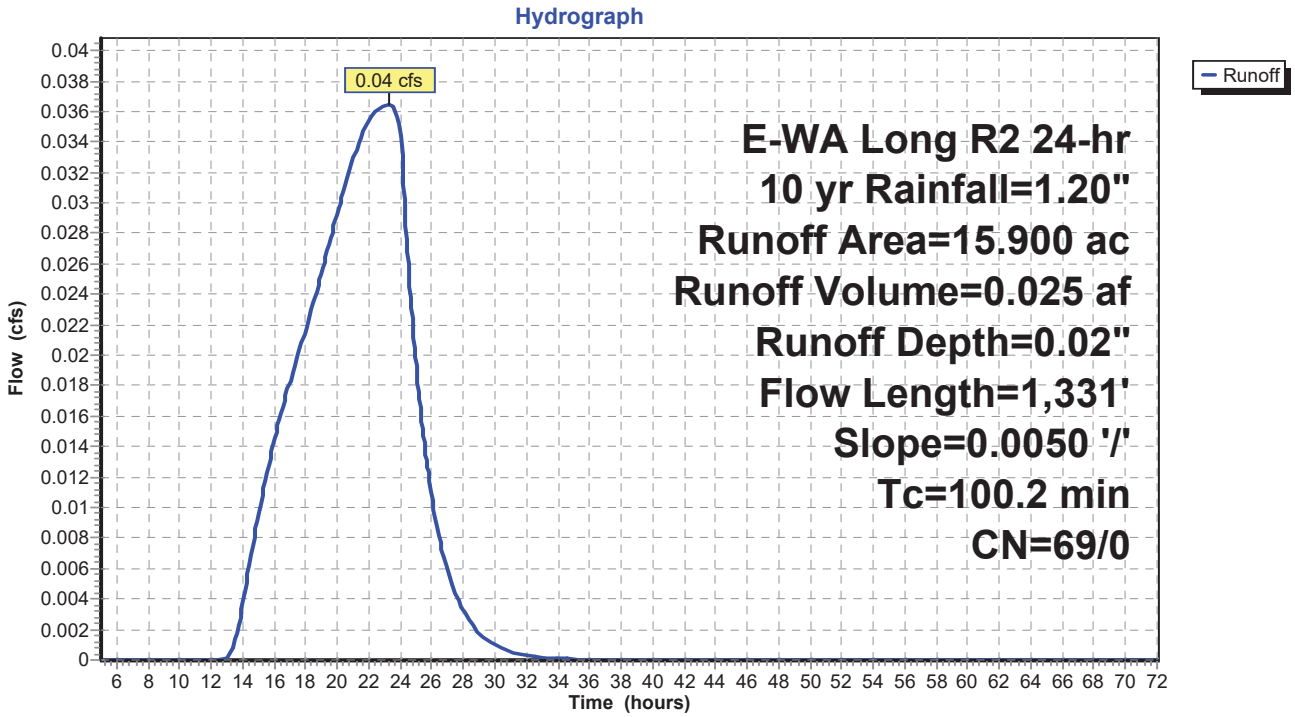
Runoff = 0.04 cfs @ 23.25 hrs, Volume= 0.025 af, Depth= 0.02"

