Vancouver Energy

Operations Facility Oil Spill Contingency Plan

EFSEC Application for Site Certification No. 2013-01

Docket No. EF131590

Appendix D

Hazard Evaluation/Risk Analysis

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APPENDIX D
HAZARD EVALUATION/RISK ANALYSIS

D.1 INTRODUCTION

An evaluation of the major components of the oil transfer and storage system at the terminal has been completed for the purpose of identifying the potential risk of oil spills associated with each component. The analysis is focused on identifying the components or areas that pose the greatest overall risk of spills.

The spill prevention measures for any components/areas identified as having a significant spill risk were then evaluated to ensure that the best achievable technologies are in place based on industry standards. In the unlikely event that additional protection measures should be taken, recommendations will be made for additional measures.

D.2 FACILITY OIL SPILL RISK ANALYSIS

D.2.1 Scope

The oil spill risk analysis identifies potential oil spill risks and evaluates the frequency and severity of such risks. For the purposes of the risk analysis, the storage and transfer facilities are grouped into the following areas.

Area 200	Rail transfer facilities
Area 300	Storage tanks and their containment
Area 400	Marine transfer facilities
Area 500	Transfer pipeline leak outside of secondary containment

All of these facilities are operated in an integrated fashion by the Certificate Holder. Therefore, any risks that transcend the artificial boundaries established by the above grouping were an integral part of the analysis.

The risk analysis was primarily intended to identify hazards that could lead to oil spills that could reach the waters of the State. Small spills on land that cannot impact the waters of the State were not to be analyzed in detail.

The preceding sections of this plan discuss the measures taken to prevent oil spills from the facility. In many cases, these measures are not repeated in this section.

D.2.2 Method

Hazard identification was done using the checklists in Ecology’s Facility Risk Analysis Guidelines as the starting point. The checklists were made site-specific by adding items that have resulted in past spills at other facilities, items that are discussed in the prevention plan, and other items that could present potential oil spill risks.

From the oil spill hazards identified by the checklist review, oil spill scenarios that could conceivably lead to oil reaching the river were developed. The frequency and severity of these spill scenarios were identified qualitatively. This identification was based primarily on the operating history of the facility and a detailed knowledge of the operating procedures, inspection program and results, and maintenance schedules of the oil storage and transfer facilities. A “Frequency-Severity Matrix” similar to the one shown in Ecology’s guidelines was used to identify the risk category into which each scenario fell.

D.2.3 Analysis of Past Spills

The Facility is not yet constructed and therefore there are no past spills to evaluate.

D.2.4 Risk Estimation and Scenario Development

Risks from the hazards identified in completing the checklists were addressed by developing spill scenarios that contained one or more of the identified hazards. Low probability spills with high potential severities also were addressed.

Scenarios were not developed for every possible combination of events or hazards. The following guidelines were used in developing the scenarios:

Cover the range of hazards identified, even the ones viewed as unlikely.

For a group of related scenarios, use the one representing the worst combination of frequency and severity, yet still plausible.

As determined using the Hazard Identification Checklist (**Figure D.1**) and this risk analysis, a risk of a significant discharge exists in the terminal tank yard, at the truck and rail transfer areas, from pipelines, and at the marine header/dock.

The possibility of a catastrophic discharge impacting state or navigable waters is extremely low due to the location of the terminal and strict adherence to established operating and maintenance procedures. The terminal is located approximately 1,800 feet inland from the Columbia River. There is limited direct drainage from the terminal to the river, and several roads and naturally occurring impoundments are located between the terminal and river which should provide containment and collection sites.

The single marine transfer pipeline that extends from the Storage Area to the Marine Terminal is equipped with three valves that are closed and locked when transfers are not in progress. The total volume of the pipeline from the Storage Area to the Marine Terminal is approximately 5,505 barrels. The total volume of the pipeline from the Rail Unloading Area to the Marine Terminal is approximately 3,802 barrels. The volume between the dock header valve and first inline valve is approximately 314 barrels. All marine transfers are continuously monitored by trained and qualified personnel. A Tesoro Operator is positioned on the dock and maintains radio contact with the vessel and the Storage Area. Marine transfers can be terminated within 60 seconds of notice, and valves closed immediately thereafter.

Figure D.1. Hazard Identification Checklist

STATE OF WASHINGTON DEPARTMENT OF ECOLOGY

OIL SPILL PREVENTION PLAN
FACILITY OIL SPILL RISK ANALYSIS
HAZARD IDENTIFICATION CHECK LIST

FACILITY: Vancouver Energy DATE:

Spill Potential Ratings:
High (H) Medium (M) Low (L)

"No" answers with high to medium spill potential require further investigation. Formal risk analysis methods should be considered for situations with high to medium spill potential.

	YES	NO	SPILL POTENTIAL	COMMENTS	RESPONSE
A. MARINE LOADING/UNLOADING AREA					
Fire Related Spill Hazards					
1. Is the fire extinguishing system adequate?	X				
2. Are sufficient fire extinguishers nearby?	X				
3. Are block valves, check valves, pumps, filters, etc... made of steel?	X				
4. Are pipe supports fire proofed?		X		Pipeline supports are constructed of steel and concrete	
5. Have flammable material ignition sources been eliminated?	X				
6. Does all electrical equipment meet explosion proof requirements?		X		Where required by NEC, API, and NFPA electrical equipment is explosion proof	

Figure D.1. Hazard Identification Checklist (continued)

STATE OF WASHINGTON DEPARTMENT OF ECOLOGY

OIL SPILL PREVENTION PLAN
FACILITY OIL SPILL RISK ANALYSIS
HAZARD IDENTIFICATION CHECK LIST

FACILITY: Vancouver Energy DATE:	Spill Potential Ratings: **High (H) Medium (M) Low (L)**

"No" answers with high to medium spill potential require further investigation. Formal risk analysis methods should be considered for situations with high to medium spill potential.

