Westway Expansion Project

Final Environmental Impact Statement

Main Report

CITY OF HOQUIAM

DEPARTMENT OF ECOLOGY
State of Washington

September 2016

City of Hoquiam
609 8th Street
Hoquiam, WA 98550

Washington State Department of Ecology
300 Desmond Drive SE
Lacey, WA 98503

September 30, 2016

The City of Hoquiam and the Washington State Department of Ecology—the co-lead agencies—are issuing the Final Environmental Impact Statement (Final EIS) for the proposed expansion of the existing bulk liquid storage terminal owned by Westway Terminal Company LLC (the applicant). The Westway Expansion Project (proposed action) would expand the existing bulk liquid storage terminal to receive crude oil by train, and store and load crude oil onto tank vessels at Terminal 1 of the Port of Grays Harbor in Hoquiam, Washington, for shipment.

The EIS was prepared in accordance with the Washington State Environmental Policy Act (SEPA) and the City of Hoquiam Municipal Code. The purpose of the EIS is to evaluate the potential environmental impacts of constructing and operating the proposed action.

The following resource areas were evaluated in the EIS.

- Earth (including earthquake/tsunami risk)
- Air
- Water
- Plants
- Animals
- Energy and Natural Resources
- Noise and Vibration
- Land and Shoreline Use
- Aesthetics, Light, and Glare
- Recreation
- Historic and Cultural Preservation
- Tribal Resources
- Public Services and Utilities
- Hazardous Materials
- Rail Traffic
- Vehicle Traffic and Safety
- Vessel Traffic
- Environmental Health and Safety (spills, fires and explosions)
- Economics, Social Policy, and Cost-Benefit Analysis per Hoquiam Municipal Code

During the Draft EIS scoping phase, many areas of concern associated with the proposed action were identified. These issues were considered and subsequently addressed in the Draft EIS. The Draft EIS evaluated the impacts from construction, onsite operations, and offsite rail and vessel transport related to the proposed action, as well as the contribution of the proposed action to cumulative environmental impacts. The Draft EIS also identified proposed mitigation measures for adverse environmental impacts of the proposed action. In addition to the proposed action, the no-action alternative was also evaluated.

The Draft EIS was released for public comment on August 31, 2015. All comments received during the 90-day comment period—August 31 to November 30, 2015—were reviewed, compiled, and considered in the development of the Final EIS. All comments and responses to those comments are presented in the Final EIS.

The Final EIS builds on the Draft EIS and includes additional information, updated and additional analyses, and recent changes to regulations. No new or more significant impacts were identified as a

result of these updates. The Final EIS identifies proposed mitigation measures to address adverse environmental impacts of the proposed action. In some cases, implementation of mitigation measures would reduce but not completely eliminate the potential for significant adverse impacts. These remaining impacts are highlighted in the Final EIS as *potential unavoidable and significant adverse impacts* and are found in the following resource areas: Environmental Health and Safety (spill/fire/explosion), Noise, Tribal Resources, and Vehicle Traffic and Safety.

The Final EIS will be used as an information resource by local and state agencies who will be making permit decisions for the proposed action. The City of Hoquiam will be the first agency to take action on the proposal through consideration of the application for a required shoreline substantial development permit. Construction of the proposed action could begin once all required permits and plans are issued.

Questions about this Final EIS may be directed to:

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Thank you for your interest in the Westway Expansion Project environmental review process.

Sincerely,

Brian Shay, City Administrator, City of Hoquiam

Date: 9/30/2016 Signature: Brian J. Shay

Sally Toteff, Southwest and Olympic Regional Director, Washington State Department of Ecology

Date: 9/30/2016 Signature: Sally Toteff

Fact Sheet

Project Title

Westway Expansion Project

Description of Proposed Action and Alternatives

Westway Terminal Company LLC (the applicant) is proposing to develop 7 acres of its 16-acre site[1] as an expansion to its bulk liquids storage facility to allow for receiving, storing, and loading crude oil for transport. Crude oil would be transported to the project site by rail and from the project site by tank vessel. Proposed facilities would include up to five storage tanks, expanded rail spurs and unloading facilities, vessel loading equipment, and pipelines connecting the storage tanks with the rail unloading and vessel loading areas.

Under the no-action alternative, none of the proposed facilities would be constructed and the applicant would continue to operate its existing facility. For the purpose of evaluating impacts, the no-action alternative includes planned infrastructure improvements that have already been funded or are expected to be permitted prior to 2017 and assumes continued future growth and development in the region over the subsequent 20 years.

Location

The proposed action would occur on the existing Westway facility (project site), located between Terminals 1 and 2 of the Port of Grays Harbor (Port) in Hoquiam, Washington, just north of where the Chehalis River empties into Grays Harbor.

Proponent

Westway Terminal Company LLC

Co-Lead Agencies

City of Hoquiam and Washington State Department of Ecology

Responsible Officials

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[1] The additional 9 acres of the project site are already developed.

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Contact Persons

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Required Permits, Approvals, and Plans

The following permits and/or approvals would be required for the proposed action.

City

- City of Hoquiam Critical Areas Review for fish and wildlife habitat and geologically hazardous areas
- City of Hoquiam Shoreline Substantial Development Permit
- City of Hoquiam Conditional Land Use Permit
- City of Hoquiam Building Permit
- City of Hoquiam Grade and Fill Permit
- City of Hoquiam Fire Department Approval
- City of Hoquiam Demolition Permit
- City of Aberdeen Utility Services Agreement
- City of Aberdeen Critical Areas Review for fish and wildlife habitat and geologically hazardous areas
- City of Aberdeen Building Permit
- City of Aberdeen Grade and Fill Permit

- City of Aberdeen Fire Department Approval

State

- Washington State Department of Ecology National Pollutant Discharge Elimination System Construction Stormwater General Permit
- Washington State Department of Ecology Resource Conservation and Recovery Act Notice of Registration Update
- Washington State Olympic Region Clean Air Agency Approval Order
- Washington State Department of Ecology National Pollutant Discharge Elimination System Industrial Stormwater Permit
- Washington State Department of Ecology Spill Prevention Plan
- Washington State Department of Ecology Spill Contingency Plan
- Washington State Department of Ecology Facility Operations Manual
- Washington State Department of Ecology Oil Handling Facility Training and Certification Report
- Washington State Department of Ecology Oil Handling Facility Safe and Effective Threshold Report

Federal

- U.S. Environmental Protection Agency Facility Response Plan
- U.S. Environmental Protection Agency Spill Prevention Control and Countermeasure Plan
- U.S. Coast Guard Facility Response Plan
- U.S. Coast Guard Letter of Intent
- U.S. Coast Guard Oil Spill Response Plan
- U.S. Coast Guard Facility Security Plan and Facility Security Assessment
- U.S. Coast Guard Operations Manual Update

Environmental Impact Statement Authors and Principal Contributors

This document has been prepared under the direction of the co-lead agencies. Key authors and topics are listed below.

Author	Topic(s)
ICF International 710 Second Avenue, Suite 550 Seattle, WA 98104 (206) 801-2800	Environmental impact statement and community affairs lead. Existing conditions and impact analyses for earth, air quality, water, plants, animals, energy and natural resources, noise and vibration, land use, aesthetics and light and glare, recreation, public services and utilities, historical and cultural resources, tribal resources, vehicle traffic and safety, rail traffic, vessel traffic, oil spill modeling, environmental health and safety, economics, social policy, and cost-benefit analysis. Mitigation refinement in coordination with co-lead agencies.
AnchorQEA 412 SW 6th Ave, Suite 550 Portland, OR 97205 (503) 670-1108	Environmental health and safety
Coast and Harbor Engineering 110 Main Street, Suite 103 Edmonds, WA 98020 (425) 778-6243	Tsunami risk assessment
DKS Associates 720 SW Washington Street, Suite 500 Portland, OR 97205 (503) 243-3500	Vehicle traffic modeling
WolfRAMPANT, LLC 8307 66th Avenue NW Gig Harbor, WA 98332 (206) 782-4308	Vessel traffic
VTD Rail Consulting, Tom White 6707 230th Street SW Mountlake Terrace, WA 98043 (425) 345-6337	Rail modeling, rail traffic
ECONorthwest 1218 3rd Avenue, Suite 1709 Seattle, WA 98101 (206) 388-0083	Economic modeling

Date of Draft Environmental Impact Statement Issuance

August 31, 2015

Date Draft Environmental Impact Statement Comments Were Due

November 30, 2015

Date and Place of Draft Environmental Impact Statement Public Meetings

October 1, 2015, 1:00 to 9:00 p.m., at the Satsop Business Park, Flextech Building, 150 Technology Way, Elma, WA 98541

October 8, 2015, 1:00 to 9:00 p.m., at the D&R Theatre, 205 South I Street, Aberdeen, WA 98520

Date of Final Environmental Impact Statement Issuance

September 30, 2016

Availability of the Final Environmental Impact Statement

The document is posted on the Washington State Department of Ecology web site: http://www.ecy.wa.gov/geographic/graysharbor/terminals.html. To obtain a printed copy or CD of the Final EIS (for the cost of production), follow the instructions provided at http://www.ecy.wa.gov/services/disclosure/disclose.html.

The document is also available as a reference at the following locations:

- Washington State Department of Ecology
  300 Desmond Drive SE, Lacey, WA 98503
- City of Hoquiam
  609 8th Street, Hoquiam, WA 98550
- Hoquiam Timberland Library
  420 7th Street
  Hoquiam, WA 98550-3616

Next Actions

The City of Hoquiam will be the first agency required to take action on the proposal through consideration of the application for a shoreline substantial development permit. The City is required to publish two public notices, followed by a 30-day comment period after which it has 120 days to make a decision on the application (i.e., whether to issue or deny the permit). Construction of the proposed action could begin as soon as all required permits and approvals are issued.

Previous Environmental Documents

Prior environmental review was conducted for the Westway Terminal Expansion Project, including the following documents.

- Environmental Checklist with attachments, February 20, 2013
- Shoreline Substantial Development Permit Application, December 3, 2012

- Conditional Land Use Permit Application, December 3, 2012

Prior environmental review also was conducted for the original facility, Raw Material Tank Farm Project, including the following document.

- Environmental Checklist with attachments, November 27, 2008

When appropriate, prior environmental documents were considered in the preparation of this EIS.

Location of Background Information

All materials incorporated by reference and supporting technical memoranda are available for review at the following location.

Washington State Department of Ecology
300 Desmond Drive SE
Lacey, WA 98503

Summary

Westway Terminal Company LLC (the applicant) is proposing to expand its existing bulk liquid storage and distribution facility at the Port of Grays Harbor (Port) in Hoquiam, Washington.

The applicant's objective of the proposed action is to expand the existing bulk liquid storage terminal to receive crude oil by train, store the crude oil, and load crude oil onto tank vessels at the Terminal 1 dock for shipping to refineries.

This summary provides an overview of key elements of the environmental review process and the Final Environmental Impact Statement (Final EIS).

Environmental Review Process

What is the purpose of the environmental review process?

The Washington State Environmental Policy Act (SEPA) requires state and local agencies in Washington to identify and consider the environmental impacts that could result from governmental decisions including issuing permits for private projects, such as the proposed action.

Under SEPA, an EIS process is necessary if a proposed project is likely to result in significant adverse environmental impacts. An EIS provides the public and agencies with information about the effects of a proposed project and informs local and state agency permitting decisions.

What are the roles of the City of Hoquiam and the Washington State Department of Ecology?

The City of Hoquiam and the Washington State Department of Ecology (Ecology) served as co-lead agencies in the development of the EIS. The City of Hoquiam and Ecology issued a SEPA Determination of Significance on April 4, 2014, for the proposed action. This determination provided notice of the intent to develop a Draft EIS and Final EIS.

How does the proposed action relate to the REG (formerly Imperium Terminal Services) Expansion Project?

The City of Hoquiam and Ecology are co-lead agencies for a SEPA review process for a similar proposal adjacent to the Westway project site, the REG (formerly Imperium Terminal Services) Expansion Project. Although these projects are unrelated, because the proposals are similar, the sites are located in the same community, and the applications were submitted at the same time, the co-lead agencies conducted some parts of the EIS process jointly. Public comment periods and hearings were conducted at the same time. Parallel and joint expanded public review allows for greater efficiency and aids in transparent community engagement.

How were the public, agencies, and tribes involved in the development of the Draft and Final EISs?

The first step in the SEPA EIS process is called *scoping*. The co-lead agencies asked members of the public, agencies, and tribes to comment on what should be analyzed in the Draft EIS during the scoping period between April 10 and May 27, 2014. The co-lead agencies established the scope of the Draft EIS based on state and local SEPA guidance and comments received during the scoping period.

The co-leads coordinated with applicable state and local agencies with technical expertise or jurisdiction during the development of the Draft EIS. The co-leads also requested information from the Quinault Indian Nation and the Confederated Tribes of the Chehalis Reservation to identify important tribal resources and assess potential impacts of the proposed action on tribal resources.

The co-lead agencies then released the Draft EIS for public review and comment on August 31, 2015. The initial expanded 60-day public comment period, which ran through October 29, 2015, was further extended for a total of 90 days, closing on November 30, 2015.
Comments were accepted by mail, online, and in person at two public hearings held on the following days.

- October 1, 2015, 1:00 to 9:00 p.m., at the Satsop Business Park, Flextech Building, 150 Technology Way, Elma, WA 98541
- October 8, 2015, 1:00 to 9:00 p.m., at the D&R Theatre, 205 South I Street, Aberdeen, WA 98520

Approximately 97,000 comment submissions were received during the public comment period, from federal, state, and local agencies; tribes; organizations; and the public. The co-lead agencies reviewed and considered all the comments in the development of the Final EIS. All comments on the Draft EIS and the responses to those comments are presented in the Final EIS.

Alternatives

What is the proposed action?

The applicant is proposing to expand its existing methanol distribution facility at Terminal 1 at the Port in Hoquiam, Washington, to handle (unload and load) and store crude oil. The applicant plans to continue to operate the existing methanol distribution facility as it does currently and dedicate new capacity to the handling and storage of crude oil. The methanol facility and operations are separate and are not part of the proposed action so it are included as part of the environmental review under the no-action alternative.

The maximum amount of crude oil that could be stored on site would be 42 million gallons (1 million barrels). The maximum annual throughput of crude oil would be 751.8 million gallons (17.9 million barrels).

The proposed action involves constructing a facility on the applicant's existing industrial property at Port Terminal 1. The facility would include five bulk liquid storage tanks (each with a capacity of 8.4 million gallons or 200,000 barrels), new and modified rail spurs, rail-unloading equipment, vessel

loading equipment, and pumps and pipelines connecting the storage tanks to loading and unloading areas.

Crude oil would be delivered to the project site by rail, and is expected to come in the form of Bakken crude oil from the Intermountain Region and Central United States or diluted bitumen from Alberta, Canada. From Centralia, all trains would use the Puget Sound & Pacific Railroad (PS&P) rail line [1] to reach the project site. At maximum throughput, operation of the proposed action would result in an average of 1.25 unit train trips[2] per day along the PS&P rail line (458 per year).

Crude oil would be transported from the project site by tank vessel (tanker or tank barge), likely to refineries in the Puget Sound area and California. At maximum throughput, operation of the proposed action would result in 0.7 tank vessel trip[3] every other day (238 trips per year).

Construction would occur in two phases. Phase 1, which would include all structures except for three of the five storage tanks, is would begin upon receipt of all permits and approvals and is anticipated to last 10 to 12 months. If the applicant decides to construct Phase 2, the construction of the three remaining storage tanks is anticipated to last 10 months. The proposed action would become operational upon completion of construction, which was assumed for the purposes of the analysis to be 2017.

What is the no-action alternative?

In addition to the proposed action, SEPA requires that the no-action alternative be evaluated to provide a baseline of comparison for the proposed action. Under the no-action alternative, none of the proposed facility would be constructed and the applicant would continue to operate its existing facility.

Significant Areas of Controversy and Uncertainty

Concerns have been raised throughout the preparation of the EIS, including during the public scoping and Draft EIS public comment periods.

Scoping comments centered mostly on public safety and environmental impacts related to transportation. Rail transport concerns include increases in air pollutants, vehicle delay at and near PS&P rail line grade crossings (including emergency vehicle access and delay), and the hazards and costs related to potential oil spills, fires, or explosions. Vessel transport concerns have also focused on hazards and costs related to potential oil spills, fires, or explosions. Because oil spill response requires specialized equipment, there is also concern that local emergency responders may not be adequately trained, staffed, or equipped should an incident occur. Concerns were also raised about the potential for the proposed action to affect human health, recreational resources, natural resources, tribal resources, cultural resources, and greenhouse gas emissions. Further concerns were described about the potential for increased safety risks related to a tsunami at the project site. Additionally, commenters emphasized that the environmental review consider the cumulative impacts of implementing all three of the proposals to operate bulk liquid terminals at the Port that

[1] A short line that runs between Centralia and Hoquiam, Washington.
[2] A trip represents one-way travel; in other words, an inbound trip and an outbound trip are counted as two trips.
[3] A vessel trip also represents one-way travel.

are currently before the co-lead agencies: the proposed action, the REG (formerly Imperium Terminal Services) Expansion Project, and Grays Harbor Rail Terminal Expansion Project.

Approximately 97,000 comments were submitted during the comment period for the Draft EIS. The majority of comments focused on the following concerns.

- The potential for an incident involving crude oil, particularly related to offsite rail transport, and the related potential for impacts on public health and safety, the environment, and the local economy. Also, the potential limits of liability for response to and cleanup of an oil spill.
- The geographic scope of the study area analyzed in Chapter 3, *Affected Environment, Impacts and Mitigation*, and Chapter 4, *Environmental Health and Safety*, and the desire for a more detailed analysis in the extended study area and consideration of all proposed crude oil terminal projects in the state.
- The potential for impacts on treaty rights, namely the Quinault Indian Nation's Usual and Accustomed fishing areas.
- The risks associated with siting the facility in an earthquake and tsunami hazard area.
- Greenhouse gas emissions from extended rail and vessel transport and the potential for the proposed action to induce crude oil production at the source. The contribution of these emissions to global emissions and climate change.
- Health risks related to emissions of diesel particulate matter, especially from rail operations between the rail yard and the project site.

Environmental Impacts and Applicant Mitigation Measures

This section summarizes the environmental impacts that would likely result from construction and routine operation of the proposed action, measures that have been identified to mitigate those impacts, and unavoidable and significant adverse impacts that would remain after mitigation. This section also summarizes the environmental health and safety impacts related to oil spills, fires, and explosions; the impacts that could occur outside the detailed study area; and the contribution of the proposed action to cumulative impacts. Additionally, economic, social policy, and cost-benefit considerations are included as required by the Hoquiam Municipal Code.

What is the study area and what activities were analyzed?

The study area is specific to each element of the environment but in most cases includes the following components.

- Resources on and near the project site that could be affected by construction and onsite operations.
- Resources along the PS&P rail line—from Centralia, Washington, to the project site—that could be affected by rail transport.
- Resources in and around Grays Harbor that could be affected by vessel transport.

The project site is limited to the property leased by the applicant on which the existing and proposed facility are and would be located. Activities at the project site would include construction (e.g., clearing the site and erecting storage tanks) and operations (e.g., rail unloading and vessel loading) that would be directly under the control of the applicant. These activities would be subject to the permit conditions that would be required by the City of Hoquiam, Ecology, and other state and local agencies.

Transport of crude oil to and from the project site by rail and vessel would occur under the responsibility of the rail and vessel operators, respectively. Although the applicant does not have control over rail and vessel transport, implementation of the proposed action would generate rail and vessel trips that could result in environmental impacts along these transportation corridors. The rail and vessel transportation corridors affected would vary depending on the source of the crude oil and the final destination. However, all rail trips generated by the proposed action would occur along the PS&P rail line between Centralia and the project site because this is the only rail line connecting the national mainline railroad system to the Port. Similarly, all vessel trips generated by the proposed action would travel through Grays Harbor along the Grays Harbor Navigation Channel between Terminal 1 and the Pacific Ocean.

What are the environmental impacts and mitigation related to construction and routine operations?

The following sections summarize the potential impacts associated with construction and routine operations on site (at the terminal) and during rail and vessel transport in the study area for each element of the environment.

- Earth
- Air
- Water
- Plants
- Animals
- Energy and Natural Resources
- Noise and Vibration
- Land and Shoreline Use
- Aesthetics, Light, and Glare
- Recreation
- Historic and Cultural Preservation
- Tribal Resources
- Public Services and Utilities
- Hazardous Materials
- Rail Traffic
- Vehicle Traffic and Safety
- Vessel Traffic

Potential impacts from increased risk of incidents (e.g., spills, fires, or explosions) are discussed in the section on environmental health and safety risks.

Earth

Potential impacts of construction and routine operation of the proposed action related to Earth resources are summarized below. Chapter 3, Section 3.1, *Earth*, provides a full discussion.

Construction

Construction of the proposed action could increase erosion and soil instability from work to prepare the project site. Construction activities would expose bare soil and could result in the need to

stockpile soil temporarily. The potential for increased erosion on the project site is low because the site is relatively flat and because sandy, gravely soils have a low erosion potential. Implementation of erosion control and best management practices would further reduce the potential for erosion.

Onsite Operations

The project site is located in an area that has the potential for moderate to severe earthquakes. The extent of earthquake damage would depend on the magnitude of the event. Although the likelihood of earthquakes is unchanged with or without the proposed action, the new facility would expose additional structures and workers to potential harm. The risk of damage to the new facility from an earthquake could increase potential impacts. Depending on the magnitude of the event, the new storage tanks could also become ruptured and result in a leak of crude oil into the environment. The proposed action would be designed to meet local building codes and standards. For example, pilings would be used to stabilize the storage tanks in case of ground movement or liquefaction.

The project site is also located in an area that has the potential to be inundated by tsunami waves. The extent of damage would vary with the magnitude of the seismic event, the tidal level at the time of the earthquake, the current state of sea-level rise, and the amount of debris. Although the likelihood of tsunami would be the same with or without the proposed action, the new facility would expose additional structures and workers to potential harm. Implementation of a tsunami evacuation plan (Table S-1, provided at the end of this summary) would reduce these risks. Depending on the magnitude of the event, the new storage tanks could also become damaged and contribute to the tsunami debris or rupture and result in a release of crude oil into the environment.

Implementation of proposed mitigation measures (Table S-1) would reduce impacts of seismic-related events, including a large-scale earthquake and subsequent tsunami and liquefaction.

Rail and Vessel Transport

Although the proposed action would not result in any modifications to the PS&P rail line that would directly affect soils or geological resources, geological events could affect increased rail traffic and safety under the proposed action. Potential events that could affect the PS&P rail line include landslides, earthquakes, and other seismic events, such as liquefaction, coseismic subsidence, and tsunamis.

Although the proposed action would not result in modifications to the harbor that would directly affect soils or geological resources, vessel operations could result in the slight increased potential for shoreline erosion associated with vessel wake. Additionally, geological events, specifically earthquake-related hazards of coseismic subsidence and tsunamis, could affect increased vessel traffic and safety under the proposed action.

The potential impacts related to routine rail and vessel operations would not differ substantially from existing conditions, because there would be no ground disturbance related to rail and vessel transport and the likelihood of seismic events affecting these corridors would not change. The increased potential for incidents to result in spills, fires, or explosions during rail and vessel transport is addressed in the environmental health and safety risks section.

Air

Potential impacts of construction and routine operation of the proposed action on air are summarized below. Chapter 3, Section 3.2, *Air*, provides a full discussion.

Construction

Construction equipment and activities would emit criteria air pollutants but at amounts well below the standards established by the U.S. Environmental Protection Agency and Washington State. These activities would also emit toxic air pollutants, particularly diesel particulate matter, but not at levels that would be of concern.

Onsite Operations

The proposed action would emit criteria and toxic air pollutants from stationary sources (such as storage tanks and the marine vapor combustion unit) and mobile sources (such as trains and vessels idling at the project site). These emissions are projected to be below state and federal standards. Emissions of nitrogen oxides would be closest to reaching established thresholds. Implementation of proposed mitigation measures (Table S-1) would reduce these impacts to acceptable levels.

Rail and Vessel Transport

At maximum throughput, operation of the proposed action would increase rail traffic along the PS&P rail line by an average of 1.25 train trips per day. Increased rail traffic would approximately double the emissions of criteria pollutants currently associated with rail transport in Grays Harbor County. However, these emissions would be spread out along the 59-mile PS&P rail line, making it unlikely that state or federal standards would be exceeded at any single location.

Increased rail traffic would also increase toxic air pollutants, primarily diesel particulate matter. Exposure to high levels of diesel particulate matter has been shown to increase the risk of cancer. The most diesel particulate matter would be emitted between the Poynor Yard in Hoquiam and the project site. A cancer risk analysis was conducted to determine risk of exposure to diesel particulate matter from rail operations in this area. The analysis was updated for the Final EIS based on information from PS&P regarding the number and type of locomotives used in these operations. The resulting level of diesel particulate matter emissions and related exposure levels are not considered significant. Elsewhere along the PS&P rail line, emissions would be dispersed and would not be concentrated in any one area. Risk of exposure would be reduced further in the future when new rail locomotives that emit less diesel particulate matter are put into service. The contribution of the proposed action to cumulative impacts is discussed in the cumulative impacts section.

Vessels related to the proposed action would travel along the Grays Harbor Navigation Channel, which is located away from the shoreline. Emissions of criteria and toxic air pollutants (primarily diesel particulate matter) would be spread out over the length of the navigation channel. Emissions would not likely exceed state and federal standards.

Greenhouse Gases

Construction and operation of the proposed action and associated rail and vessel transport would result in the emission of greenhouse gases. These gases are described as carbon dioxide equivalents (greenhouse gas emissions are calculated in terms of the equivalent warming potential of carbon

dioxide, a primary greenhouse gas). Construction activities would emit approximately 887 metric tons of carbon dioxide equivalent per year.

Greenhouse gas emissions from onsite operations, rail transport from the likely source (Williston Basin in North Dakota), and vessel transport to the furthest likely destination (Port of Long Beach, California) at maximum throughput were estimated at 123,247 metric tons of carbon dioxide equivalent per year. Because crude oil for the proposed action is expected to replace crude oil from the Alaska North Slope and other more distant sources, emissions from roundtrip transport of crude oil between Valdez, Alaska, and the Port of Long Beach were estimated as a conservative representation of emissions offset by the proposed action. The resulting net greenhouse gas emissions were estimated at 76,199 metric tons of carbon dioxide equivalent per year.

The combustion of crude oil also emits greenhouse gases. To the extent that crude oil transloaded through the proposed facility would replace oil shipped to West Coast refineries by other means and from other sources (e.g., Alaska or international ports), combustion emissions would not be entirely additive. For purposes of disclosure, greenhouse gas emissions from combustion of annual maximum throughput of crude oil transloaded under the proposed action were estimated and are presented in Table 3.2-10 of the Final EIS.

Water

Potential impacts of construction and routine operation of the proposed action on water are summarized below. Chapter 3, Section 3.3, *Water*, provides a full discussion.

Construction

Construction would occur within 200 feet of the shoreline of Grays Harbor. No dredge or fill operations or other in-water construction work is needed for the proposed action in these waters or any other surface waters, wetlands, or floodplains. Construction is not expected to result in any permanent impacts on water resources. Temporary impacts could occur from construction activities that involve soil disturbance, equipment and material use, and storage tank hydrostatic testing. Implementation of best management practices consistent with the required permits would ensure that water quality standards are met. Construction would not affect wetlands because wetlands are not present on or within 300 feet of the project site.

Onsite Operations

Routine operation at the project site could result in leaks or spills of various petrochemicals used for facility operations and maintenance that could adversely affect water resources from contaminated stormwater runoff. Other potential stormwater contaminants include vehicle residues that accumulate in parking lots and material handling areas; airborne particulates from vehicle and vessel exhaust and facility emissions that are deposited on pavement and other impervious surfaces of the facility; and residues of herbicides from areas where vegetation management (e.g., weed control in tank containment area) occurs. These chemicals could enter adjacent surface waters by transport in stormwater runoff and could degrade water quality and adversely affect both aquatic vegetation and aquatic life near the facility or be transported to other portions of Grays Harbor. The proposed action could slightly increase the potential for water quality impairment related to routine operations. However, the proposed design features, including containment structures and the oil/water separator, and the implementation of prevention and control measures and stormwater

best management practices required by state and federal law and applicable permits, would ensure that impacts from contaminated stormwater would be low.

Potential impacts from increased risk of onsite incidents involving the release of crude oil with the potential to directly affect water resources are addressed in the section on environmental health and safety.

Rail and Vessel Transport

Increased rail traffic and associated maintenance could result in the increased potential for leaks and spills that could affect the quality of surface waters and groundwater along the PS&P rail line as the result of contaminated stormwater runoff. Sensitive areas that could be affected by such releases include the Chehalis River Surge Plain Natural Area Preserve and the designated Critical Aquifer Recharge Area in the Black River and Scatter Creek subwatersheds in Thurston County. These releases would likely be limited to minor drips and leaks captured in the underlying ballast rock resulting in relatively limited risk of exposing water resources to contaminated stormwater. The potential for such leaks would be reduced by regularly inspecting and maintaining locomotives and rail cars and by implementing best management practices. Although the proposed action would result in a slight increase in these types of leaks and spills compared to the no-action alternative, the overall impacts on water quality are anticipated to remain low. Potential impacts from increased risk of rail incidents involving the release of crude oil with the potential to directly affect water resources are addressed in the section on environmental health and safety.

Increased vessel traffic and associated routine operation could result in water quality impacts related to ballast water discharge, propeller wash and vessel wake, and minor leaks and spills.

Increased vessel activity would incrementally increase the potential for erosion in Grays Harbor and along the harbor shoreline associated with wake and propeller wash compared with the no-action alternative. Any associated water quality impacts would be short-term and are not anticipated to be significant.

Vessels calling at the Terminal 1 berth could degrade water quality via ballast water discharge. Although the vessels would be required to exchange ballast water at sea to reduce potential transport of invasive species during the loading process, risks would remain. Implementation of proposed mitigation (Table S-1) for ballast water monitoring would further reduce potential impacts on water quality.

Increased vessel activity would result in a slight increase in the potential for diesel fuel, oils, grease, and other fluids required for the operation and maintenance of vessels to contaminate water. Regular inspections and implementation of standard best management practices would reduce these types of leaks and spills. These releases would be limited to minor drips and leaks from equipment located within contained areas of the vessel such that there would be limited risk of exposing water resources to contaminated stormwater. Potential impacts from increased risk of vessel incidents involving the release of crude oil with the potential to directly affect water resources are addressed in the section on environmental health and safety.

Plants

Potential impacts of construction and routine operation of the proposed action on plants are summarized below. Chapter 3, Section 3.4, *Plants*, provides a full discussion.

Construction

Ground disturbance for construction would result in the loss of approximately 1 acre of vegetation. The areas where construction would occur do not support native plant communities and do not provide valuable habitat to animals. Construction activities could temporarily affect shoreline and aquatic vegetation near the project site. Disturbances could temporarily increase total suspended solids near the project site and result in the release of construction vehicle fluids or construction materials. Implementation of best management practices per the required water quality permits would ensure these impacts would not exceed acceptable levels.

Onsite Operations

Operation of the proposed action would not affect plants or animal habitat on the project site, because the project site would be completely developed and no plants would be expected to colonize the developed site. The proposed action could affect plants and habitat in and around the harbor as the result of impacts on air and water quality associated with routine operations.

Routine operation at the project site could result of leaks or spills of various petrochemicals used for facility operations and maintenance that could adversely affect plants near the project site and potentially further into Grays Harbor from contaminated stormwater runoff. As discussed under *Water*, although routine operations could slightly increase the potential for contaminated stormwater runoff, the proposed design features and the implementation of prevention and control measures and stormwater best management practices required by state and federal law and applicable permits would ensure that these potential impacts would be low. Potential impacts from increased risk of incidents during transport are addressed in the section on environmental health and safety.

Onsite operations could affect plants near the project site as a result of emissions, primarily nitrogen dioxide and nitrogen oxides; however, because these emissions would be short-term and areas near the project site include the industrial shoreline, roadways, and developed uses, potential impacts on plants would not be significant.

Rail and Vessel Transport

Increased rail traffic and associated routine operations could result in plant impacts related to contaminated stormwater and emissions.

Increased rail traffic and associated maintenance could result in the increased potential for leaks and spills of petrochemicals that could affect plants along the PS&P rail line as the result of contaminated stormwater runoff. As discussed under *Water*, although the proposed action would result in a slight increase in these types of leaks and spills compared to the no-action alternative, the overall impacts on water quality are anticipated to remain low. The potential for associated impacts on plants is also anticipated to be low. Potential impacts from increased risk of rail incidents are addressed in the section on environmental health and safety.

Rail transport along the PS&P rail line would also emit nitrogen dioxide and nitrogen oxides; however, typical concentrations would be considerably lower than for onsite operations and are not anticipated to result in impacts on plants.

Increased vessel traffic and associated routine operations could result in plant impacts related to ballast water discharge, propeller wash and vessel wake, shading, and contaminated stormwater.

Vessels calling at the Terminal 1 berth could bring invasive species to Grays Harbor via ballast water. Although the vessels would be required to exchange ballast water at sea to reduce potential transport of invasive species during the loading process, risks would remain. Implementation of mitigation (Table S-1) ballast water monitoring would further reduce the risk of spreading invasive species.

Increased vessel activity would result in the potential for a small, incremental increase in impacts on plants in Grays Harbor and along the harbor shoreline associated with wake and propeller wash compared with the no-action alternative.

Vessels calling at the Terminal 1 berth would result in increased shading in the shallow-water habitat beneath and adjacent to existing berthing structures (e.g., docks, trestles). Because of the tidal currents and flow in this location, the level of increased shading is not expected to reduce the primary productivity of plankton or aquatic plants.

As discussed under *Water,* increased vessel activity would result in a slight increase in the potential for contaminated stormwater for leaks and spills of diesel fuel, oils, grease, and other fluids required for the operation and maintenance of vessels. The potential for associated impacts on plants is also anticipated to be low. Potential impacts from increased risk of incidents during transport are addressed in the section on environmental health and safety.

Animals

Potential impacts of construction and routine operation of the proposed action on animals are summarized below. Chapter 3, Section 3.5, *Animals*, provides a full discussion.

Construction

Construction activities could temporarily increase total suspended solids in water near the project site and result in the release of construction vehicle fluids or construction materials. Implementation of best management practices per the required water quality permits would ensure these impacts would not exceed acceptable levels that could adversely affect animals.

Noise would increase above ambient levels during construction. However, no special-status species have been recently documented in the study area. There is suitable habitat for the bald eagle, blue heron, and peregrine falcon, but it is unlikely that these species would be found near the project site. Underwater noise from pile driving is not anticipated to be an issue due to the distance from the pile to the nearest waterbody (Chehalis River).

Onsite Operations

Operation of the proposed action would not affect animal habitat on the project site, because the project site would be completely developed and no suitable habitat for animals would be present. The proposed action could affect animals in and around the harbor as the result of impacts on water quality and noise associated with routine operations.