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

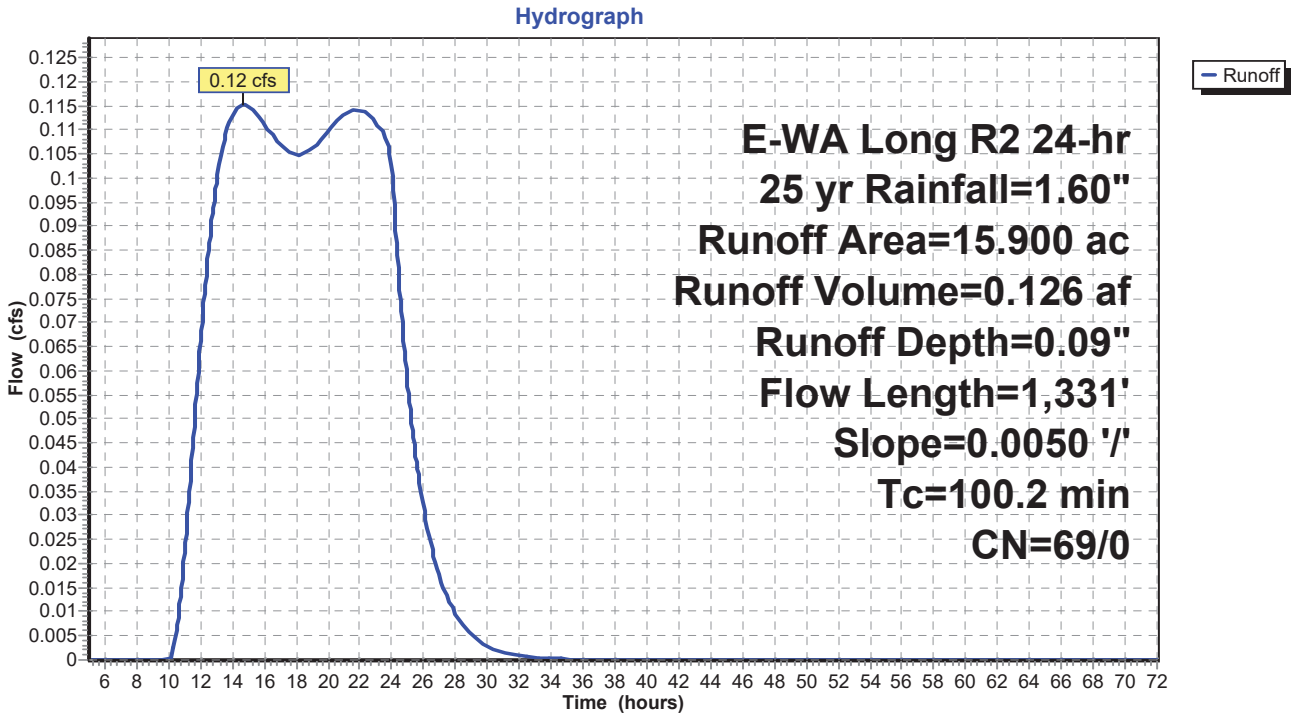
Runoff = 0.12 cfs @ 14.64 hrs, Volume= 0.126 af, Depth= 0.09"