	YES	NO	SPILL POTENTIAL	COMMENTS	RESPONSE
Material Handling Related Spill Hazards					
7. Are remotely operated controls installed for emergency shutdown?	X				
8. Are barricades and/or shields installed to protect equipment?	X				
9. Are unloading lines equipped with check values allowing one way flow?	X				
10. Are hoses in good repair and pressure tested on a regular basis?	X				
11. Is the over-pressure prevention system adequate?	X				
12. Are there spill collection facilities?	X				

Figure D.1. Hazard Identification Checklist (continued)

STATE OF WASHINGTON DEPARTMENT OF ECOLOGY OIL SPILL PREVENTION PLAN FACILITY OIL SPILL RISK ANALYSIS HAZARD IDENTIFICATION CHECK LIST					
FACILITY: Vancouver Energy DATE:				Spill Potential Ratings: **High (H) Medium (M) Low (L)**	
"No" answers with high to medium spill potential require further investigation. Formal risk analysis methods should be considered for situations with high to medium spill potential.					
	YES	**NO**	**SPILL POTENTIAL**	**COMMENTS**	**RESPONSE**
13. Is oil spill containment equipment on hand and adequate?	X				
14. Is there an oil spill response plan?	X				
15. Are vessel overfill devices and/or procedures adequate?	X				
B. DOCK TRANSFER PIPELINES					
Material Handling Related Spill Hazards					
1. Is the corrosion protection and inspection program adequate?	X				
2. Are external coatings used and in good condition?	X				
3. Is right-of-way clear and patrolled on a regular basis? Is it effective?	X X				
4. Are pipelines protected from impact damage (Barricades/depth of cover)?		X	L	Pipelines where adjacent to traffic have barricades. DOT standards have been used to determine barricade placement based on road configuration and permitted vehicle speeds.	
5. Are surge and fatigue loadings acceptable?	X				

Figure D.1. Hazard Identification Checklist (continued)

STATE OF WASHINGTON DEPARTMENT OF ECOLOGY

OIL SPILL PREVENTION PLAN
FACILITY OIL SPILL RISK ANALYSIS
HAZARD IDENTIFICATION CHECK LIST

FACILITY: Vancouver Energy DATE:

Spill Potential Ratings:
High (H) Medium (M) Low (L)

"No" answers with high to medium spill potential require further investigation. Formal risk analysis methods should be considered for situations with high to medium spill potential.

	YES	NO	SPILL POTENTIAL	COMMENTS	RESPONSE
6. Is there an effective leak detection system?	X				
7. Are pipelines susceptible to soil movement? (Landslides, washouts, etc.)	X			Pipelines are designed for soil movements resulting from static settlement and liquefaction.	
8. Have lines been hydrostatically tested? What level and frequency?	X			Dock lines are hydrostatically tested prior to start-up and annually thereafter in accordance with USCG requirements 33 CFR 154 and WAC 173-180-420.	
C. BULK STORAGE TANK FARM					
Fire Related Spill Hazards					
1. Is fire protection adequate? Does system meet industry codes and A.P.I. standards?	X				
2. Is there adequate fire water?	X				
3. Are tank valves made of steel?	X				
4. Are pipe supports fire proofed?		X		Pipeline supports are constructed of steel and concrete	
5. Are firewalls (dykes) in place and sized to meet industry standards?	X				

Figure D.1. Hazard Identification Checklist (continued)

STATE OF WASHINGTON DEPARTMENT OF ECOLOGY

OIL SPILL PREVENTION PLAN
FACILITY OIL SPILL RISK ANALYSIS
HAZARD IDENTIFICATION CHECK LIST

FACILITY: Vancouver Energy DATE:

Spill Potential Ratings: **High (H) Medium (M) Low (L)**

"No" answers with high to medium spill potential require further investigation. Formal risk analysis methods should be considered for situations with high to medium spill potential.

	YES	NO	SPILL POTENTIAL	COMMENTS	RESPONSE
6. Do oil lines inside fire walls have welded joints?	X				
Material Handling Related Spill Hazards					
7. Do tanks have high level alarms?	X				
8. Is there an automatic shutdown system on high level?	X				
9. Are there ground level or remote fill level gauges?	X				
10. Do pipelines penetrate dykes and fire walls?		X		Pipelines do not penetrate dikes or fire walls.	
Containment/Control Related Spill Hazard					
11. Is tank farm lot impervious to oil spill penetration?	X				
12. Is there a spill collection system inside tank lot?	X				
13. Are containment dykes sized to meet codes?	X				

Figure D.1. Hazard Identification Checklist (continued)

STATE OF WASHINGTON DEPARTMENT OF ECOLOGY OIL SPILL PREVENTION PLAN FACILITY OIL SPILL RISK ANALYSIS HAZARD IDENTIFICATION CHECK LIST					
FACILITY: Vancouver Energy DATE:			Spill Potential Ratings: **High (H) Medium (M) Low (L)**		
"No" answers with high to medium spill potential require further investigation. Formal risk analysis methods should be considered for situations with high to medium spill potential.					
	YES	**NO**	**SPILL POTENTIAL**	**COMMENTS**	**RESPONSE**
D. PUMP STATION					
Fire Related Spill Hazards					
1. Are pumps, valves and other vessels fire rated?	X				
2. Is fire protection system adequate?	X				
3. Are all ignition sources eliminated?	X				
Material Handling Related Spill Hazards					
4. Is over-pressure system adequate?	X				
5. Is there an emergency shutdown system?	X				
6. Is there a spill collection system (pump slab, dykes, collection drains, sump tank, etc..)?	X				
E. TRUCK/RAIL LOADING/UNLOADING					
Fire Related Spill Hazards					
1. Is fire protection adequate?	X				
2. Is there adequate fire water? Does it meet codes and industry standards?	X				