Routine operation at the project site could result of leaks or spills of various chemicals used for facility operations and maintenance that could adversely affect animals from contaminated stormwater runoff. As discussed under *Water*, although routine operations could slightly increase the potential for contaminated stormwater runoff, the proposed design features and the implementation of prevention and control measures and stormwater best management practices

required by state and federal law and applicable permits would ensure that these potential impacts would be low. Potential impacts from increased risk of incidents during transport are addressed in the section on environmental health and safety. Implementation of best management practices consistent with the required permits would ensure that water quality standards are met and the potential impact on animals would not be significant.

Noise from onsite operations would be similar to existing conditions and would not result in substantial increases in noise that would be noticeable to animals likely to be found around the project site.

Rail and Vessel Transport

Increased rail traffic and associated routine operations could result in impacts on animals related to noise, collisions, and contaminated stormwater.

Operational noise (primarily train horns at PS&P rail line grade crossings) could affect animals along the PS&P rail line during rail operations. However, because impacts would last only the duration of the train passing and only occur within a certain distance of the track, and because species along the rail line are habituated to rail noise and are generally mobile, noise impacts would likely be imperceptible and would not affect species populations or fitness.

Additional rail trips on the PS&P rail line are expected to proportionally increase mortality of animals because of collisions with trains and increased predation risk. This increased risk is not expected to measurably alter species populations or fitness.

Increased rail traffic and associated maintenance could result in the increased potential for leaks and spills of petrochemicals that could affect animals as the result of contaminated stormwater runoff. As discussed under *Water*, although the proposed action would result in a slight increase in these types of leaks and spills compared to the no-action alternative, the overall impacts on water quality are anticipated to remain low. The potential for associated impacts on animals is also anticipated to be low. Potential impacts from increased risk of rail incidents are addressed in the section on environmental health and safety.

Increased vessel traffic and associated routine operations could result in impacts on animals as a result of ballast water discharge, propeller wash and vessel wake, shading, noise, and contaminated stormwater.

Increased vessel activity related to the proposed action would have a small, incremental increase in the potential for impacts associated with wake and propeller wash compared with the no-action alternative, including stranding of nearshore aquatic species, especially juvenile fish, on the shoreline.

Vessels calling at the Terminal 1 dock would result in increased shading that could slightly increase the potential to affect fish migration, prey capture, or predation.

Increased vessel traffic related to the proposed action would generate increased underwater noise that could affect aquatic animals, especially marine mammals because they rely on sound as a means of communication for finding food and mates, and for detecting predators. The potential for these impacts would increase somewhat under the proposed action because of increased vessel trips but impacts would not be significant.

Increased vessel traffic would also increase the chance of vessels striking marine mammals in the navigation channel, particularly during transits outside the mouth of the harbor, compared to the no-action alternative. However, because the likelihood of vessel strikes and the potential for population-level impacts would be low, impacts would not be significant.

Vessels calling at the Terminal 1 could bring invasive species to the Grays Harbor in their ballast water that could affect aquatic life. Although the vessels would be required to exchange ballast water at sea to reduce potential transport of invasive species during the loading process, the risks would remain. Implementation of mitigation (Table S-1) would reduce the risk of spreading invasive species.

As discussed under *Water,* increased vessel activity would result in a slight increase in the potential for contaminated stormwater for leaks and spills of diesel fuel, oils, grease, and other fluids required for the operation and maintenance of vessels. The potential for associated impacts on animals is also anticipated to be low. Potential impacts from increased risk of vessel incidents are addressed in the section on environmental health and safety.

Energy and Natural Resources

Potential impacts of construction and routine operation of the proposed action on energy and natural resources are summarized below. Chapter 3, Section 3.6, *Energy and Natural Resources*, provides a full discussion.

Construction

The proposed action would be constructed of materials that require energy and natural resources to manufacture. Energy would also be consumed in the transport of these materials to the project site. The increase in energy consumption is anticipated to be met by existing local energy and fuel supply and natural resources. Implementation of mitigation (Table S-1) would reduce energy consumption.

Onsite Operations

Energy would be used to operate equipment at the terminal. The proposed action's energy consumption during operation would be primarily in the forms of electricity, natural gas, and fuel. The increase in energy consumption is anticipated to be met by existing local fuel supply. To reduce energy consumption, the applicant would implement energy-saving measures in project design and operation (Table S-1).

Rail and Vessel Transport

Rail traffic associated with the proposed action would consume diesel fuel. The demand for diesel under the proposed action is anticipated to be met by regional supply. Vessels would likely use marine distillate fuel. The demand for marine distillate fuel under the proposed action is anticipated to be met by regional supply.

Noise and Vibration

Potential impacts of construction and routine operation of the proposed action related to noise and vibration are summarized below. Chapter 3, Section 3.7, *Noise and Vibration*, provides a full discussion.

Construction

Construction of the proposed action would result in a temporary increase in noise and vibration near the project site. Construction noise would consist primarily of operating construction equipment, such as pile-driving equipment, backhoes, cement mixers, and excavators. The greatest noise increases would result from pile driving, which is anticipated to last approximately 2 to 3 months. However, noise and vibration levels would be low at the nearest residential areas (approximately 1,500 feet) and are not anticipated to disrupt residents or other sensitive groups surrounding the project site. Implementation of mitigation (Table S-1) to keep construction and maintenance equipment in good working order would reduce noise and vibration impacts. Additionally, because construction would only occur during daytime hours, any noise or vibration from these activities would be limited to daytime hours.

Onsite Operations

Onsite operations would generate noise and vibration from equipment use and rail and vessel loading and unloading activities. Noise and vibration levels associated with these activities would be similar to levels generated by existing operations at the project site and in the Port area. The increases in noise and vibration are not anticipated to be disruptive to residents or other sensitive groups near the project site.

Rail and Vessel Transport

At maximum throughput, operation of the proposed action would increase rail traffic along the PS&P rail line by an average of 1.25 unit train trips per day. Noise-sensitive receptors (such as residences) would be exposed more frequently to two types of train noise.

- Wayside noise: The combined effect of locomotive noise and car/wheel noise.
- Horn noise: The sound of locomotive warning horns, which are sounded in advance of grade crossings per federal safety requirements.

Trains associated with the proposed action would travel at the same speeds as existing trains, and locomotives would sound horns consistent with existing practices. Therefore, the wayside and horn noise levels associated with any individual train trip would not change substantially compared to existing conditions.

However, because the proposed action would result in more rail traffic, average noise levels[4] along the PS&P rail line would increase. Noise monitoring identified the baseline conditions at various sites along the rail line. Noise impacts were determined based on the assessment methods developed by the Federal Transit Administration and adopted by the Federal Railroad Administration. Based on these methods, where existing noise levels are higher, the amount of noise increase needed to result in a moderate or severe impact decreases.

The noise increase would be most noticeable for residences located close to the PS&P rail line, particularly near grade crossings where trains are required to sound horns. The greatest noise impacts on residences would occur between Satsop and Elma, and at some residences close to the

[4] Average noise level, measured as day-night sound level (L_{dn}), is essentially a 24-hour average noise exposure over the course of any given day. It is adjusted upward to account for the potential that noise will occur during the night when most people are more sensitive to noise.

rail line in Central Park, Malone-Porter, and Centralia. Implementation of mitigation (Table S-1) to assist with the development of quiet zones in coordination with PS&P and the Federal Railroad Administration could reduce noise from train horns; however, if these measures were not implemented, noise increases from the additional train traffic would remain. The contribution of the proposed action to cumulative impacts is discussed in the cumulative impacts section. The potential for noise impacts to remain if mitigation is not feasible is discussed in the unavoidable and significant adverse impacts section.

Increased vessel traffic in Grays Harbor would not significantly increase noise levels. The nearest noise-sensitive receptors are along the shoreline (approximately 1,800 feet from the navigation channel), and impacts from vessel noise would be negligible.

Because vibration levels are primarily a function of train speed, and train traffic associated with the proposed action would not increase train speeds along the PS&P rail line, vibration impacts from rail traffic would be negligible. Vibration-sensitive receptors would experience no vibration on land from increased vessel traffic, because vessels would be traveling approximately 1,800 feet from the shoreline.

Land and Shoreline Use

Potential impacts of construction and routine operation of the proposed action on land and shoreline use are summarized below. Chapter 3, Section 3.8, *Land and Shoreline Use*, provides a full discussion.

Construction

Construction would occur in both the City of Hoquiam's and City of Aberdeen's Industrial Districts, where construction activities are compatible with the land and shoreline use designations of both cities' comprehensive plans and shoreline master programs. The applicant would be required to obtain all appropriate permits and/or approvals prior to construction. Therefore, impacts on land and shoreline use from construction of the proposed action are not anticipated.

Onsite Operations

Implementation of the proposed action would require land use permits from the City of Hoquiam and the City of Aberdeen, which require demonstration of consistency with the applicable policies and zoning. Operation of the proposed action at the project site would be consistent with the applicable policies, including consistency with comprehensive plans, zoning ordinances, critical areas ordinances, and shoreline master programs. The applicant would be required to obtain appropriate permits and approvals to ensure compliance with these requirements and consistency with the applicable land use and shoreline management programs and ordinances. Impacts on land and shoreline use from operation of the proposed action are not anticipated to occur.

Rail and Vessel Transport

Increased rail and vessel traffic associated with the proposed action would occur in existing transportation corridors. Rail and vessel transport in these areas is currently ongoing and the proposed increases in traffic would be consistent with applicable land use plans, policies, zoning, and regulations.

Aesthetics, Light, and Glare

Potential impacts of construction and routine operation of the proposed action on aesthetics, light, and glare are summarized below. Chapter 3, Section 3.9, *Aesthetics, Light, and Glare*, provides a full discussion.

Construction

The presence of construction equipment and the related increase in activities would create short-term visual changes at the project site. However, the project site is an existing industrial area and cranes and industrial operations are a common part of the visual environment. Construction would not require the use of high-intensity nighttime lighting and would not negatively affect day or nighttime public views. Glare would not be increased on the project site during construction.

Onsite Operations

Operation of the proposed action is not anticipated to result in substantial changes in views of the Port or harbor that would negatively affect any viewer groups. The most prominent features to be built on the project site would be the storage tanks. Implementation of mitigation (Table S-1) would ensure that the proposed facility would be consistent with the existing industrial character of the Port and immediately surrounding area and would not materially change the visual character or quality of views or result in glare. The changes in lighting toward the interior of the Port and away from residential areas are not anticipated to affect views from scenic routes. Although some additional nighttime lighting would be installed, the additional lighting is not expected to affect any viewer groups negatively.

Rail and Vessel Transport

Although nighttime rail and vessel transport lighting would increase compared with the no-action alternative, the increase would not be expected to disturb surrounding land uses.

Recreation

Potential impacts of construction and routine operation of the proposed action on recreation are summarized below. Chapter 3, Section 3.10, *Recreation*, provides a full discussion.

Construction

Construction vehicles would not likely block or reduce vehicle access to the 28th Street boat launch, fishing pier, viewing tower, or nearby parks. No in-water construction or access to the project site by water is proposed; therefore, the activities would not conflict with in-water recreation near the project site. Construction activities, primarily pile driving, would result in increased noise levels that could disturb surrounding recreational uses.

Onsite Operations

Vessel loading would restrict recreational boating and fishing access to the area directly adjacent to the Terminal 1 dock. Impacts on recreational boaters would not be significant because boaters could access other boating and fishing areas throughout the harbor. Implementation of mitigation (Table S-1) would reduce impacts on recreational boaters. Operational noise levels would be similar to

existing noise levels at the project site and would be consistent with current uses surrounding the project site. Additionally, the applicant would voluntarily cease vessel-loading operations of crude oil for 2 weeks each year (Table S-1) during the Grays Harbor Shorebird Festival. Potential impacts on animals, including fish, are described above.

Rail and Vessel Transport

Increased noise along the PS&P rail line from increased rail traffic could affect recreational uses; however, the maximum level of noise associated with a single train passing by likely to be experienced in recreational areas would not change because all trains would continue to travel at the same speeds as existing trains and would sound horns similarly. Increased train noise could temporarily disturb surrounding recreational uses during the passage of a train. Because recreational uses already experience noise levels associated with rail operations and because noise is temporary, noise impacts from the additional rail traffic under the proposed action are not considered significant. Potential impacts on animals from rail and vessel transport are described above.

For the majority of the rail line, the increase in rail traffic would not result in a substantial increase in vehicle delays or blocked vehicular access that could restrict access to recreational areas. However, vehicle access to Morrison Riverfront Park, which can only be accessed through entrances to the Olympic Gateway Plaza, would be blocked more frequently and for longer durations because of train operations in Aberdeen. Implementation of mitigation (Table S-1) to address vehicle delays at this location would reduce this impact.

Because vessel traffic under the proposed action would be limited to the navigation channel, impacts on recreational uses in the harbor outside the channel are not expected. The 28th Street boat launch area is near the navigation channel and project site; however, it is expected that recreational boaters would have sufficient room to navigate safely away from the launch into the harbor. They would not be substantially affected by vessels passing through the navigation channel. All other major access points for recreational boaters would be distant and not affected by vessel traffic. Recreational fishing does occur in the navigation channel, primarily in the fall. While this area would not be accessible while a vessel was making the trip to and from the project site (approximately 2 hours one way), recreational fishing and boating is seasonal, and even at the height of the season, the boat density is considered low, meaning potential conflicts are not anticipated to be frequent or to last for a substantial amount of time. Additionally, alternative fishing areas that would not be affected by vessel traffic are available. Implementation of mitigation (Table S-1) to provide advance notice of vessel transit would reduce impacts on recreational fishing.

Historic and Cultural Preservation

Potential impacts of construction and routine operation of the proposed action on cultural resources are summarized below. Chapter 3, Section 3.11, *Cultural Resources*, provides a full discussion.

Construction

No significant or protected cultural resources have been found at the project site. Although unlikely, archaeological resources may be found below the ground surface during construction. Construction of the proposed facility mainly involves surface grading and driving piles, which would not require significant excavation or deep ground disturbance. Implementation of mitigation (Table S-1) to

develop and implement an unanticipated discovery plan and to conduct onsite archaeological monitoring would address this impact.

Onsite Operations

Operation of the proposed action would not affect cultural resources because no cultural resources have been identified at or immediately surrounding the project site.

Rail and Vessel Transport

Increased rail traffic would not affect cultural resources because it would not involve ground-disturbing activities, increase vibration along the PS&P rail line, or alter views of historically important features of any historical resources.

Although unlikely, increased vessel traffic could slightly increase shoreline erosion, potentially affecting onshore cultural resources.

Tribal Resources

Potential impacts of construction and routine operation of the proposed action on tribal resources are summarized below. Chapter 3, Section 3.12, *Tribal Resources*, provides a full discussion.

Construction

Construction of the proposed action would likely have no impact on tribal resources because no in-water work is required. No access to the project site by water is proposed; therefore, the activities would not conflict with tribal fishing resources near the project site. Construction activities, primarily pile driving, would result in increased noise levels that could disturb aquatic species, including fish, and tribal fishers near the project site.

Onsite Operations

At maximum throughput, operation of the proposed action would result in vessels loading at the Terminal 1 dock up to 119 days per year, which, when added to baseline vessel forecasts over the planning period, would result in vessels at the Terminal 1 berth 177 days per year. This increase in vessels docking at Terminal 1 would reduce access to the tribal fishing area directly in front of the Terminal 1 dock. Lighting impacts on fish behavior from nighttime transfer operations could also affect the efficiency of drift netting.

While a vessel is at berth, fishers cannot extend fishing nets as far and cannot access the areas nearest to the dock structure. Implementation of mitigation (Table S-1) to coordinate docking schedules with fishing schedules, provide advance notice of vessel calls and movements, and work with the Quinault Indian Nation to identify other measures as appropriate could reduce these potential impacts on treaty tribal fishing but would not eliminate the potential to affect the tribe's ability to access resources.

Onsite operations of the proposed action could affect tribal resources if they were to degrade the resources used by the tribes, including the plants, wildlife, and fisheries. Impacts on these resources are described in their respective sections above.

The potential for impacts on tribal resource to remain after mitigation is discussed in the unavoidable and significant adverse impacts section.

Rail and Vessel Transport

Rail traffic along the PS&P rail line would increase by an average of 1.25 train trips per day. This increase would not significantly reduce access to Quinault Indian Nation tribal resources because there are few grade crossings between the Quinault Indian Nation reservation and Quinault fishing and access sites and substantial delays are not expected at these grade crossings. The Chehalis Tribe's access to fishing sites would not be affected because access roads to fishing sites on their reservation do not cross the PS&P rail line.

As described above under *Animals,* increased rail traffic and associated routine operations could affect animals along the PS&P rail line as the result of increased noise, increased mortality (collisions with moving trains), and increased exposure to pollutants (spills). These impacts could, in turn, affect the number of animals available for take by hunters from the Quinault Indian Nation and Confederated Tribes of the Chehalis Reservation. Although these impacts could increase incrementally compared to the no-action alternative, they are not expected to affect species populations or fitness.

Vessel traffic would increase by one vessel trip every other day. Vessel traffic would not likely affect Quinault Indian Nation tribal resources outside of the navigation channel (including crab fishing in the harbor). However, vessel operations could exclude tribal fishers from a portion of their typical fishing area in the navigation channel (from approximately the Crossover Channel Reach of the navigation channel to the turning basin upstream of Terminal 2). Conflicts would be greatest during the fall salmon fishery when tribal fishers use gillnets. Vessel traffic could also reduce access to marine fisheries (including crab) in the ocean because tribal fishers may not be able to cross the bar when tank vessels are moving into or out of the navigation channel. Implementation of mitigation (Table S-1) to coordinate docking schedules with fishing schedules, provide advance notice of vessel calls and movements, and work with the Quinault Indian Nation tribal officials to identify other measures as appropriate could reduce the potential for these impacts. The potential for tribal impacts to remain after mitigation is discussed in the unavoidable and significant adverse impacts section. The contribution of the proposed action to cumulative impacts is discussed in the cumulative impacts section.

Rail and vessel operations also could affect tribal resources if they were to degrade the plants used by the tribes. Impacts on plants are described above.

Public Services and Utilities

Potential impacts of construction and routine operation of the proposed action on public services and utilities are summarized below. Chapter 3, Section 3.12, *Public Services and Utilities*, provides a full discussion.

Construction

Construction of the proposed action would temporarily increase the demand for water at the project site. Construction activities would also result in a temporary increase in solid waste and hazardous waste. These services would not exceed public service or utility service provider capability.

Onsite Operations

During operations, new buildings and additional employees would modestly increase the demand for potable water on site. Routine operation of the proposed action would increase the amount of solid waste generated at the project site and could generate hazardous waste as a result of minor releases. These hazardous materials would require safe disposal and would be hauled separately from regular solid waste.

Rail and Vessel Transport

No utility or public service impacts would result from rail and vessel transport.

Hazardous Materials

Potential impacts of construction and routine operation of the proposed action related to hazardous materials are summarized below. Chapter 3, Section 3.14, *Hazardous Materials*, provides a full discussion.

Construction

Construction activities would be required to comply with applicable regulations. Implementation of mitigation (Table S-1) would reduce these impacts.

Onsite Operations

Although the unloading, storage, and loading of crude oil would be similar to existing operations, there is increased risk of exposure of people (primarily workers) and the environment due to the increase in throughput and increased consequences to human health and the environment due to harmful substances. Similar to existing conditions, exposure to hazardous materials associated with routine operations would be most likely to occur during unloading and loading activities. These routine operations could result in minor releases that would be contained and cleaned up by trained terminal personnel. The proposed facility would be designed and operated to meet the appropriate safety standards as a designated oil facility under federal and state law. Specifically, the facility would be designed to meet primary and secondary containment standards in the event of a spill. Additionally, the applicant would be required to develop operation manuals and spill prevention, contingency, and response plans to reduce the potential for a spill of crude oil. These identify emergency notification and response protocols during site operations and vessel transfers. Similar to existing conditions, the applicant would continue to ensure that personnel training and handling and storage activities would also comply with the appropriate safety standards intended to reduce the risks of incidents and to address potential spills during operation. Potential impacts from increased risk of incidents and related consequences (e.g., oil spills) are described in the section on environmental health and safety risks.

Rail and Vessel Transport

Potential impacts related to rail and vessel transport of hazardous materials are addressed in the environmental health and safety risks section.

Rail Traffic

Potential impacts of routine operation of the proposed action on rail traffic are summarized below. Chapter 3, Section 3.15, *Rail Traffic*, provides a full discussion.

Construction of the proposed action would not affect existing rail traffic. Operation of the proposed action at maximum throughput would add 1.25 unit train trips per day (458 trips per year) along the PS&P rail line to existing/no-action traffic (approximately 3.1 trips per day on average or 1,100 trips per year). The total estimated rail traffic, including the existing and proposed action, would be 4.35 trips per day on average. The rail traffic modeling and analysis shows that the PS&P rail line has the theoretical capacity to accommodate up to 12 trips per day. Based on this analysis, the rail line would have sufficient capacity to accommodate rail traffic under the proposed action. However, rail traffic and operations, particularly switching operations,[5] would result in increased blockages along the rail line, most substantially at intersections between Aberdeen and the project site. The potential impacts on vehicle delay and safety are addressed in the next section.

Vehicle Traffic and Safety

Potential impacts of construction and routine operation of the proposed action on vehicle traffic and safety are summarized below. Chapter 3, Section 3.16, *Vehicle Traffic and Safety*, provides a full discussion.

Construction

Construction of the proposed action would result in more vehicles traveling to and from the project site to transport construction workers, equipment, and materials. However, these trips would represent a small increase in daily traffic in the area and would not likely affect vehicle delays and safety.

Onsite Operations

Operation of the proposed action would add vehicle trips to and from the project site, mainly from additional employees. These trips would also represent a small increase in daily traffic and would not likely affect vehicle delays and safety.

Rail and Vessel Transport

At maximum throughput, operation of the proposed action would increase rail traffic along the PS&P rail line by an average of 1.25 train trips per day. The increase in rail traffic along the PS&P rail line would block at-grade crossings more frequently and for longer periods than under the no-action alternative. Vehicle delay at most of these crossing would not increase substantially. This is because the existing and projected vehicle traffic is relatively low along this corridor and the chance of encountering a project train at a crossing would continue to be low.

Several intersections in Centralia and Aberdeen currently have long vehicle delays. These delays would continue under the no-action alternative and would increase under the proposed action.

[5] Switching operations are generally related to disassembling unit trains by setting rail cars on multiple tracks, rearranging rail cars on tracks to facilitate loading or unloading, sorting rail cars by destination, delivering rail cars to an industry, picking up rail cars from an industry, or assembling unit trains from rail cars on multiple tracks.

These delays would be greatest during rush hour traffic. Projected 2017 daily crossing time at at-grade crossings in Centralia would be 28 to 39 minutes compared to approximately 17 to 26 minutes under the no-action alternative.

At-grade crossings in Aberdeen (Olympic Gateway Plaza and Port of Grays Harbor areas) would experience the most substantial increase in average vehicle delay with the addition of proposed action trains. For example, trains currently occupy all grade crossings in the Olympic Gateway Plaza area for up to 35 minutes about four times per week. Under the proposed action, this time would increase to up to 45 minutes and up to four more times per week. Trains currently occupy the Industrial Road crossing adjacent to the project site for up to 13 minutes. Under the proposed action, this time would increase to up to 22 minutes.

Because vehicle delay would increase, emergency vehicle delay would also increase at grade crossings. Emergency access is most limited in the Olympic Gateway Plaza and Port of Grays Harbor areas where trains can block all access to certain properties during switching operations.[6] Existing communication and response procedures for providing emergency access at blocked crossings would reduce impacts related to the proposed action.

Implementation of mitigation (Table S-1) could decrease vehicle delays and emergency access issues. Potential infrastructure changes in the future could also reduce impacts. The potential for impacts on vehicle delay to remain after mitigation is discussed in the unavoidable and significant adverse impacts section. The contribution of the proposed action to cumulative impacts is discussed in the cumulative impacts section.

Vessel Traffic

Potential impacts of construction and routine operation of the proposed action on vessel traffic are summarized below. Chapter 3, Section 3.17, *Vessel Traffic*, provides a full discussion.

Construction

Construction of the proposed action would involve no in-water work and no vessel transport, and therefore would not affect existing vessel traffic.

Onsite Operations

At maximum throughput, operation of the proposed action would result in vessels at berth at Terminal 1 up to 119 days per year, which added to baseline vessel forecasts over the planning period would result in vessels at the Terminal 1 berth 177 days per year. Factoring annual downtime, a berth is available up to 90% of the time or 328 days per year. The proposed action would not exceed berth availability. The contribution of the proposed action to cumulative impacts is discussed in the cumulative impacts section.

Increased occupancy of the Terminal 1 berth under the proposed action would reduce access to fishing areas next to the Terminal 1 dock, which is in a commercial fishing area. During periods of maximum catch for Chinook, coho, or chum salmon, the fall fishery may be open 2 to 4 days per week and for limited periods (e.g., 8:00 a.m. to 12:00 noon). Approximately 15 to 20 boats may participate each year and the fishery is open is approximately 7 days total. Commercial fisheries do

[6] Assembling and disassembling unit trains and delivering and picking up rail cars to and from the project site.

not occur during other times of the year; therefore, vessel traffic at other times of the year would not affect commercial fisheries.

Depending on the specific circumstances of each interaction (e.g., chance of a vessel calling during an open fishing window, distribution of the fish within the channel, number of fishers on any given day), it is difficult to predict whether increased occupancy at Terminal 1 would significantly affect any single fisher's daily catch. However, if a vessel is at berth during the fall fishery, fishers would have the option to fish longer (complete more drifts) or may choose to fish other preferred locations in Grays Harbor (such as other portions of the navigation channel, farther away from the shoreline or father upstream), although opportunities to relocate during intense fishing periods may be limited if the other areas are occupied by fishers. Implementation of mitigation (Table S-1) to announce vessel arrivals and departures could reduce impacts on commercial fishers.

Vessel Transport

Operation of the proposed action at maximum throughput would add 238 tank vessel trips per year (0.7 trip per day on average) along the navigation channel to projected large commercial vessel trips under the no-action alternative—between 338 and 436 large commercial vessel[7] trips per year in 2017 and 2037, respectively, or approximately one trip per day on average.

Considering the opportunities available for these vessels to travel through the harbor at various channel depths, the proposed action would not result in exceeding the capacity of the navigation channel. The increase in vessel traffic would increase the demand for tugs and pilots in Grays Harbor, but this demand could be managed with existing resources. It is not anticipated that availability of tugs or pilots would limit vessel operations at the Port. The contribution of the proposed action to cumulative impacts is discussed in the cumulative impacts section.

Increased vessel traffic could affect commercial fishing activities by disrupting fishing in the navigation channel, particularly from the Crossover Channel Reach of the navigation channel to the turning basin. Vessel traffic would not affect fishing outside the navigation channel (including crab fishing in the harbor). Conflicts would only occur during the fall salmon fishery. Increased traffic could limit access to commercial fishing areas. Implementation of mitigation (Table S-1) to announce vessel arrivals and departures would reduce these impacts further.

What are the environmental health and safety risks of oil spills, fires, and explosions?

This section summarizes impacts from increased risk of incidents (e.g., storage tank failure, train derailments, vessel collisions) and related consequences (e.g., oil spill, fire, or explosion). Chapter 4, *Environmental Health and Safety*, provides a full discussion.

Risk of Oil Spills

Because it is not possible to predict the timing or magnitude of an oil spill, the EIS focuses on spill scenarios. The spill scenarios include those required by law for contingency planning plus others that were relevant to the proposed action. Each spill scenario is defined by the type of activities, spill location, and the amount spilled.

[7] The term *large commercial vessels* refers collectively to tank and cargo vessels.

The main spill scenarios and their likelihood of occurrence are summarized by activity in Table S-2.

Table S-2. Likelihood of an Incident for Select Spill Scenarios Related to the Proposed Action

Source	Spill Scenario	Occurrence Interval[a]	Probability of Occurrence
Small			
Project site	Up to 2,100 gallons (50 barrels) spilled when transferring oil from rail cars or to vessels at the project site	25 years	0.11 per rail unloading 0.12 per vessel loading
Rail transport	Up to 1,000 gallons (24 barrels) spilled during a derailment along the PS&P rail line	100 years with current rail cars 105 years with rail car improvements	0.010 per year with current rail cars 0.0095 per year with rail car improvements
Medium			
Project site	Represented by 10,000 gallons (238 barrels) spilled when transferring oil to a vessel at the project site	588 years	0.0074 per loading
	Represented by 50,400 gallons (1,200 barrels) spilled from pipeline or storage tank at the project site	2,500 years	0.0005 per year per tank
Rail transport	Represented by 30,000 gallons (714 barrels or the contents of one full tank car) spilled during a derailment along the PS&P rail line	36 years with current rail cars 43 years with rail car improvements	0.0287 per year with current rail cars 0.023 per year with rail car improvements
Large			
Project site	8.4 million gallons (200,000 barrels, the entire contents of 1 full storage tank) spilled on project site	50,000 years	0.000025 per year per tank
Rail transport	Roughly 90,000 gallons (2,140 barrels or the contents of three full tank cars) spilled during a derailment along the PS&P rail line	250 years with current rail cars 370 years with rail car improvements	0.0041 per year with current rail cars 0.0027 with rail car improvements
	Roughly 150,000 gallons (3,570 barrels or the contents of five full tank cars) spilled during a derailment along the PS&P rail line	4,800 years with current rail cars 11,000 years with rail car improvements	0.00021 per year with current rail cars 0.00009 per year with rail car improvements
	900,000 gallons (21,400 barrels or the contents of 30 full tank cars) spilled during a derailment along the PS&P rail line	10,000 years with current rail cars 74,000 years with rail car improvements	0.0000014 per year with current rail cars 0.000007 per year with rail car improvements
Vessel transport	Up to 105,000 gallons (2,500 barrels) spilled into Grays Harbor from a vessel collision	120 years	0.008 per year
	Up to 1.2 million gallons (29,000 barrels) from a vessel grounding in Grays Harbor	740 years	0.0021 per year
	Up to 15.1 million gallons (360,000 barrels) or the entire contents of one full tanker, including fuel) spilled into Grays Harbor from a vessel allision at harbor entrance	360 years	0.0028 per year

[a] Event could occur once in number of years listed.

Construction and operational standards, equipment design, training and regulatory requirements for prevention of, preparedness for, and response to incidents involving the release of crude oil, in addition to the mitigation measures presented in Table S-1 would reduce the potential for impacts related to an oil spill, fire, or explosion. However, no mitigation measures would completely eliminate the possibility of a spill, fire, or explosion, nor would they completely eliminate the adverse consequences. Depending on the location of the incident, amount spilled, type of crude oil, and environmental conditions, such as the time of year, water flows, and weather conditions, the potential adverse environmental impacts could be significant.

Risk of Fire or Explosion

An incident involving a spill could result in a fire or explosion if there is an ignition source and combustible gases are present in a quantity that could ignite. The incident could cause sparking, which could ignite the spill. The extent of the damage would depend on numerous factors, including the cause of the incident, any fire suppression capabilities, and the timing and nature of response actions. It would also depend on the material: Bakken crude oil is more flammable than heavier crude oils. The flammability of diluted bitumen varies based on the diluent (diluting agent) used.

Although fires or explosions can result from spills resulting from events like collisions and derailments, long-term historical data show that most spills do not result in fires or explosions. A fire or explosion would be less likely to occur than a spill. While multiple recent derailments of trains on main lines have resulted in fires or explosions, the chance of an extreme derailment is very limited in the study area because of the relatively slower speeds on the PS&P rail line compared to typical mainline speeds. In general, large derailments from high-speed trains lead to releases from multiple rail cars. The energy involved in high-speed derailments and the resulting effect on rail cars yield the greatest chance of a fire that affects other rail cars and possibly results in an explosion. However, a spill of any size poses the potential risk of a fire or explosion depending on the conditions.

Building codes, equipment safety requirements, training, spill prevention, preparedness, and response requirements are intended to reduce the likelihood of a fire or explosion and the resulting environmental damage. Implementation of mitigation measures (Table S-1) would further reduce the risks; however, no measures could completely eliminate the possibility of a spill, fire, or explosion. Depending on the location of the incident, amount spilled, type of crude oil, and environmental conditions, such as the time of year, water flows, and weather conditions, the potential adverse environmental impacts could be significant.

Environmental Damage

Depending on the circumstances of each incident, the extent of damage would vary. Factors that influence the spread of oil or hazardous materials include the amount spilled, type of material, location, weather, and actions taken to contain or respond to the incident.

Spills of crude oil are considered hazardous. These materials can lead to injury or even death in plants, animals, and humans if prolonged exposure occurs. Additionally, Grays Harbor and the Chehalis River provide habitat for numerous sensitive and unique plant and animal species. The area also provides important commercial and recreational opportunities, including fishing and shellfish growing, and cultural, historical, and tribal resources. Potential impacts from oil spills, fires, or explosions are summarized by resource in Table S-3.

Table S-3. Environmental Damage from Oil Spills, Fires, or Explosions

Environmental Resource	Potential Impacts from Crude Oil Spill	Potential Impacts from Fire or Explosion
Water	Contaminated surface water and groundwater	Altered water chemistry
Plants	Stunted growth, impaired reproduction, and death; possible changes to overall community structure	Injury, death, and impaired reproduction; possible changes to overall community structure
Animals	Stunted growth, impaired reproduction, behavior changes, and death; possible changes to overall community structure	Injury, immigration, emigration, or death; possible changes to overall community structure
Aesthetics	Degraded views from oil buildup	Degraded views from burns
Recreation	Degraded or closed recreational areas	Degraded or closed recreational areas
Commercial Fishing	Restricted access to or closure of commercial fisheries	Restricted access to or closure of commercial fisheries
Cultural Resources	Contaminated historical resources, archaeological sites, and culturally important areas; possible damage during cleanup activities	Damaged historical and culturally sensitive properties
Tribal Resources	Degraded water quality; damage to fisheries, important plants and animals, and ceremonial qualities; possible damage and disturbance during cleanup activities	Degraded water quality; damage to fisheries, important plants and animals, and ceremonial qualities
Public Services	Disruption of public services; increased demand for emergency response services beyond existing capabilities	Disruption of public services; increased demand for emergency response services beyond existing capabilities
Air	Degraded air quality; potentially toxic fumes	Degraded air quality; potentially toxic fumes
Human Health	Respiratory problems; dizziness and nausea; eye, throat, and skin irritation, emotional and psychological stress; injury or death	Respiratory problems; dizziness and nausea; eye, throat, and skin irritation; emotional and psychological stress; injury or death

What are the potential impacts of extended rail and vessel transport?

This section summarizes potential impacts from rail and vessel transport in the extended study area. Chapter 5, *Extended Rail and Vessel Transport*, provides a full discussion.

The extended study area consists of the BNSF Railway Company (BNSF) mainline rail corridor from the Williston Basin in North Dakota[8] to Centralia, Washington, and the vessel routes along the U.S. West Coast to Puget Sound and California refineries, with a focus on Washington State.

Rail traffic related to the proposed action would account for a small percentage of BNSF rail traffic in Washington State: between 0.7 and 4.8% of 2035 rail traffic volume projections along the assumed

[8] The Williston Basin rail terminals are primarily in North Dakota but extend into Montana, South Dakota, and Saskatchewan, Canada.

routes; along the assumed routes for loaded trains, proposed action trips represent between 0.7 and 1.9% of 2035 estimates.