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

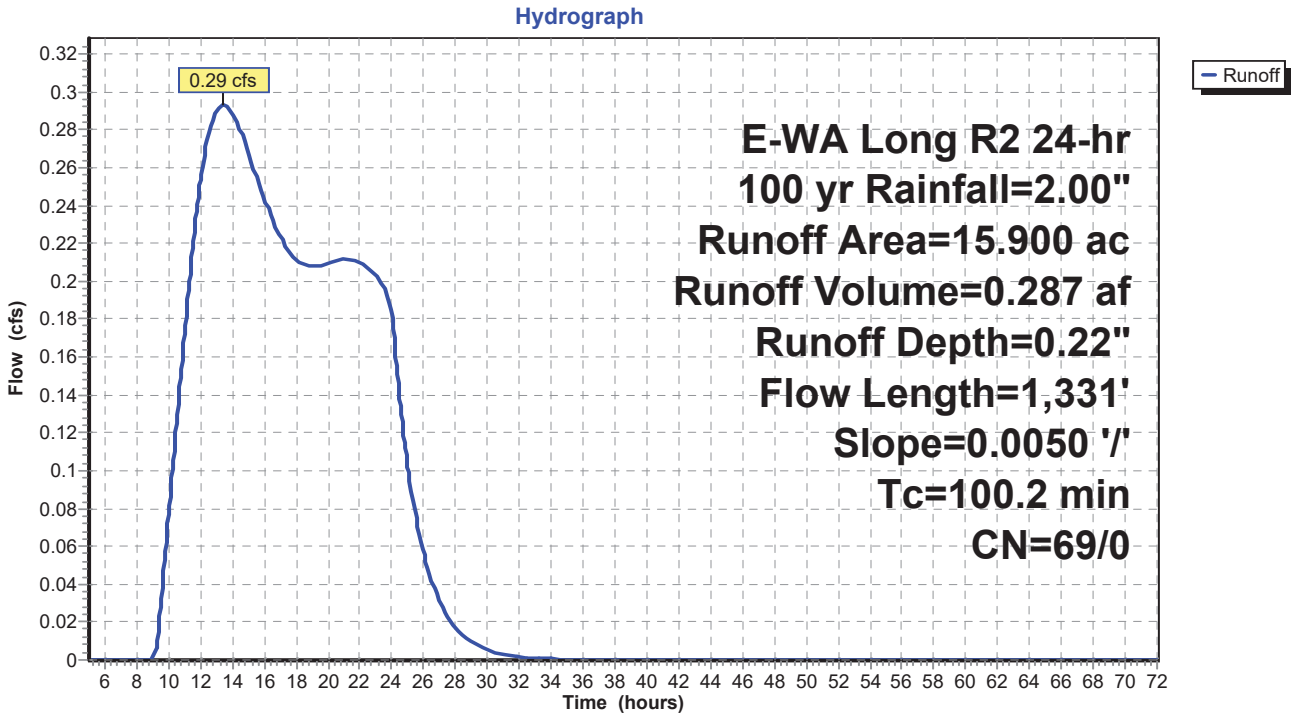
Runoff = 0.29 cfs @ 13.41 hrs, Volume= 0.287 af, Depth= 0.22"

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

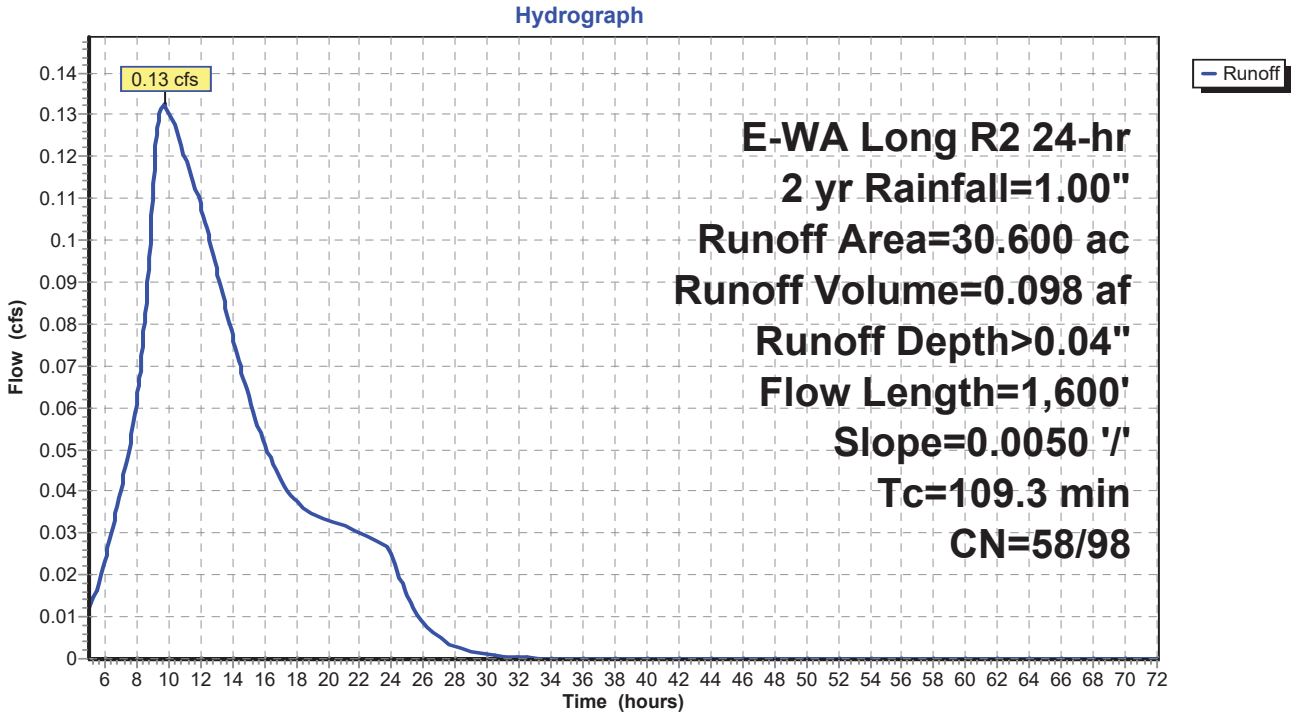
Runoff = 0.13 cfs @ 9.72 hrs, Volume= 0.098 af, Depth> 0.04"