Figure D.1. Hazard Identification Checklist (continued)

STATE OF WASHINGTON DEPARTMENT OF ECOLOGY

OIL SPILL PREVENTION PLAN
FACILITY OIL SPILL RISK ANALYSIS
HAZARD IDENTIFICATION CHECK LIST

FACILITY: Vancouver Energy DATE:

Spill Potential Ratings:
High (H) Medium (M) Low (L)

"No" answers with high to medium spill potential require further investigation. Formal risk analysis methods should be considered for situations with high to medium spill potential.

	YES	NO	SPILL POTENTIAL	COMMENTS	RESPONSE
3. Are block valves fire rated?	X				
4. Does electrical equipment meet explosion proof requirements?	X				
Material Handling Related Spill Hazards					
5. Is system manual or automatic?				BOTH	
6. Do trucks/rail cars have overfill protection?				Not Applicable	
7. Is there an emergency shutdown system?	X				
8. Are there pressure relief devices on system?	X				
9. Are block valves secure and safe from the public?	X				
10. Are public access areas fenced and lighted?	X				
Containment/Control Related					
11. Is there a spill collection system around loading/unloading areas?	X				

Figure D.1. Hazard Identification Checklist (continued)

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OIL SPILL PREVENTION PLAN
FACILITY OIL SPILL RISK ANALYSIS
HAZARD IDENTIFICATION CHECK LIST

FACILITY: Vancouver Energy DATE:

Spill Potential Ratings:
High (H) Medium (M) Low (L)

"No" answers with high to medium spill potential require further investigation. Formal risk analysis methods should be considered for situations with high to medium spill potential.

	YES	NO	SPILL POTENTIAL	COMMENTS	RESPONSE
F. PROCEDURES					
1. Does facility have an up-to-date operating procedures manual?	X				
2. Does facility have an oil spill response plan and procedures?	X				
3. Is there a system to ensure compliance with applicable codes?	X				
4. Is there a quality management system in place to ensure compliance with above procedures and programs?	X				
5. Is there a program for monitoring/controlling third party activities?	X				
G. GENERAL					
1. Is there a fitness for purpose testing program in place for critical oil movement lines (hydrostatic pressure testing, internal inspection, external inspection, coating inspection, etc.)?	X				
2. Have natural hazards been investigated and monitored (landslides, slope instability, bed scouring on flowing water, soil subsidence, etc.)?	X				

Figure D.1. Hazard Identification Checklist (continued)

<table>
<tr><td colspan="6">STATE OF WASHINGTON DEPARTMENT OF ECOLOGY
OIL SPILL PREVENTION PLAN
FACILITY OIL SPILL RISK ANALYSIS
HAZARD IDENTIFICATION CHECK LIST</td></tr>
<tr><td colspan="4">FACILITY: Vancouver Energy DATE:</td><td colspan="2">Spill Potential Ratings:
High (H) Medium (M) Low (L)</td></tr>
<tr><td colspan="6">“No” answers with high to medium spill potential require further investigation. Formal risk analysis methods should be considered for situations with high to medium spill potential.</td></tr>
<tr><td></td><td>YES</td><td>NO</td><td>SPILL POTENTIAL</td><td>COMMENTS</td><td>RESPONSE</td></tr>
<tr><td>3. Are leak detection surveys conducted and records maintained for two years min? Is a material balance maintained for the facility?</td><td>X
X</td><td></td><td></td><td></td><td></td></tr>
<tr><td>4. Are changes to equipment critical set points controlled adequately?</td><td>X</td><td></td><td></td><td></td><td></td></tr>
<tr><td>5. Are pipeline crossings by third parties controlled? Are crossing agreements in use?</td><td>X</td><td></td><td></td><td></td><td></td></tr>
<tr><td>6. Is there a training program for employees on safe operation and maintenance of all oil movement systems?</td><td>X</td><td></td><td></td><td></td><td></td></tr>
</table>

D.3 HAZARD EVALUATION AND IDENTIFICATION

A completed Ecology's Hazard Identification Check List is provided in **Figure D.1**. None of the "no" answers on the checklist contribute to high or medium spill risk, therefore the following qualitative discharge risk analysis is provided:

D.3.1 Storage Tank Leak or Failure

All storage tanks are constructed to API 650 and Uniform Fire Code specifications. The tank yard and surrounding area is cathodically protected. The entire area is visually inspected daily. Future tank inspections will be made in compliance with API 653 guidelines.

The maximum quantity of crude oil which could be discharged is based on the capacity of the largest single tank which is 360,000 barrels. The rate of flow would be variable depending on the size and location of the leak or failure. The total quantity of crude oil which could be discharged would not exceed 360,000 barrels.

Spilled crude oil would be contained in the tank yard impoundment area. The impoundment area is fully diked and provides storage volume in excess of the capacity of the largest tank.

D.3.2 Tank Overflow

During crude oil receipt there is potential for tank overflow due to operator error or equipment failure. Tanks are equipped with high level audible alarms which are set at approximately 95 percent of capacity. A redundant high level emergency shutdown level alarm is additionally included. Due to the large storage capacity, tanks are seldom "topped-off," and normally are filled to only 70 percent of capacity.