The proposed action could result in an increase in rail traffic along the BNSF main lines in the extended study area, which could affect rail capacity if BNSF does not take actions to address this growth. It is expected that BNSF will make the necessary investments or operating changes to accommodate the growth in rail traffic, but the timing of these actions is unknown.

In addition to potential impacts on rail capacity, routine rail transport along the BNSF main lines related to the proposed action could result in an incremental increase in the following impacts on the natural and built environment similar to existing conditions and the no-action alternative.

- Emission of ambient air pollutants and air toxics from train engine exhaust.
- Incidental leaks and spills from engines and tank cars.
- Train noise, including wayside noise from passing trains and horn noise at grade crossings.
- Vehicle delay at at-grade crossings, including disruption to emergency vehicle response times.
- Impacts on tribal resources.

Maximum annual vessel traffic related to the proposed action represents the following percentage of 2015 large commercial vessel traffic in major West Coast destinations: 4.5% of Puget Sound traffic, 4.0% of San Francisco Bay area traffic, and 3.2% of Los Angeles area traffic.

Vessel traffic related to the proposed action would have a negligible impact on vessel traffic in the extended study area. However, it could result in an incremental increase in the following impacts on the natural and built environment similar to existing conditions and the no-action alternative.

- Emission of ambient air pollutants and air toxics from vessel engine exhaust.
- Water quality impacts from incidental leaks.
- Introduction of invasive species through ballast water exchanges.
- Impacts on aquatic species from increased underwater noise and vibration, vessel strikes, and increased wake and propeller wash.
- Impacts on tribal resources.

In addition, rail and vessel transport of crude oil in the extended study area under the proposed action could increase the likelihood of rail and vessel incidents and related consequences (i.e., oil spills, fires, and explosions). However, the potential consequences would remain similar in nature and magnitude to those that could occur under existing conditions and the no-action alternative. Depending on the specific location of an incident (e.g., proximity to population centers, sensitive resources), the type of material released, the volume of the release, and the potential for ignition (e.g., fire, explosion), impacts could be significant.

What are the potential cumulative impacts?

This section summarizes the contribution of the proposed action to cumulative impacts. Chapter 6, *Cumulative Impacts*, provides a full discussion.

The analysis considered other reasonably foreseeable projects, past and present actions, and future conditions for cumulative impacts in the study area. These cumulative projects are the proposed

action, the REG (formerly Imperium Terminal Services) Expansion Project, the Grays Harbor Rail Terminal Project, and dredging for the Grays Harbor Navigation Improvement Project. The REG project currently includes handling crude petroleum, refined petroleum, and biological oils but REG has stated that they do not intend to handle crude oil and will revise their proposal. The crude oil proposal for the Grays Harbor Rail Terminal Project is no longer active; however, industrial growth is anticipated at this site between 2017 and 2037. Therefore, the analysis of cumulative impacts retains the original proposals for REG and Grays Harbor Rail Terminal considered in the Draft EIS. Future development at these sites would not include crude oil due to the revised zoning codes for the Cities of Hoquiam and Aberdeen.

Air

Air emissions associated with the cumulative projects are not anticipated to exceed applicable state and federal air quality standards; however, under worst-case conditions, the 1-hour standard for nitrogen oxides could be exceeded if all cumulative projects are conducting loading or unloading activities at the same time.

Greenhouse gas emissions would increase with the cumulative projects. Cumulative greenhouse gas emissions for onsite operations and offsite rail and vessel transport within the state, estimated at 118,447 metric tons of carbon dioxide equivalent per year, represent 0.13% of related 2011 statewide GHG emissions and approximately 0.26% of Washington State's 2050 statutory reductions. Greenhouse gas emissions from onsite operations, rail transport from and to the likely source and destination were estimated at 433,130 metric tons of carbon dioxide equivalent per year. Because crude oil handled under the cumulative projects is expected to replace crude oil from the Alaska North Slope and other more distant sources, emissions from roundtrip transport of crude oil between Valdez, Alaska, and the Port of Long Beach were estimated as a conservative representation of emissions offset by the proposed action. The resulting net greenhouse gas emissions from the cumulative projects were estimated at 263,620metric tons of carbon dioxide equivalent per year. This represents approximately 0.004% of national emission reduction targets for 2025, and 0.0006% of global emission reduction targets.

Greenhouse gas emissions from the cumulative projects would contribute to global greenhouse gas emissions, which contribute to climate change. Climate change affects Washington State and the region by increasing the risk of wildfires, floods, drought, increased temperatures, ocean acidification, and changes in precipitation. Climate change also contributes to sea level rise; however, no flooding from sea level rise is predicted at the project site.

Noise and Vibration

The cumulative projects would add 4.25 train trips per day to the 3 train trips per day under existing conditions. The increase in noise along the PS&P rail line could disturb residents and other sensitive groups. Using methods established by the Federal Rail Administration and Federal Transit Authority, assuming that the cumulative projects are operating at maximum throughput, the average daily noise increase related to horn soundings would have moderate impacts on 756 residents and severe impacts on 253 residents. Severe impacts would be most likely near grade crossing in Elma, Satsop, Montesano, East Aberdeen, Malone, Porter, and Rochester.

The cumulative projects would also result in an average daily noise increase related to wayside noise from passing trains. Between Elma and Satsop, 10 residences could be exposed to severe

impacts. Implementation of mitigation (Table S-1) to establish quiet zones for severe impacts identified for the proposed action would also reduce cumulative noise impacts. However, as long as train horns continue to sound for safety at these grade crossings, the potential for exposure to severe impacts at these crossings would remain.

Tribal Resources

At maximum throughput, operation of the cumulative projects would add 758 vessel trips to projected large commercial vessel trips along the navigation channel, for 1,082 trips in 2017 to 1,180 vessel trips in 2037 per year. This increased traffic and the increased occupancy of the Terminal 1 dock could disrupt tribal fishing in the navigation channel (from approximately the Crossover Channel Reach of the navigation channel to the turning basin upstream of Terminal 2) and adjacent to Terminal 1, respectively.

Vessel traffic would not likely affect Quinault Indian Nation tribal resources outside of the navigation channel (including crab fishing in the harbor). However, vessel operations could exclude tribal fishers from a portion of their typical fishing area within the navigation channel (from approximately the Crossover Channel Reach of the navigation channel to the turning basin upstream of Terminal 2). Conflicts would be greatest during the fall salmon fishery. Vessel traffic could also reduce access to marine fisheries (including crab) in the ocean because tribal fishers may not be able to cross the bar when tank vessels are moving into or out of the navigation channel. Implementation of mitigation (Table S-1) to coordinate docking schedules with fishing schedules, provide advance notice of vessel calls and movements, and work with Quinault Indian Nation tribal officials to identify other measures as appropriate could reduce the potential for these impacts.

Rail Traffic

The cumulative projects would add approximately 4.25 trips per day on average to the PS&P rail line to the approximately three trips per day under existing conditions. Based on modeling, the PS&P rail line has the capacity to handle up to 12 trips per day. Although the total number of minutes each day that grade crossings would be blocked along the PS&P rail line would increase, trains associated with the cumulative projects could be accommodated on the PS&P rail line with existing infrastructure and there would be no cumulative impacts on rail traffic.

Vehicle Traffic and Safety

Increased rail traffic associated with the cumulative projects, described above, would increase vehicle delays at grade crossings along the PS&P rail line. These delays would not be substantial for most of the rail line between Centralia and Aberdeen, because the chance of encountering a blocked grade crossing would remain relatively low.

Vehicle delay would be most substantial in Centralia and Aberdeen. Vehicle delay would be greatest if a train traveled to or from the project site during rush hour. In Aberdeen, rail operations on the PS&P rail line are heavily influenced by train movements related to Poynor Yard. Substantial vehicle delays would occur with the cumulative projects in Aberdeen from the eastern end of the Olympic Gateway Plaza (Fleet Street) to the Port area and in Centralia at Tower Street, Pearl Street, and H Street grade crossings.

Vehicles at grade crossings in Aberdeen would experience longer delays from switching operations between Poynor Yard and the project sites and between Poynor Yard and Olympic Gateway Plaza.[9] Currently, vehicles have to wait when trains block grade crossings in Olympic Gateway Plaza for up to 44 minutes per train. For the cumulative projects, this delay would increase to up to 52 minutes per train and would occur more frequently.

Vehicle delay would also substantially increase in the Port area near the project sites. Trains currently occupy grade crossings in this area for up to 13 minutes four times per week. This time would increase up to 22 minutes for the proposed action and up to 77 minutes for the REG (formerly Imperium Terminal Services) project. Vehicle delays at grade crossings could also cause congestion and delays at upstream intersections (east of the project sites).

Because vehicle delay would increase, emergency vehicle delay would also increase at grade crossings. Emergency access is most limited in the Olympic Gateway Plaza and Port of Grays Harbor areas where trains can block all access to certain properties because of switching operations.[10] Existing communication and response procedures for providing emergency access at blocked crossings would reduce impacts related to the cumulative project. Increased rail traffic related to the cumulative projects could increase the frequency of accidents along the PS&P rail line. The grade crossings that would have the shortest predicted intervals between accidents would be in Aberdeen near the Olympic Gateway Plaza and in the Port area because of switching operations involving Poynor Yard. Both vehicle delays and accident frequencies would generally improve by 2037 for some grade crossings because improvements such as grade-crossing protections are assumed to be implemented by then. Additionally, improvements considered for the East Aberdeen Mobility Project would likely improve both delay and safety at grade crossings in the Olympic Gateway Plaza area.

Implementation of mitigation (Table S-1) for impacts of the proposed action, including the applicant working with local jurisdictions to implement accepted measures to address these delays, could also reduce impacts from cumulative projects. Potential infrastructure changes in the future may also reduce impacts.

Vessel Traffic

At maximum throughput, the cumulative projects would add 758 tank vessel trips per year to projected large commercial vessel trips, for 1,082 trips in 2017 to 1,180 trips in 2037, annually. Considering the opportunities available for these vessels to travel through the harbor at various channel depths, the cumulative projects would not exceed the capacity of the navigation channel. The increase in vessel traffic would increase the demand for escort tugs and pilots in Grays Harbor but this demand could be managed with existing services.

Adding the maximum number of days that tank vessels related to the cumulative projects[11] (up to 319 days) would be docked at Terminal 1 to the number of days forecast for baseline vessels, the Terminal 1 berth would be occupied 363 days per year. Although this exceeds the number of days that the Terminal 1 berth would be available per year (90% of 365 days is equal to 328 days), it is

[9] Relates only to the proposed action and REG (formerly Imperium Terminal Services) Expansion Project.
[10] Assembling and disassembling unit trains and delivering and picking up rail cars to and from the project site.
[11] Only includes vessels related to the proposed action and REG (formerly Imperium Terminal Services) Expansion Projects, because vessels associated with the Grays Harbor Rail Terminal Project would call at Terminal 3.

based on very conservative assumptions.[12] Moreover, if tankers were used instead of tank barges, berth occupancy could be as low as 318 days per year and there would be sufficient capacity.

The increased vessel traffic could affect commercial fishing by disrupting fishing in the navigation channel, particularly from the Crossover Channel Reach of the navigation channel to the turning basin and at Terminal 1. Vessel traffic would not affect commercial or recreational fishing outside the navigation channel (including crab fishing in the harbor). Conflicts would only occur during the fall salmon fishery. Although it is difficult to predict whether the increased vessel traffic would result in an overall inability of a fisher to reach their limit, increased traffic could limit access to commercial fishing areas. Implementation of mitigation (Table S-1) related to the proposed action to announce vessel arrivals and departures would reduce these impacts further.

Environmental Health and Safety

The spill scenarios used in the risk assessment for the proposed action were also used to assess risks of the cumulative projects. These scenarios looked at terminal operations, rail transportation, and vessel transportation. The increased activities related to the cumulative projects would increase the potential for more frequent spills and the possibility of spilling crude oil. As shown in Table S-4, although the chance of an incident occurring is generally similar to the proposed action, the combined operations of the cumulative projects would result in an increased chance of an incident occurring compared to any single project, such as the proposed action, alone.

[12] Maximum number of vessels (tank barges) and a full 24 hours at dock for each tank barge.

Table S-4. Likelihood of an Incident for Select Spill Scenarios under Cumulative Conditions

Source	Spill Scenario	Occurrence Interval[a]	Probability of Occurrence
Small			
Project site	Up to 2,100 gallons (50 barrels) spilled when transferring oil from rail cars or to vessels at the project site	3 years	0.38 per year
Rail transport	Up to 1,000 gallons (24 barrels) spilled during a derailment along the PS&P rail line	29 years with current rail cars 31 years with rail car improvements	0.034 with current rail cars 0.032 with rail car improvements
Medium			
Project site	Represented by 10,000 gallons (238 barrels) spilled when transferring oil to a vessel at the project site	43 years	0.023 per year
	Represented by 50,400 gallons (1,200 barrels) spilled from pipeline or storage tank at the project site	450 years	0.0022 per year
Rail transport	Represented by 30,000 gallons (714 barrels or the contents of one full tank car) spilled during a derailment along the PS&P rail line	11 years with current rail cars 13 years with rail car improvements	0.0094 with current rail cars 0.0078 with rail car improvements
Large			
Project site	Up to 8.4 million gallons (200,000 barrels, the entire contents of 1 full storage tank) spilled on project site	9,000 years	0.00011 per year
Rail transport	Roughly 90,000 gallons (2,140 barrels or the contents of three full tank cars) spilled during a derailment along the PS&P rail line	73 years with current rail cars 110 years with rail car improvements	0.014 per year with current rail cars 0.0091 per year with rail car improvements
	Roughly 150,000 gallons (3,570 barrels or the contents of five full tank cars) spilled during a derailment along the PS&P rail line	1,400 years with current rail cars 3,300 years with rail car improvements	0.0007 per year with current rail cars 0.0003 per year with rail car improvements
	900,000 gallons (21,400 barrels or the contents of 30 full tank cars) spilled during a derailment along the PS&P rail line	22,000 years with current rail cars 44,000 years with rail car improvements	0.000046 per year with current rail cars 0.000023 per year with rail car improvements
Vessel transport	Up to 105,000 gallons (2,500 barrels) spilled into Grays Harbor from a vessel collision	45 years	0.022 per year
	Up to 1.2 million gallons (29,000 barrels) from a vessel grounding in Grays Harbor	128 years	0.0078 per year
	Up to 15.1 million gallons (360,000 barrels) or the entire contents of one full tanker, including fuel) spilled into Grays Harbor from a vessel allision at harbor entrance	116 years	0.0086 per year

[a] Event could occur once in number of years listed.

What are the potential economic impacts of the proposed action?

Economic impacts were analyzed in accordance with the Hoquiam Municipal Code. No additional economic analysis was conducted as part of the environmental review.

Construction

Construction would temporarily stimulate the economy through purchases of materials, supplies, equipment, and services; payroll to construction workers; and related indirect and induced effects. Construction would result in various tax revenues accruing to state and local governments.

Operations

Operation would likely result in increased employment and income associated with direct spending for labor salaries and material purchases. Additionally, these activities could result in indirect and induced employment and income impacts. The annual economic output of the proposed action in Grays Harbor County is estimated at $19.9 million. At full buildout, the proposed action would generate an estimated 36 direct jobs in Grays Harbor County.

What are the potential social policy impacts of the proposed action?

Construction

Construction would not result in elements that would bisect, disrupt, or isolate any established communities or change the existing community character, nor would it require relocating any residences or businesses. Construction would not have a significant impact on community welfare because it would not substantially degrade air quality, increase noise, reduce access to recreational facilities, or reduce property values. Construction would not result in the permanent relocation of workers from outside the study area, displacement of local residents, or the requirement for additional housing, and would not disproportionately affect minority and low-income populations.

Operations

Onsite operations of the proposed action would not require acquisition of new properties that would require relocating any residences or businesses, nor would it change the existing community character. Although the PS&P rail line is an existing facility, the increased traffic associated with the proposed action would have an impact on community cohesion in Aberdeen from increased vehicle delay. Vessel traffic and docked vessels associated with the proposed action would have an impact on community cohesion by disrupting commercial and tribal fishing that occurs in the navigation channel and at Terminal 1, respectively. The increase in vessels would limit the timing, duration, and physical area that could be fished.

Community welfare impacts off site would be related to noise, recreation, vehicle traffic, and environmental health and safety impacts as described in the respective sections above. Operation of the proposed action would have a limited potential to affect population demographics.

Routine onsite operations are not anticipated to result in significant environmental impacts and would, therefore, not be expected to disproportionately affect minority and low-income populations

around the project site. For rail and vessel transport, minority and low-income populations closest to the rail line and around Grays Harbor could be disproportionately affected. Potential disproportionate impacts from rail transport would include increased noise and vehicle delay. Potential disproportionate impacts would also include increased exposure to risks of incidents resulting in spills, fires, or explosions.

What are the costs and benefits of the proposed action to the City of Hoquiam?

Cost-benefit impacts were analyzed in accordance with the Hoquiam Municipal Code. No additional cost benefit analysis was conducted as part of the environmental review. Implementation of the proposed action would result in some economic and financial benefits to the City of Hoquiam as well as some costs. Table S-5 summarizes the main benefits and costs that are likely to occur as a result of the proposed action. When enough information was available, monetary estimates are provided in 2013 dollars. Costs that would be incurred in the event of a spill, fire, or explosion are discussed in general below and in more detail in Chapter 7, Section 7.3, Cost-Benefit Analysis.

Table S-5. Main Benefits and Cost of the Proposed Action to the City of Hoquiam (2013 Dollars)

Benefits	Quantification
Direct labor income during construction	Estimate: $3.8 million to $4.3 million
Annual direct labor income during each year of operations	Estimate: $195,000 to $260,000 per year
Additional labor income associated with indirect and induced jobs in during construction and operations	Not estimated
Property tax collections during construction	Estimate: $55,783
Property tax collections during each year of operations	Estimate: $467,161 per year
Additional tax collections during construction and operations from local sales and use tax, business and occupation tax and utility taxes	Not estimated
Costs	
Increased traffic delays	Previous studies estimate: $9.66 and $16.18 per person delayed in traffic, per hour, for local traffic $16.51 and $24.76 per person delayed in traffic, per hour, for intercity traffic
Increased exposure to traffic accidents risks	Previous studies estimate: $3,037 per person to $1.5 million per person involved in a traffic accident, depending on severity of incident
Cost of training for the City of Hoquiam Fire Department on flammable liquid fires risks and to review and practice material release emergency response	Not estimated
Potential decrease in property values	Previous studies estimate: $3,500 to $5,800 on average 3 to 5% for increases of 9 trips per day 5 to 20% for increases of 18 trips per day

In addition to those listed in Table S-5, other costs would be incurred in the event of an oil spill. These include direct, market, and nonmarket costs. Direct costs are associated with property damage, such as the market value of the oil spilled; damage to other property; reimbursement for

the state's expenses to respond; assess, and investigate an incident; penalties for violations of federal or state laws; and response and clean-up activities. Market costs include financial losses to local businesses forced to close in the aftermath of an oil spill incident, closure of commercial fisheries, and human health costs. Nonmarket costs include losses of public goods that are not valued in the market. These losses occur when nonpriced services, such as ecosystem services, clean air, clean water, and aesthetic quality, are affected.

What permits and plans apply to the proposed action?

The following permits and/or approvals would be required for the proposed action.

City

- City of Hoquiam Critical Areas Review for fish and wildlife habitat and geologically hazardous areas
- City of Hoquiam Shoreline Substantial Development Permit
- City of Hoquiam Conditional Land Use Permit
- City of Hoquiam Building Permit
- City of Hoquiam Grade and Fill Permit
- City of Hoquiam Fire Department Approval
- City of Hoquiam Demolition Permit
- City of Aberdeen Utility Services Agreement
- City of Aberdeen Critical Areas Review for fish and wildlife habitat and geologically hazardous areas
- City of Aberdeen Building Permit
- City of Aberdeen Grade and Fill Permit
- City of Aberdeen Fire Department Approval

State

- Washington State Department of Ecology National Pollutant Discharge Elimination System Construction Stormwater General Permit
- Washington State Department of Ecology Resource Conservation and Recovery Act Notice of Registration Update
- Washington State Olympic Region Clean Air Agency Approval Order
- Washington State Department of Ecology National Pollutant Discharge Elimination System Industrial Stormwater Permit
- Washington State Department of Ecology Spill Prevention Plan
- Washington State Department of Ecology Spill Contingency Plan
- Washington State Department of Ecology Facility Operations Manual
- Washington State Department of Ecology Oil Handling Facility Training and Certification Report

- Washington State Department of Ecology Oil Handling Facility Safe and Effective Threshold Report

Federal

- U.S. Environmental Protection Agency Facility Response Plan
- U.S. Environmental Protection Agency Spill Prevention Control and Countermeasure Plan
- U.S. Coast Guard Facility Response Plan
- U.S. Coast Guard Letter of Intent
- U.S. Coast Guard Oil Spill Response Plan
- U.S. Coast Guard Facility Security Plan and Facility Security Assessment
- U.S. Coast Guard Operations Manual Update

What are the potential unavoidable and significant adverse impacts?

Implementation of mitigation (Table S-1) would reduce but not completely eliminate significant adverse impacts on noise, tribal resources, vehicle traffic, and environmental health and safety. The following sections describe the unavoidable and significant adverse impacts of the proposed action.

Earth

Although the likelihood of a large-scale tsunami event is relatively low, such an event would likely cause unavoidable and significant adverse environmental impacts at or near the project site if the facility was not constructed to withstand it. If the storage tanks are constructed according to the inputs identified in Section 3.1.7.1, *Applicant Mitigation*, they are expected to withstand tsunami forces and provide full containment of contents during and after seismic and tsunami events. While the proposed facility may not be operational following a large seismic event, the storage tanks would contain materials until the materials could be safely recovered or the facility returns to operational status.

Noise

The proposed action would result in increased rail traffic that would increase the average noise levels along the PS&P rail line. These increases could result in impacts considered severe, based on the assessment methods developed by the Federal Transit Administration and adopted by the Federal Railroad Administration. These impacts would occur because of horns sounded for public safety near eight grade crossings, representing 33 receptors with up to eight receptors affected at any one grade crossing. Local communities can apply to the Federal Railroad Administration to establish a quiet zone to limit train horn sounding. Mitigation is proposed for the applicant to fund and support a process for the affected communities to establish quiet zones under the Federal Railroad Administration regulations. Quiet zones would eliminate impacts where implemented. Where not implemented, train horns would continue to sound for safety and the potential for exposure to severe impacts would remain.

Tribal Resources

Implementation of mitigation (Table S-1) would reduce but may not completely eliminate impacts on tribal resources. Vessels related to the proposed action would travel through and dock in usual and accustomed fishing areas in Grays Harbor. Under current and future conditions, increased vessel traffic could restrict access to tribal fishing areas in the navigation channel and adjacent to Terminal 1. This conflict is most likely during fall fishing for salmon, steelhead, and sturgeon. Because other factors besides vessel operations affect fishing opportunities, such as the number of fishers, fish distribution, timing, and duration of fish windows, the extent to which vessel operations related to the proposed action would affect tribal fishing is difficult to quantify.

Vehicle Traffic and Safety

Implementation of applicant mitigation measures (Table S-1) could reduce impacts on vehicle traffic but average and peak hour vehicle delays at the following grade crossings in Aberdeen would remain significant.

- Average hour: East Heron Street and Newell Street (Olympic Gateway Plaza area).
- Peak hour: Washington Street (Port of Grays Harbor area).

Addressing vehicle delay at the grade crossings at the Olympic Gateway Plaza area and between Poynor Yard and the project site would require the participation of a broad group of stakeholders in coordination with ongoing regional transportation planning efforts. Ongoing regional transportation planning efforts such as the East Aberdeen Mobility Project could reduce vehicle delay impacts and improve safety conditions at the Olympic Gateway Plaza area. In addition, other regional transportation planning efforts to reduce vehicle delay (such as grade separation, early-warning system, grade-crossing protections) would also help to reduce vehicle delay.

Environmental Health and Safety

Compliance with building codes, design and equipment requirements, and regulatory requirements that address prevention of, preparedness for, and response to incidents involving the release of crude oil and implementation of mitigation (Table S-1) would reduce impacts related to environmental health and safety. However, no mitigation measures would completely eliminate the possibility of a spill, fire, or explosion, nor would they completely eliminate the adverse consequences of a spill, fire, or explosion. Depending on the location of the incident, amount spilled, type of crude oil, and environmental conditions, such as the time of year, water flows, and weather conditions, the potential adverse environmental impacts could be significant.

The following resources could experience significant impacts.

- Water
- Plants
- Animals
- Aesthetics
- Recreation
- Commercial fishing

- Cultural resources
- Tribal resources
- Public services
- Air
- Human health

Cumulative Impacts

Compliance with best management practices, required permit conditions, and recommended mitigation would minimize the potential for the proposed action to result in impacts that would be cumulatively significant with the exception of potentially significant impacts on noise, tribal resources, vehicle traffic, and environmental health and safety. Therefore, the proposed action would contribute to unavoidable adverse impacts on these resources that would also have the potential to be cumulatively significant.

Next Steps

The Final EIS will be used by the local and state agencies in making permit decisions for the proposed action. After a required 7-day waiting period following issuance of the Final EIS, agency action may be taken on the proposed action, including evaluation and issuance of permits required for construction and operation. Construction of the proposed action could begin upon receipt of all required permits and approvals.

Table S-1. Summary of Impacts Requiring Mitigation

Environmental Resource	Potential Impact	Applicant Mitigation Measure(s) to Address Impact	Potential Unavoidable and Significant Adverse Environmental Impacts?
3.1 Earth	The addition of buildings, storage tanks, and related infrastructure carrying and storing crude oil could expose people to harm if damaged during a seismic event, such as an earthquake. Under the no-action alternative, the risk remains the same as current conditions.	• To minimize the potential for impacts at the project site related to unstable soils, the applicant will prepare the project site for construction as described in the applicant's geotechnical report (Hart Crowser 2013). ○ Recompact and/or over-excavate and replace areas observed to be soft, loose, wet, or yielding with structural fill. ○ Install a geotextile stabilization fabric, additional clean gravel material, and/or a greater thickness of fill if areas larger than 0.5 acre of exposed ground are unusually soft or disturbed. ○ In all disturbed areas during construction, remove any soft, loose, or organic zones and replace with structural fill. The upper material provides lateral support for pile foundations. In areas with pile and structural slab systems, rigorous preparation of the subgrade is not required. • To minimize the potential for damage to the storage tanks related to geologic risks and unstable soils, the applicant will install pile-supported foundations that extend to necessary depths to embed in competent soil required to resist seismic forces and maintain stability if liquefaction, lateral spreading, and settlement of surface soils occurs. • To minimize the potential for damage to the storage tanks related to geologic risks and unstable soils, the applicant will develop final design specifications for proposed structures based on the following updated standards/information, including additional site-specific evaluation for the easternmost portion of the project site. ○ U.S. Geological Survey ground-shaking report and maps released in July 2014 (Petersen et al. 2014). ○ American Petroleum Institute Standard 650 (2012). ○ International Building Code 2012. • To minimize the potential for spills and leaks that could occur at oil storage tank connection points, the applicant will design and install	No

Environmental Resource	Potential Impact	Applicant Mitigation Measure(s) to Address Impact	Potential Unavoidable and Significant Adverse Environmental Impacts?
		flush-mounted or internal automatic shut-off valves that allow the tanks to remain isolated from pipe distribution systems that may shear off or be damaged during seismic-related events.	
3.1 Earth	The proposed facility could expose workers at the project site to increased risks of harm from a tsunami. Although the likelihood of a tsunami would remain unchanged compared to existing conditions, the new facility would result in new infrastructure and additional workers that would be exposed to these risks. Under the no-action alternative, the risk remains the same as current conditions.	• The applicant will ensure that a tsunami evacuation and emergency management plan is prepared prior to beginning project operations. This plan will consider evacuation planning, identification of safe havens, and identification of evacuation routes to natural high ground and will be developed in coordination with emergency management officials (City of Hoquiam, Grays Harbor County, Washington State, U.S. Coast Guard, ship captains, and pilots).	No
3.1 Earth	The new storage tanks, and related infrastructure carrying and storing crude oil could rupture in the event of a tsunami and expose people and the environment to increased harm. Under the no-action alternative, the risk remains the same as current conditions.	• To reduce the potential for environmental damage related to a tsunami event, the applicant will conduct a study to assess the technical feasibility and cost of implementing measures to construct the proposed facility to withstand a Cascadia Subduction Zone (CSZ) L1M_W 9.0 tsunami wave based on the Scenario 2 inputs listed in Table 3 of the *Tsunami Impact Modeling and Analysis* (Appendix C). If ASCE 7 Standard, *Minimum Design Loads for Buildings and Other Structures, Chapter 6 – Tsunami Loads and Effects*, is adopted by future Uniform Building Code updates before project design is completed and is more protective, the updated standards will supersede the mitigation measure. Agreed-upon measures will be implemented prior to project design and construction in coordination with the co-lead agencies.	Yes
3.2 Air	Construction and operation of the proposed action would result in increased air emissions compared to the no-action alternative.	• The applicant will ensure that all engine-powered equipment and vehicles used in construction, operation, and maintenance at the facility are subject to a regular inspection and maintenance schedule in order to minimize air pollutant emissions, greenhouse gas	No

Environmental Resource	Potential Impact	Applicant Mitigation Measure(s) to Address Impact	Potential Unavoidable and Significant Adverse Environmental Impacts?
		emissions, and fuel consumption. Preventive maintenance activities will include but not be limited to the following actions. ○ Replacing oil and oil filters as recommended by manufacturer instructions. ○ Maintaining proper tire pressure in on-road vehicles. ○ Replacing of worn or end-of-life parts. ○ Scheduling routine equipment service checks. • The applicant will develop and implement an anti-idling policy for both construction and operation and ensure that equipment operators receive training on best practices for reducing fuel consumption in order to reduce project-related greenhouse gas emissions. The anti-idling policy will include required warmup periods for equipment and prohibit idling beyond these periods. The policy will define any exemptions where idling is permitted for safety or operational reasons, such as when ambient temperatures are below levels required for reliable operation. In addition, the use of technologies such as idle management systems or automatic shutdown features will be considered part of the policy. • To minimize idling from trains and vessels and resulting emissions, the applicant will coordinate with the Port of Grays Harbor and PS&P to manage waiting times for rail and vessel arrivals or departures.	
3.4 Plants/ 3.5 Animals	Increased vessel traffic related to the proposed action could increase the risk of spread of invasive species compared to the no-action alternative.	• To reduce the potential for impacts on aquatic plants from the increase in ballast water discharges during bulk liquid operations, the applicant will prepare an invasive species monitoring plan in consultation with Washington Department of Fish and Wildlife and implement prior to the start of the proposed operation.	No
3.6 Energy	Construction and operation of the proposed action would result in increased energy consumption compared to the no-action alternative, although this would not be a	• Voluntary Measure—To minimize energy use, the applicant will employ the most energy-efficient systems for all pumps, motors, electrical equipment, and process technology equipment as practicable. • Voluntary Measure—To minimize energy use, the applicant will apply U.S. Green Building Council Leadership in Energy and Environmental	No

Environmental Resource	Potential Impact	Applicant Mitigation Measure(s) to Address Impact	Potential Unavoidable and Significant Adverse Environmental Impacts?
	significant impact.	Design (LEED) Silver Standards to the design of new buildings.	
3.7 Noise and Vibration	Construction of the proposed action could result in short term, temporary increased in low levels of noise at the project site.	• To reduce construction noise at nearby sensitive receptors, the applicant will maintain construction and maintenance equipment in good working order with properly functioning mufflers to control noise.	No
3.7 Noise and Vibration	Increased rail traffic related to the proposed action would increase average noise levels for residents and other sensitive groups along the PS&P rail line.	• To address increased noise from rail traffic related to the proposed action that would result in severe impacts on sensitive receptors, the applicant will fund and support a process for the affected communities to establish quiet zones under the Federal Railroad Administration (FRA) regulations. FRA regulations apply to rail corridors with more than one crossing within 0.5 mile, in which case all crossings must be considered. Crossings equipped with signage only will be upgraded to active warning devices (light and gates, constant warning train detection) and other required safety standards. Crossings with existing active warning devices will also likely need to be upgraded to meet minimum standards. If FRA does not approve the quiet zones, the applicant will work with PS&P and fund the installation of wayside horns at crossings to reduce noise impacts. Elimination of locomotive horn sounding at the affected grade crossings would reduce impacts from increased horn noise. Quiet zones and crossings can be established using a procedure established in FRA regulations. The quiet zone allows the installation of enhanced safety measures at grade crossings such that train horns would not be required to be used. Implementation of a quiet zone is subject to FRA approval. Quiet zones include measures to maintain the level of safety while reducing noise. Occasional train horn noise will occur even if quiet zones are established; for example, in situations such as trespassers along the tracks or signal malfunctions.	Yes

Environmental Resource	Potential Impact	Applicant Mitigation Measure(s) to Address Impact	Potential Unavoidable and Significant Adverse Environmental Impacts?
3.9 Aesthetics, Light and Glare	The proposed action would result in new structures that would be visible from surrounding areas although the overall impact would not be significant.	• To reduce potential glare, the applicant will ensure the proposed storage tanks are of a tone that blends into the surrounding landscape and/or match the existing facility tank paint or insulation, appropriate to the existing design and without affecting air emissions for the surrounding structures. • To ensure that lighting at the project site does not conflict with other land uses, the applicant will coordinate with the Port of Grays Harbor to develop the proposal for project lighting.	No
3.10 Recreation	Increased vessel loading activity at the Terminal 1 dock from the proposed action could result in disruption to the attendees of the annual Grays Harbor Shorebird Festival.	• Voluntary Measure—To acknowledge the importance of the annual Grays Harbor Shorebird Festival to the community and its visitors and to eliminate the potential for a spill from vessel-loading operations occurring during the festival, the applicant will coordinate with the City of Hoquiam to receive advance notice of the date for and will halt crude oil vessel-loading operations for a period of 2 weeks each year overlapping with the event.	No
3.10 Recreation	Increased vessel traffic related to the proposed action could disrupt recreational vessels although the overall impact would not be significant.	• While fishing boats are required to follow the U.S. Coast Guard navigation rules, to improve awareness of vessel traffic in the navigation channel, the applicant will work with the Grays Harbor Safety Committee, including the U.S. Coast Guard and Port of Grays Harbor, to establish procedures to announce project-related vessel traffic arrivals and departures over a designated VHF marine radio channel at least 1 hour before arriving and departing.	No
3.11 Cultural Resources	There is a low but increased possibility that construction activities involving ground disturbance could result in impacts on otherwise unknown archaeological resources compared to the no-action alternative.	• To reduce the risk of disturbing undocumented cultural resources, the applicant will prepare an unanticipated discovery plan to address previously unidentified archaeological resources should any be discovered during the construction of the proposed action. The applicant will submit the plan to the Washington State Department of Archaeology and Historic Preservation before construction. The plan will contain provisions requiring that if archaeological resources are uncovered during excavations, construction activities will cease immediately and the applicant will notify the City of Hoquiam, the Department of Archaeology and Historic Preservation, the Quinault Indian Nation, and the Confederated Tribes of the Chehalis	No