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

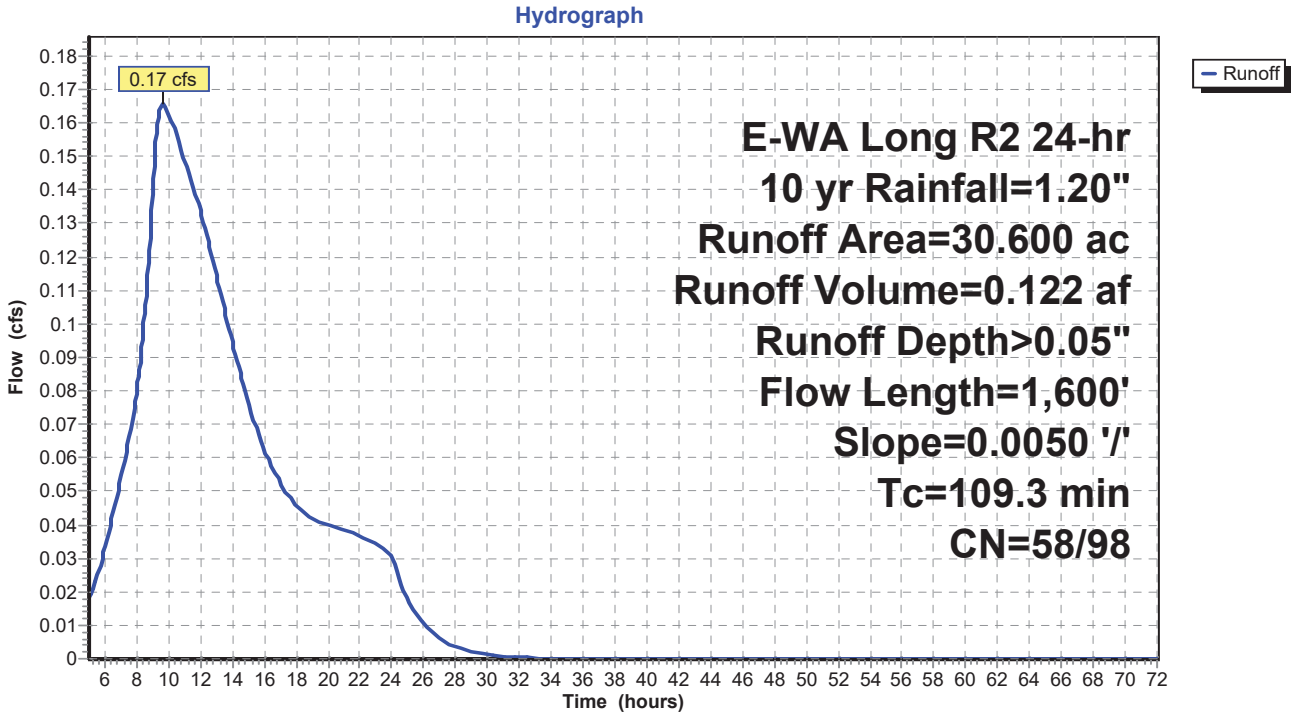
Runoff = 0.17 cfs @ 9.69 hrs, Volume= 0.122 af, Depth> 0.05"