During all bulk transfers to or from the crude oil storage tanks operators are on duty. Continuous communication is maintained between the receiving and delivering operator. At a minimum at least one operator will be monitoring operations at the storage area and another operator at either the rail unloading operation when loading the tanks, or at the dock when unloading the tanks.

The total quantity of crude oil that could be discharged is proportional to the length of time the tank is overflowing. It is estimated that 250 barrels could be discharged based on transfer monitoring procedures, delivery rates, and shutdown procedures.

Spilled crude oil would be contained in the storage area impoundment area.

D.3.3 Rail Unloading Rack

At the rail unloading area there is potential for discharge due to operator error or equipment failure. The area is attended during all transfers activities. The rack is equipped with automatic and manual shutdown capability. Emergency shutdown switches are located every 6 unloading stations.

Each rail unloading station is capable of unloading 8.33 barrels per minute of crude. The maximum capacity of all 90 unloading stations is 750 barrels per minute.

The total quantity of crude oil that could be discharged is variable. The worst case discharge is based on the capacity of an entire rail car which is approximately 700 barrels.

Spilled crude oil would flow into the containment collection system which consists of continuous drip pans and collection piping that flows into surge tanks and pumped into aboveground containment tanks that have a minimum capacity of 770 barrels.

D.3.4 Marine Transfer Pipeline

A 36-inch transfer pipeline extends approximately 4,600 feet from the storage area marine terminal. A spill could result from a pipeline fracture or leak. The pipeline is constructed of welded steel and cathodically protected. Where underground the pipeline includes secondary containment consisting of either double walled pipe or located within casings. It is hydrostatically pressured tested annually in accordance with API standards. The pipeline is equipped with three isolation valves which are closed and locked when transfers are not in progress.

Maximum rate of flow is 36,000 barrels per hour.

Total volume that could be discharged would be variable depending upon the location and nature of the leak or fracture. The volume between the dock valves and first inline valve is approximately 314 barrels. The total capacity of the pipeline is approximately 5,505 barrels.

Direction of flow from a pipeline discharge would be dependent upon the location of the failure. The pipeline alignment is sloped to direct spills and drainage to storm drain inlets designed to separate and retain oil.

D.3.5 Rail Unloading Transfer Pipeline

Three 24-inch transfer pipelines extend approximately 4,500 feet from the rail unloading area to the storage area. A spill could result from a pipeline fracture or leak. The pipeline is constructed of welded steel and cathodically protected. Where underground the pipeline includes secondary containment consisting of either double walled pipe or located within casings. It is hydrostatically pressured tested annually in accordance with API standards. The pipelines is equipped with three isolation valves each which are closed and locked when transfers are not in progress.

Maximum rate of flow is 11,000 barrels per hour.

Total volume that could be discharged would be variable depending upon the location and nature of the leak or fracture. The total capacity of each pipeline is approximately 2,458 barrels.

Direction of flow from a pipeline discharge would be dependent upon the location of the failure. The pipeline alignment is sloped to direct spills and drainage to storm drain inlets designed to separate and retain oil.

D.3.6 Marine Terminal

A discharge may result from operator error and/or hose or piping failure during marine transfers. All marine transfer personnel are trained and qualified to USCG standards. All transfer equipment is visually inspected, a pre-transfer conference is conducted, and a Declaration of Inspection is completed prior to transfer.

Marine transfer equipment is maintained to USCG requirements (33 CFR Part 154, 155, 156). During marine transfer, a Tesoro Terminal Operator is stationed adjacent to the transfer hose header. He maintains radio communication with the vessel and terminal.

It is estimated that less than 100 barrels could be discharged at the dock based upon operating procedures and the close proximity of shutdown valves.

Drip pans are positioned beneath the header and hose connections to contain leaks and drips. In the event of a spill to water, the movement of crude oil which enters the Columbia River would be determined by the prevailing currents and weather. Containment boom and sorbents, which are maintained at the head of the dock would be deployed within one hour.

Figure D.2. Facility Spill History

Date:	
Release Description/Cause/Location:	
Material:	
Quantity (spilled/recovered) in barrels:	
Amount Reaching Navigable Water:	
Effectiveness and Capacity of Secondary Containment:	
Clean-up actions taken:	
Steps taken to reduce possibility or reoccurrence:	
Total oil storage capacity of tank(s) or impoundment(s) from which material discharged:	
Enforcement actions:	
Effectiveness of monitoring equipment (describe):	
Spill detection:	

NOTE: The facility has had no spills or releases to date.

D.4 POTENTIAL ROUTES OF DISCHARGE

A spill from the Facility will probably originate in one of three areas. Each has been discussed above.

Rail Unloading Area Spill

Terrain directly adjacent to the Rail Unloading Area is flat and generally slopes to the south. Spilled oil within the rail unloading structure would be captured by the containment system and remain on-site.

Storage Area Spill

Terrain directly adjacent to the Storage Area is flat and generally slopes to the south. Spilled oil within the Storage Area would be retained within the perimeter secondary containment dike.

Transfer Pipeline Spill

A total of 9,100 feet of transfer pipeline alignment exists on site connecting the rail unloading area, storage area, and marine terminal. A rupture of this pipeline where buried would be contained within the casing annular space and receiving vaults at either end. Monitoring is provided to detect any leaks in the below ground portions of the pipeline. A rupture of the pipeline where the pipeline runs above ground would be detected by calibrated flow meters and observations by on-site personnel. A sudden drop of pressure or discrepancy between flow meter data will cause a shutdown of pumping operations and valves will close within 30 seconds. The pipeline alignment is sloped to direct spills and drainage to storm drain inlets designed to separate and retain oil. Oil traps are installed on all drainage inlets and supplemented by downstream water quality vaults that also contain oil/water separating baffles.