Environmental Resource	Potential Impact	Applicant Mitigation Measure(s) to Address Impact	Potential Unavoidable and Significant Adverse Environmental Impacts?
		Reservation. In such cases, the applicant will provide for a site inspection and evaluation by a professional archaeologist to ensure that all possible valuable archaeological data are properly salvaged or mapped. • The applicant will have a qualified professional archaeologist monitor ground-disturbing activities that would result in the excavation and exposure of subsurface deposits at depths greater than 15 feet below the current ground surface. If archaeological monitoring reveals fill deposits at greater depths, these results will be used to establish a 100-foot buffer around the location of the discovery in which no additional archaeological monitoring would be needed to the maximum depth at which fill deposits have been documented.	
3.12 Tribal Resources	Increased vessel activity related to the proposed action would increase the potential for conflict with tribal fishing in Grays Harbor compared to the no-action alternative.	• To mitigate potential impacts on tribal fishing, the applicant will coordinate with the Quinault Indian Nation and Washington Department of Fish and Wildlife, annually, as requested, to support review and possible adjustments of docking schedules to minimize conflict with fishing schedules negotiated preseason by the state and tribe. Consultation will account for operations, including anticipated vessel movements related to the proposed action. • While tribal fishing boats are required to follow the U.S. Coast Guard navigation rules, to improve awareness of vessel traffic in the navigation channel, the applicant will work with the Grays Harbor Safety Committee, including the U.S. Coast Guard and Port of Grays Harbor, to establish procedures to announce project-related vessel traffic arrivals and departures over a designated VHF marine radio channel at least 1 hour before arriving or departing. • To mitigate impacts on access to tribal treaty fishing areas, the applicant will initiate a process between stakeholders and Quinault Indian Nation tribal officials to discuss and identify additional mitigation measures. Initiation of the process between the parties will occur before vessel operations begin.	Yes

Environmental Resource	Potential Impact	Applicant Mitigation Measure(s) to Address Impact	Potential Unavoidable and Significant Adverse Environmental Impacts?
3.14 Hazardous Materials	Construction of the proposed action could increase the risk of exposing hazardous materials potentially present at the project site compared to the no-action alternative.	• If groundwater or odiferous, stained, or discolored soil is encountered during construction activities, or if groundwater encountered is suspected to be contaminated during construction activities, the following mitigation measures will be implemented. ○ The applicant will seek the professional recommendation of a consultant specializing in the handling and identification of hazardous materials and contaminated media. ○ If deemed necessary, based on the above consultation, the applicant will conduct soil and/or groundwater testing for identification of possible hazardous materials. ○ Construction personnel will isolate and cover suspect soil until analytical results are reviewed by qualified personnel. ○ The consultant will compare analytical results to the applicable U.S. Environmental Protection Agency's regional screening levels, which address common environmental pollutants. If hazardous materials are discovered in the soils and/or groundwater at levels above the regional screening levels, the consultant will provide recommendations on the steps required for proper treatment and/or removal and disposal of the contaminated media.	No
3.16 Vehicle Traffic and Safety	Increased rail traffic related to the proposed action would result in substantial increases in vehicle delay at the Olympic Gateway Plaza and between Poynor Yard and the project site compared to the no-action alternative.	• To mitigate vehicle traffic impacts associated with rail operations of the proposed action, the applicant will work with the City of Hoquiam, City of Aberdeen, Port of Grays Harbor, Grays Harbor Council of Governments, and PS&P to address vehicle delay between the project site and Poynor Yard. Washington State Department of Transportation (WSDOT), the City of Hoquiam, City of Aberdeen, and Port of Grays Harbor will approve proposed measures for the areas where they are responsible for vehicle delay. The applicant will ensure measures are in place prior to beginning the proposed operations. The proposed changes should include an evaluation of impacts on potentially affected low-income and minority populations. • To mitigate vehicle traffic impacts associated with rail operations related to the proposed action, the applicant will work with the City of Hoquiam, City of Aberdeen, Port of Grays Harbor, Grays Harbor	Yes

Environmental Resource	Potential Impact	Applicant Mitigation Measure(s) to Address Impact	Potential Unavoidable and Significant Adverse Environmental Impacts?
		Council of Governments, and PS&P to address vehicle delays at PS&P grade crossings into and out of the Olympic Gateway Plaza. WSDOT, the City of Hoquiam, City of Aberdeen, and Port of Grays Harbor will approve proposed measures for the areas where they are responsible for vehicle safety. The applicant will ensure acceptable measures are in place prior to beginning the proposed project operations. The proposed changes should include an evaluation of impacts on potentially affected low-income and minority populations.	
3.16 Vehicle Traffic and Safety	Increased rail traffic related to the proposed action could result in increased in emergency responses times compared to the no-action alternative if alternative access was not available.	• To address the potential for emergency access conflicts to areas along the PS&P rail line during unplanned unit train stoppages, the applicant will work with PS&P and local emergency service providers along the PS&P rail line to develop and implement a notification protocol to inform local emergency service providers and other interested parties of the duration and magnitude of the unplanned stoppages. The notification protocol will be in place prior to the beginning of operations involving transport of crude oil. • To reduce the potential for increased delay of emergency vehicles at PS&P grade crossings during project operations, the applicant will work with local emergency service providers to provide advance notification of incoming trains. • To improve the timeliness of emergency response, the applicant will work with the Aberdeen and Hoquiam Fire Departments and private landowners along the unpaved road on the south side of the PS&P rail line and west of F Street to identify options for first responder access to properties in this area.	No
3.17 Vessel Traffic	Increased vessel activity related to routine operations of the proposed action could result in the need for increased coordination among stakeholders in the Port of Grays Harbor.	• To improve vessel management and situational awareness and to reduce potential risk of incident of vessel collision or allision in Grays Harbor, the applicant will fund and work with U.S. Coast Guard, Washington State Department of Ecology, Port of Grays Harbor, and Grays Harbor Safety Committee to propose, develop, and implement a formalized vessel management system. The vessel management system will include the ability to schedule, track, and monitor vessel movements in the harbor and off the entrance to the harbor. The	No

Environmental Resource	Potential Impact	Applicant Mitigation Measure(s) to Address Impact	Potential Unavoidable and Significant Adverse Environmental Impacts?
		vessel management system will be active prior to the applicant beginning the proposed operations. If a rule is adopted under RCW 88.16, Pilotage Act, prior to beginning operations, the requirements of the new rule would be followed. The vessel management system will assist in the following actions. ○ Ensure vessel traffic is limited while a laden tank vessel is in the navigation channel. ○ Prohibit the transit of any other deep-draft vessels within the south channel reach (just off Westport) to Terminal 1 in both directions whenever a laden tank vessel is transiting within the same channel. ○ Include real-time automatic identification system tracking and monitoring. • To improve vessel management and reduce the risk of an incident, the applicant will coordinate with the Port of Grays Harbor and as a member of the Grays Harbor Safety Committee, work to develop and implement specific procedures for escorting, tethering, refueling, and emergency maneuvering to control laden tank vessels. The procedures must be drafted prior to the proposed operations beginning. These procedures should be included in the Grays Harbor Safety Plan. At a minimum, these must include the following elements. ○ Escort configurations and maneuvering characteristics of escorted tankers and tank barges. ○ Specific emergency connection and tethering procedures for connection of escort tugs to tankers and tank barges. ○ Specific maneuvers necessary for the escort tug to maintain control of the tanker while transiting Grays Harbor waters specifically during incidents of loss of propulsion or steering or in bad weather. ○ Appropriate safe speed of transit in Grays Harbor when escort tugs are tethered. ○ Guidelines for tanker or tank barge bridge team to rapidly	

Environmental Resource	Potential Impact	Applicant Mitigation Measure(s) to Address Impact	Potential Unavoidable and Significant Adverse Environmental Impacts?
		recognize and respond to a loss of power or steering. By improving recognition and reaction time, the escort tugs can more effectively steer the vessel through the navigation channel upon incident. ○ Requirement for a pretransit conference. ○ Requirements for refueling of the vessel.	
3.17, Vessel Traffic	Increased vessel traffic related to the proposed action could result in conflicts with commercial fishing vessels.	• While commercial fishing boats are required to follow the U.S. Coast Guard navigation rules, to improve awareness of vessel traffic in the navigation channel, the applicant will work with the Grays Harbor Safety Committee, including the U.S. Coast Guard and Port of Grays Harbor, to establish procedures to announce project-related vessel traffic arrivals and departures over a designated VHF marine radio channel at least 1 hour before arrival and departure.	No
4.4, Environmental Health Risks-Terminal (Onsite)	The proposed action would increase the potential for an incident involving a spill, fire, or explosion of crude oil during onsite operations compared to the no-action alternative.	• To improve response effectiveness in the case of a spill, provide information to support oil spill modeling, identify specialized spill response or prevention equipment for the facility prevention plan and contingency plan, and assist with determinations of safe and effective conditions for prebooming, the applicant will purchase an equipment and software package to supplement information on environmental conditions. Information will include tides, currents, wave heights, wind (speed and direction), air temperature, water temperature, and barometric pressure. This information should be provided for the following locations: at the facility, at the entrance to Grays Harbor, at Oakville on the Chehalis River. In addition, the applicant will purchase and stage a current measuring device that includes direction and velocity at the facility dock. The system will be in place before construction begins. Data will be provided to Ecology at 6, 12, and 18 months after the system is in place. At least 12 months of data will be provided before operations begin. • To improve oil recovery in the case of a spill during vessel loading at the dock, the applicant will retain a licensed engineer to perform an independent engineering analysis and feasibility study. The engineer	Yes

Environmental Resource	Potential Impact	Applicant Mitigation Measure(s) to Address Impact	Potential Unavoidable and Significant Adverse Environmental Impacts?
		will determine the number of days per year it is safe and effective to preboom oil transfers and will identify site-specific improvements. The applicant will submit the study to Ecology for review and approval before operations begin. If approved, the applicant will implement improvements from the study. • If the study identifies no feasible alternative or until the changes are in place, and if prebooming is not feasible, the applicant will implement the following alternative measures during oil transfers in addition to those measures already required by regulation: ○ One oil spill response vessel with crew, skimmer, and at least 1,000 feet of boom at the dock. ○ On-water tank barge storage devices (not including bladders) prestaged at the dock with the skimmer to ensure a minimum of 450 barrels of recovery ready to be deployed.	
4.4, Environmental Health Risks-Terminal (Onsite)	The proposed action would increase the potential for environmental damage from an incident involving the spill of crude oil during onsite operations compared to the no-action alternative. Potential impacts are described in general terms in Section 4.7, *Impacts on Resources*, and apply to the resources described in greater detail in Chapter 3, *Affected Environment, Impacts, and Mitigation Measures*.	• To improve contingency planning and response actions and to minimize potential impacts, the applicant will gather and provide data to improve the GNOME Location File for Grays Harbor. The data will assist in developing trajectories for the GNOME and TAP oil spill models. To support model development and use, the applicant will collect remote sensing data at the facility location, at the entrance to Grays Harbor, at Oakville on the Chehalis River. The data provided will be sufficient so that the models can complete the following actions: ○ Predict how wind, currents, and other processes might move and spread oil spilled on the water. ○ Depict a relative distribution of spilled oil movement in Grays Harbor from the entrance to the Pacific Ocean to a point upstream in the Chehalis River near Oakville, Washington. ○ Predict a spills trajectory based on a worst-case spill scenario from spills at the terminal, from vessels transiting to and from the terminal, and from derailments along the PS&P rail line. The applicant will coordinate with Ecology to ensure the data meets the identified criteria. A peer review of the model will be funded by the	Yes

Environmental Resource	Potential Impact	Applicant Mitigation Measure(s) to Address Impact	Potential Unavoidable and Significant Adverse Environmental Impacts?

		applicant using a third-party reviewer as approved by Ecology. Data will be gathered and the peer review conducted before operations for the proposed facility begin.
		• To reduce the risks and impacts from an oil spill, prior to beginning the proposed operations the applicant will conduct a study to identify an appropriate level of financial responsibility for the potential costs for response and cleanup of oil spills, natural resource damages, and costs to state and affected counties and cities for their response actions. The study should address the factors in RCW 88.40.025, Evidence of Financial Responsibility for Onshore or Offshore Facilities, including a reasonable worst-case spill volume; the cost of cleaning up the spilled oil; the frequency of operations at the facility; prevention measures employed by the facility that could reduce impacts through spill containment, immediate discovery, and shutoff times; and the damages that could result from the spill (including restoration). The study should identify any constraints related to the commercial availability and affordability of financial responsibility. Based on the study, Ecology will determine the appropriate level of financial responsibility and require the applicant to demonstrate their financial responsibility to the satisfaction of Ecology. Proof of financial responsibility will be included as documentation in the applicant's contingency plan.
		• To improve oil recovery in the case of a spill, equipment required at hour 6 under WAC 173–182–355 must be resident in Grays Harbor. Additionally, the applicant must purchase and stage the following equipment in Grays Harbor:
		  ○ An additional 200 feet of boom and temporary storage of at least 196 barrels with the ability to collect, contain, and separate collected oil from water. The additional boom should be capable of encountering oil at advancing speeds of at least 2 knots in waves. This boom will be of a type appropriate for the operating environment.
		  ○ An additional 1,000 feet of shore seal boom.	

Environmental Resource	Potential Impact	Applicant Mitigation Measure(s) to Address Impact	Potential Unavoidable and Significant Adverse Environmental Impacts?
		• To improve oil recovery in the case of a spill of crude oil that weathers, sinks or submerges, the applicant will ensure access through agreements or contracts to have the following equipment available. The equipment will be capable of being on scene within 12 hours of spill notification and the means of access will be documented in the applicant's contingency plan and available prior to beginning operations. ○ Sonar, sampling equipment or other methods to locate the oil on the bottom or suspended in the water column. ○ Containment boom, sorbent boom, silt curtains, or other methods to contain the oil that may remain floating on the surface or to reduce spreading on the bottom. ○ Dredges, pumps, or other equipment necessary to recover oil from the bottom and shoreline. ○ Equipment necessary to assess the impact of such discharges. ○ Other appropriate equipment necessary to respond to a discharge involving the type of oil handled, stored, or transported. • To reduce the impacts from an oil spill, the applicant will establish and implement a procedure for blocking all drains on the dock prior to oil transfers and observing the area for discharges before removal. This best practice will be documented in the facility operations manual for approval by Ecology.	
4.4, Environmental Health Risks-Terminal (Onsite)	The proposed action would result in increased need for local emergency service response services that could exceed capacity.	• Voluntary Measure—Supply three totes of alcohol-resistant aqueous film-forming foam at the project site for use by local fire departments. • To improve preparedness for incidents, including oils spills, explosions, and fires, the applicant will ensure an emergency preparedness workshop is conducted prior to beginning project operations. The applicant will coordinate the workshop with Ecology. The workshop will be no more than 1 day in length and will be held prior to beginning operations and thereafter will become part of the facility drill program. The initial workshop will focus on familiarizing local emergency responders, tribes, and communities with the	Yes

Environmental Resource	Potential Impact	Applicant Mitigation Measure(s) to Address Impact	Potential Unavoidable and Significant Adverse Environmental Impacts?
		contents of the Northwest Area Contingency Plan, the Grays Harbor and Chehalis Geographic Response Plans, other local response plans, the facility response plan, and the measures that are in place for a rapid and effective spill response • To improve the capability of local emergency responders to respond to spills, fires, or explosions at or near the project site, the applicant will contribute a fair share of the total cost to replace the City Hoquiam Fire Department's fire apparatus to ensure it is able to handle crude oil fires. Equipment must be available and operational prior to beginning operations. The applicant will consult with the local fire departments to determine specifications for the equipment. The total applicant contribution will be determined by the City and applicant through negotiation at the time of the equipment purchase. • To improve response times and communication in the event of an incident that could affect tribal resources, the applicant will include tribal contacts (names and/or phone numbers) in notification protocols in the oil spill contingency plan. • To reduce risks related to an explosion or fire onsite, the applicant will meet with local emergency management officials including representatives from the City of Hoquiam and City of Aberdeen Fire Departments to identify training needs for local responders who will respond to an emergency on the project site. This effort will include development and execution of a training program for those responders to increase level of awareness and understanding of the hazards associated with a rail tank car incident or a storage tank incident onsite. The training will include identification of notification protocols, use of personal protective equipment, and equipment deployment procedures. This training will be completed before the applicant begins receiving oil trains and will be offered at least annually.	
4.5, Environmental Health Risks -	Increased rail transport related to the proposed action would increase the	• Voluntary Measure—To reduce potential risk from tank car punctures and spills identified with use of DOT-111 tank cars for transport of Bakken crude oil, the applicant will not accept crude oil by rail unless	Yes

Environmental Resource	Potential Impact	Applicant Mitigation Measure(s) to Address Impact	Potential Unavoidable and Significant Adverse Environmental Impacts?
Rail Transport	likelihood of an incident involving a spill, fire, or explosion of crude oil along the PS&P rail line compared to the no-action alternative.	the following actions occur. • The rail cars meet or exceed the new U.S. Department of Transportation specification 117 design or performance criteria. • Existing tank cars are retrofitted in accordance with the U.S. Department of Transportation-prescribed retrofit design or performance standard (80 FR 26643). • To improve the safe transport of crude oils with different volatilities and sinking tendencies, the applicant will not accept crude oil by rail unless the applicant has received verification that a sample of the oil has been tested and properly classified and characterized. • To reduce risks of a spill due to a rail incident, the applicant will not accept crude oil unit trains by rail unless the train has in place a functioning two-way end-of-train device or distributed power for operations on the PS&P rail line to the local yard. • To reduce the risks of derailments and impacts on rail infrastructure due to increased rail traffic and the weight of crude oil trains, the applicant will not accept crude oil by rail until PS&P verifies track integrity based on an evaluation of load limits. The evaluation will be completed prior to beginning operations.	

Environmental Resource	Potential Impact	Applicant Mitigation Measure(s) to Address Impact	Potential Unavoidable and Significant Adverse Environmental Impacts?
4.5, Environmental Health Risks - Rail Transport	Increased rail traffic related to the proposed action would result in increased potential for environmental damage from an incident involving the spill of crude oil compared to the no-action alternative. Potential impacts are described in general terms in Section 4.7, *Impacts on Resources*, and apply to the resources described in greater detail in Chapter 3, *Affected Environment, Impacts, and Mitigation Measures*.	• Due to sensitivity of the local environment, tribal resource concerns, and the potential presence of special-status species, to improve coordination and response capabilities in the event of a rail incident, the applicant will not accept crude oil by rail unless PS&P prepares, submits to Ecology for approval, and implements a contingency plan meeting the requirements identified below. This requirement will remain in place until state contingency plan requirements for railroads are implemented by Ecology pursuant to ESHB 1449, Section 5, and/or amendments to the federal oil spill response plan rule (49 CFR 130) is adopted. ○ Disclose full details of the method of response to spills to various sizes. ○ Define a worst-case spill planning volume. ○ Identify response notification and coordination procedures. ○ Identify personnel assigned to implement the plan. ○ Reference applicable Washington State geographic response plans. ○ Describe a training and exercise program for personnel and equipment. ○ Identify prepositioned spill containment and cleanup equipment and trained personnel. ○ Identify arrangement for enlisting qualified and trained cleanup personnel to implement the plan. ○ Describe how plan relates to other relevant contingency plans, such as facility plans, other rail plans, including federal oil spill response plans, and regional plans. ○ Ensure equipment identified that is necessary for determining air quality conditions but not available through local agencies or fire departments will be made available to local fire departments.	Yes
4.5, Environmental Health Risks - Rail Transport	The proposed action would result in increased need for local emergency service response services that could	• Voluntary Measure—Supply three totes of alcohol-resistant aqueous film-forming foam at the project site for use by local fire departments. • To improve preparedness for incidents, including oils spills, explosions, and fires, the applicant will ensure an emergency	Yes

Environmental Resource	Potential Impact	Applicant Mitigation Measure(s) to Address Impact	Potential Unavoidable and Significant Adverse Environmental Impacts?

	exceed capacity.	preparedness workshop is conducted prior to beginning project operations. The applicant will coordinate the workshop with Ecology. The workshop will be no more than 1 day in length. It will be held prior to beginning operations and thereafter will become part of the facility drill program. The initial workshop will focus on familiarizing local emergency responders, tribes, and communities with the contents of the Northwest Area Contingency Plan, the Grays Harbor and Chehalis Geographic Response Plans, other local response plans, the facility response plan, and the measures that are in place for a rapid and effective spill response.6
		• To increase the timeliness of responses to spills and incidents involving trains and to maximize coordination of responses along the PS&P rail line, the applicant will not accept crude oil by rail unless the following measures are completed.
		  ○ PS&P participates with the local fire districts in a public safety drill at least once every 2 years.
		  ○ PS&P tests one geographic response plan strategy annually and invites Ecology to participate. This requirement will remain in place until state contingency plan requirements for railroads are implemented by Ecology pursuant to ESHB 1449, Section 5.
		  ○ PS&P participates in testing the applicant's oil spill contingency plan with a rail scenario at least once every 3 years. This drill will be designed with Ecology and scheduled on the regional drill calendar.
		• To improve response capability for spills that may occur on the Chehalis River, the applicant will coordinate with Ecology to advertise and extend registration of Vessels of Opportunity to the Chehalis River and to tribal boat owners prior to beginning operations. Applicants for the Vessel of Opportunity Program should be directed to www.oilspills101.wa.gov for information and registration.
		• To improve capability to respond to potential incidents involving trains transporting crude oil to the project site, the applicant will not accept crude oil until a foam truck has been provided to the Elma Fire	

Environmental Resource	Potential Impact	Applicant Mitigation Measure(s) to Address Impact	Potential Unavoidable and Significant Adverse Environmental Impacts?
		Department. The foam truck will provide fire-fighting capability along the PS&P rail line. The foam truck must be available and operational prior to beginning operations. The applicant will consult with Ecology and the local fire department to determine the capacity of the foam truck. • To improve response times to reduce the initial impacts of an oil spill, the applicant will ensure that two trailers containing the spill response equipment listed below are available prior to beginning crude oil operations for use by initial local and emergency responders along the PS&P rail line. This equipment will be offered to fire departments along the PS&P rail line and the Chehalis Indian Tribe. The trailer and equipment will be maintained by the applicant and inspected annually. The equipment will only be provided to fire departments and Chehalis Tribe if they agree to store the equipment in a secure location and ensure the equipment used by appropriately trained personnel. The applicant will work with Ecology and local emergency officials to update the Western Region Response List website (www.wrrl.us), any applicable spills response plans to address the emergency equipment caches and to document notification protocols, necessary training, use of personal protective equipment, and equipment deployment procedures. Mobile trailers of a specific size to hold the below equipment: ○ 3,000 feet of river boom ○ 5,000 feet of sausage sorbent boom ○ 30 anchoring systems (anchors, lines, floats) ○ 20 shoreside anchoring systems ○ 1 towing bridle ○ 4 heaving lines ○ 1 machete (or other vegetation cutting tool) ○ 1 pair of bolt cutters ○ 50 sandbags ○ 1 roll plastic sheeting	

Environmental Resource	Potential Impact	Applicant Mitigation Measure(s) to Address Impact	Potential Unavoidable and Significant Adverse Environmental Impacts?
		○ 4 each plywood sheets (4 feet by 8 feet) ○ 500 feet 3/8-inch poly line ○ PPE: coveralls or Tyvek ® disposable suits, gloves, outer (chemical-resistant and disposable) boots, safety glasses or chemical splash goggles, hard hats - sufficient for 5 people • To improve local emergency planning and response, the applicant will fund development of a geographic information system layer that identifies critical facilities near the proposed facility and along the PS&P line. The facilities will include schools, hospitals, community centers, and parks within 0.5 mile of the rail line. The GIS layer will be provided to the Local Emergency Planning Commission, local fire departments, and Ecology. The study will be submitted prior to beginning operations. • To improve response capability and protect human health, the applicant will contract with an experienced air-monitoring consultant to respond with equipment and personnel for incidents. The contract will be incorporated into the facility's contingency plan and will be approved by Ecology. The contract will be in place prior to beginning operations. • To reduce risks related to an oil spill, the applicant will not accept crude oil by rail until PS&P meets with local emergency management officials to identify training needs for local responders who will respond to an emergency on the PS&P rail line. This effort will include development and execution of a training program to these responders to increase level of awareness and understanding of the hazards associated with an oil train incident. The training will include identification of notification protocols, use of personal protective equipment, equipment deployment procedures. This training will be completed before the applicant begins receiving oil trains and will be offered at least annually. • To improve response capability on the Confederated Tribes of the Chehalis Reservation lands in the case of an oil spill, the applicant will ensure that an annual 1-day hazard awareness oil spill training for	

Environmental Resource	Potential Impact	Applicant Mitigation Measure(s) to Address Impact	Potential Unavoidable and Significant Adverse Environmental Impacts?

		identified Chehalis tribal members is provided, including conducting and inviting tribal members to participate in drills.
		• To improve response capability in the Grays Harbor area in the case of an oil spill, the applicant will ensure an annual one-day hazard awareness oil spill training is provided for identified Quinault Indian Nation tribal members, including conducting and inviting tribal members to participate in drills.
		• To increase the timeliness and maximize the coordination of responses to spills and incidents involving crude oil trains along the PS&P rail line, the applicant will ensure the Grays Harbor Local Emergency Planning Committee's emergency response plan is updated to address the applicant's operations. This information must be included prior to beginning operations.
		• To improve oil recovery in the case of a spill, equipment required at hour 6 under WAC 173-182- 355 must be resident in Grays Harbor. Additionally, the applicant must purchase and stage in Grays Harbor:
		  ○ An additional 200 feet of boom and temporary storage of at least 196 barrels with the ability to collect, contain, and separate collected oil from water. The additional boom should be capable of encountering oil at advancing speeds of at least 2 knots in waves. This boom shall be of a type appropriate for the operating environment.
		  ○ An additional 1,000 feet of shore seal boom.
		• To improve oil recovery in the case of a spill of crude oil that weathers, sinks or submerges, the applicant will ensure access through agreements or contracts to provide the following equipment. The equipment will be capable of being on scene within 12 hours of spill notification and the means of access will be documented in the applicant's contingency plan and available prior to beginning operations.
		  ○ Sonar, sampling equipment or other methods to locate the oil on the bottom or suspended in the water column.
		  ○ Containment boom, sorbent boom, silt curtains, or other methods	

Environmental Resource	Potential Impact	Applicant Mitigation Measure(s) to Address Impact	Potential Unavoidable and Significant Adverse Environmental Impacts?
		to contain the oil that may remain floating on the surface or to reduce spreading on the bottom. ○ Dredges, pumps, or other equipment necessary to recover oil from the bottom and shoreline. ○ Equipment necessary to assess the impact of such discharges. ○ Other appropriate equipment necessary to respond to a discharge involving the type of oil handled, stored, or transported. • To improve the capability of local emergency responders to respond to spills, fires, or explosions at or near the project site, the applicant will contribute a fair share of the total cost to replace the City Hoquiam Fire Department's fire apparatus to ensure it is able to handle crude oil fires and with foam capabilities is available to for the. Equipment must be available and operational prior to beginning operations. The applicant will consult with the local fire departments to determine specifications for the equipment. The total applicant contribution will be determined by the City and applicant through negotiation at the time of the equipment purchase.	

Environmental Resource	Potential Impact	Applicant Mitigation Measure(s) to Address Impact	Potential Unavoidable and Significant Adverse Environmental Impacts?
4.6, Environmental Health Risks-Vessel Transport	Increased vessel transport related to the proposed action would increase the likelihood of an incident involving the spill of crude oil within Grays Harbor compared to the no-action alternative.	• Due to sensitivity of the local environment, tribal resource concerns, and the potential presence of sensitive species, to reduce the risk of incident from loss of propulsion, loss of steering, grounding, or severe weather, the applicant will not receive or load crude oil to tankers or tank barges unless the vessels have tug escorts through Grays Harbor as described below. This requirement will remain in place until rules are implemented pursuant to ESHB 1449, Section 12, at which time the rules will apply to the proposed action. ○ At least one tug must accompany a laden tanker or tank barge carrying oil between the Hoquiam River and Grays Harbor entrance, and two tugs (one escort tug and one assist tug) must assist the vessel during mooring procedures. ○ For laden tankers, the escort tug must be appropriately tethered while transiting Grays Harbor. ○ Tugs must have an aggregate shaft horsepower equivalent to at least 5% of the deadweight tons of the escorted oil tanker or tank barge. ○ Tugs must have sufficient mechanical capabilities to provide for safe escort. • To ensure adequate safety for tug operations and thereby reduce the risk of an incident, the applicant will not receive or load crude oil to tankers or tank barges unless the vessels supply Grays Harbor pilots and tug companies with bollard pull capacities of the vessels prior to entering Grays Harbor. • To reduce potential risk of incident of vessel collision or allision in Grays Harbor, the applicant will provide funding for and work with the U.S. Coast Guard, Ecology, Port of Grays Harbor, and Grays Harbor Safety Committee to propose, develop, and implement a formalized vessel management system. The vessel management system will include the ability to schedule, track, and monitor vessel movements in the harbor and off the entrance to the harbor. The vessel management system will be active prior to the applicant beginning the proposed operations. If a rule is adopted under RCW 88.16, Pilotage	Yes

Environmental Resource	Potential Impact	Applicant Mitigation Measure(s) to Address Impact	Potential Unavoidable and Significant Adverse Environmental Impacts?
		Act, prior to beginning operations, the requirements of the new rule would be followed. To reduce potential risk of vessel collision while in Grays Harbor, the vessel management system should act as follows. ○ Ensure vessel traffic is limited while a laden tank vessel is in the navigation channel. ○ Ensure that no other deep-draft vessels are in the navigation channel when a laden tank vessel is transiting the channel. ○ Include real-time Automatic Identification System tracking and monitoring. • To reduce the risk of a fire or explosion from tank barges, the applicant will not receive or supply Bakken crude oil to tank barges unless the tank barges are able to inert their tanks when carrying Bakken crude oil. • To reduce the risk of an incident, the applicant will coordinate with the Port of Grays Harbor and, as a member of the Grays Harbor Safety Committee, work to develop and implement specific procedures for escorting, tethering, and emergency maneuvering to control laden tank vessels. The procedures must be drafted prior to the proposed operations beginning. These procedures should be included in the Grays Harbor Safety Plan. At a minimum, these procedures must include the following elements. ○ Escort configurations and maneuvering characteristics of escorted tankers and tank barges. ○ Specific emergency connection and tethering procedures for connection of tugs to tankers and tank barges. ○ Specific maneuvers necessary for the tug to maintain control of the tanker while transiting Grays Harbor waters specifically during incidents of loss of propulsion or steering. ○ Appropriate safe speed of transit in Grays Harbor when tugs are tethered. ○ Guidelines for tanker or tank barge bridge team to rapidly	

Environmental Resource	Potential Impact	Applicant Mitigation Measure(s) to Address Impact	Potential Unavoidable and Significant Adverse Environmental Impacts?
		recognize and respond to a loss of power or steering. By improving recognition and reaction time, the tug can more effectively steer the vessel through the navigation channel upon incident. ○ Requirement for a pretransit conference. ○ Refueling operations. • To reduce the risk of an incident during vessel refueling, the applicant will ensure that any tank barges loaded with fuel for purposes of refueling vessels at the project site follow the navigation and safety mitigation measures for crude oil tank barges described in this section. • To reduce the potential for a spill from a vessel incident, the applicant will allow only tankers with independent fuel tanks (i.e., not located next to the hull) at the dock. To improve response times and increase coordination of responses, the applicant will develop and implement a program approved by Ecology to educate its tankers and tank barge customers on the reporting requirements for vessel incidents resulting in a threat of a spill under RCW 88.46.100, Notification of Vessel Emergencies Resulting in Discharge of Oil, prior to beginning the proposed operations.	
4.6, Environmental Health Risks-Vessel Transport	Increased vessel traffic related to the proposed action would result in increased potential for environmental damage from an incident involving the spill of crude oil compared to the no-action alternative. Potential impacts are described in general terms in Section 4.7, *Impacts on Resources*, and apply to the resources described in greater detail in Chapter 3, *Affected Environment,*	• To improve response times and communication in the event of an incident that could affect commercial or recreational fishing, the applicant will develop a method for provide information on potential incidents to commercial and recreational fishing boats and will describe this measure in the oil spill contingency plan prior to beginning operations. • To improve oil recovery in the case of a spill, equipment required at hour 6 under WAC 173-182–355 must be resident in Grays Harbor. Additionally, the applicant must purchase and stage the following equipment in Grays Harbor: ○ An additional 200 feet of boom and temporary storage of at least 196 barrels with the ability to collect, contain, and separate collected oil from water. The additional boom should be capable of encountering oil at advancing speeds of at least 2 knots in waves.	Yes

Environmental Resource	Potential Impact	Applicant Mitigation Measure(s) to Address Impact	Potential Unavoidable and Significant Adverse Environmental Impacts?
	Impacts, and Mitigation Measures.	This boom will be of a type appropriate for the operating environment. ○ An additional 1,000 feet of shore seal boom. • To improve oil recovery in the case of a spill of crude oil that weathers, sinks or submerges, the applicant will ensure access through agreements or contracts to have the following equipment available. The equipment will be capable of being on scene within 12 hours of spill notification and the means of access will be documented in the applicant's contingency plan and available prior to beginning operations. ○ Sonar, sampling equipment or other methods to locate the oil on the bottom or suspended in the water column. ○ Containment boom, sorbent boom, silt curtains, or other methods to contain the oil that may remain floating on the surface or to reduce spreading on the bottom. ○ Dredges, pumps, or other equipment necessary to recover oil from the bottom and shoreline. ○ Equipment necessary to assess the impact of such discharges. ○ Other appropriate equipment necessary to respond to a discharge involving the type of oil handled, stored, or transported. • To improve response times and communication in the event of an incident that could affect tribal resources, the applicant will include tribal contacts (names and/or phone numbers) in notification protocols in the oil spill contingency plan.	
4.6, Environmental Health Risks-Vessel Transport	The proposed action would result in increased need for local emergency service response services that could exceed capacity.	• Voluntary Measure—Supply three totes of alcohol-resistant aqueous film-forming foam at the project site for use by local fire departments. • To improve marine firefighting capabilities in Grays Harbor, the applicant will ensure that marine firefighting equipment (i.e., nozzle and pump) is available to and can be installed in a boat owned by the Grays Harbor Sheriff. The equipment will be available before operations. Specifications will be determined through discussions with the Grays Harbor Sheriff.	