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

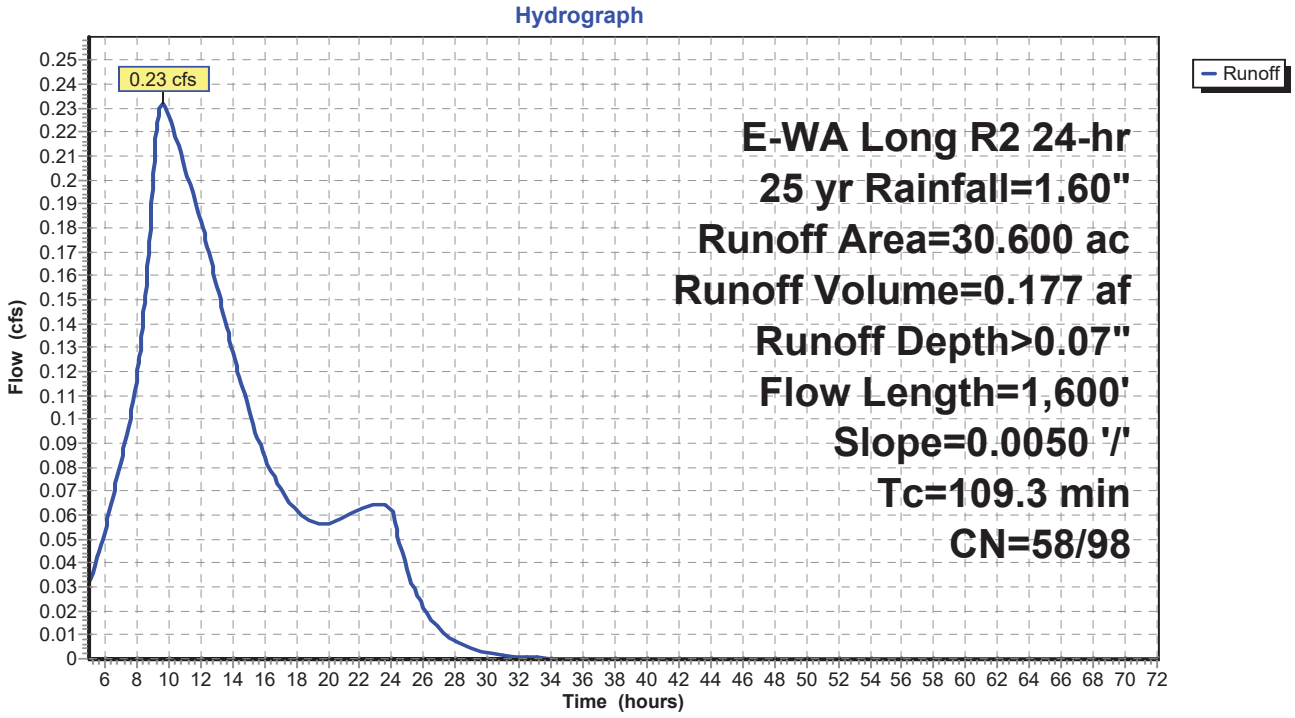
Runoff = 0.23 cfs @ 9.64 hrs, Volume= 0.177 af, Depth> 0.07"