Marine Terminal Spill

Crude oil storage tanks at the Facility are connected to the marine terminal by the 36-inch pipeline. In accordance with EPA and USCG contingency planning requirements, a worst-case scenario must be considered for response planning purposes. While highly unlikely, the required worst-case scenario to consider is the loss of the full contents of the largest tank into the Columbia River. Once oil is in the river, it would be transported downstream at a speed that, on a seasonable basis, varies between 1 and 6 knots. For planning purposes, it will be assumed that the average speed of oil moving downstream on the Columbia River is 2 knots.

D.5 PLANNING DISTANCE CALCULATIONS

The planning distance method for tidally-influenced navigable waters is based on worst case discharges of persistent and non-persistent oils.

Planning distance calculations are based on the following factors and guidelines in accordance with 40 CFR 112, Attachment C-III, 4.2:

Persistent oils

Planning distance is 5 miles from the facility down current during ebb tide and to the point of maximum tidal influence or 5 miles, whichever is less, during flood tide.

Tesoro will plan to respond to a spill for distance from 5 miles upstream and downstream to the mouth to the Columbia River.

D.6 DISCHARGE SCENARIOS

The equipment and manpower to respond to a spill are available from several sources and are listed with the equipment and contractors in **Section 7** and **Appendix B**.

D.6.1 Average Most Probable Discharge/Major Inland Discharge

Incident

At Time 0 the Facility is transferring crude oil across the dock to a vessel. The crude oil pumping rate is 36,000 barrels per hour. The Tesoro Operator at the dock observes a leak develop at the flange which connects the transfer hose to the dock. The flange separates and oil is pumped into the water. The Terminal Operator, who is standing by in the control room of the Marine Terminal shuts down the transfer pumps and secures all transfer valves. The Vessel Operator closes the valves on the vessel to minimize continued crude oil loss. The Terminal Operator's estimates based on shutdown time and transfer rates that approximately 100 barrels of crude oil were spilled. For the purpose of a small/average scenario, it is assumed that some of the oil was caught in the catch basin on the dock, but 50 barrels (2,100 gallons) flowed into the Columbia River. For the purpose of a medium (major) spill scenario, it is assumed that 100 barrels (4,200 gallons) flowed into the Columbia River.

Conditions

Weather: Light rain, temperature 57 degrees, winds from the north at 10 knots.

Water: Maximum daily current of 2.0 knots with favorable wave conditions for skimming.

Forecast: Cloudy, high temperature of 59 degrees, continued winds from the north at 10 to 15 knots with persistent light rain throughout the day.

Immediate Response

A response to an average/small spill would be much the same as to a medium spill.

The Operator at the Facility Marine Terminal and the Vessel Operator immediately stopped the flow of crude oil from the vessel by shutting down the pump and closing the transfer valves. The Terminal Operator radios the other Facility Operator and Terminal Manager and notifies them of the problem, provides spill assessment information, and requests an on-water response. Initial site characterization will take place to ensure appropriate PPE is used by initial responders either from the vessel or dock crew. The Vessel Operator is directed to spread absorbent pads on areas of the spill on the dock or barge which are not covered by a containment basin to minimize the spill volume which will flow into the Columbia River. Once that task is done, the Vessel Operator is instructed to remain clear of the area and to monitor the vessel to ensure safety of the vessel.

The Facility Manager directs Facility personnel to secure the transfer valves in the tank storage area, and then to drive to the dock to prepare the Facility boat and boom for launching. The Facility Terminal Manager becomes the Facility Incident Commander. He uses the checklist provided in SECTION 2 and FIGURE 3.4 of this plan and notifies the National Response Center, Washington Emergency Management Division, Oregon Emergency Response System, USCG, MSRC, CRCI, and the Vancouver Police and Fire departments at 911. Notification takes approximately 30 minutes.

The Facility and Tesoro operators are familiar with the properties of crude oil and recognize that it presents little danger of fire and a low health risk for clean-up workers or the community. Both Facility/Tesoro operators meet at the Facility boat house within 15 minutes, don appropriate personal protective equipment and use the boat to initiate deployment of 1,000 feet of boom to begin to contain any crude oil which may still be dripping from the dock. At Time = 1 hour, the leading edge of the spill has moved approximately 2 miles downstream.

The Vessel Operator has the free oil on the dock covered with absorbent pads. The used absorbent will be placed in plastic garbage bags and then into 55 gallon drums.

Containment and Cleanup

At Time = .30 hours CRCI arrives on scene. CRCI's focus will be on recovery and shoreline cleanup operations. Additional contractor personnel arrive with two response vessels, 2 Douglas Skimpack 4200 (Derated Capacity of 275 bbls/day each), 2 - 2" portable pumps, an additional 2,000 feet of boom, and 2-2500-gallon storage bladders.

Small boats with Viscous Sweep are deployed by CRCI along the shoreline. Men with small skimmers and booms also are placed along the shoreline in preparation for oil recovery. Vacuum trucks are ordered by CRCI and will arrive on scene within 30 minutes after notification to begin shoreline recovery operations. NRCES resources are used for additional boom, sorbents, drums, and manpower. Equipment will arrive based on the schedules provided in **Section** 7.

Additional Viscous Sweep is deployed to sweep oil from the surface of the water are removed and placed in drums. Sweeping the spill with Viscous Sweep, skimming operations, and adjustments to the containment boom continue until the oil is contained and recovered or evaporated. Spent sorbents, and viscous sweep are disposed of by CRCI after appropriate testing and the recovered oil/water mixture from skimmer and vacuum trucks is returned to the terminal for storage.