Environmental Resource	Potential Impact	Applicant Mitigation Measure(s) to Address Impact	Potential Unavoidable and Significant Adverse Environmental Impacts?
6.5.1, Air (Cumulative Impacts)	Increased air emissions under cumulative conditions could exceed acceptable levels of nitrogen oxides near Poynor Yard and at the project site.	• In order to identify NOx emissions if the proposed action, REG (formerly Imperium Terminal Services) Expansion Project and Grays Harbor Rail Terminal Projects are permitted, Westway, REG, and Grays Harbor Rail Terminal will ensure air monitoring stations are installed to monitor the NO_2 emissions at or near the facility prior to the third proposed facility beginning operations. Air monitoring reports will be submitted to Olympic Region Clean Air Agency annually. If levels are observed to be approaching the National Ambient Air Quality Standards, then additional measures could be required in the agency's air permit.	No
7.0 Economics, Social Policy, Cost Benefit Analysis	Operation of the proposed action could result in an increased need to establish ways to provide and share information with the public and City of Hoquiam.	• The applicant will appoint a community liaison to consult with affected communities, businesses, and agencies; develop cooperative solutions to address local concerns; be available for public meetings; and conduct periodic public outreach. The applicant will provide the name, telephone number, and email address of the community liaison to mayors and other local officials in each community through which the PS&P rail line passes. • The applicant will appoint a tribal liaison to assist in addressing issues of concerns to federally recognized tribes; develop cooperative solutions to tribal concerns; be available for tribal meetings; and conduct periodic outreach. The applicant will provide the name, telephone number, and email address of the tribal liaison to officials of each tribe that wish to be notified. • The applicant will submit quarterly reports to the City of Hoquiam on the progress of, implementation of, and compliance with all mitigation measures. The reporting period for these reports will begin the first quarter after permit issuance and continue quarterly through the first year of project operations after which the applicant will submit a report annually through the first 5 years of operation.	No

WESTWAY EXPANSION PROJECT

FINAL ENVIRONMENTAL IMPACT STATEMENT

City of Hoquiam
609 8th Street
Hoquiam, WA 98550

Washington State Department of Ecology
300 Desmond Drive SE
Lacey, WA 98503

September 2016

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Acronyms and Abbreviations

°C	degrees Celsius
°F	degrees Fahrenheit
µg/m^3	micrograms per cubic meter
AGP	Ag Processing, Inc.
ALLSITES	Facility/Site Identification System Listing
AMC	Aberdeen Municipal Code
API	American Petroleum Institute
applicant	Westway Terminal Company, LLC
AR-AFFF	alcohol-resistant aqueous film-forming foam
ASIL	acceptable source impact level
ATB	articulated tug-barge
BMP	best management practice
BNSF	BNSF Railway Company
Btu	British thermal unit
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Federal Comprehensive Environmental Response, Compensation, and Liability Information System
CFR	Code of Federal Regulations
cfs	cubic feet per second
Chehalis	Confederated Tribes of the Chehalis Reservation
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
CSCSL NFA	Confirmed and Suspected Contaminated Sites – No Further Action
CSZ	Cascadia Subduction Zone
CTC	Centralized Traffic Control
CWCOG	Cowlitz-Wahkiakum Council of Governments
DAHP	Washington State Department of Archaeology & Historic Preservation
dBA	A-weighted decibels
DNL	day-night sound level
DPM	diesel particulate matter
DPS	distinct population segment
Ecology	Washington State Department of Ecology
EIS	environmental impact statement
EMS	emergency medical services

EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ESHB	Engrossed Substitute House Bill
FAST Act	Fixing America's Surface Transportation Act
FEMA	Federal Emergency Management Agency
FINDS	Facility Index System/Facility Registry System
FR	Federal Register
FRA	Federal Railroad Administration
FRA/FTA Manual	Transit Noise and Vibration Impact Assessment
FTA	Federal Transit Administration
g	gravity
GHCOG	Grays Harbor Council of Governments
GHG	greenhouse gas
GIS	geographic information system
GMA	Growth Management Act
GRP	geographic response plan
HMC	Hoquiam Municipal Code
Hz	hertz
IMPLAN	Impact Analysis for Planning Model
IPCC	Intergovernmental Panel on Climate Change
kg CO_2 per mmBtu	kilograms of carbon dioxide per million British thermal unit
kHz	kilohertz
Ldn	day-night sound level
Leq	equivalent sound level
Leq [h]	hourly equivalent sound level
LOS	level of service
LUST	leaking underground storage tank
MANIFEST	Hazardous Waste Manifest Information
MHHW	mean higher high water
MLLW	mean lower low water
$MMTCO_2e$	million metric tons of carbon dioxide equivalent
MP	milepost
mph	miles per hour
M_W	moment magnitude scale
N_2O	nitrous oxide
NAAQS	national ambient air quality standards
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NIMS	National Incident Management System

nm	nautical miles
NO_2	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NO_X	nitrogen oxide
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NTSB	National Transportation Safety Board
O_3	ozone
OPA 90	Oil Pollution Act of 1990
PGA	peak ground acceleration
PHMSA	Pipeline and Hazardous Materials Safety Administration
PM10	particulate matter with a diameter of 10 micrometers or less
PM2.5	particulate matter of 2.5 micrometers or less
Port	Port of Grays Harbor
ppb	parts per billion
proposed action	Westway Expansion Project
PS&P	Puget Sound & Pacific Railroad
PUD	Public Utility District
QIN	Quinault Indian Nation
Quinault	Quinault Indian Nation
RCRA	Resource Conservation and Recovery Act Information
RCW	Revised Code of Washington
REG project	REG (formerly Imperium Terminal Services) Expansion Project
SEL	sound exposure level
SEPA	State Environmental Policy Act
SMA	Shoreline Management Act
SO_2	sulfur dioxide
SOSC	State-On-Scene Coordinator
SQER	small quantity emission rate
SQG	small quantity generator
SR	State Route
SR 105	State Route 105
SR 109	State Route 109
SR 507	State Route 507
SR 520	State Route 520
TMDL	total maximum daily load
TPC	train performance calculator
TWC	Traffic Warrant Control
U.S.C	United States Code

UP	Union Pacific
US 101	US Highway 101
US 12	US Highway 12
USACE	U. S. Army Corp of Engineers
USCG	U.S. Coast Guard
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VCP	Voluntary Cleanup Program
VdB	velocity decibels
VHF	very high frequency
VOC	volatile organic compound
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WISAARD	Washington Information System for Architectural and Archaeological Records Database
WNHP	Washington Natural Heritage Program
WRIA	Watershed Resources Inventory Area
WSDOT	Washington State Department of Transportation
WUTC	Washington Utilities and Transportation Commission

Appendices

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Chapter 1
Introduction

1.1 What is the proposed action?

Westway Terminal Company LLC (applicant) proposes to expand its existing bulk liquid storage and distribution facility at the Port of Grays Harbor (Port) in Hoquiam, Washington. The expansion would enable the applicant to receive crude oil by train, store it on site, and load it onto tank vessels for shipment to refineries located primarily on the West Coast (proposed action). At full build-out, the expansion would enable the applicant to receive approximately 751.8 million gallons (17.9 million barrels) of crude oil per year and store 42 million gallons (1 million barrels) at one time. The proposed action would include constructing up to five storage tanks, each with a capacity of 8.4 million gallons (200,000 barrels), and the pumps and pipelines required to connect the tanks to vessel loading facilities at the Terminal 1 dock and an expanded onsite rail unloading area.

Chapter 2, *Proposed Action and Alternatives*, provides a detailed description of the existing and proposed facilities and operations at the project site.

1.2 Why was this document prepared?

This final environmental impact statement (Final EIS) addresses the environmental impacts associated with the proposed action. The EIS was prepared under the Washington State Environmental Policy Act (SEPA) Chapter 43.21C of the Revised Code of Washington [RCW]), the SEPA Rules (Chapter 197-11 Washington Administrative Code [WAC]), and the City of Hoquiam Municipal Code (HMC) 11.10.

The proposed action triggers SEPA review because it requires state and local permits. The Final EIS supports decisions regarding the issuance of these permits. The Washington State Department of Ecology (Ecology) and City of Hoquiam are serving as co-lead agencies in the development of the Final EIS.

The co-lead agencies issued a determination of significance on April 4, 2014, and requested public and agency comments on the scope of the Draft EIS. The Draft EIS scoping period concluded on May 27, 2014 (scoping comments are included in Appendix A, *Scoping Comments*). The co-lead agencies established the scope of the Draft EIS based, in part, on comments received during the scoping period, and identified elements of the environment that should be addressed in the Draft EIS. Accordingly, the Draft EIS addressed the potential impacts on earth; air; water; plants; animals; energy and natural resources; noise and vibration; land and shoreline use; aesthetics, light, and glare; recreation; historic and cultural preservation; tribal resources; public services and utilities; hazardous materials; rail traffic; vehicle traffic and safety; vessel traffic; and environmental health and safety. The Draft EIS also considered economics, social policy, and the costs and benefits of the proposed action consistent with HMC 11.10.160.

The co-lead agencies issued the Draft EIS for public review and comment on August 31, 2015. Public comments were received between August 31 and November 30, 2015. All comments received during the comment period were reviewed, compiled, and considered in the development of this Final EIS.

All comments and responses to those comments are presented in this Final EIS. The Final EIS reflects updates based on public comments, updated analysis, and new or revised regulations as described below in Section 1.4, *What changes are reflected in the Final EIS?*

1.3 How is this document organized?

The remainder of this Final EIS is organized as follows.

Chapter 2, Proposed Action and Alternatives. Chapter 2 provides a description of the proposed action (project location and existing and proposed facilities and operations), construction schedule and methods, and the no-action alternative.

Chapter 3, Affected Environment, Impacts, and Mitigation. Chapter 3 describes existing conditions in the study area, environmental impacts that would likely result from the proposed action and no-action alternative, and any measures to mitigate impacts of the proposed action. The chapter is subdivided into 17 sections, with each section addressing one element of the environment and the potential impacts related to construction and routine operations. Chapter 3, Section 3.0, *Introduction,* provides an overview of the scope and approach to completing the analysis of impacts.

- 3.0 Introduction
- 3.1 Earth
- 3.2 Air
- 3.3 Water
- 3.4 Plants
- 3.5 Animals
- 3.6 Energy and Natural Resources
- 3.7 Noise and Vibration
- 3.8 Land and Shoreline Use
- 3.9 Aesthetics, Light, and Glare
- 3.10 Recreation
- 3.11 Historic and Cultural Preservation
- 3.12 Tribal Resources
- 3.13 Public Services and Utilities
- 3.14 Hazardous Materials
- 3.15 Rail Traffic
- 3.16 Vehicle Traffic and Safety
- 3.17 Vessel Traffic

Chapter 4, Environmental Health and Safety. In addition to potential impacts associated with routine operations, the proposed action could result in impacts from potential incidents (e.g., storage tank failures, train derailments, vessel collisions) and related consequences (e.g., spills of

crude oil, fires, or explosions). Chapter 4 addresses the likelihood of various spill scenarios related with onsite operation of the proposed facility and offsite rail and vessel transport in the study area and describes potential impacts related to oil spills, fires, and explosions. This section also includes a discussion of the regulatory framework for spill prevention and preparedness and emergency service response, and identifies any additional measures that would be required to mitigate the impacts of the proposed action.

Chapter 5, Extended Rail and Vessel Transport. Chapter 5 addresses the impacts associated with transporting crude oil beyond the study area addressed in Chapters 3 and 4. It is expected this would most likely entail the transport of Bakken crude oil to the project site by rail from the Williston Basin in North Dakota and transport from the project site by vessel to refineries on the West Coast. However, transport could vary depending on the volume, source, and final market for delivery. This chapter considers existing and projected (where available) traffic in these areas and addresses potential impacts related to routine transport and risk.

Chapter 6, Cumulative Impacts. Chapter 6 addresses the potential impacts of the proposed action when considered in combination with all other past, present, and reasonably foreseeable future projects.

Chapter 7, Economics, Social Policy, and Cost-Benefit Analysis. As required by the City of Hoquiam Municipal Code 11.10.160, Chapter 7 addresses economics, social policy, and the costs and benefits related to the proposed action. Because the cost-benefit analysis informs the City of Hoquiam's decision regarding issuance of the land use permits, the scope of the analysis is limited to potential costs and benefits to the residents of Hoquiam.

Chapter 8, Distribution List. Chapter 8 lists the individuals, agencies, and companies that received notice of the Draft and Final EIS.

Chapter 9, References. Chapter 9 lists the references cited in the Final EIS.

Appendix A, Scoping Comments. This report presents all written comments received during the public scoping comment period.

Appendix B, Applicable Regulations. This appendix presents regulations applicable to the proposed action and related rail and vessel transport.

Appendix C, Tsunami Impact Modeling and Analysis. This technical memorandum presents the results of analysis and numerical modeling of tsunami wave generation and propagation to estimate elevation of inundation in the project area during the design tsunami event and determine possible forces on oil tank structures from the tsunami wave during the design earthquake event.

Appendix D, Air Data. This appendix presents information on existing air quality conditions and estimated emissions of criteria air pollutants and air toxins related to construction and operation of the proposed action.

Appendix E, FEMA Flood Insurance Rate Maps. This appendix presents current Federal Emergency Management (FEMA) flood mapping for the project site.

Appendix F, Special-Status Species. This appendix lists all special-status plant and animal species known to occur in the study area counties.

Appendix G, Noise Data. This appendix presents the results of the technical noise surveys conducted in the study area, including horn and wayside noise levels and counts of sensitive noise receptors affected at all grade crossings.

Appendix H, Local Policies Governing Land and Shoreline Use. This appendix presents the City of Hoquiam and City of Aberdeen policies governing land and shoreline use.

Appendix I, Local Policies Governing Aesthetics, Light, and Glare. This appendix presents the City of Hoquiam and City of Aberdeen policies governing aesthetics, light, and glare.

Appendix J, Cultural Resources Technical Report. This appendix presents the cultural resources study, which characterizes cultural resources sensitivity and describes potential impacts of the proposed action on these resources.

Appendix K, Rail Traffic Technical Information. This appendix provides information on the basics of rail operations and characteristics, defines common railroad terminology, presents graphic simulations and data tables of current scheduled traffic and typical traffic patterns, and illustrates how switching operations occur.

Appendix L, Vehicle Traffic Analysis. This appendix presents the results of the vehicle traffic and safety analysis, including vehicle grade-crossing delay and safety and emergency vehicle access under existing conditions, the no-action alternative, and the proposed action. Attachment L-1, *Vehicle Traffic Modeling*, presents the specific PS&P rail line grade crossings considered in the analysis and describes information sources and how impacts were evaluated.

Appendix M, Risk Assessment Technical Report. This appendix presents the detailed methods, assumptions, sources of data, and results for the likelihood that different spill scenarios could occur from onsite operation of the proposed facility and offsite rail and vessel transport in the study area.

Appendix N, Oil Spill Modeling. This appendix presents information about how various factors interact to influence the movement of spilled oil and depicts the movement of oil spilled at the facility or from a train or tank vessel under different combinations of weather and water flow conditions specific to the study area. This appendix also presents the methods, assumptions, and tools used in modeling oil spills.

Appendix O, Economic Impact Analysis. This appendix presents the analysis of economic impacts of construction and operation of the proposed action.

Appendix P, Census Block Group Data. This appendix presents data on minority and low-income populations in the study area census block groups.

Appendix Q, Crude Oil Market Analysis. This appendix presents information about existing and projected oil production at the likely sources of crude oil, existing and planned infrastructure to move the projected volumes of oil, and the potential for the proposed action to result in additional crude oil development and production at these sources. The analysis also considers the implications of the recently lifted ban on the export of crude oil and the potential for crude oil transloaded under the proposed action to be exported.

1.4 What changes are reflected in this Final EIS?

The Final EIS reflects the following changes to the Draft EIS. In general, revisions have been made to clarify details of the proposed action, correct inadvertent errors, provide additional information related to the analysis of impacts, and refine and present additional mitigation measures to address potentially significant impacts. No new or more significant impacts were identified as a result of these updates. Substantive revisions are identified below.

Chapter 2, Proposed Action and Alternatives

- The applicant's objective for the proposed action, which was presented in the Draft EIS *Summary*, has been added to this Final EIS along with the supporting conditions.
- Additional detail has been added to describe onsite operations (automated monitoring) and storage tank construction.
- Text has been added to clarify that bunkering is not included in the proposed action.
- The no-action alternative description has been revised to clarify that the analysis did not consider another development at the project site.

Chapter 3, Affected Environment, Impacts, and Mitigation

- **Section 3.0, Introduction.** The description of the alternatives analyzed has been revised to clarify that impacts are identified in the Draft EIS for the life of the proposed action and proposed mitigation measures are intended to apply for the life of the proposed action as well.
- **Section 3.2, Air**
  - The cancer risk analysis for diesel particulate matter has been updated to reflect revised assumptions regarding rail operations based on information from PS&P. The revised analysis resulted in lower emissions that are not considered significant; therefore, mitigation to conduct monitoring for diesel particulate matter has been removed.
  - Greenhouse gas emissions estimates from rail and vessel transport have been revised to include emissions beyond Washington State. The estimates reflect rail transport from the likely source (Williston Basin, North Dakota) and vessel transport to the furthest likely destination (Port of Long Beach, California). In addition, roundtrip emissions between Valdez, Alaska, and Port of Long Beach have been estimated to represent offset transport emissions of crude oil likely replaced by the crude oil transported under the proposed action.
  - A discussion of potential odor impacts from the proposed action has been added.
  - Emissions estimates have been updated to reflect the applicant's revised notice of construction (air permit) application. The application was updated to reflect recently published crude oil data. As a result, emission estimates for two criteria pollutants—carbon monoxide and volatile organic compounds—changed. In both cases emissions decreased from those presented in the Draft EIS. Emissions of all air toxics changed; the updated emissions are still under regulatory thresholds for all air toxics.
- **Section 3.4, Plants.** A discussion of potential impacts on plants from emissions related to the proposed action has been added.

- **Section 3.5, Animals.** Birds of Conservation Concern and additional special-status species and critical habitat have been identified in the study area. Additional information has been provided on several species in the study area, including Chinook salmon, whales and other marine mammals, and sea turtles. Information has been added to the discussion of potential impacts on animals from routine rail transport.
- **Section 3.12, Tribal Resources**. The description of Quinault Indian Nation fishing methods and gear has been updated and the related impacts clarified. A discussion of potential impacts on tribal hunting has been added. Details have been added to the discussion of impacts on access to tribal resources from rail traffic. Impacts on tribal fishing from vessel activity have been clarified.
- **Section 3.15, Rail Traffic.** Revisions include adding the results of recent bridge inspections; a description of PS&P operating guidelines related to track maintenance, inspection, and safety in handling for any crude oil trains in the study area; and the requirements of the Federal Railroad Administration's bridge management program.
- **Section 3.16, Vehicle Traffic and Safety**. Clarifying information has been added on existing emergency response procedures and communication protocols between PS&P and the Aberdeen and Hoquiam Fire Departments if a train is blocking access to a crossing. Details regarding emergency access impacts at Olympic Gateway Plaza and Port of Grays Harbor areas have been clarified. An additional mitigation measure related to access to industrial areas south of the PS&P line near the Port of Grays Harbor has been added.
- **Section 3.17, Vessel Traffic.** The capabilities of the tugs stationed in Grays Harbor have been clarified. Additional information on vessel traffic management has been included. The discussion of impacts on tug availability has been expanded. Potential impacts on commercial fishing have been clarified.

Chapter 4, Environmental Health and Safety

- **Section 4.1, Introduction.** The basis for selecting the various spill scenarios considered in the risk analysis has been clarified. Because risk figures have been deleted from Sections 4.4, 4.5, and 4.6, the description of qualitative terms used in Chapter 4 to describe the magnitude of environmental consequences depicted in the figures has also been deleted.
- **Section 4.2, Applicable Regulations**. Updated information about new or revised state and federal regulations pertaining to facility operations and the transport of crude oil by rail and vessel has been added. Requirements and existing local emergency response capabilities for preparing for and responding to a potential incident involving the release of crude oil have been clarified.
- **Section 4.3, Risk Considerations.** Information has been added about the types of crude oil likely to be handled, stored, and transported related to the proposed action, including a broader range of chemical properties, weathering behaviors, and unique response and cleanup considerations.
- **Section 4.4, Environmental Risks—Terminal (Onsite), Section 4.5, Environmental Risks—Rail Transport, and Section 4.6, Environmental Risks—Vessel Transport.** These sections have been revised to include a fuller discussion of the existing preparedness and response capabilities and requirements and the potential for impacts to occur under the no-action alternative. Section 4.5 has been updated to reflect additional incidents along the PS&P rail line

since the release of the Draft EIS. The risk figures (depicting the range of risks related to the proposed action) have been replaced with a fuller discussion of the potential impacts of the proposed action, the risk assessment methods (from Appendix M, *Risk Assessment Technical Report*), and the potential for significant unavoidable impacts to occur. Additional mitigation measures have been added to help address the potential for the environmental impacts described in Section 4.7, *Impacts on Resources.*

- **Section 4.7, Impacts on Resources.** The type and range of potential environmental consequences that could occur as the result of a spill, fire, or explosion have been clarified. This includes information regarding the potential for impacts on air quality, human health, tribal and commercial fishing, and public services and information about past incidents during rail transport. This section has also been revised to clarify that the potential impacts identified in Section 4.7 could also affect the resources listed in Chapter 3, *Affected Environment, Impacts, and Mitigation*.

Chapter 5, Extended Rail and Vessel Transport. A discussion has been added regarding the likely sources and destinations for crude oil transloaded under the proposed action and the potential for the proposed action to induce growth at these sources, based on the analysis in Appendix Q, *Crude Oil Market Analysis*. In addition, this section has been revised to clarify the anticipated rail and vessel routes to and from the project site, existing and projected (where available) rail and vessel traffic along these routes, and the types and magnitude of impacts that could occur under existing conditions, the no-action alternative, and the proposed action.

Chapter 6, Cumulative Impacts. This section has been revised to reflect applicable updates to the analysis of impacts of the proposed action described above.

Chapter 7, Economics, Social Policy, and Cost-Benefit Analysis.

- **Section 7.2, Social Policy.** This section has been revised to reflect applicable updates to the analysis of impacts of the proposed action.
- **Section 7.3, Cost-Benefit Analysis.** This section has been revised to add information about the range of social and economic impacts that could occur in the event of an oil spill, fire, or explosion.

Appendices

- **Appendix A, Scoping Comments**. This report has been revised to present all written comments received during the public scoping comment period compared to the Draft EIS Scoping Report, which only included comments submitted via the web.
- **Appendix B, Applicable Regulations.** This appendix has been revised to include updates to regulations applicable to the proposed action and related rail and vessel transport.
- **Appendix N, Oil Spill Modeling.** This report has been updated to include an attachment providing information about considerations relevant to the use of the select modeling tool.
- **Appendix Q, Crude Oil Market Analysis.** This analysis has been prepared for the Final EIS. It describes the likely sources of crude oil shipped through the proposed facility and the potential for the proposed action to induce production at those sources; it also considers the implications of the lifting of the ban on U.S. crude oil exports. It supports the greenhouse gas analysis in Section 3.2, *Air*, and the study area for extended vessel transport in Chapter 5, *Extended Rail and Vessel Transport*.

Chapter 2
Proposed Action and Alternatives

2.1 What is the proposed action?

Westway Terminal Company LLC[1] (applicant) is proposing to expand its bulk liquid storage facility by developing an additional 7 acres of its 16-acre site. The expansion would allow the facility to receive crude oil unit trains,[2] store crude oil from these trains, and load crude oil onto tank vessels[3] (proposed action).

2.1.1 Applicant's Project Objective

The applicant's objective of the proposed action is to expand the existing bulk liquid storage terminal to receive crude oil by train, store the crude oil, and load the crude oil onto tank vessels at the Terminal 1 berth for shipping to refineries.

The applicant has stated the following conditions support this objective.

- Demand from refineries in Washington State and along the West Coast for additional sources of crude oil.
- Operational flexibility to adapt to fluctuations in market demand.
- Direct vehicle, rail, and vessel transportation access at the existing site, making it well situated for the efficient and economical operation of the proposed facility.

2.1.2 Project Location

The proposed action would occur on the existing applicant's facility (project site), located[4] between Terminals 1 and 2 of the Port of Grays Harbor (Port) in Hoquiam, Washington, north of the confluence of the Chehalis River and Grays Harbor (Figure 2-1). The project site covers 16 acres, 9 of which are developed with existing facilities for loading, unloading, and storing methanol.

Local road access to the project site is provided via Port Industrial Road at the intersection with West 1st Street. Regional highway connections are provided within a few miles of the project site by US Route 12 (US 12), which runs east, and US Route 101 (US 101), which runs north and south.

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[1] Westway Terminal Company LLC was incorporated in 2008 and is based in New Orleans, Louisiana; as of 2009, it operates as a subsidiary of Westway Group, LLC.

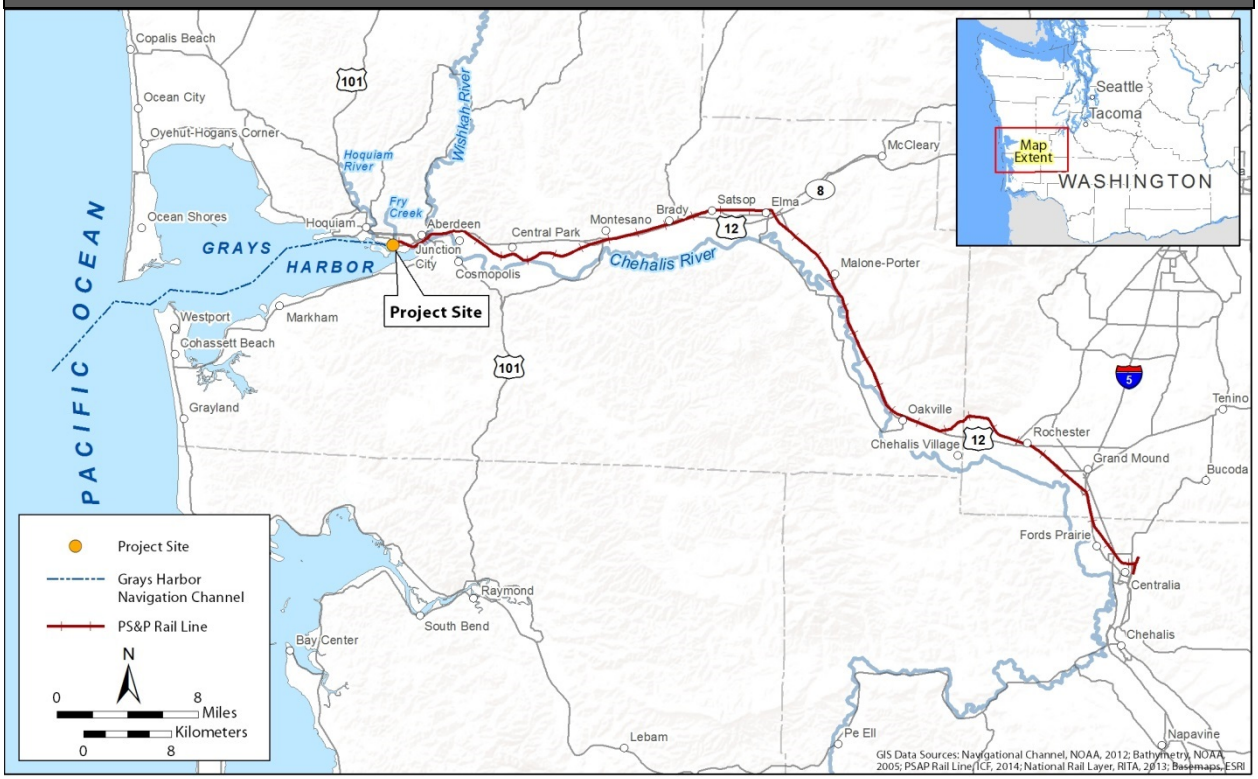
[2] A *unit train* is a train in which all cars carry the same commodity and all cars are shipped from the same origin to the same destination, without being split up or stored en route.

[3] The term *tank vessel* refers to a marine vessel used to transport bulk liquids such as crude oil; it includes tankers (self-propelled ships) and tank barges (barges propelled by tugs).

[4] Tax Assessor's Parcel Information: City of Hoquiam in Section 18, Township 17, Range 9 West, North of the Willamette Meridian, Tax Parcel Number #056402300000; and City of Aberdeen in Section 7, Township 17, Range 9 West, North of the Willamette Meridian, Tax Parcel Number #029902000200.
Latitude: 46.968253, longitude: -123.855871.

Rail access to the project site is provided by the Puget Sound & Pacific Railroad (PS&P), which is owned and operated by Genesee and Wyoming, Inc. The rail line extends 59 miles from Centralia to Hoquiam. Trains arriving at and departing from the project site must travel along the PS&P rail line before connecting with either the BNSF Railway (BNSF) or Union Pacific Railroad in Centralia. The PS&P rail line largely parallels US 12 from Centralia to Aberdeen, where it generally parallels the Chehalis River before terminating at the Port's loop track (Figure 2-1). No changes to the PS&P rail line are proposed as part of the proposed action.

Figure 2-1. Project Location



Tank vessels approach the project site via the Grays Harbor Navigation Channel, which runs from the mouth of Grays Harbor to the Port docks. Tank vessels calling at the project site typically berth at the Port's Terminal 1 dock. The project site also has access to the Terminal 2 facility; however, Terminal 2 is frequently used by other Port tenants, which limits the terminal's availability for additional vessels. Therefore, loading vessels would occur under the proposed action at Terminal 1 and Terminal 2 is not considered as part of the proposed action.

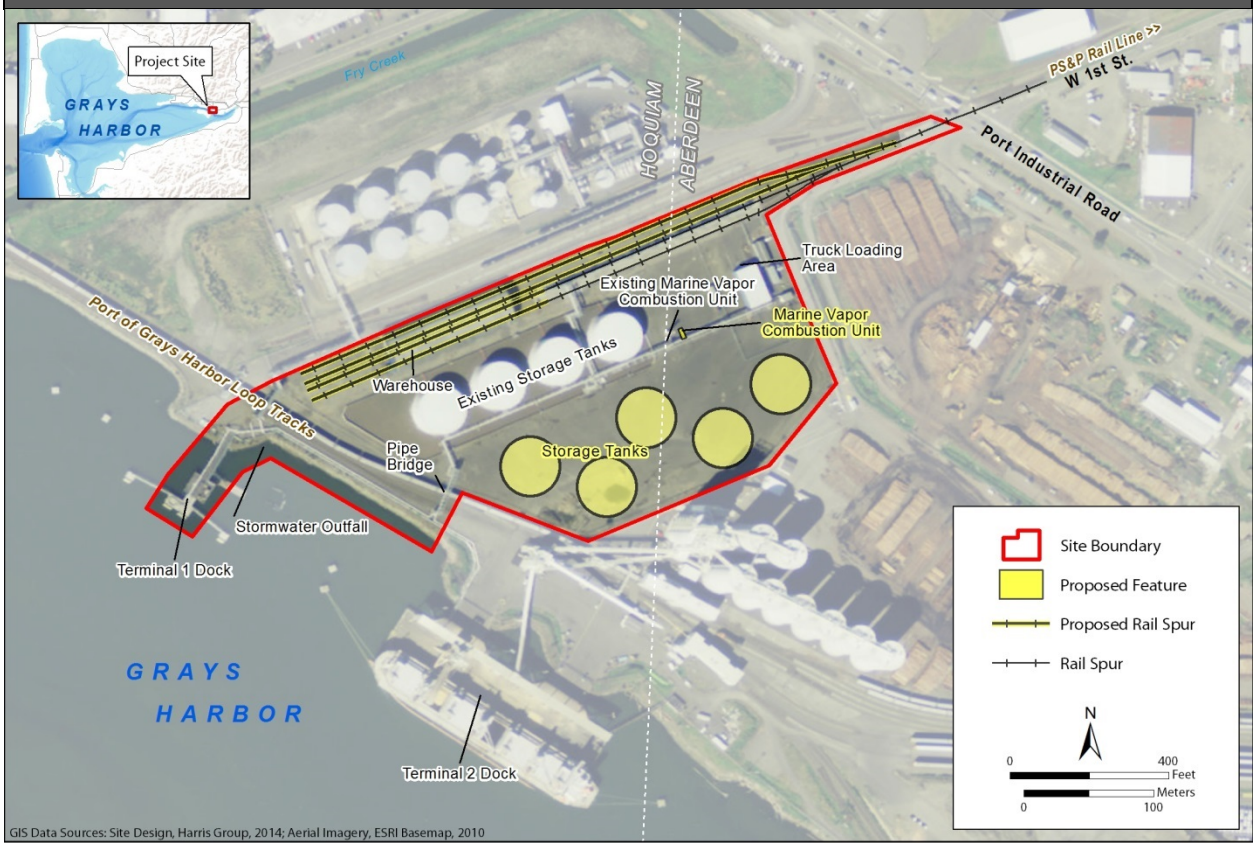
2.1.3 Existing Facilities and Operations

The applicant currently operates a methanol distribution facility at the project site. Operations involve receiving, storing, and loading (for transport) methanol, as described further in this section.

2.1.3.1 Existing Facilities

The existing facilities, constructed in 2009, include bulk liquid storage tanks, loading and unloading areas, a system of pipelines connecting the loading areas with bulk liquid storage tanks, and associated office and electrical buildings (Figure 2-2).

Figure 2-2. Project Site



Storage Tanks

Four aboveground storage tanks are located on the northern portion of the project site. Each tank has the capacity to hold approximately 3.4 million gallons (81,000 barrels), totaling 13.6 million gallons (324,000 barrels) of storage for the facility. The tanks are located in a containment area—an underlying concrete footer surrounded by a concrete wall—with the capacity to hold the volume of a single tank, plus an allowance for precipitation (Figure 2-3).

Loading and Unloading Areas

The applicant is currently permitted to load methanol by rail and tanker truck and unload methanol tank vessels and rail cars. A vapor combustion unit, which is used to incinerate vapors associated with rail and truck loading, is located east of the storage tanks (Figure 2-2).

Figure 2-3. Existing Storage Tanks in Containment Area

Rail Loading and Unloading Area

Two rail spurs with 18 loading and unloading spots connect to the PS&P rail line via a crossing of Port Industrial Road at West 1st Street. The loading and unloading spots are located over a concrete containment area that has the capacity to hold the contents of a single rail car, plus an allowance for precipitation (Figure 2-4).

Figure 2-4. Existing Rail Loading and Unloading Spots over Concrete Containment Area

Truck Loading and Unloading Area

The truck loading area is paved, covered, and located near the northeast entrance to the project site (Figure 2-2). It has containment capacity equal to an entire tanker truck.

Vessel Loading and Unloading Area

Tank vessels are unloaded at the Terminal 1 berth. The berth is also used by Imperium Terminal Services to load biodiesel produced at the company's production facility, which is located directly west of the project site, for transport by tank vessel. The two companies have separate infrastructure used for vessel loading and unloading: the applicant's pipelines run along the north side of the dock and Imperium Terminal Services' pipelines run along the south side.

Pipelines

A system of pipelines connects the loading and unloading areas (rail, truck, and vessel) with the storage tanks. The pipelines run from the truck and rail loading and unloading areas via elevated pipe bridges, then along the southern side of the storage tanks via at-grade supports, then cross the Port's loop track at the southwest corner of the project site via an elevated pipe bridge to connect with the Terminal 1 dock. Docklines throughout the facility are constructed per American Society of Mechanical Engineers Code for Pressure Piping (ASME B31) and are tested annually to 1.5 times the maximum allowable working pressure per U.S. Coast Guard regulations. Non-dockline piping is tested after construction and periodically retested per applicable codes (API 570 nondestructive examinations).

Buildings

Several smaller buildings and an adjacent parking lot are located on the eastern edge of the project site: two of the buildings provide office space for four full-time employees; the third is an electrical building. An empty wood-frame warehouse is located along the northwestern edge of the project site.