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

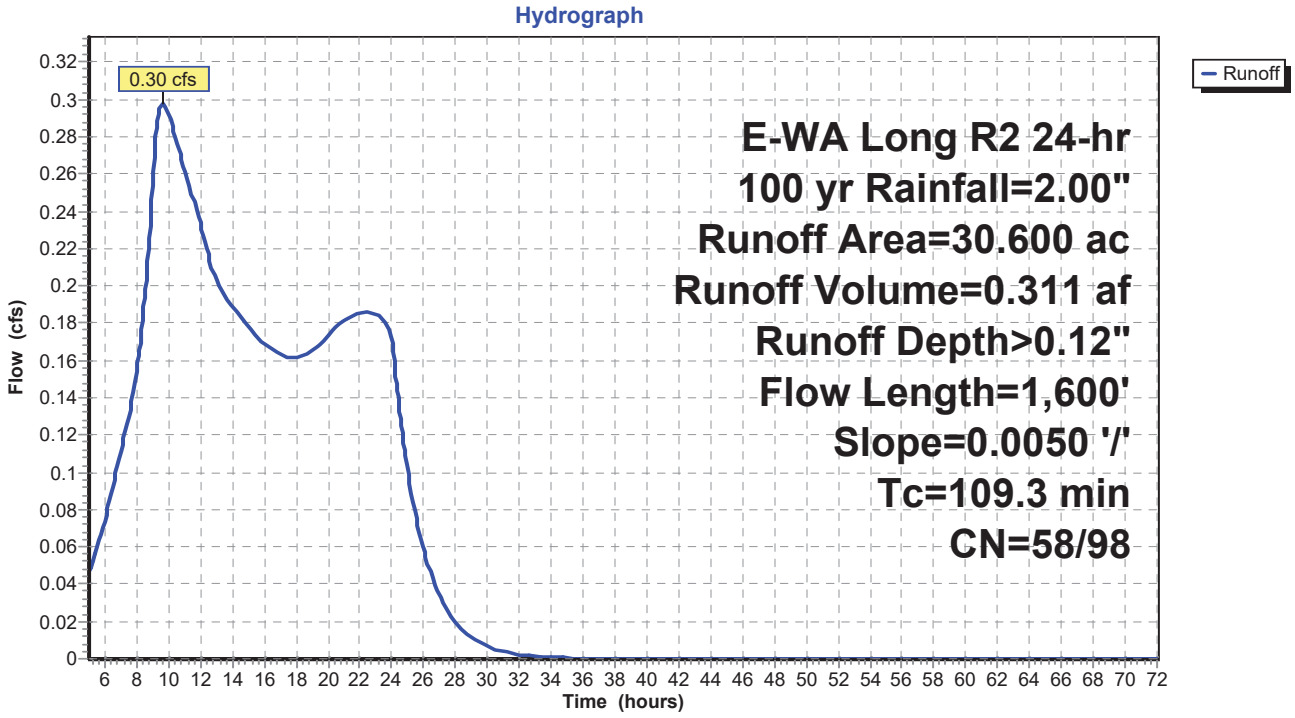
Runoff = 0.30 cfs @ 9.62 hrs, Volume= 0.311 af, Depth> 0.12"