Wildlife Protection

The small spill size, volatility of the crude oil, and immediate response prevented wildlife from being impact by the spill. Some shoreline clean-up may be required. Permits will be sought as necessary.

Command and Control

The Facility Terminal Manager is the Incident Commander and uses CRCI to manage clean-up operations. Planning, Logistics, and Financial Units are not independently activated. Additional Tesoro resources are not required. Tesoro, USCG and Ecology are on-site and set up a Unified Command with all Sections. The Vancouver Police and Fire departments are released from the spill after their initial response to the scene due to the low danger of fire or explosion.

Post Spill Review and Reporting

The Incident Commander convenes a meeting the next day between the Clean Rivers Co-op Manager, USCG Representative, and Ecology Representative to review the cause of the spill and the response. A report is drafted and submitted to the Ecology and USCG.

D.6.2 Worst-Case Discharge

Incident

At midnight on a Friday night before a three-day weekend, an earthquake strikes Vancouver causing TK-001 to spill 360,000 barrels of crude oil, into the Columbia River.

This is a highly unlikely set of circumstances, but there is no other route in which 100 percent of the Worst-Case Discharge (WCD) from the Facility will discharge into the Columbia River. Methods to stop the tank from draining will not be used in this scenario, even though numerous options are available to stop the loss of crude oil from this tank if the event were real.

Conditions

Weather: The sky is overcast, the temperature is 60 degrees F, and the winds variable at 10 miles per hour.

Water: The average current is 2 knots with wave conditions not favorable for skimming.

Forecast: Cloudy with showers. Continued variable winds.

Response

This spill is not discovered for 2 hours until an evening fisherman smells crude oil and sees it floating down the river. He immediately notifies the Vancouver Police Department. The Police Department notifies the Vancouver Fire Department. They discover the source of the crude oil, take immediate action to initiate an area evacuation, and immediately notify the Tesoro Terminal Manager.

The Tesoro Terminal Manager is alerted by the Vancouver Police Department at Time = 3 hours. Once he understands the circumstances, he calls the terminal operators and requests them to go to the terminal to attempt to stop the oil flow. He also makes immediate notification to CRCI and MSRC requesting standby assistance in deploying oil spill equipment downstream of the dock for protection of sensitive areas.

He then notifies the agencies, and responders listed in Incident Commander checklist (**Figure 2.1**) .He makes a call to the Facility Qualified Individual requesting activation of the West Coast Away Team. Notification takes approximately 30 minutes.

At Time = 4 hours the Facility Manager arrives at the Facility. The Chief of the Vancouver Fire Department indicates he will be the Incident Commander who is in control of all emergency actions to protect life and property. The Federal On-Scene Coordinator, State On-Scene Coordinator, and Facility Incident Commander will not be allowed to respond as long as there is danger of fire. The USCG is asked to close the river to all traffic and emergency actions are taken by the police and fire departments to continue to evacuate a corridor on and near the river as the crude oil drifts downstream.

The Unified Command will be allowed to set protective boom sufficiently ahead of the crude oil to attempt to divert it away from sensitive areas. They will not be allowed to attend the boom beginning 4 hours ahead of when the crude oil is expected to reach the boom site. Facility authorizes CRCI to use the equipment and people listed in **Section 7**, and **Appendix B** of this plan. Boom will be set to protect the sensitive areas identified in **Section 6** of this plan unless the Natural Resource Damage Assessment Team proposes alternative strategies.

The Facility Manager working with CRCI personnel prepare a health and safety plan following the format provided in **Section 5**. A Material Safety Data Sheet for crude oil is available at the Facility office.

CRCI has identified 46 potential boom sites, which will require a total of 57,800 feet of boom. A summary of these sites is included in **Section 6**. Assuming a team of four men using two boats can set 1,000 feet of boom an hour, it can be calculated that it would take 60 team-hours to boom all of the sites. Facility requests that CRCI supply six booming teams using a total of twenty-four 40-hour HAZWOPER-trained responders and 12 small boats. Their goal is to boom all sensitive areas that have not already been impacted. Booming is initiated at Time = 5 hours near the confluence of the Lewis and Columbia Rivers (River Mile 86). The booming teams, under the direction of the CRCI Operations Chief, work their way downstream remaining a minimum of 4 hours ahead of the oil.

The entire team (some will arrive within a couple of hours) will arrive on scene at Time = 8 hours. CRCI is asked to establish a command post at their Portland office or nearer location sufficient to house the West Coast Regional Response Team and additional personnel.

Initial site safety is completed before it is determined that the crude oil spill cleanup can begin.

The Tesoro Supervisor of Contingency Planning has access to NOAA's "ADIOS" computer model that is used to calculate evaporation and dispersion rates of oils spills. Several runs are made with this program at Time + 5 hours based on the following assumptions:

A continuous spill of 360,000 barrels of crude oil over 24 hours (15,000 bbls/hr)

Average current is 2 knots

Wind speed is 10 knots

Water temperature is 60 degrees F

The ADIOS Model will predict the percent evaporation and emulsification of the crude oil. Based on this data responders will determine when it is safe to approach the spill to begin skimming oil. This assumption will be tested using flammable gas and benzene meters when actually approaching the crude oil.

CRCI and MSRC will be directed by Tesoro to transport equipment and personnel by truck to St. Helens, Oregon where it should be safe to begin recovery operations. A convenient recovery site will be selected near the boat ramp at St Helens, preferably upstream of the island located at River Mile 86. The ADIOS Model will provide an estimate of volume of oil and oily water that will be available for recovery. Initially skimmed oil will be contained in tankage available from CRCI and co-op members (**Appendix B**). Tesoro Marine Department will charter in any additional on-water tankage. Tesoro would arrange to have up to 20,000 barrels of combined storage available to designated staging and/or deployment areas.