2.1.3.2 Existing Operations

Onsite Operations

The facility receives, certifies, and loads methanol on behalf of its customers for transport to the end customer. The facility's allowable (permitted) throughput capacity is 54.6 million gallons of methanol per year. Currently, the facility receives approximately 36.0 million gallons and ships approximately 33.3 million gallons of methanol annually.[5] In general, methanol arrives at the project site by rail or vessel, is unloaded via a system of pipes and hoses, and is transferred to storage tanks for certification. The methanol is then transported via the same pipeline system from the storage tanks to the tanker truck and rail loading areas.

Offsite Transport

The specific mode of transportation to and from the project site depends on the source and final destination of the methanol. As stated above, methanol is transported to the facility by rail and tank vessel and from the facility by tanker truck and rail.

Approximately 60% of the incoming methanol arrives at the facility by rail as part of PS&P rail line standard freight traffic. Most of this methanol originates from Medicine Hat, Alberta, Canada. Rail cars carrying methanol are separated from other cars in the Aberdeen rail yard; they are stored on sidings in the yard then moved by a switching locomotive to the facility for unloading. This process typically results in one to two trips onto and off the project site each day, to deliver and remove an average of 10 rail cars. The rails cars are parked on the existing rail spurs on the facility where methanol is unloaded via the pipeline system and pumped to the storage tanks.

The remaining 40% of methanol entering the facility is transported by tank vessels. These tank vessels typically originate from Brunei, Indonesia, Malaysia, and Venezuela and berth at Terminal 1. From Terminal 1, they are unloaded via the pipeline system that transports the methanol to the storage tanks (Figure 2-2). This process takes about 24 to 36 hours. Recent operations at the project site have resulted in approximately six vessel calls per year.

Methanol is transported from the project site by tanker truck and rail. Methanol is transferred from the storage tanks to tanker truck at the truck-loading area for transport off site. Tanker trucks enter and leave the terminal via Port Industrial Road and make approximately 2,700 round trips each year. Rail cars transporting methanol from the project site are parked along the existing rail spurs and loaded via the same process described for unloading. Loaded rail cars are moved off site as part of the one to two switch trips described previously.

[5] The difference in volume received and shipped represents the volume required to maintain the internal floating roof and to meet customer distribution requirements.

Stormwater Management

Stormwater is water that falls onto Earth's surface during precipitation events (e.g., rainfall, snow, and ice melt). It includes the portion of this water that sinks into the ground and that accumulates on or flows over the ground surface on its way to a receiving water (stormwater runoff).

Currently, 15 acres of the 16-acre project site are covered with impervious asphalt and concrete. Consequently, most precipitation that falls at the project site runs off as sheet flow.[6] Stormwater that falls within the storage tank and rail containment areas is directed to containment sumps where it is visually inspected. After inspection, stormwater is manually released to the Port's stormwater conveyance system and discharged to the harbor via the Port outfall located next to the Terminal 1 dock (Figure 2-2). If stormwater is determined to be contaminated, it can be treated in place or, if necessary, pumped out by a certified wastewater hauler and taken to an appropriate treatment facility.

Stormwater that falls outside of the existing containment areas flows into catch basins that drain into the same conveyance system and discharge to Grays Harbor via the same outfall.

2.1.4 Proposed Facility and Operations

Under the proposed action, the applicant would develop 7 acres of its 16-acre site to allow for receiving, storing, and loading crude oil for transport. Crude oil would be shipped to the project site by rail and shipped from the project site by tank vessel.

Up to five storage tanks would be constructed at the project site to the south/southeast of the existing storage tanks (Figure 2-2). The existing rail facilities would be expanded, and pipelines would be installed to connect the storage tanks with the rail unloading spots and the vessel loading at the Terminal 1 berth. A marine vapor control system would be installed on the dock and pipeline supports would be installed above the dock. No in-water work is proposed.

The proposed action would be completed in two phases: Phase 1 would include constructing two storage tanks, expanding the existing onsite rail facilities, constructing related pipelines, upgrading dock capabilities, and installing a marine vapor combustion unit. Phase 2 would include constructing three additional storage tanks. Depending on market conditions, Phases 1 and 2 may be developed at the same time.

2.1.4.1 Proposed Facility

Storage Tanks

The proposed action would involve constructing up to five storage tanks at the project site south of the existing storage tanks (Figure 2-2). Each tank would be approximately 150 feet in diameter and 64 feet in height and would have the capacity to hold approximately 8.4 million gallons (200,000 barrels) of crude oil, for a total crude oil storage capacity of 42 million gallons (1 million barrels).

The tanks would be designed with internal floating roofs that would rise and fall with the liquid levels inside the tanks, eliminating the vapor space above the liquid level and reducing the emissions from volatile hydrocarbons that are to be stored in the tanks. Inside the tanks, the liquid surface

[6] Sheet flow is the form runoff takes when it is evenly dispersed across a surface.

would be entirely covered by the floating roofs, with the exception of a small ring-shaped space between the edge of the roof and the tank wall and around the internal tank support columns. These spaces contain seals attached to the edges of the roofs that slide against the tank walls and support columns as the roofs move up and down.

An impervious clay liner, approved by a registered Washington State Professional Engineer, would be installed inside the entire storage tank area to prevent any spills or leaks from contacting soil in the area. The clay liner would be covered by clean fill/soil and a top layer of crushed rock. This containment area, which would be surrounded by a 5-foot-tall concrete wall, would have the capacity to contain the total volume of a single tank plus an allowance for precipitation.

Loading and Unloading Areas

Proposed expansion of the rail loading and unloading area and equipment and improvements related to vessel loading and unloading are described below. No changes are proposed for the existing truck loading and unloading areas.

Rail Loading and Unloading Area

Under Phase 1, the two existing rail spurs would be lengthened and two new spurs would be added, thereby increasing the total number of loading and unloading spots from 18 to 80 (Figure 2-2). Similar to the existing spots, the new loading and unloading spots would be constructed on top of a containment area—a center-sloped concrete slab that collects and directs any spills to a central sump. This containment area would have the capacity to contain the total volume of a single rail car, plus an allowance for precipitation.

Connection of the new spurs to the PS&P rail line would use the existing grade crossing at Port Industrial Road and would require no track to be constructed off site. This connection would be maintained by the Port.

Vessel Loading and Unloading Area

The following improvements would be made to accommodate the loading of tank vessels with crude oil. A hose tower would be installed on the dock to add structural support for the hoses used to load crude oil onto the tank vessels. The dockline from the terminal would connect to one end of the tower, and a 6- or 8-inch hose on the other end of the tower would be used to load the tank vessels.

A marine vapor control system would be installed to control emissions of volatile organic compounds from vapors displaced during the loading of crude oil into tank vessels. The system would consist of three components: marine safety unit, vapor blower unit, and vapor combustion unit. Vapors would be collected from tank vessels and routed through a vapor hose into the marine safety unit. The marine safety unit would protect the tank vessels against explosions or fires, as well as excessive pressure and excessive vacuum. The vapor-blower staging unit would transfer the vapors from the marine safety unit to the vapor combustion unit. Vapors transferred to the combustion unit would be thermally destroyed in a controlled manner.

The marine safety unit would be installed on top of the dock, if space allows, with no modification to the dock structure in the water. If adequate space is not available on the dock, the unit would be installed on the shoreline near the dock in accordance with U.S. Coast Guard siting requirements. The vapor blower staging unit and vapor combustion unit would be installed next to the existing combustion unit.

The entire system would be constructed and operated in compliance with U.S. Coast Guard regulations (33 Code of Federal Regulations [CFR] 154) and the applicable air permit.

Pipelines

During Phase 1, a system of pipelines would be constructed to connect the new rail loading and unloading spots to the storage tanks, and the storage tanks to the vessel-loading facilities at the Terminal 1 dock. A 24-inch-diameter carbon steel pipeline would be installed on the existing pipe bridge to connect the storage tanks to the vessel loading facilities at the Terminal 1 dock (Figure 2-2). New 10- or 12-inch-diameter carbon steel pipelines would be installed to move crude oil from the rail unloading areas to the storage tanks. Hoses used at Terminal 1 for over-water transfers will comply with U.S. Coast Guard hose assembly requirements for facilities transferring oil or hazardous material in bulk (33 Code of Federal Regulations [CFR] 154.500, Hose Assemblies). They will be pressure-tested annually per U.S. Coast Guard requirements. The hoses used for crude oil transfer elsewhere at the project site will be designed for crude oil use.

Buildings

Also under Phase 1, additional office space and support facilities would be constructed, including a new electrical building south of the existing electrical building and shower and change rooms. The existing warehouse is not currently being used and would be removed to make room for the new and expanded rail spurs.

2.1.4.2 Proposed Operations

Under the proposed action, the facility's allowable (permitted) throughput capacity would increase by 751.8 million gallons (17.9 million barrels) of crude oil per year for a cumulative total of 19.2 million barrels (806.4 million gallons) per year, including existing methanol operations. The applicant intends to continue to handle methanol similar to existing conditions, and the new capacity provided under the proposed action would be dedicated to handling crude oil.

Onsite Operations

The applicant would receive crude oil from its future customers (i.e., owners of the oil) who would arrange rail transport to, and vessel transport from, the project site. The applicant would be responsible for receiving and unloading the crude oil from rail cars, storing it, and transferring it onto tank vessels for shipment. No crude oil would be transported by tanker truck. Once on site, rail cars would be pushed onto the loading and unloading spots where the crude oil would be unloaded into a central collection area and then pumped to the storage tanks. The system would include automated monitoring, which would be designed to shut down the offload pumps if the destination tank reaches a predetermined height. Under the proposed action, the facility would be capable of unloading one unit train per day, but the applicant plans to receive one unit train every other day on average. The crude oil would be pumped from the storage tanks via the new pipelines to the Terminal 1 vessel-loading facilities where it would be transferred onto the tank vessel by hose. Depending on the size of the vessel calling, loading could take up to 36 hours. Proposed operations do not include vessel bunkering (fueling) at the project site.

To acknowledge the importance of the annual Grays Harbor Shorebird Festival to the community and its visitors and to eliminate the chance of a spill from vessel-loading operations during the festival, the applicant will coordinate with the City of Hoquiam to receive advance notice of the date

of the festival and will halt crude oil vessel-loading operations for a period of 2 weeks each year overlapping with the event.

Offsite Transport

Crude oil would be transported to the project site by rail and transported from the project site by tank vessel. Arranging transportation to and from the project site would be the responsibility of the applicant's customers and would be under the control and regulation of the rail and vessel operators.

Rail

Crude oil would be transported to the project site by rail. It is expected to come in the form of Bakken crude oil from the Williston Basin in North Dakota[7]; however, it could come in the form of diluted bitumen derived from oil sands from Alberta, Canada. Depending on the source of the crude oil, trains could travel a variety of routes on the national rail system toward the Port. From Centralia, all trains would use the PS&P rail line to reach the project site (Figure 2-1). Rail transportation is discussed in detail in Chapter 3, Section 3.15, *Rail Traffic*, and Chapter 5, *Extended Rail and Vessel Transport*.

Under the proposed action, increased train traffic would consist of unit trains of approximately 120 cars (1.25 miles long). Unit trains are typically transported by two locomotives and would have to be broken into smaller segments and taken by switch engine to and from the project site. Unit trains transporting crude oil to the project site would consist only of new rail cars that meet or exceed the new U.S. Department of Transportation Specification 117 design or performance criteria or rail cars that have been retrofitted in accordance with the U.S. Department of Transportation-prescribed retrofit design or performance standard (80 *Federal Register* [FR] 26643). Operation of the proposed action at maximum throughput would result in a maximum of 458 unit train trips[8] per year, or an average of 1.25 trips per day, along the PS&P rail line. These trains would result in additional switch trips to bring the cars onto and off the project site as discussed in Chapter 3, Section 3.15*, Rail Traffic*.

Vessel

Crude oil would be transported from the project site by tank vessel. It is anticipated that crude oil from the project site would be transported to refineries in the Puget Sound area and California. Although the crude oil could be transported overseas, it is unlikely for the economic reasons described in Chapter 5, Section 5.3, *What is the destination for crude oil shipped from the proposed action?*

Tank vessels would travel through the harbor along the navigation channel. Vessel transportation is discussed in detail in Chapter 3, Section 3.17, *Vessel Traffic*. The depth constraints of the navigation channel limit the size of the vessel able to enter the harbor. The mix of tankers could vary over time, but the largest tankers would be Panamax class[9] with the capacity to hold up to 14.7 million gallons

[7] The Williston Basin rail terminals are primarily in North Dakota but extend into Montana, South Dakota, and Saskatchewan, Canada.

[8] A trip represents one-way travel; in other words, an inbound trip and an outbound trip are counted as two trips.

[9] Panamax class refers to the size limits for vessels traveling through the Panama Canal.

(350,000 barrels). Tank barges are anticipated to be the most likely vessel type with capacity in the range of 6.3 million gallons to 7.8 million gallons (150,000 to 185,000 barrels) per barge.

Operation of the proposed action at maximum throughput would result in a maximum of 192 to 238 trips[10] per year, depending on the size of the vessel, or 0.7 trip per day on average.[11]

Stormwater Management

Impervious surface area would increase at the project site by 1 acre under the proposed action. Six of the 7 acres proposed for development are currently paved, and construction of the proposed action would require paving the remaining acre. In general, runoff would flow into the Port's stormwater system similar to existing conditions. Under the proposed action, the applicant would continue to inspect the sump for potential pollution prior to discharge and would conduct any additional testing required by its National Pollution Discharge Elimination System (NPDES) permit. For more information, see Chapter 3, Section 3.3, *Water*.

2.1.5 Construction Schedule and Methods

Phase 1 construction of the proposed action is tentatively scheduled to start in 2016 and is anticipated to last 10 to 12 months. Construction would require approximately 86 workers and would occur during daylight hours (7:30 a.m. to 4:30 p.m.), Monday through Friday. However, the schedule may be altered to add some weekend daytime construction to make up for weather delays. The start date for Phase 2 construction is unknown, but construction is anticipated to last 10 months and require approximately 49 workers.

Construction would require using the following types of machinery: an excavator, D-8 dozer, dump truck(s), backhoe(s), maintenance trucks, a 70-ton crane, two 40-ton cranes, a 250-kilowatt generator, a 65-kilowatt generator, a 60-foot manlift, forklift(s), air compressor(s), a concrete pump, a compactor, and concrete finisher. Construction activities for several of the facilities would likely occur simultaneously.

2.1.5.1 Storage Tanks

The area where the new tanks would be built is currently paved with asphalt. Construction of the proposed tanks would require removing the existing paved area on the project site. Because the proposed tanks would be supported by piles, no soil preloading would be required to consolidate the underlying soil. The area would be graded and leveled by removing approximately 14,000 cubic yards of paved material using an excavator, D-8 dozers, dump trucks, and backhoes. Once contoured, the geotechnical (clay) liner would be installed over the surface of the storage tank area and covered by soil and crushed rock. The concrete containment wall would be constructed around the tank storage area, tall enough to hold the contents of the largest tank plus a 24-hour/25-year rain event.

The storage tanks would each sit on a concrete slab supported by approximately 200 piles (18-inch-diameter steel pipes). The piles would be driven into the ground to necessary depths to reach required embedment into competent soils. Based on investigations completed at the project site

[10] A trip represents one-way travel.

[11] Number of trips assumes all tank barges.

(Hart Crowser 2013), competent soil is generally reached at 150 feet below ground surface.[12] Once all piles are driven for a tank foundation, the concrete slab would be formed. Rebar for the slab would extend 20 to 30 feet into the piles. Concrete would then be poured, filling the piles and the form for the slab. The applicant's current designs assume that tanks would sit on top of the foundation without mechanical attachment to the slab and that the weight of the tanks themselves would hold them in place. However, final design and construction would be based on detailed geotechnical analysis and civil design in accordance with current building and fire codes and associated standards and requirements.

One 70-ton crane would be used as the pile-driving rig. Impact pile driving would last approximately 2 to 3 months during daylight hours. Welding machines would be used to weld the pipes for the piles. A 40-ton crane would be used to move the pipes around the project site and stack them into the jigs for welding. Concrete would be brought in by truck from the local Ready Mix concrete vendors and piles would arrive by train. The storage tanks would be assembled on site along with the associated pipeline and pumps.

2.1.5.2 Loading and Unloading Areas

Rail Loading and Unloading Area

All elements of the rail loading and unloading area would be constructed during Phase 1. Construction of the rail facilities would require demolishing the existing warehouse then grading and forming the project site. Crews would lay rebar and pour concrete to construct the containment area underlying the new and extended rail spurs. The entire rail area would be built on a solid concrete slab; there would be no wood ties or ballast rock in the rail area. The loading and unloading equipment (racks, hoses, pipelines, and pumps) would then be installed. This work would require the use of bulldozers, lifts, delivery trucks, and small cranes.

Vessel Loading and Unloading Area

Welding machines would be used to weld the hose tower to the dock.

All components of the marine vapor combustion unit would be manufactured off site and set on foundations. If the marine safety unit is on the dock, it would be installed on a concrete pad and anchored to the existing dock with foundation anchor bolts. A new concrete foundation would be built for the vapor blower unit and vapor combustion unit. The metal frame of each unit would be bolted to the foundation. The foundation designs would be provided by a Washington State-licensed structural Professional Engineer. Once installed, the manufacturer would calibrate the system for operation.

[12] The detailed foundation design and quantity and depth of piles would be determined based on detailed geotechnical analysis and civil design in accordance with current building and fire codes (International Building Code and International Fire Code) and their associated design standards and seismic requirements, including the American Society of Civil Engineers Standard 7 (Standard ASCE 7) and the American Petroleum Institute Standard 650 (API 650).

2.1.5.3 Pipelines

Pipelines would be constructed in segments and would be above ground. Pipes would be delivered by truck. This work would require the use of welding machines, a forklift, and a 40-ton crane to move the structural steel for pipe bridges and swing concrete into foundations. Pipeline work in the shoreline area would not require any in-water work.

2.1.5.4 Buildings

The support buildings would be used strictly for operations, not construction, and the locations are identified in Figure 2-2. The building designs have yet to be developed, but construction would include preparing the project site by removing earth, pouring a foundation, framing the structure, and installing walls and windows. One of the buildings would be used as an electrical building and the other building would house showers and changing rooms.

2.2 What is the no-action alternative?

Under the no-action alternative, none of the proposed facilities related to crude oil distribution would be constructed and the applicant would continue to operate its existing methanol facility as described in Section 2.1.3.2, *Existing Operations*.

Unrelated to the proposed action, the applicant anticipates an increase in throughput of methanol. For the purposes of this analysis and based on the applicant's understanding of market conditions, an additional estimated throughput of up to 12 million gallons of methanol per year would arrive by vessel, would be unloaded and stored on site, and would be loaded into barges or rail cars for offsite transport in a manner similar to existing conditions. Offsite transport is estimated to add approximately one tanker in, 10 tank barges out, and 364 rail cars (accommodated as part of existing freight trains) per year.

Chapter 3
Affected Environment, Impacts, and Mitigation

3.0 Introduction

This chapter describes existing conditions in the study area, presents the environmental impacts that would likely result from construction and routine operation[1] of the proposed action, and identifies measures to mitigate those impacts. For comparison purposes, the consequences of the no-action alternative are also discussed.

3.0.1 What topics are addressed in the impact analysis?

This chapter is divided into the following 17 sections, with each section addressing one element of the built or natural environment.

- 3.1 Earth
- 3.2 Air
- 3.3 Water
- 3.4 Plants
- 3.5 Animals
- 3.6 Energy and Natural Resources
- 3.7 Noise and Vibration
- 3.8 Land and Shoreline Use
- 3.9 Aesthetics, Light, and Glare
- 3.10 Recreation
- 3.11 Historic and Cultural Preservation
- 3.12 Tribal Resources
- 3.13 Public Services and Utilities
- 3.14 Hazardous Materials
- 3.15 Rail Traffic
- 3.16 Vehicle Traffic and Safety
- 3.17 Vessel Traffic

3.0.2 How is each resource section organized?

Each section answers the following questions.

[1] Chapter 4, *Environmental Health and Safety*, addresses the potential impacts from increased risk of incidents (e.g., storage tank failure, train derailments, vessel collisions) and related consequences (e.g., release of crude oil).

- What is the study area for the resource?
- What laws and regulations apply to the resource?
- How were impacts on the resource evaluated?
- What are the types and condition of the resource in the study area?
- What are the potential impacts on the resource?
- What mitigation measures would reduce impacts on the resource?
- Would the proposed action have unavoidable and significant adverse impacts on the resource?

3.0.3 What alternatives are analyzed in this chapter?

This chapter presents an analysis of impacts that could occur as a result of construction and routine operation of the proposed action. Where impacts were quantitatively evaluated, potential impacts are considered in 2017—the anticipated first year of operation—and in 2037 to account for future growth and development. This approach provides context to decision-makers about how the impacts of operations would evolve over a reasonably foreseeable period. This is particularly relevant for transportation- and risk-related impacts that can evolve over time because of reasonably foreseeable increased growth, planned infrastructure changes, and phased regulatory requirements for improved transportation efficiency and safety. The impacts identified in these years would apply for the lifetime of the proposed action and proposed mitigation measures are intended to apply for the lifetime of the proposed action.

This chapter also presents an analysis of impacts that could occur if the proposed action were not approved (the no-action alternative). Where impacts were quantitatively evaluated, the analysis of the no-action alternative also considers impacts in 2017 and 2037 and includes impacts associated with future growth and development that is reasonably certain to occur during this timeframe, regardless of the proposed action. Impacts of the no-action alternative are presented first as a basis of comparison.

3.0.4 What areas and activities were analyzed?

The study area is specific to each resource but in most cases includes resources on and near the project site that could be affected by construction and onsite operations, resources along the Puget Sound & Pacific Railroad (PS&P) rail line—from Centralia, Washington, to the project site—that could be affected by rail transport, and resources in and around Grays Harbor that could be affected by vessel transport.

The project site includes the property leased by Westway Terminal Company LLC (applicant) on which the existing and proposed facilities are and would be located. Activities at the project site would include construction (e.g., site clearing and erecting storage tanks) and operations (e.g., rail unloading and vessel loading) that would be directly under the control of the applicant. These activities would be subject to the permit conditions that would be required by the City of Hoquiam, the Washington State Department of Ecology (Ecology), and other state and local agencies.

Transport of bulk liquids to and from the project site by rail and vessel would occur under the responsibility of the rail and vessel operators, respectively. Although the applicant does not have control over offsite transport, implementation of the proposed action would generate rail and vessel

trips that could result in environmental impacts along the transportation corridors. For example, increased rail and vessel trips could lead to congestion and related traffic delays, increased noise, and increased air emissions. The transportation corridors that would be affected by offsite transport would vary depending on the source of the crude oil and the final destination. However, all rail trips generated by the proposed action would occur along the PS&P rail line between Centralia and the project site, because this is the only rail line connecting the national mainline railroad system to the Port of Grays Harbor. Similarly, all vessel trips generated by the proposed action would travel through Grays Harbor from Terminal 1 to the Pacific Ocean. Therefore, these known corridors are the focus of the impact analysis related to offsite transport in this chapter.

3.0.5 How was mitigation identified?

Development of the mitigation measures included an evaluation of whether applicable regulations, specific permit conditions, and the required plans would adequately reduce potentially significant impacts identified in this draft environmental impact statement (Draft EIS). Additionally, when applicable, the Draft EIS considered the incorporation of specific voluntary measures or design features to be executed by the applicant and how those measures would reduce potential impacts. When those combined measures did not sufficiently reduce the risk of impacts, additional applicant measures were identified as required by the Washington State Environmental Policy Act (SEPA) consistent with Washington Administrative Code [WAC] 197-11-660. The thresholds and measures were developed based on direction and guidance from the co-lead agencies. Potential measures were identified and evaluated even if they were not under the jurisdiction of the deciding co-lead agencies, in this case, the City of Hoquiam and Ecology.

3.0.6 What impacts are addressed in other chapters of the Draft EIS?

The analysis in this chapter focuses on impacts associated with construction and routine operation of the proposed action in the study area. The following chapters present additional impacts.

Chapter 4, *Environmental Health and Safety*, looks at the potential for increased safety risks under the proposed action. Specifically, onsite operation activities (e.g., rail unloading, tank storage, and vessel loading) and the increased frequency of rail and vessel trips could increase the likelihood of an incident (e.g., storage tank rupture, train derailment, or vessel collision) and result in adverse environmental outcomes (e.g., release of crude oil). Although the specific impacts would depend on the frequency, location, contents, and volume of a spill, as well as the efforts to contain and clean up the spill, the potential impacts on the human and natural environment could be far-reaching.

Chapter 5, *Extended Rail and Vessel Transport*, addresses impacts related to rail and vessel transportation in the extended study area from the source of the crude oil to its final point of delivery.

Chapter 6, *Cumulative Impacts*, addresses the impacts of the proposed action when considered in combination with all other past, present, and reasonably foreseeable future projects.

Chapter 7, *Economics, Social Policy, and Cost-Benefit Analysis*, addresses economics, social policy, and the costs and benefits related to the proposed action.

3.1 Earth

Earth refers to the soil and geology conditions in a particular area. Soils and geology are resources if the defining characteristics (such as soil structure, composition, or geologic formations) are unique or valuable or support unique habitats. Soils and geology can also influence the potential for geologic hazards, such as landslides, earthquakes, seismic effects (e.g., surface fault ruptures, strong ground shaking, liquefaction, lifting and lowering of the surface, and tsunamis), and volcanic activity. Understanding the types of soils and the underlying geologic conditions is important in determining whether a project would be exposed to increased risks related to these conditions.

This section describes earth resources in the study area, including geology and soils and geologic hazards. It then describes impacts on geology and soils that could result under the no-action alternative or as a result of the construction and routine operation[1] of the proposed action. Finally, this section presents any measures identified to mitigate impacts of the proposed action and any unavoidable and significant adverse impacts.

3.1.1 What is the study area for earth resources and conditions?

The study area for earth resources consists of geology and soils on and near the project site that could be affected by construction and routine operation of the proposed action. The study area also includes geology and soils that could be affected during routine rail transport along the Puget Sound & Pacific Railroad (PS&P)[2] rail line and vessel transport through Grays Harbor out to 3 nautical miles from the mouth of the harbor.

The study area includes the broader geologic conditions that could affect the project site and the rail and vessel transportation systems. These broader conditions include the potential for geologic hazards (e.g., landslides, earthquakes, seismic-related events, and volcanic activity).

3.1.2 What laws and regulations apply to earth resources and conditions?

Laws and regulations for determining potential impacts on earth resources are summarized in Table 3.1-1. More information about these laws and regulations is provided in Appendix B, *Laws and Regulations*.

[1] Chapter 4, *Environmental Health and Safety*, addresses the potential impacts from increased risk of incidents (e.g., storage tank failure, train derailments, vessel collisions) and related consequences (e.g., release of crude oil).

[2] The PS&P rail line refers to the rail line between Centralia and the project site.

Table 3.1-1. Laws and Regulations for Earth

Laws and Regulations	Description
Federal	
Clean Water Act, Section 402 (33 U.S.C. 1251 et seq.)	Establishes the NPDES permitting program, which regulates discharges of pollutants and mandates that certain types of construction activity comply with the requirements of the EPA NPDES program.
State	
State Building Code (RCW 19.27)	Provides specific design standards, through the adoption of the International Building Code, for occupied structures that should be met to reduce the risk of damage to people and property from geologic hazards.
Facility Oil Handling Standards (WAC 173-180)	Establishes minimum standards for oil facility and transfer operations.
Local	
Adoption of International Building Code (HMC 2.08 and AMC 15.08)	Recognizes that the respective city has adopted the International Building Code, 2012 Edition, as the official building code of the city.
Adoption of International Fire Code (HMC 2.38 and AMC 15.12)	Recognizes that the respective City has adopted the International Fire Code, 2012 Edition, as the official fire code of the City.
Land Development—Erosion and Sediment Control (HMC 10.05.120 and AMC 13.70)	HMC 10.05.120 requires all new industrial development to provide for the control and management of stormwater runoff. AMC 13.70 establishes minimum requirements and procedures to control the adverse impacts associated with increased storm and surface water runoff.
Shoreline Management (HMC 11.04 and AMC 16.20)	Carries out responsibilities imposed by the Shoreline Management Act of 1971.
Critical Areas Ordinance (HMC 11.06 and AMC 14.100)	Sets forth the definitions and process for designating and protecting critical areas within the city limits of Hoquiam and Aberdeen, respectively.

U.S.C. = United States Code; EPA = U.S. Environmental Protection Agency; NPDES = National Pollutant Discharge Elimination System; RCW = Revised Code of Washington; WAC = Washington Administrative Code; HMC = Hoquiam Municipal Code; AMC = Aberdeen Municipal Code

3.1.3 How were impacts on earth resources and conditions evaluated?

This section describes the sources of information and methods used to evaluate impacts.

3.1.3.1 Information Sources

Information on earth resources in the study area was obtained from the following sources. Although past permits and approvals are no longer applicable, information from these sources is relevant to characterizing the affected environment and regulatory context.

- Environmental permitting documents prepared for the proposed action by the applicant, the City of Hoquiam, and Washington State Department of Ecology (Ecology).
    - October 2012 and February 2013 Washington State Environmental Policy Act (SEPA) environmental checklists and associated appendices.
    - November 2012 Shoreline Substantial Development Permit application package.
    - December 2012 Critical Areas Permit Checklist and assessment report.
    - April 2013 Mitigated Determination of Nonsignificance.
    - April 2013 Findings of Fact and Conclusions of Law of the Shoreline Administrator.
    - February 2014 Joint Aquatic Resource Permit Application.
    - Geotechnical engineering report (Hart Crowser 2013).
- U.S. Geological Survey (USGS) National Seismic Hazard Maps and associated report.
- Cascadia Region Earthquake Workgroup report on Cascadia subduction zone earthquakes.
- Grays Harbor County 2011–2016 Hazard Mitigation Plan (2006).
- Federal Emergency Management Agency Risk Report (Draft) for Grays Harbor County including the Cities of Hoquiam, Cosmopolis, Hoquiam, Ocean Shores, Westport, Montesano, McCleary, Elma, and Oakville.
- Geologic mapping of the Hoquiam area by Logan (1987).
- Washington State Department of Natural Resources geologic and hazard mapping.
- An updated assessment of tsunami risks specific to the project site (Appendix C, *Tsunami Impact Modeling and Analysis*).
- Washington State Seismic Safety Committee (2012) Resilient Washington State report.
- Geological literature from professional journals, USGS, and the Washington State Department of Natural Resources as referenced in this section.

Data obtained from these sources were augmented with general observations of site conditions made during a September 10, 2014, site visit and facility tour.

3.1.3.2 Impact Analysis

The impact analysis for geology and soils considers both the potential for the proposed action to affect the geologic environment and for the geologic environment to affect the proposed action. These impacts were evaluated in the context of the regulatory requirements (Section 3.1.2), the geologic and soil conditions at the site, and the broader geologic environment that can affect the project site or its associated transportation corridors (PS&P rail line and Grays Harbor Navigation Channel).

3.1.4 What earth resources and conditions are in the study area?

This section describes the earth resources in the study area that could be affected by construction and operation of the proposed action or that could contribute to impacts on the proposed action. This section provides the general context for earth resources in the study area and describes earth resources and geologic hazards on the project site, along the PS&P rail line, and in and along the shoreline of Grays Harbor.

3.1.4.1 Regional Geology

The regional geology of western Washington is related to the eastward movement of the San Juan de Fuca tectonic plate against the North American Plate (Parsons et al. 2005; Washington State Department of Natural Resources 2014a). The San Juan de Fuca plate plunges (or forms a subduction zone) progressively deeper as it move east underneath the North American plate. The movement compresses the rocks above it, producing uplift and down dropping. This plunging zone, the Cascadia Subduction Zone (CSZ), extends from northern California through Oregon and Washington to southern British Columbia. The Juan de Fuca plate also melts at depth and the magma (lava) that is produced rises to the surface forming the Cascade Range volcanic arc.

Hoquiam and Grays Harbor are at the western edge of the Washington Coast Ranges within the Willapa Hills physiographic province (Washington State Department of Natural Resources 2014b). The Willapa Hills are composed of a variety of sedimentary and volcanic rocks and are not intensely deformed compared to the Olympic Mountains to the north. The area is outside the extent of glaciation although glacial-influenced river sedimentation did occur along the Chehalis River during glacial periods. The Chehalis River crosses the Willapa Hills and enters the Pacific Ocean through Grays Harbor. The glacial-age (greater than 10,000 years ago) ancestral Chehalis River flowed through this same valley and the surficial deposits in the valley range from recent alluvium (that is, ongoing sediment transport with associated river channel and floodplain deposition) and older alluvial deposits that are slightly higher in elevation (river terraces). These deposits extend along the Chehalis River to Centralia and beyond. The Chehalis River is at a relatively low elevation along its entire length. It is at about 140 feet mean sea level at Centralia (River Mile 66), about 55 feet mean sea level at Oakville (River Mile 42) about 20 feet mean sea level at Satsop (River Mile 20), and is at sea level at Aberdeen.

3.1.4.2 Geology and Soil Conditions

Project Site

Prior to the late 1970s, the majority of the project site was occupied by a boat slip (Slip 2) that was constructed in the 1920s as part of the Port of Grays Harbor (Port) Marine Terminal 1. This slip was used to berth ships for loading and fueling and for the storage of floating logs and log rafts. A 2000-foot by 300-foot pier (Pier 1) once extended along the northern portion of the site, separating Slip 2 from an adjacent boat slip to the northwest (Slip 1). This pier included docks along both sides that provided mooring locations in both slips, two traveling cranes along the Slip 1 dock, and other freight-handling equipment. Other features included multiple rail lines down the center of the pier and a large warehouse adjacent to Slip 2. Between 1983 and 1994, Slip 2 was filled by the Port with sediment dredged from Grays Harbor to create new areas for marine development (Boersema

2013:11–12). Additional information on the historical conditions and photographs of the project site is provided in Section 3.11, *Historic and Cultural Preservation*.

The project site is flat (1% maximum slope) with an average elevation of approximately 11 feet above mean sea level. The majority of the site is currently paved (15 acres of the 16-acre site; 6 of the 7 acres proposed for development), with minimal exposed soils and no natural or agricultural soils present. It is underlain at depth by river and floodplain deposits of glacial- and post-glacial-age alluvium (Quaternary-age alluvium from 1.8 million years ago) (Logan 1987; Washington State Department of Natural Resources 2014a: Interactive Geologic Map). Because soils at the project site consist of fill of variable characteristics, the normal U.S. Department of Agriculture, Natural Resources Conservation Service soil mapping and erosion hazard designations are not applicable. If exposed, the underlying dredge materials would have a low erosion hazard (surface, rill, and inter-rill) based on the project site's low gradient.

Geotechnical investigations at the project site and the adjacent site were completed in 2013 and 2006, respectively. According to the investigations completed at the project site (Hart Crowser 2013), the majority of the site consists of gravel to about 40 feet below the surface underlain by loose to dense sandy gravel to a depth of about 130 feet below the surface. Figure 8 of the Hart Crowser report (2013) indicates competent soil is generally reached at 150 feet below ground surface. Borings collected at the eastern part of the project site indicate sandier soils. Subsurface investigations completed for the project site (GeoEngineers 2006) yielded similar results with subsurface layers ranging from moist to wet and soft to medium stiff to loose. The report estimates that gravel occurred below 150 feet and bedrock at depths greater than 200 feet below ground surface at the project site.