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

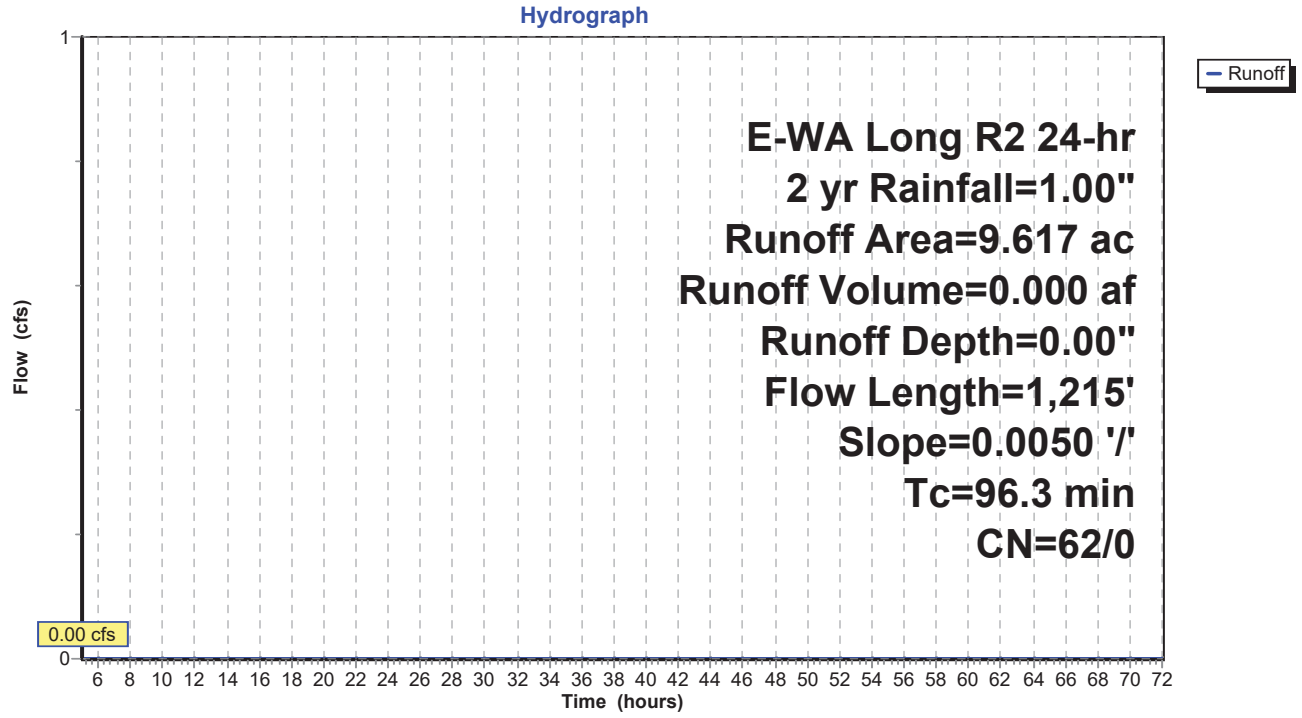
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

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

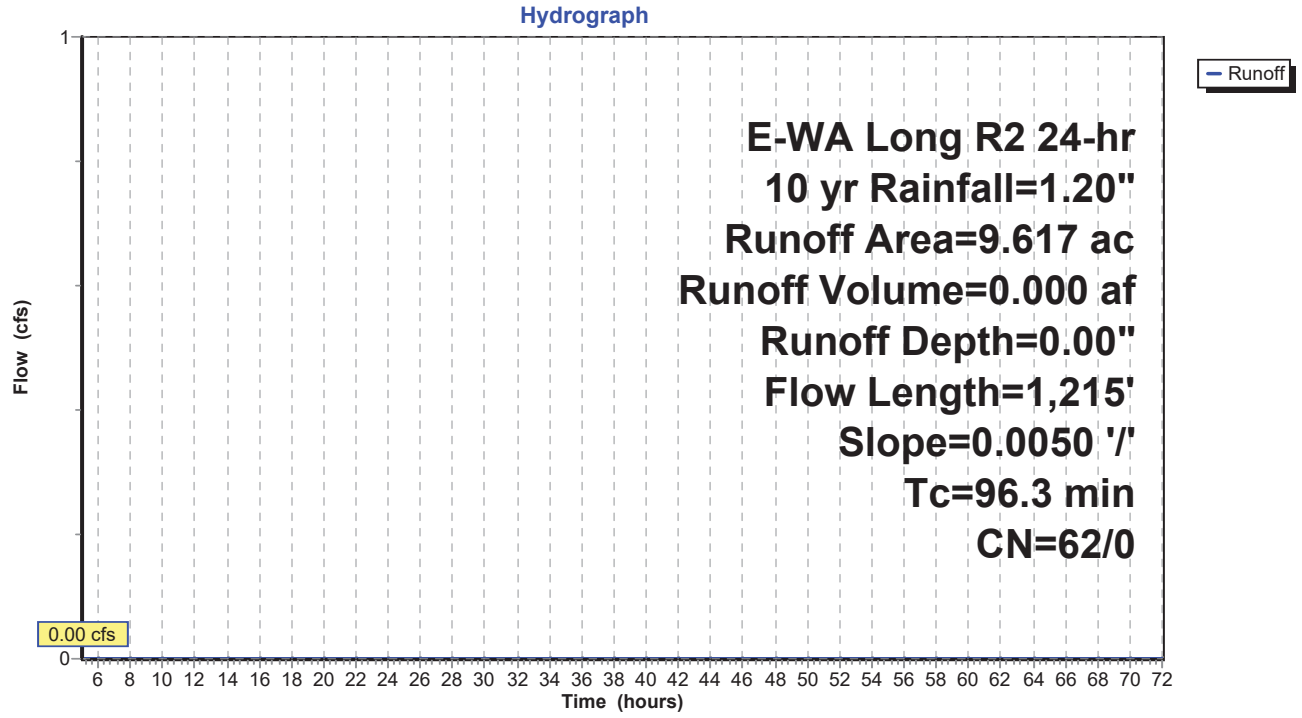
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