An overflight is made at Time = 6 hours (at first light) to determine the extent of the crude oil distribution. Booming operations will be directed based on frequent aerial observations.

The booming and skimming operations are successful and the weathered crude oil is recovered as it approaches St. Helens. Shoreline impacts have traveled approximately 30 miles downstream from the facility. Recovered oil is recycled for fuel, as described in **Section 7** of this plan. Oil does not escape downstream.

A shoreline damage assessment is made after Tank TK-001 is empty at Time = 24 hours. Injured wildlife are recovered and treated under the direction of the National Marine Fisheries Service and the Washington Department of Wildlife. Permission for access and permits are obtained and the shoreline is cleaned as appropriate.

Treatment will probably include oily debris collection and cold water flushing. Oily debris will be returned to the Facility as discussed in **Section 7** for temporary storage, testing, recycling, and disposal.

A post-spill meeting is held with Savage, Tesoro, CRCI, USCG, EPA, Ecology, and other interested agencies and response contractors. A final report is written by the Certificate Holder and submitted to the agencies.

D.7 RESPONSE PLANNING STANDARD CALCULATIONS

D.7.1 Washington Department of Ecology Worst-Case Discharge

Ecology requires that the facility plan for the WCD, which is defined as the capacity of the largest above ground storage tank, complicated by adverse weather. Tank 0300-TK-001 may store up to 360,000 barrels of crude oil. Ecology regulations require that it must be assumed that 100 percent of this volume reaches the Columbia River.

The largest vessel for the Tesoro Vancouver Terminal is 900 feet long. Therefore, the terminal must have capability to initiate the deployment of four times the largest vessel (4x900=3,600 feet) or 2,000 feet of boom, whichever is less, within 3 hours. Tesoro has access to 7,000 feet of boom and a boat stored at the vessel dock, which can be deployed by the three Terminal Operators within the mandated time frame.

Ecology planning milestones include

2 hours 1,000 feet of boom

3 hours 2,000 feet of boom

6 hours 6,000 feet of additional boom
12,000 bbls/day derated recovery capacity
1 x Effective daily recovery capacity (12,000 barrels storage)

12-hours	20,000 feet of additional boom 36,000 bbls/day derated recovery capacity 1.5 x Effective daily recovery capacity (54,000 barrels storage)
24-hours	20,000 feet of additional boom 48,000 bbls/day derated recovery capacity 2 x Effective daily recovery capacity (96,000 barrels storage)
48-hours	Additional boom as necessary 60,000 bbls/day derated recovery capacity Additional storage as necessary

D.7.2 USCG Planning Standards

When calculating the WCD for the portion of a facility under USCG jurisdiction (i.e., from the dock to the first valves inside secondary containment), the facility must assume that all dock pipelines that could be in service simultaneously are in service and are pumping at their maximum rates.

They must also assume that all lines, in service or not, are severed at the same time and that once the pipelines are shut down and isolated, the entire contents of each line drains out into the water.

The scenario that would result in the largest WCD volume involves vessel loading of crude oil from the Facility Marine Terminal. In this case the assumptions are as follows.

Maximum Pumping rate = 36,000 barrels per hour
Draindown volume = 314 barrels
5 minutes for detection, transfer shutdown, and onshore valve closure

Therefore the **WCD** is:

36,000 bph x 1hr/60min x 5min + 314 bbls line vol. **= 3314 bbls**

The **WCD inland on-water planning volume** (Group 1 through 4 oil) is:

3,314 bbls x 1.0 (emulsification) x 0.2 (removal) = **663 bbls**

Planning volume calculations are provided in Figure D.3.

Figure D.3. USCG Planning Volume Calculations

Calculation		Groups 2 – 4 Oil (Persistent)
Areas Impacted: Nearshore and Inland		
Pipeline Contents:		Crude Oil (Group II, III, & IV)
Total Pumping Rate: (bbl/hr)		36,000
Total Pumping Loss: (L = Pumping rate x 5 min.) (bbl/hr)		3000
Total Static Pipe Volume: (V = Pipe volume between dock and 1st non-MTR valve) (bbl)		314
Adjustment Factor: (AF)		1.0
Worst Case Discharge: (WCD = V x AF + L) (bbl)		3314
Average Most Probable: (AMP = Lesser of 1% WCD or 50 bbl) (bbl)		50
Maximum Most Probable Discharge: (MMP = Lesser of 10% WCD or 1,200 bbl) (bbl)		331 bbls
On-Water Recovery Factor (OWRF)		0.2
On-Shore Recovery Volume (OSRF)		0.1
Emulsification Factor (EF)		1.0
On-Water Clean-Up Planning Volume (OWRV = WCD x OWRF x EF) (bbl/day)		663
Shoreline Clean-Up Planning Volume (OSRV = WCD x OSRF x EF) (bbl/day)		331
On-Water Recovery Capacity (OWRC = OSRV x Resource Mobilization Factor) (bbl/day)	Tier 1	235 x 0.15 = 35
	Tier 2	235 x 0.25 = 59
	Tier 3	235 x 0.40 = 94
On-water Recovery Response Caps (OWRRC) (bbl/day)	Tier 1	10,000
	Tier 2	20,000
	Tier 3	40,000
Amount needed to be identified, but not contracted for (OWRC – OWRRC) (bbl/day)	Tier 1	< 0
	Tier 2	< 0
	Tier 3	< 0

D.7.3 EPA Planning Standards

The EPA worst-case discharge standard is 100% of the volume of the largest tank at the facility. The EPA planning standard for Tank TK-001 is 360,000 bbls of crude oil, which is Persistent Oil. [1] Based on OPA 90 criteria, response equipment must be available assuming the following:

80 percent of the worst case volume naturally disperses

20 percent of the worst case volume remains floating

10 percent of the worst case volume impacts the shoreline

Based on these assumptions, the following volumes are used to calculate the initial planning standards:

On-water recovery (360,000 bbls) (0.20) = 72,000 bbls

Shoreline recovery (360,000 bbls) (0.10) = 36,000 bbls.