The area surrounding the project site is also relatively flat with the closest areas of steeper slopes occurring approximately 0.75 mile to the north. The adjacent mountain bedrock uplands begin approximately 0.75 mile to the north with river alluvium, alluvial fans, and talus along the valleys inset within the bedrock (Hoquiam River, Fry Creek, Wishkah River).

PS&P Rail Line

The entire PS&P rail line is built on river sediments of the Chehalis River or its tributaries. Some of these sediments are slightly higher river terraces above the elevation of the floodplain. These sediments are approximately hundreds of feet deep (Logan 1987; Washington State Department of Natural Resources 2014a: Interactive Geologic Map).

Grays Harbor

Overall, the sediments underlying Grays Harbor and the adjacent nonbedrock uplands are varying sequences of shallow marine, longshore coastal bar, estuarine, intertidal, river alluvium, and floodplain deposits. In general, these sediments range from gravel to sands, silts, and clays with the finer grain sizes dominating. Geotechnical investigations at the Port adjacent to the North Channel Reach of the navigation channel have found these types of sediments to depths of greater than 150 feet below ground surface (GeoEngineers 2006; Hart Crowser 2013; Shannon and Wilson 2013).

3.1.4.3 Geologic Hazards

In the study area, the broader geologic conditions that could affect the project site and transportation corridors include landslides and slope instability, earthquake and earthquake-related hazards, and volcanic activity.

Landslides and Slope Instability

Landslides can occur as the result of various factors, but primarily occur on steeper slopes in combination with loose or unstable soils. Landslides most often occur during the rainy season such as during the December 2007 storm, the January 2009 storm, and the January 2015 storms (Sarikhan and Contreras 2009; Stewart et al. 2013; Washington State Department of Natural Resources 2014b), but can also occur as the result of earthquakes and other earthquake-related hazards. Earthquake-induced landslides also occur primarily during saturated conditions (Washington State Department of Natural Resources 2014b).

Project Site

The soil and slope characteristics of the project site (i.e., gravel, sand, and relatively flat) result in a low potential for landslides or soil instability. Additionally, the risks of mass movement of soil into the adjacent harbor are considered very low because the shoreline adjacent to Terminal 1 is well supported with riprap and armoring for stabilization. No landslide hazard areas are mapped along the Hoquiam shoreline, including the project site (Washington State Department of Natural Resources 2014c: hazard map landslides). The closest landslide hazard area (Slaughter et al. 2013) is approximately 0.75 mile to the north and any landslides at this distance would have no impact on the project site.

PS&P Rail Line

Along the PS&P rail line, there are several areas where landslides could occur because of steeper slopes and looser soils. Beginning on the east side of Aberdeen where it closely parallels US Route 12 (US 12) between highway milepost (MP) 0.0 and MP 2.5, the rail line travels within 60 to 190 feet of a steep hillside for about 2.25 miles before heading south onto the Chehalis River floodplain. It is again close to hillsides from the east side of Central Park, coming within approximately 50 to 100 feet of the base of the slope for about 1.5 miles. In Elma, the rail line comes closer to the hillsides but is still approximately 800 feet away at the closest point. Beginning approximately 3 miles to the southeast of Elma to just east of Oakville, the rail line closely parallels US 12 for about 9.75 miles between MP 24.5 and MP 34.25 and is immediately adjacent to steep hillsides to the east. It is also immediately adjacent to hillsides on its north side for about 5 miles between Oakville and the community of Gate. From Gate to Centralia, the rail line is not adjacent to hillsides except for approximately 0.25 mile where it is next to the hillside at Blakeslee Junction immediately northwest of Centralia.

For the sections of the PS&P rail line that closely parallel US 12, the Washington State Department of Transportation (WSDOT) Unstable Slope Management Program[3] provides some information on the stability of adjacent hillsides (Figure 3.1-1). For the segment between US 12 MP 0.0 and MP 2.5, WSDOT identifies six areas of unstable slopes, including one rock fall, four landslides, and one debris flow that vary between 0.01 and 0.46 mile in length (Trople pers. comm.). The rock fall, debris flow, and one of the landslide areas are located on the north side of the highway (i.e., immediately upslope of the roadway), with the toe of the unstable slope located between 110 and 370 feet away from the edge of the PS&P rail line. WSDOT has installed mitigation measures along the rock fall area in this segment. The remaining three landslide areas occur on the south side of the highway (i.e., immediately upslope of the PS&P rail line), with the toe-of-slope located between about 10 to 20 feet of the rail line.

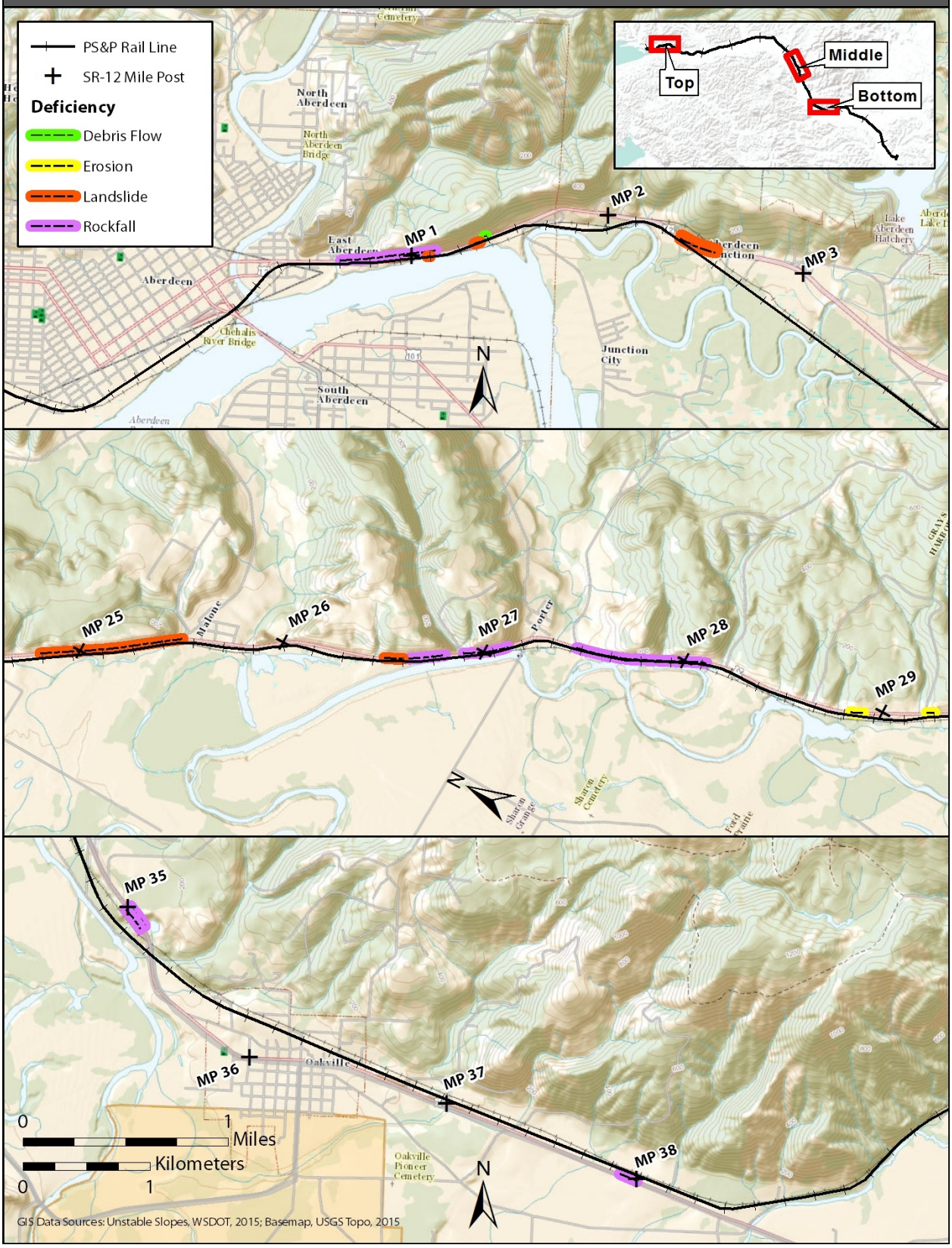
For the segment the PS&P rail line that parallels US 12 between MP 24.5 and MP 34.25, WSDOT identifies seven unstable slopes including three areas with rock falls, two areas with landslides, and two areas with slope erosion issues (Trople pers. comm.). These areas vary between 0.04 to 0.7 mile in length, with the unstable slopes occurring on the east side of the highway (i.e., immediately upslope of the roadway). Distance between the rail line and toe-of-slope in these areas typically varies between 60 to 280 feet. WSDOT has installed mitigation measures for one of the rock fall areas in this segment.

Grays Harbor

Some moderately steep slopes are directly adjacent to the Grays Harbor shoreline along the northern edge of the Bowerman Basin near Grays Harbor City, approximately 4 miles west of the project site. This area is susceptible to shallow landsliding (Slaughter et al. 2013). Submarine (underwater) landslides do occur in deep water approximately 40 miles west of the entrance to Grays Harbor. However, these landslides would not cause any instability within Grays Harbor.

[3] The Unstable Slope Management Program was developed by WSDOT to inventory, rate, and describe unstable slopes within the WSDOT highway system and to develop conceptual slope mitigation designs and cost estimates for these areas. It includes the Unstable Slope Management System, which is a computer program used to evaluate known unstable slopes by balancing hazard and risk in prioritizing funding for proactive stabilization efforts (Washington State Department of Transportation 2010).

Figure 3.1-1. Unstable Slopes near the PS&P Rail Line



Earthquakes

Western Washington is subject to substantial earthquake activity (Washington State Department of Natural Resources 2014b). Earthquakes are most often the result of sudden movement within the Earth's crust or from volcanic activity. The Richter scale has been replaced by the moment magnitude scale (M_W). The magnitude is measured on a logarithmic scale (1.0 to 10.0). The scale of a single step is measured by $10^{1.5}$ or approximately a 32-fold increase. Two steps is 10^3 or a 1,000-fold increase. Simply stated, a M_W=6 releases 32 times more energy than a M_W=5, and a M_W=7 releases 1,000 times more energy than a M_W=5.

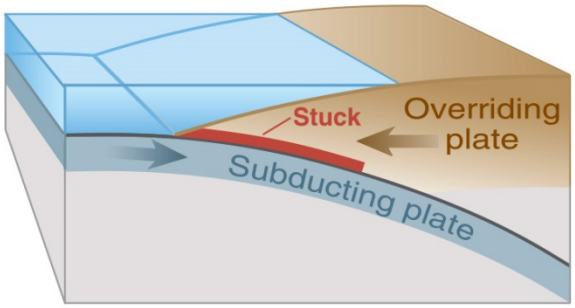
The Modified Mercalli intensity scale[4] correlates the measured magnitude of an earthquake with the perceived intensity of individuals that felt the ground movement and reports the likelihood of damage associated with the expected intensity. For example, according to the Mercalli scale, earthquakes of 6.0 to 6.9 magnitude are considered strong with slight to moderate damage to ordinary, well-built structures. Historic moderate to large earthquakes in the region include the magnitude 7.1 Olympia earthquake (April 13, 1949), the magnitude 6.5 Seattle-Tacoma earthquake (April 29, 1965), and the magnitude 6.8 Nisqually earthquake (February 28, 2001) (Noson et al. 1988; Pacific Northwest Seismic Network 2014). Earthquakes of these magnitudes can cause substantial damage in the immediate vicinity of their occurrence. The amount of shaking and associated damage declines with distance from the earthquake source.

The largest magnitude earthquakes (9.0 magnitude and higher) that could affect the region would likely occur as the result of movement along the CSZ, which extends from northern California through Oregon and Washington to southern British Columbia. A subduction zone is the area created when one tectonic plate moves over another plate within the Earth's crust. The CSZ is created as the San Juan de Fuca tectonic plate plunges (or forms a subduction zone) progressively deeper as it move east underneath the North American plate. The overriding plate is compressed, producing stress (Figure 3.1-2, Panels A and B). The CSZ earthquake is the result of the release of that stress by the unlocking of, and movement between, the two plates.

A rupture along the CSZ would create effects along the entire coastline from northern California to southern British Columbia, and intensity would vary depending on the length of the ruptured CSZ. A full rupture would be the most intense for the entire coastline, but a partial rupture would cause varied intensity depending on the location. Damage would occur in communities facing the Pacific Ocean (e.g., Cosmopolis, Hoquiam, and Aberdeen, Washington) and in the major urban areas of Portland, Oregon; Puget Sound, Washington; California and Vancouver, British Columbia (Cascadia Region Earthquake Workgroup 2013).

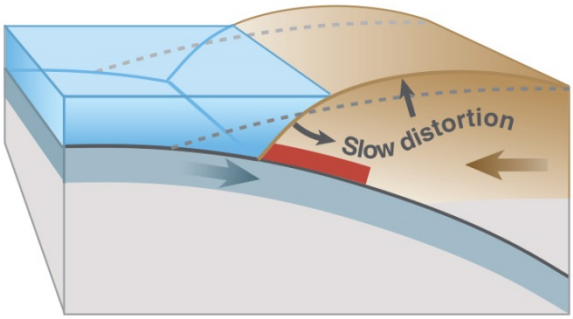
[4] The Modified Mercalli intensity uses a series of 10 intensity levels (Levels I through X) to provide a more meaningful measure of earthquake severity to the nonscientist than the magnitude scale because it describes the actual effects that might be experienced during an earthquake of a certain magnitude (U.S. Geological Survey 2015). According to the Modified Mercalli scale, earthquakes with magnitudes of 6.0 to 6.9 are characterized as Level VI to VII events causing strong to very strong shaking that is felt by all, with slight to moderate damage to ordinary, well-built structures. Earthquakes of magnitudes of 7.0 to 7.9 are characterized as Level VII to VIII that cause very strong to severe shaking, with moderate to substantial damage to ordinary, well-built structures. Earthquakes with magnitudes of 8.0 or higher are characterized as Level VIII to X events with severe to extreme shaking resulting in substantial structural damage to total structure destruction. Historic moderate to large earthquakes in the region have been Level VI to VII events.

Figure 3.1-2. Subduction Zone Earthquake



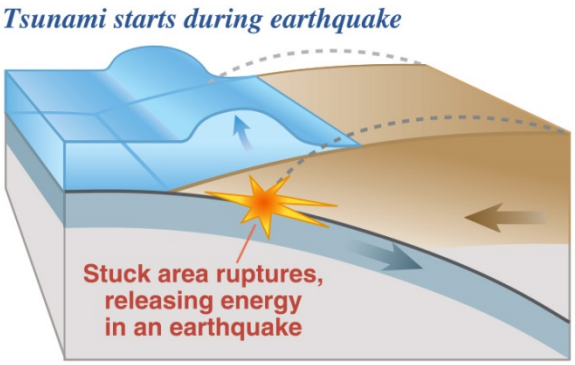
A. Vertical Slice Through a Subduction Zone

One of the many tectonic plates that make up Earth's outer shell descends, or "subducts," under an adjacent plate. This kind of boundary between plates is called a "subduction zone." When the plates move suddenly in an area where they are usually stuck, an earthquake happens.



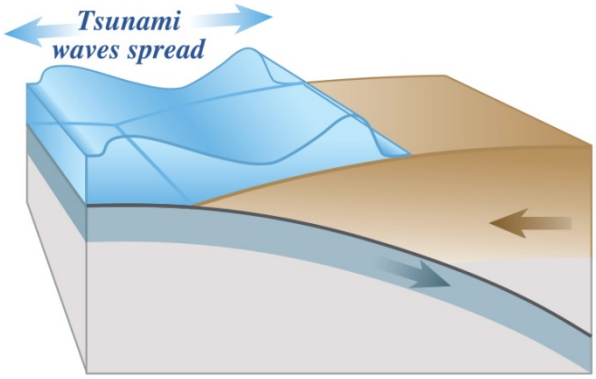
B. Between Earthquakes

Stuck to the subducting plate, the overriding plate gets squeezed. Its leading edge is dragged down, while an area behind bulges upward. This movement goes on for decades or centuries, slowly building up stress.



C. During an Earthquake

An earthquake along a subduction zone happens when the leading edge of the overriding plate breaks free and springs seaward, raising the sea floor and the water above it. This uplift starts a tsunami. Meanwhile, the bulge behind the leading edge collapses, thinning the plate and lowering coastal areas.



D. Minutes Later

Part of the tsunami races toward nearby land, growing taller as it comes in to shore. Another part heads across the ocean toward distant shores.

Source: Atwater et al. 2005

Although no CSZ earthquakes have occurred during the period of written records of the region, there is evidence that they have occurred in recent geologic history. The most recent CSZ earthquake was the 1700 event (Atwater et al. 1995; Jacoby et al. 1997). Its date is known quite precisely (January 26, 1700), because it caused a substantial tsunami in Japan (Atwater et al. 2005).

The probabilities of earthquakes of magnitude 6.0 to 9.0 and greater affecting the study area are shown in Table 3.1-2. In general, the likelihood of an earthquake decreases as the magnitude of the event increases. At the project site, a magnitude 6.0 earthquake has a 30 to 40% likelihood of occurring once in 50 years. A full rupture CSZ earthquake of magnitude (M_W) 9.0 or greater has a lower likelihood of occurring or a 6 to 8% chance within a 50-year window. A series of partial rupture, M_W 8.0 events along the CSZ would have a greater likelihood of occurrence, closer to a 30% chance within a 50-year window. At this time, the 2014 USGS national seismic hazard maps use the full rupture scenario, M_W 9.0, to predict hazards (Peterson et al. 2014).

Along the PS&P rail line, which extends 59 miles from Hoquiam to Centralia, the likelihood of an earthquake of a given magnitude varies over that distance, reflecting the change in distance from a given earthquake source. The likelihood of earthquakes of magnitudes of 7.0, 8.0, and 9.0 declines from west to east relative to the distance from the CSZ, the dominant source of these larger earthquakes. The likelihood of an earthquake of magnitude 6.0 initially increases then decreases moving west to east away from the CSZ and into and away from the complex of interrelated faults of the Puget Sound region, the more likely source of earthquakes of this magnitude.

Table 3.1-2. Probability of Stronger Earthquakes in the Study Area

Earthquake Magnitude (Moment Magnitude Scale, M_w)	Probability of Occurrence at the Project Site (% within 50-year period and within 31 miles)	Probability of Occurrence Along the PS&P Rail Line (% within 50-year Period and within 31 miles)
6.0 or greater	30–40	30–50
7.0 or greater	12–15	3–15
8.0 or greater	10–12	2–12
9.0 or greater	6–8	1–8

Source: U.S. Geological Survey 2009 generates maps based on zip code, earthquake magnitude, and time span. Note that the source distance of these earthquakes is only 31 miles (50 kilometers) so that it does not fully capture more distant earthquakes such as at the western part of the Cascadia Subduction Zone. Additionally, this website calculator has not been updated for 2014 (Petersen et al. 2014). However, this data still provides a useful comparison of expected earthquake magnitudes by location across the study area. Note that the maps produced for Hoquiam and Elma (approximately halfway between Hoquiam and Centralia) are the same. Consequently, data from the maps generated for Hoquiam are used in the table.

Seismic-Related Effects

CSZ earthquakes are known to cause surface rupture, ground shaking, liquefaction, coseismic uplift and subsidence,[5] and tsunamis. These seismic effects are described below.

[5] Coseismic subsidence refers to the lifting and lowering of coastal areas that occurs simultaneous to the earthquake.

Surface Fault Rupture

Earthquakes caused by movement within the earth's crust can cause surface fault rupture. Surface fault rupture occurs when the ground moves in two different directions above a fault line that intersects the surface. This movement can damage infrastructure, such as roads or buildings that sit atop a fault line. No recognized surface-exposed faults are active or potentially active in the study area (Lidke et al. 2003). The Grays Harbor Fault Zone, located on the sea floor, is the closest fault to the study area. It begins approximately 1 mile offshore to the west of Ocean Shores and runs east-west for approximately 13 miles. This fault has an estimated most recent event of less than 1,500 years ago (Lidke et al. 2003). The seaward edge of the CSZ is about 120 miles to the west of Hoquiam. Because there are no active surface faults located in the study area, the potential for impacts related to surface fault rupture are not discussed further.

Strong Ground Shaking

Large earthquakes can also cause damage through strong ground shaking. Ground shaking is most commonly measured in terms of peak ground acceleration (PGA). PGA is a measure of the earth's acceleration compared to earth's gravity (g) as recorded by seismic instruments. Earth's gravity is 1.0 g. To provide context for the intensity of the movement in terms of how such events feel and what the extent of the damage may be, the Mercalli intensity scale can be used to describe general relationships between PGA and perceived shaking and the potential damage that could occur. According to this scale, PGA in the range of 0.34 to 0.65 g is perceived as severe shaking and could cause moderate to heavy damage, depending on the duration of the event and the structural integrity of affected buildings. PGA in the range of 0.65 to 0.8 g is perceived as violent shaking and would likely cause heavy damage (Petersen et al. 2014).

To characterize the potential risks within an area, USGS develops National Seismic Hazard Maps that show the degree of ground shaking that could occur at various probability levels. These USGS maps inform the design requirements in building codes and other professional standards that apply to the proposed action (Section 3.1.2, *What laws and regulations apply to earth resources and conditions?*).

The USGS maps show the expected peak ground movement that could occur as the result of all possible earthquake events within a specific area. The 2014 USGS map shows that, for the study area, there is a 2% probability of an earthquake exceeding a PGA of 0.7 g in a 50-year period. As a generalization, this means that in any 50-year period, there is a 2% chance that an earthquake could occur that would result in severe shaking and moderate to heavy structural damage.

Ground shaking would be strongest in areas underlain by soft soils or unconsolidated deposits such as sand and silt and least in areas underlain by solid rock. The Site Class Map of Grays Harbor County, Washington characterizes the project site as Site Class E, which is the highest level of expected increase of ground shaking due to the type of underlying materials (Palmer et al. 2004). Similar areas of soft soils also occur along the PS&P rail line and would be susceptible to ground shaking in the event of a magnitude 6.0 earthquake or higher.

Liquefaction

Liquefaction occurs when water-saturated, loose sand layers that occur below the ground surface liquefy during strong ground shaking. These liquefied layers can flow like a liquid or lose their strength and consistency such that they cannot support the ground above them. The flowing sediment may erupt to the surface, producing sand boils or sand volcanoes. The liquefied soil layers

may also flow laterally and enter waterways. The loss of support for overlying layers may result in these overlying layers subsiding or moving laterally (lateral spreading). Liquefaction also contributes to the loss of bearing capacity for shallow foundations. Subsidence or lateral spreading can damage building foundations or lead to building collapse.

The Hoquiam-Aberdeen area is underlain by sandy gravel, which is susceptible to liquefaction. The Hoquiam-Aberdeen shoreline, including the project site, is mapped as having a high liquefaction hazard (Slaughter et al. 2013); consequently, these areas are susceptible to liquefaction during a strong (6.0 magnitude or greater) earthquake. This high hazard zone extends up to 0.5 mile inland from the shoreline of the harbor.

From Grays Harbor to Centralia, the liquefaction hazard of the majority of the Chehalis River Valley is classified as moderate to high with smaller areas of low and very low risk (Washington State Department of Natural Resources 2014c:natural hazards map). Consequently, earthquakes of magnitude 6.5 to 7.0 or higher could cause liquefaction of the ground surface along much of the PS&P rail line. Earthquakes of magnitude 6.5 to 7.0 would cause localized areas of liquefaction while larger magnitude earthquakes would cause more extensive areas of liquefaction. Liquefaction could also destabilize bridges or other foundations where railroad tracks cross streams. The PS&P rail line has more than 30 stream crossings between Grays Harbor and Centralia. Larger named stream crossings include the Wishkah River, Van Winkle Creek, Higgins Slough, Wynoochee River, Camp Creek, Satsop River, Newman Creek, Vance Creek, Cloquallum Creek, Mox Chehalis Creek, Porter Creek, Gibson Creek, Cedar Creek, Harris Creek, Roundtree Creek, Black River, Scatter Creek, Prairie Creek, and Skookumchuck River. Although the PS&P rail line parallels and is near the Chehalis River at many locations, it does not actually cross the river.

Coseismic Subsidence

Subduction zone earthquakes are also known to result in extensive coseismic uplift and subsidence, where parallel strips of coastline are lifted or lowered, respectively (Cascadia Region Earthquake Workgroup 2013). In the study area, these motions would occur because of the pre- and post-earthquake interaction between the subducting San Juan de Fuca plate and the overlying North American plate. During a CSZ earthquake, coseismic subsidence would occur almost instantaneously and the land in the study area would drop 5 feet or more. Substantial geologic evidence exists of these events in the Grays Harbor vicinity and in Grays Harbor specifically (Atwater 1992; Shennan et al. 1996; Atwater and Hemphill-Haley 1997; Wang et al. 2013).

As noted above, the most recent CSZ earthquake and associated coseismic subsidence occurred January 26, 1700 (Atwater et al. 1995; Jacoby et al. 1997; Atwater et al. 2005). Wang et al. (2013) reviewed CSZ earthquake subsidence analyses from a wide variety of CSZ sites from northern California to British Columbia. Based on two sites in the Grays Harbor area that they consider to provide the best basis for determining the amount of local coseismic subsidence from the event, Wang et al. (2013) approximate coseismic subsidence of approximately 2 to 5 feet. This subsidence would affect all of Grays Harbor, Hoquiam, Aberdeen, and the lower part of the Chehalis River. Subsidence on this order would increase the depth of the navigation channel, Grays Harbor, and the project site in general by approximately 5 feet.

Tsunamis

Tsunamis are a train of waves that can be generated during an earthquake by the rapid movement of the sea floor or a lakebed (Figure 3.1-2, Panel D) and even by larger landslides. As mentioned above,

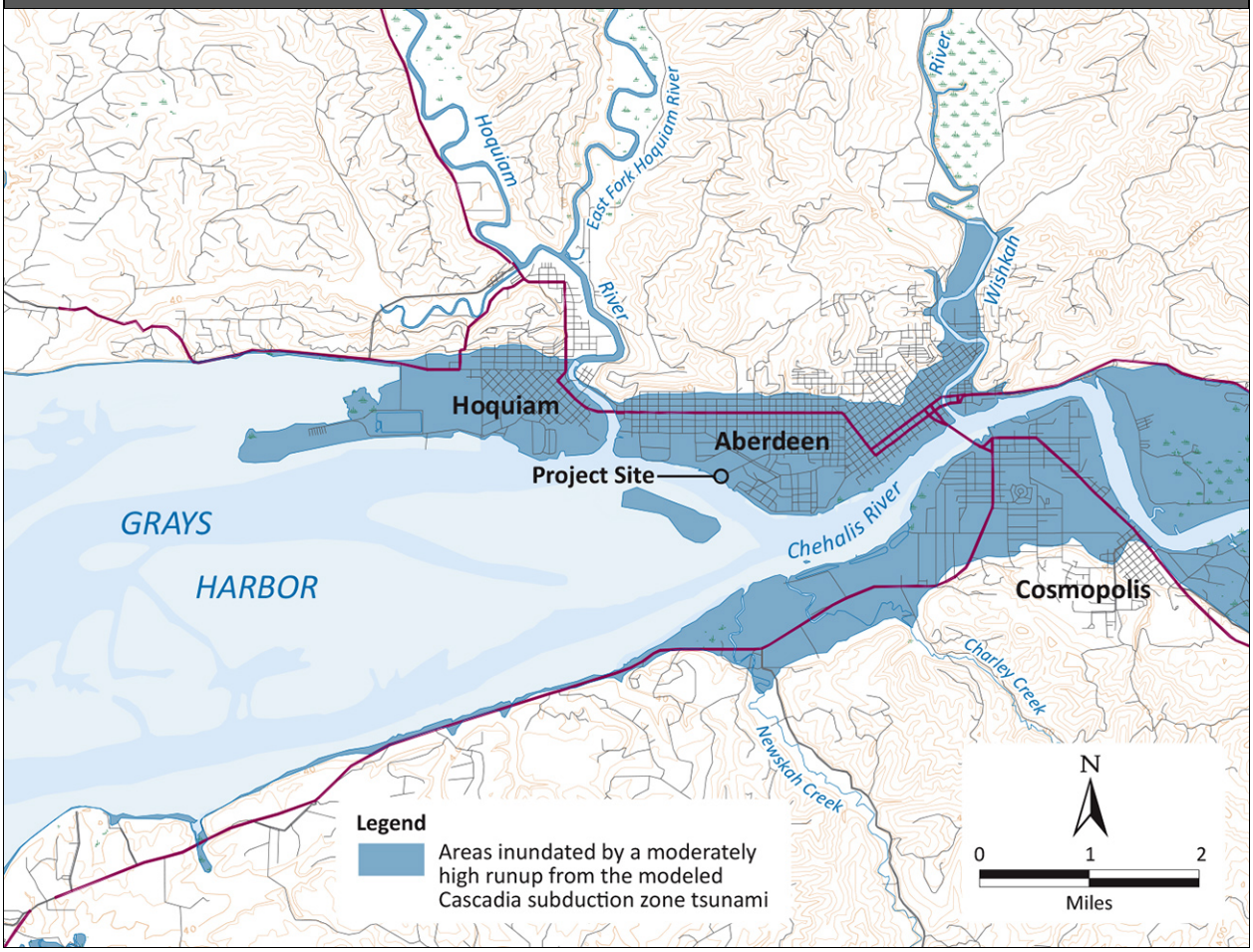
there are some areas susceptible to shallow landsliding around the harbor (Slaughter et al. 2013); however, these areas occur near shallow water, resulting in a very low potential for larger waves to occur.

Tsunamis generated by seismic activity in the open ocean have small wave heights at the point of origin but gain height as they enter shallow coastal zones. When reaching the land surface, the tsunami surge wave may travel inland until it loses its momentum. At that point, the water will flow back toward the ocean. A large tsunami may have many waves that reach the shore over a period of hours. Tsunamis are highly destructive because of the weight and velocity of the water combined with the items that are pushed along by the wave (e.g., boats, cars, refrigerators, propane tanks, debris from destroyed buildings). The destruction occurs from both directions as the wave moves inland and then flows back to the ocean.

Tsunamis may reach the Washington coast from several locations; however, the largest potential tsunamis are associated with a CSZ event. Tsunami modeling by Walsh et al. (2000) was used to develop hazard mapping for Washington State to characterize tsunami risks for planning purposes. The modeling was completed for a moderate CSZ earthquake consistent with a 500-year event.[6] The modeling was informed by the best available data at the time of analysis and showed that most of the Grays Harbor communities (including Westport, Ocean Shores, Hoquiam, Aberdeen, and Cosmopolis) would be inundated by a moderately high run-up CSZ tsunami (Figure 3.1-3). Based on the model used to develop the mapping, the first tsunami wave would reach Hoquiam in 1 hour, with a wave elevation above the ground surface of about 2 feet and a maximum height of subsequent waves of about 3.5 feet (Walsh et al. 2000). In contrast, the modeled wave heights at Westport and Ocean Shores on the south and north spits, respectively, at the west end of Grays Harbor, would be over 11 feet and 13 feet, respectively.

[6] A 500-year event means the probability that a moderately powerful CSZ earthquake will occur in any given year is 0.2%.

Figure 3.1-3. Modeled Tsunami Inundation from a Cascadia Subduction Zone Earthquake



Source: Walsh et al. 2000

Since the publication of the state's hazard mapping in 2000, recent tsunami events and advancements in the understanding and methods applied to tsunami modeling have provided for refinement of these estimates. To further inform the risk of tsunamis in the study area, an updated tsunami model was completed (Appendix C, *Tsunami Impact Modeling and Analysis*). The model used in this updated analysis focuses specifically on the study area and extends approximately 200 miles offshore from the project site. Consistent with current practices, the updated model considers a more conservative tsunami event (i.e., a 3,333-year event[7]) than past efforts used to characterize risk, including the state's current hazard mapping. In other words, current practices evaluate the potential for a much larger seismic event (which corresponds with a lower likelihood of occurrence) and incorporate an additional factor of safety.[8] The analysis concluded that the extent of the

[7] A 3,333-year event means the likelihood that a powerful CSZ earthquake will occur in any given year is 0.03%, or very low. In general, this can be expected to occur once every 3,333 years, but two events of this same magnitude can occur more frequently.

[8] With respect to this analysis, application of a factor of safety means the results of the model (i.e., predicted height and forces of the tsunami waves) were subsequently increased (in this case by 1.3 times) to provide an additional "factor of safety." Incorporation of a factor of safety of 1.3 was used to reflect federal requirements since no state or local requirements are available.

inundation (i.e., how far inland the tsunami waves reached) would be similar to that shown in the state's hazard mapping but that the larger seismic event could cause a tsunami with wave heights of 23 to 33 feet North American Vertical Datum of 1988 (NAVD 88) near the project site. This means that in the event of a large-scale CSZ earthquake, there is a potential tsunami waves (water and debris) reaching the proposed facilities at the project site could be 21 to 26 feet above the ground surface, after coseismic subsidence occurs. As noted, the likelihood of an event that would result in waves of this size occurring in any given year is extremely low, or approximately 0.03%. In other words, the chance that a tsunami of this size would not occur would be 99.97% in any given year. For additional information about this analysis, refer to Appendix C, *Tsunami Impact Modeling and Analysis*.

Existing tsunami modeling does not extend up the Chehalis River Valley (Walsh et al. 2000; Coast and Harbors Engineering 2014). However, based on the low-elevation topography, there is some tsunami risk for approximately 5 miles up the valley to the vicinity of Montesano. Tsunami wave height and intensity would dissipate rapidly as waves move up the river valley and the risk would decrease commensurately. For example, Walsh et al. (2000) modeled tsunami crests at more than 10 feet at the entrance to Grays Harbor but only 3 feet at Aberdeen. The wave heights east of Aberdeen would be less.

Tsunamis can also be generated by large submarine landslides. These landslides disturb the overlying water and waves radiate out from that location. With sufficiently large landslides, these waves can generate tsunamis when the waves reach shallow water. Although submarine landslides are known to originate from offshore Washington, much of their activity has been correlated with CSZ earthquakes. No non-CSZ earthquake-related tsunamis are known to have been generated from submarine landslides on the outer Washington coast. Submarine landslide-generated tsunamis are not discussed further.

Volcanic Activity

Two active volcanoes are present in the Cascade Range approximately 100 miles to the east of Hoquiam and about 50 miles to the east and southeast of Centralia. Volcanic hazards at these distances would be from the air fall of volcanic ash and from volcanic mudflows that would flow down volcano slopes into, and then down, adjacent rivers. The project site is outside the lowest probability level of the accumulation of 4 or more inches of volcanic ash from a Cascade volcano eruption (Wolfe and Pierson 1995). The eastern parts of the Chehalis River Valley have an even lower risk of experiencing substantial ash fall (0.01 and 0.02%) (Wolfe and Pierson 1995) and volcanic activity would not be likely to affect rail operations in the area.