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

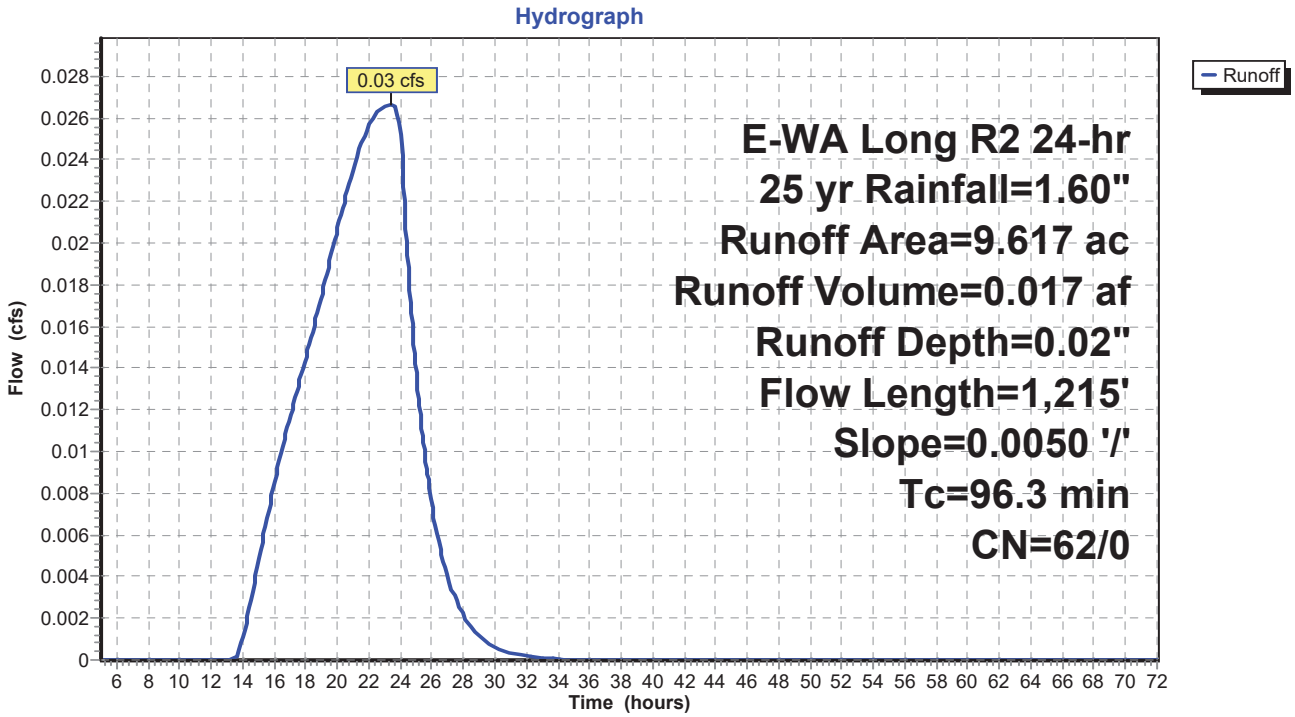
Runoff = 0.03 cfs @ 23.40 hrs, Volume= 0.017 af, Depth= 0.02"

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