The initial EPA planning standards for this terminal can then be modified by using the following EPA calculation factors:

Emulsification Factor: 1.0

Tier 1 Factor: 0.15 (Response resources to arrive in 12 hrs.)

Tier 2 Factor: 0.25 (Response resources to arrive in 36 hrs.)

Tier 3 Factor: 0.40 (Response resources to arrive in 60 hrs.)

Using these factors the final calculations to determine oil recovery rates become:

Tier 1: (72,000) (1.0) (0.15) = 10,800 bbls/day

Tier 2: (72,000) (1.0) (0.25) = 18,000 bbls/day

Tier 3: (72,000) (1.0) (0.40) = 289,800 bbls/day

Shoreline: (36,000) (1.0) = 36,000 bbls/day.

D.8 OFF-SITE CONSEQUENCES/RESOURCES AT RISK

D.8.1 Oil Movement

Oil moves across the surface of the water as a result of wind and current; therefore, it is important to have knowledge of tides, currents, prevailing winds, and other factors, which will permit the prediction of how and where a slick will move.

D.8.2 Site Conditions

The Facility and Dock are situated in the Port of Vancouver.

The Marine Terminal is located adjacent to the Columbia River.

The lower Columbia River currents will be a determining factor in oil movement.

The area surrounding the facility is highly industrial and densely populated. A plot plan of the facility is shown in **Figure 1.5**. Response maps which cover the area may be found in the Northwest ACP.

[1] The shell capacity of approximately 380,000 barrels each; however, the maximum amount of product stored in each tank will be approximately 360,000 barrels, to take into account the presence of the internal floating roof and the additional headspace required to allow product movement in the event of seismic conditions.

D.8.3 Climatic Conditions

The prevailing climatic conditions at the time of a spill can influence a variety of response factors and should be quantified to the extent practical and as soon as possible following the discovery of a spill. In general the climatic conditions in the Vancouver area include:

- Typically mild temperatures and prevailing summer northwesterly winds and winter southwesterly winds.
- Seasonal rains occur during the fall and winter months (October – March), with the summer months being considerably drier.

Local wind speed and direction information can generally be obtained by calling the National Weather Service (**Figure 3.3**) or by using a wind sock or portable anemometer.

If access to these sources is not available, grass or fine sediments can be thrown into the air to estimate wind direction, but wind speed estimates are typically very qualitative.

The key climatic conditions and the response factors that may be affected are:

- **Wind speed and direction** – Evacuation, vapor plume dispersions, worker safety, techniques effectiveness, aircraft safety, and others.
- **Visibility** – Spill surveillance, worker safety, site security, and aircraft safety.
- **Temperature** – Spill volatility, worker productivity and safety, equipment effectiveness, and others.

Visibility is determined by visual estimates concerning both the horizontal and vertical distances within which objects are clearly visible. The vertical visibility, or ceiling, is typically limited by low cloud cover or overcast conditions, but can also be dramatically reduced by heavy fog. Lateral visibility is influenced by fog or heavy rain. In general, normal aircraft operations are restricted to ceilings greater than 500 feet and horizontal visibility in excess of 0.5 mile.

Temperature can be determined using an outdoor thermometer or by calling the weather service or airport. The phone number for the National Weather Service is provided in **Figure 3.3**. Only temperatures below freezing or above 80 to 90 degrees are of concern to oil spill response operations. Temperatures above or below that range can adversely affect productivity and the health and safety of response personnel.

Both the Lower Columbia and Willamette Rivers are tidally influenced. The rise and fall of these tides can create a tidal current, which can create a reversal in the downstream current during low river flow conditions.

A detailed discussion of Lower Columbia River hydrography is provided in **Section 6**.

D.8.4 Geographic Boundaries

The location where oil may be expected to impact during the first day of a spill from the Facility are developed based on:

- Past experience with oil spills in the Lower Columbia River.
- An average flow rate of 2 knots.

D.8.5 Trajectory Analysis

Oil slicks move as a result of wind and water currents. For the terminal, river flow, tidal currents, and winds are all contributing factors, with river current or flow rate as the predominant factor.

Assumptions

1. Oil moves with the wind at approximately 3 to 4 percent of the wind velocity.
2. When wind velocity is low or wind is absent, oil will tend to move in the same direction as the current at about the same velocity.
3. When the wind is present, oil movement is affected by both water and wind currents.
4. When the wind direction is opposite to the current, the wind may reduce or possibly reverse the oil slick velocity at the surface.

Due to the complex currents of the Lower Columbia River and the many variables involved, it is difficult to accurately predict direction and speed of an oil slick before a spill occurs. This plan addresses response to spills within these geographic boundaries. Booming strategies have been developed for different wind and/or tidal current directions (**Section 6**). These booming strategies identify priorities and lengths of boom required. Additional boom is available if needed.

Although a computer model may be used to estimate oil spill movements, aerial surveillance provides the most effective means of determining spill size, location, and movement.

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