Volcanic mudflows from the 1980 Mount St. Helens volcanic eruption flowed from the volcano into the Toutle River and downstream into the Cowlitz River as far as the Columbia River (Haini 1983). However, no mudflows reached the Chehalis River. Based on past evaluations, it is unlikely mudflows from Mount Rainier would reach the Chehalis River (Cakir and Walsh 2012) and are not likely to reach the PS&P rail line.

Based on the above information, volcanic hazards would not affect the project site, the PS&P rail line, or navigation in the navigation channel or offshore. Volcanic hazards are not discussed further.

3.1.5 What are the potential impacts related to earth resources and conditions?

This section describes the impacts related to earth resources and conditions that could occur in the study area. Potential impacts of the no-action alternative are described first, followed by potential impacts of the proposed action.

3.1.5.1 No-Action Alternative

Under the no-action alternative, impacts related to earth resources from the construction of the proposed action would not occur. The applicant would continue to operate its existing facility as described in Chapter 2, Section 2.1.3.2, *Existing Operations*. Although the proposed action would not occur, it is assumed that growth in the region would continue under the no-action alternative. This growth could lead to development of another industrial use at the project site, which could result in impacts similar to those described for construction and routine operation of the proposed action. However, for the purposes of this analysis, it is assumed that no future development would occur at the project site.

As described in Section 3.1.4.3, *Geologic Hazards*, there is a potential for larger magnitude earthquakes and earthquake-related hazards to occur in the study area. Under the no-action alternative, because no new facilities or operational changes would occur, there would be no increased exposure to risk of damage related to these events compared with existing conditions.

Under the no-action alternative, geologic events, including landslides, earthquakes, ground shaking, liquefaction, coseismic subsidence, and tsunamis would continue to have the potential to disrupt existing rail service and cause incidents and derailments if the events were strong enough. Specifically, ground shaking associated with a magnitude 6.5 earthquake or higher could destabilize the tracks (because of liquefaction) or cause incidents, including possible derailments. This would be most likely to occur in areas where the PS&P rail line is located on looser soils. As discussed above, this occurs primarily closest to the project site and in areas where the PS&P rail line comes closer to the Chehalis River floodplain in areas closer to Centralia. Much larger events (CSZ event of magnitude 9.0 or greater) could also result in coseismic subsidence that could affect portions of the PS&P rail line in Hoquiam and Aberdeen and the lower part of the Chehalis River. These same areas could also be affected by tsunami waves that could be large and powerful enough to destabilize the tracks and cause train derailments.

Under the no-action alternative, large magnitude CSZ events could affect existing vessel traffic in the harbor. If large enough, tsunami waves could move vessels located in the harbor and cause incidents as vessels came into contact with one another or with debris. As discussed in Section 3.1.4.3, *Geologic Hazards,* depending on the magnitude of the event, tsunami waves between 3 to 26 feet above ground surface in height could reach the project site.

3.1.5.2 Proposed Action

This section describes the impacts that could occur in the study area as a result of construction and routine operation of the proposed action. This section also addresses potential impacts of broader geologic conditions on the proposed action and the transportation systems that would support it. First, this section describes impacts from construction of the proposed action. It then describes

impacts of routine operation at the project site and of routine rail and vessel transport to and from the project site.

Construction

Construction of the proposed action could increase erosion and soil instability from earthwork (e.g., excavation, filling, site grading) required to prepare the project site for the new facilities. Although the site is currently paved, existing asphalt in the area proposed for development would be removed and approximately 5.9 acres would be disturbed by grading activities. Approximately 7,700 cubic yards of fill material would be required and would come from material that was previously dredged from the harbor that has been stored on site. More than 14,200 cubic yards of existing materials would be removed and hauled off site.

Construction activities would expose bare soil during ground disturbance and could result in the need to temporarily stockpile soil. This would increase the potential for erosion from wind or surface-water runoff and for loose soils to enter waterways, resulting in water quality concerns. Potential water quality impacts associated with sedimentation are discussed in Section 3.3, *Water*.

As mentioned previously, the potential for increased erosion on the project site is low because the site is relatively flat and because sandy, gravely soils have a low erosion potential. Additionally, the proposed action would be required to obtain and comply with a General Permit for Stormwater Discharges Associated with Construction Activities (National Pollutant Discharge Elimination System Construction Stormwater General Permit) and to develop and implement a stormwater pollution prevention plan. Implementation of best management practices consistent with the Stormwater Management Manual for Western Washington (Washington State Department of Ecology 2012) would reduce the potential for erosion and sedimentation during construction. Geologic and soil conditions at the project site suggest that such erosion control and best management practices would be effective in reducing environmental impacts.

Although there would be small, temporary areas where soils would be stockpiled and some cut slopes, no large areas of steep slopes would be created. Therefore, construction of the proposed action would not result in the potential for increased soil instability such as landslides that could occur because of steeper slopes. Additionally, once contoured, the site would be stabilized by paving, which would limit the potential for further soil movement.

Operations

This section describes impacts that would occur as a result of routine operations at the project site, rail transport along the PS&P rail line, and vessel transport through Grays Harbor.

Onsite

Landslides and Slope Instability

There is no potential for natural landslide instability to affect the project site during operations.

Earthquakes and Related Hazards

As discussed in Section 3.1.4.2, *Geology and Soil Conditions*, the project site is located in an area that has the potential for moderate to severe earthquakes to occur. The extent of the damage would depend on the magnitude of the event, but should a CSZ earthquake of magnitude 9.0 or higher

occur, the following hazards would also occur: intense ground shaking (PGA) in the range of 0.7 g, liquefaction, and ground settling of 6 to 31 inches, coseismic subsidence on the order of 2 to 5 feet, and tsunamis that could affect the project site. Although the potential for these events to occur would remain the same compared to the no-action alternative, there could be increased risk of damage to the newly proposed occupied office buildings, storage tanks, and related infrastructure if the appropriate design standards were not met.

Prior to construction, the applicant would be required to obtain the appropriate building permits and approvals from the Cities of Hoquiam and Aberdeen. This would require final design of the proposed action to be consistent with the building codes and standards described in Section 3.1.2, *What laws and regulations apply to earth resources and conditions?* Compliance with those regulations would ensure that the proposed office structures and storage tanks meet the design standards required to reduce the risk of property and personal damage to acceptable levels.

In addition to meeting the general minimum standards, these regulations require site-specific assessments to be completed and any additional mitigation measures to be implemented to ensure risks related to geologic hazards are adequately reduced. As mentioned previously, a site-specific evaluation was completed in 2013 by Hart Crowser. The analysis considered PGA and ground settling factors for the project site (with the exception of the easternmost corner) and applied the International Building Code (2009) and American Society of Civil Engineers 7-05, using conservative values as the basis of making additional design recommendations. These measures would be required to adequately reduce the risks at the construction phase for future operation of the proposed office buildings and storage tanks.

The consideration and implementation of geotechnical engineering and structural design for a project is an iterative and ongoing process, during which varying levels of investigation and analysis are performed to identify and address the potential impacts associated with a project commensurate with its stage in development. Therefore, prior to receiving the final building permits, the applicant would need to ensure the geotechnical evaluation considered the most current applicable information and standards. Implementation of measures identified during investigations specific to the proposed action and any others identified during subsequent investigations would be required to adequately reduce the risks of the proposed action.

As discussed in Section 3.1.4.2, *Geology and Soil Conditions*, the project site is located in an area that has the potential to be inundated by tsunami waves. The extent of damage would vary with the magnitude of the seismic event, the tidal level at the time for the earthquake, the current state of sea-level rise, and the amount of debris (from ships or buildings) that may be traveling with the wave. Although the risk of tsunami is unchanged with or without the proposed action, construction of new facilities associated with the proposed action would expose additional structures and workers to potential harm. However, if a tsunami were to occur, current analyses indicate there would be approximately 1 hour for onsite personnel to evacuate. Therefore, the development and implementation of the emergency evacuation plan described in Section 3.1.7.1, *Applicant Mitigation*, would help to reduce this impact.

Depending on the magnitude of the event, the new storage tanks could also become damaged and contribute to the tsunami debris, or rupture and result in a spill of crude oil into the environment. Although the proposed action is expected to be designed and constructed to the currently required minimum design standards, these standards (as defined by the International Building Code, adopted through State Building Code [RCW 19.27] and City Building Codes [HMC 2.08 and AMC 15.08]) do

not require consideration of site-specific tsunami risks. To address this, the mitigation discussed in Section 3.1.7.1, *Applicant Mitigation*, identifies the specific forces that should be considered during the design of the proposed facilities to reduce potential impacts related to a tsunami event.[9] Other than the storage tanks, the proposed facilities would include material transfer and collection plumbing designed to move product from rail cars to the storage tanks and from storage tanks to vessels. These portions of the facility may not be designed to withstand the seismic and tsunami events described. Section 3.1.7.1, *Applicant Mitigation*, proposes the incorporation of specific shut-off valves at the connection point of the storage tanks and delivery system into the facility design that would isolate the contents of the storage tanks from the delivery systems in the event of an earthquake and related effects. The contents of the delivery systems (e.g., pipelines) would likely be released into the environment and reach the adjacent waters of Grays Harbor. Any offloading rail cars on the project site or onloading vessels at the Terminal 1 dock would also have the potential to release any contents. Chapter 4, Section 4.7, *Impacts on Resources*, describes the types of impacts that could result from an oil spill, fire, or explosion.

Rail

Although the proposed action would not result in any modifications to the PS&P rail line that would directly affect soils or geological resources, geological events could affect increased rail traffic and safety under the proposed action. Potential events that could affect the PS&P rail line include landslides, earthquakes, and other seismically related events, such as liquefaction, coseismic subsidence, and tsunamis. The potential impacts associated with incidents along the rail line are addressed in Chapter 4, *Environmental Health and Safety*.

Landslides and Slope Instability

As discussed in Section 3.1.4.3, *Geologic Hazards,* approximately 19 miles of the 59-mile PS&P rail line (about 32%) are located within 10 to 280 feet of moderate to steep slopes and hillsides. In these locations, the rail line is susceptible to damage from landslides. Although the risk of a landslide occurring in this portion of Washington is moderate because of the presence of steep slopes, unstable soils, high regional rainfall, and a relatively long rainy season, the potential for such events to derail a passing train is low. For approximately 12 of the 19 miles (about 63%) that the rail line is adjacent to steep or unstable slopes, it is separated from the adjacent hillslope by US 12 (Figure 3.1-1). East of Aberdeen US 12 is a four-lane highway that is approximately 70 feet wide divided by a concrete barrier (top panel of Figure 3.1-1). In the Malone-Porter area and near Oakville (middle and bottom panels of Figure 3.1-1), US 12 is two lanes and approximately 40 feet wide with no barrier. Based on data obtained from WSDOT's Unstable Slopes Management Program, debris flows from the majority of the known unstable slopes upslope of the highway are not expected to impede more than half of the roadway width (Fish pers. comm.). Consequently, it is unlikely that landslide debris from these locations could reach the PS&P rail line. In the two locations where potential debris flows from unstable slopes are expected to impede the entire width of the roadway, the PS&P rail line is an additional 25 to 50 feet away from the edge of the road. Although debris flows from landslides in these locations could reach the rail line, the likelihood that

[9] As discussed in Section 3.1.4.3, *Geologic Hazards*, the updated analysis of tsunami risks specific to the project site considers a risk scenario consistent with a more conservative 3,333-year event and an additional 1.3 factor of safety. Although not currently required by state or local regulations, these assumptions would be applied following guidance presented in Appendix M of the International Building Code, which documents voluntary standards.

such events could hit and derail a train is low, as these areas only account for approximately 0.1 mile (about 0.2%) of the 59-mile PS&P rail line in the study area.

In the three locations along the rail segment between Aberdeen and MP 2.5 of US 12, WSDOT identified unstable slopes between the highway and PS&P rail line (Trople pers. comm.). Debris flows from landslides in these locations could reach the rail line, as it is located close (approximately 10 feet) to the toe-of-slope in some locations. In January 2015, debris flows crossed the highway and PS&P rail line east of Morrison Park (approximately MP 1.3). Although this event demonstrates the potential for such events to occur, the potential is relatively low because these areas occur along only 0.23 mile (about 0.4%) of the 59-mile PS&P rail line in the study area.

Because there would be an increase in the number of trains traveling within this corridor under the proposed action, these risks would be similar to but slightly greater than risks under the no-action alternative. Specifically, operation of the proposed action at maximum throughput would add 458 unit train trips[10] per year (1.25 trips per day on average) along the PS&P rail line to the approximately 1,100 train trips per year (three trips per day on average) under the no-action alternative (Section 3.15, *Rail Traffic*). The increased frequency of travel could result in a slight increase in the exposure of people and property to harm from derailment incidents caused by landslides. The increased risks of exposure of the environment to crude oil (e.g., oil spills or other incidents) directly attributable to the proposed action are discussed in Chapter 4, *Environmental Health and Safety.*

Earthquakes and Related Hazards

As discussed in Section 3.1.4.3, *Geologic Hazards,* the PS&P rail line is located in an area that has the potential for moderate to severe earthquakes to occur. The extent of the damage would depend on the magnitude of the event, but should a CSZ earthquake of magnitude 9.0 or higher occur, the following hazards would also occur: intense ground shaking (PGA) in the range of 0.7 g, liquefaction, coseismic subsidence near Hoquiam and Aberdeen, and exposure to tsunami waves that could affect portions of the rail line closest to Hoquiam and Aberdeen. Events of this magnitude would have the potential to cause damage the rail line and trains to derail.

Because there would be an increase in the number of trains traveling within this corridor under the proposed action as described above, these risks would be similar to, but slightly greater, than under the no-action alternative. The increased frequency of travel could result in a slight increase in the exposure of people and property to harm from derailment incidents caused by earthquakes and earthquake-related hazards, such as those described above. The increased risks of exposure of the environment to crude oil (e.g., oil spills or other incidents) that would be directly attributable to the proposed action are discussed in Chapter 4, *Environmental Health and Safety.*

Vessel

Although the proposed action would not result in modifications to the harbor that would directly affect soils or geological resources, vessel operations could result in the slight increased potential for shoreline erosion associated with vessel wake. Additionally, potential geological events, specifically earthquake-related hazards of coseismic subsidence and tsunamis, could affect increased vessel traffic and safety under the proposed action.

[10] A trip represents one-way travel; in other words, an inbound trip and an outbound trip are counted as two trips.

Landslides and Slope Instability

Operation of the proposed action at maximum throughput would add 238 tank vessel trips[11] per year (0.7 trip per day on average) along the navigation channel to projected large commercial vessel trips under the no-action alternative—between 338 and 436 large commercial vessel[12] trips per year in 2017 and 2037, respectively, or approximately one trip per day on average, under the no-action alternative (Section 3.17, *Vessel Traffic*).

Increased vessel traffic related to the proposed action could result in a slight increase in erosion within the navigation channel and along the shoreline as the result of propeller wash or vessel wake. A ship's propeller generates a continuous stream of fast-moving water known as a propeller-induced jet (AMOG Consulting 2010:5). When a propeller-induced jet impinges directly on a seabed or channel bottom, it can resuspend soft bottom sediments, cause the erosion of channel banks and cut-lines, and physically damage aquatic vegetation and benthic communities. This is referred to as *propeller wash* and its effects are determined by a number of parameters including the depth of the waterbody; number, type, and diameter of propellers; distance between propellers and the seabed or channel bottom; size of the vessel; engine power; and maneuvering speed, among other factors. Potential effects of propeller wash on water quality and critical saltwater habitat are described in Section 3.3, *Water*, and Section 3.4, *Plants*, respectively.

Large tankers would be more likely to create turbulence that can erode bottom sediments than tugs because the large propellers on these vessels are closer to the channel bottoms. The potential for increased erosion could be reduced if vessels were to call during higher tides (as discussed below), because increased channel depth would increase the distance between the vessel's propeller and the channel bottom. Additionally, vessels associated with the proposed action are likely to be escorted into the harbor and maneuvered around the Terminal 1 dock and the turning basin by tugs, which have smaller propellers that operate nearer the surface, reducing the potential for propeller wash to impinge on the channel bottom and sides. However, as tugs maneuver a large vessel, they may create wakes perpendicular to the vessel and the navigation channel.

Vessel wake or waves caused by vessels transiting the harbor could increase shoreline erosion if large enough waves were to reach the shoreline with increased frequency and sufficient intensity to accelerate erosion. The location and extent of vessel wake effects would depend on a variety of factors, including climatic conditions, tidal conditions, vessel type, vessel location, and vessel speeds.

As described in Section 3.17, *Vessel Traffic*, transit by deep-draft vessels through the navigation channel is typically planned when tidal elevations are close to high tides and outgoing loaded vessels may wait until the tide is even higher for safety purposes. Moreover, the majority of the Grays Harbor shoreline is thousands of feet or more from the navigation channel (e.g., the farthest point of the North Bay shoreline is 8 miles from the navigation channel).

Further, a 2003 wave modeling study was conducted for the Port of Grays Harbor and coastal communities of southwest Washington to address Washington State Department of Natural Resources concerns about potential wave impacts on state-owned aquatic lands caused by the navigation channel in Grays Harbor. The study concluded that "energy from wind-generated waves generated in Grays Harbor and vessel-generated waves are shown to be insignificant in relation to the contribution from oceanic waves" (Pacific International Engineering 2003). The study focused

[11] A trip represents one-way travel.

[12] The term *large commercial vessels* refers collectively to tank and cargo vessels.

on Whitcomb Flats Natural Area Preserve, which is a sandflat that is mostly submerged during high tide and exposed during low tides; it is directly adjacent to the navigation channel and is the nearest unprotected erodible feature to the navigation channel. The study concluded that waves from vessels (a variety of large commercial vessels traveling at 15 knots were modeled) made an insignificant contribution to all waves and that natural waves (storm waves and swell from ocean) were the driving force that affected the movement and erosion of the sandflat.

For these reasons, proposed action vessel trips would result in a small, incremental increase in the potential for erosion associated with wake compared to the no-action alternative. The implications of increased vessel wake are addressed in Section 3.3. *Water*, Section 3.4, *Plants*, and Section 3.5, *Animals*.

Additionally, and as discussed in Section 3.1.4.2, *Geology and Soil Conditions,* there is the potential for localized landslides around the harbor; however, these areas are located away from Terminal 1 and would not be large enough to affect vessel traffic within the harbor.

Earthquakes and Related Hazards

As discussed in Section 3.1.4.2, *Geology and Soil Conditions,* Grays Harbor and the area where vessels would travel out to 3 nautical miles from the mouth of the harbor is located in an area that has a potential for moderate to severe earthquakes. These events could affect vessel traffic and waterway safety if the event was large enough to result in large waves, including tsunamis that could cause vessels to collide with one another or even to run aground in shallower areas.

Because the number of vessels traveling in this corridor would increase under the proposed action, described above, these risks would be similar to, but slightly greater, than under the no-action alternative. The increased frequency of travel could result in a slight increase in the exposure of people and property to harm from earthquakes and earthquake-related hazards, such as those described above. The increased risks of exposure of the environment to crude oil; e.g., oil spills related to vessel collisions or other incidents) that would be directly attributable to the proposed action are discussed in Chapter 4, *Environmental Health and Safety.*

3.1.6 What required permits apply to earth resources and conditions?

The following permit conditions and required plans are expected to reduce impacts related to earth resources and conditions.

- City of Hoquiam and City of Aberdeen Critical Areas Reviews for fish and wildlife habitat and geologically hazardous areas
    - Critical area review report
    - Buffer establishment and protection requirements
    - Buffer mitigation and monitoring requirements
    - Buffer activity limits and restrictions
- City of Hoquiam and City of Aberdeen Building Permits

  - Requirement for compliance with American Society of Civil Engineers 7 and American Petroleum Institute 650 design and construction standards, including climatic and geologic loading requirements
  - Erosion control plan
  - Geotechnical report
  - Shoreline substantial development permit
  - Critical areas review
- City of Hoquiam and City of Aberdeen Grade and Fill Permits

3.1.7 What mitigation measures would reduce impacts related to earth resources and conditions?

This section describes the applicant mitigation that would reduce impacts related to earth resources from construction and routine operation of the proposed action. Mitigation measures to reduce impacts on environmental health and safety from increased risk of incidents and related consequences are presented in Chapter 4, *Environmental Health and Safety*.

3.1.7.1 Applicant Mitigation

The applicant will implement the following mitigation.

- To minimize the potential for impacts at the project site related to unstable soils, the applicant will prepare the project site for construction as described in the applicant's geotechnical report (Hart Crowser 2013).
  - Recompact and/or over-excavate and replace areas observed to be soft, loose, wet, or yielding with structural fill.
  - Install a geotextile stabilization fabric, additional clean gravel material, and/or a greater thickness of fill if areas larger than 0.5 acre of exposed ground are unusually soft or disturbed.
  - In all disturbed areas during construction, remove any soft, loose, or organic zones and replace with structural fill. The upper material provides lateral support for pile foundations. In areas with pile and structural slab systems, rigorous preparation of the subgrade is not required.
- To minimize the potential for damage to the storage tanks related to geologic risks and unstable soils, the applicant will install pile-supported foundations that extend to necessary depths to embed in competent soil required to resist seismic forces and maintain stability if liquefaction, lateral spreading, and settlement of surface soils occurs.
- To minimize the potential for damage to the storage tanks related to geologic risks and unstable soils, the applicant will develop final design specifications for proposed structures based on the following updated standards/information, including additional site-specific evaluation for the easternmost portion of the project site.
  - U.S. Geological Survey ground-shaking report and maps released in July 2014 (Petersen et al. 2014).

  - American Petroleum Institute Standard 650 (2012).
  - International Building Code 2012.

- To minimize the potential for spills and leaks that could occur at oil storage tank connection points, the applicant will design and install flush-mounted or internal automatic shut-off valves that allow the tanks to remain isolated from pipe distribution systems that may shear off or be damaged during seismic-related events.
- The applicant will ensure that a tsunami evacuation and emergency management plan is prepared prior to beginning project operations. This plan will consider evacuation planning, identification of safe havens, and identification of evacuation routes to natural high ground and will be developed in coordination with emergency management officials (City of Hoquiam, Grays Harbor County, Washington State, U.S. Coast Guard, ship captains, and pilots).
- To reduce the potential for environmental damage related to a tsunami event, the applicant will conduct a study to assess the technical feasibility and cost of implementing measures to construct the proposed facilities to withstand a CSZ $L1M_W$ 9.0 tsunami wave based on the Scenario 2 inputs listed in Table 3 of the *Tsunami Impact Modeling and Analysis* (Appendix C). If ASCE 7 Standard, *Minimum Design Loads for Buildings and Other Structures, Chapter 6 – Tsunami Loads and Effects*, is adopted by future Uniform Building Code updates before project design is completed and is more protective, the updated standards will supersede the mitigation measure. Agreed-upon measures will be implemented prior to project design and construction in coordination with the co-lead agencies.

3.1.8 Would the proposed action have unavoidable and significant adverse impacts on earth resources and conditions?

Although the likelihood of a large-scale tsunami event is relatively low, such an event would likely cause unavoidable and significant adverse environmental impacts at or near the project site if the facility was not constructed to withstand it. If the storage tanks are constructed according to the inputs identified in Section 3.1.7.1, *Applicant Mitigation*, they are expected to withstand tsunami forces and provide full containment of contents during and after seismic and tsunami events. While the proposed facility may not be operational following a large seismic event, the storage tanks would contain materials until the materials could be safely recovered or the facility returns to operational status. The potential for the release of oil to the environment from the oil transfer and collection system and from unloading rail cars onsite and onloading vessels at dock would remain. Potential impacts related to increased risk of incidents and related consequences are addressed in Chapter 4, *Environmental Health and Safety*.

3.2 Air

Clean air is vital to human health and is a resource protected by federal, state, and local regulations. Pollutants in the air can negatively affect humans, plants, animals, and human-made structures. Ambient (outdoor) air is affected by climate, topography, meteorological conditions, and airborne pollutants produced by natural or artificial sources.

This section describes the existing air quality in the study area. It then describes impacts on air quality that could result under the no-action alternative or as a result of the construction and routine operation[1] of the proposed action. Finally, this section presents any measures identified to mitigate impacts of the proposed action and any remaining unavoidable and significant adverse impacts.

3.2.1 What is the study area for air quality?

The study area for air quality consists of air quality on and near the project site that could be affected by construction and routine operation at the project site. The study area also includes air quality that could be affected during routine rail transport along the Puget Sound & Pacific Railroad (PS&P)[2] rail line and vessel transport through Grays Harbor out to 3 nautical miles from the mouth of the harbor.

The study area for greenhouse gas (GHG) emissions includes the project site and emissions related to rail and vessel transportation between the likely source of crude oil (Williston Basin in North Dakota) and the farthest likely refinery destination (Port of Long Beach, California). The source and destination are based on the analysis presented in Appendix Q, *Crude Oil Market Analysis.*

3.2.2 What laws and regulations apply to air quality?

Laws and regulations for determining potential impacts on air quality are summarized in Table 3.2-1. More information about these laws and regulations is provided in Appendix B, *Laws and Regulations*.

[1] Chapter 4, *Environmental Health and Safety*, addresses the potential impacts from increased risk of incidents (e.g., storage tank failure, train derailments, vessel collisions) and related consequences (e.g., release of crude oil).
[2] The PS&P rail line refers to the rail line between Centralia and the project site.

Table 3.2-1. Laws and Regulations for Air Quality

Laws and Regulations	Description
Federal	
Clean Air Act of 1963 (42 U.S.C. 7401 et seq.)	Regulates the nation's air emissions through the enforcement of the National Ambient Air Quality Standards for criteria air pollutants in the ambient (outside) air. In 2007, the U.S. Supreme Court ruled to regulate GHG emissions as air pollutants under the CAA.
State	
Clean Air Act (RCW 70.94)	Regulates stationary sources of emissions to protect air quality.
Controls for New Sources of Toxic Air Pollutants (WAC 173-460)	Establishes the systematic control of new or modified sources emitting toxic air pollution to prevent air pollution, reduce emissions, and maintain air quality that will protect human health and safety.
Reporting of Emissions of Greenhouse Gases (WAC 173-441)	Establishes mandatory GHG reporting requirements for owners and operators of certain facilities that directly emit GHGs at a rate of 10,000 $MTCO_2e$ per year or greater.
Limiting Greenhouse Gas Emissions (RCW 70.235)	Establishes statutory reductions of overall GHG emissions and report emissions to the governor bi-annually. The first target statutory reduction is to achieve 1990 level GHG emissions by 2020 and 50% below 1990 levels by 2050 (or 70% below the State's expected emissions that year).
Local	
No local laws or regulations apply to air quality.	

U.S.C. = United States Code; GHG = greenhouse gas; CAA = Clean Air Act; RCW = Revised Code of Washington; WAC = Washington Administrative Code; $MTCO_2e$ = metric tons of carbon dioxide equivalent.

3.2.3 How were impacts on air quality evaluated?

This section describes the sources of information and methods used to evaluate impacts.

3.2.3.1 Information Sources

The following sources provided information on air quality.

- National Weather Service.
- State and federal air quality regulations and emissions levels (Table 3.2-1).
- NW AIRQUEST, a tool developed by Washington State University's Northwest International Air Quality and Environmental Science and Technology Consortium.
- The U.S. Environmental Protection Agency (EPA) EPA MOVES 2010 model.
- California Air Resources Board vessel transit emissions study (2008).

The following sources provided information on GHG emissions.

- World Resources Institute GHG emission information.
- Washington State Department of Ecology (Ecology) state GHG emissions inventory (2014a).

- Intergovernmental Panel on Climate Change Fifth Assessment Report (2013) World Resources Institute Climate Analysis Indicators Tool.
- Council on Environmental Quality draft guidance on considering climate change in National Environmental Policy Act (NEPA) reviews.

3.2.3.2 Impact Analysis

The air analysis involved two distinct parts: a quantitative analysis of the contribution of the criteria air pollutants and GHG emissions, and a qualitative discussion of the potential impacts of criteria air pollutants and toxic air pollutants on air quality in the study area. The analysis considered annual emissions based on assumptions for 2017 and annual emissions based on assumptions for 2037; differences in the results are noted, where applicable.

The quantitative analysis of the contribution of criteria air pollutants and GHG emissions included the emissions from construction and routine operation of the proposed action in the study area. Air pollutant emissions from the following sources were quantified.

- Use of equipment to construct the proposed facilities (Chapter 2, Section 2.1.5, *Construction Schedule and Methods*).
- Onsite operations, including emissions from stationary sources[3] (including the marine vapor combustion unit), vehicles, rail switching operations,[4] and vessels at dock.[5]
- Rail transport[6] along the PS&P rail line. GHG emissions along the rail route from the Williston Basin in North Dakota to the project site.
- Vessel transport[7] to 3 nautical miles from the mouth of Grays Harbor. GHG emissions along the vessel route between the project site and the farthest likely refinery destinations (Port of Long Beach, California).

Emission calculations from these sources were based on the estimated hours of operation, types of equipment, and types of fuel consumed.

Based on information from PS&P, the following assumptions regarding locomotives were used in calculating rail emissions (Irvin pers. comm.).

- No more than two locomotives would be used to move rail cars from Poynor Yard to the project site.
- Ninety-eight percent of the locomotives would be equipped with Automatic Engine Shut-off System (AESS).
- All locomotives would be Class 1 line-haul engines, not locomotives from PS&P.

[3] Based on the estimated hours of operation, types of equipment, and types of fuel consumed based on information provided in the air permit applications.
[4] From the locomotive engines while moving cars and while idling during switching and unloading.
[5] From auxiliary engines used to internally power the shipboard electricity, pumps, bilge, etc.
[6] Based on the travel speeds and fuel consumption while loaded and unloaded, and locomotive fleet turnover changes over the 20-year planning period.
[7] From engines of tank barge (barge auxiliary engine and tug engine), assist tugs, and escort tugs based on the typical travel speeds and fuel consumption while arriving (unloaded) and departing (loaded).

Criteria pollutant emissions were considered in the context of Grays Harbor County emissions. GHG emissions were considered in the context of statewide, national, and global emissions.

The qualitative discussion of the effect of emissions of toxic air pollutants on sensitive receptors was informed by determining the emissions from onsite operations including rail and vessel emissions during loading and unloading. The toxic air pollutants with the potential to exceed Washington State Small Quantity Emission Rates, as identified in Controls for New Sources of Toxic Air Pollutants (Washington Administrative Code [WAC] 173-460), were assessed through dispersion modeling to demonstrate the ambient level of each toxic pollutant with respect to its acceptable source impact level (ASIL).[8]

3.2.4 What is the air quality in the study area?

This section describes the climate and air quality in the study area. This section also describes sensitive air quality receptors.

3.2.4.1 Climate

The climate in Grays Harbor is characterized by mild temperatures, year-round rainfall with peaks in the winter, and strong coastal winds. Temperature and precipitation records from 1891 to 2013 for the Aberdeen National Weather Service Cooperative Station show that monthly temperatures are lowest in January when the average monthly lows are 34.6°F. August is typically the warmest month with an average monthly maximum temperature of 69.8°F. Aberdeen experiences an average of about 8.6 inches of annual snowfall. Most of the precipitation falls as rain with an annual average of 83.20 inches. Average monthly rainfall over the period of record ranges from 1.21 inches in July to 13.44 inches in December. The region experiences strong coastal winds, while inland wind speeds are typically weaker. Appendix D, *Air Data*, describes climate in the study area in more detail.

3.2.4.2 Existing Air Quality

Grays Harbor County is designated an attainment area for criteria air pollutants, which means that air quality meets the federal and state health-based ambient air quality standards.

Particulate matter is the primary air pollutant at the project site. However, the highest measured 24-hour concentration nearest to the project site was well below the air quality standard for particulate matter of 2.5 micrometers or less (PM2.5).[9] The primary sources emitting particulate matter in the vicinity are home heating, trucks, fishing vessels, and commercial cargo vessels.

Background concentrations of other criteria pollutants at the project site were estimated using NW AIRQUEST.[10] Table 3.2-2 shows the criteria pollutant concentrations estimated for the project site

[8] Washington State Department of Ecology has established acceptable source impact levels (ASIL), which are screening concentrations of toxic air pollutants in the ambient air.

[9] As shown in Appendix D, *Air Data*, the highest 24-hour average PM2.5 concentration from January 1, 2010 to June 30, 2014, was 18 micrograms per cubic meter (μg/m^3)(January 2014), well below the PM2.5 air quality standard of 35 μg/m^3.

[10] NW AIRQUEST was developed by Washington State University's Northwest International Air Quality and Environmental Science and Technology Consortium (2013) as sponsored by EPA Region 10, Washington State Department of Ecology, and others. The work developed background design value estimates for 2009 to 2011 based on model-monitor interpolated products that provide realistic background design value estimates where

and their percentage of the current national or state (whichever is more stringent) ambient air quality standard.

Table 3.2-2. Background Concentrations of Criteria Air Pollutant at the Project Site and Percentage of Air Quality Standard

Pollutant Parameter	Background Concentration[a]	Percentage of National or State Ambient Air Quality Standard[b]
PM2.5 24-hour	6.9 μg/m^3	20%
PM2.5 annual	3.5 μg/m^3	29%
O_3 daily 8- hour maximum	51 ppb	68%
NO_2 1-hour	21 ppb	21%
NO_2 annual	1.9 ppb	3.6%
SO_2 1-hour	5.1 ppb	6.8%
SO_2 3-hour	3.3 ppb	0.7%
SO_2 24-hour	1.1 ppb	0.8%
SO_2 annual	0.6 ppb	3.0%
CO 1-hour	532 ppb	1.5%
CO 8-hour	420 ppb	4.7%
PM10 24-hour	25 μg/m^3	17%

[a] Northwest AIRQUEST 2009–2011 design value.
[b] Whichever is more stringent.
PM2.5 = particulate matter with a diameter of 2.5 micrometers or less; μg/m^3 = micrograms per cubic meter; ppb = parts per billion; O_3 = ozone; NO_2 = nitrogen dioxide; SO_2 = sulfur dioxide; CO = carbon monoxide; PM10 = particulate matter with a diameter of 10 micrometers or less; ppb = parts per billion

3.2.4.3 Sensitive Receptors

Sensitive air quality receptors were defined to determine potential air quality impacts at the receptors. Sensitive air quality receptors were defined as a facility or land use that houses or attracts members of the population who are particularly sensitive to the effects of air pollutants, such as children, the elderly, and people with illnesses. Examples of sensitive receptors include schools, hospitals, day care centers, convalescent facilities, senior centers, and parks or recreational facilities. These types of facilities and land uses are located near the project site, along the PS&P rail line between Centralia and the project site, and along the shoreline of Grays Harbor. The following sections identify sensitive receptors at the project site, along the PS&P rail line, and along the shoreline of Grays Harbor.

Project Site

Because emissions of toxic air pollutants and criteria air pollutants would be the highest at and near the project site from rail, vessel, and project site operations, the greatest potential for impacts on sensitive receptors would be near the project site.

There are 21 sensitive receptors within 1 mile of the project site (Table 3.2-3). The closest sensitive receptors to the project site are the 28th Street Landing boat launch and 28th Street Viewing Tower

nearby ambient monitoring data are unavailable. More information about the NW AIRQUEST tool can be found at http://www.lar.wsu.edu/nw-airquest/lookup.html.

(approximately 0.2 mile west of the project site along the Grays Harbor shoreline) and the West End Playfield (approximately 0.3 mile north of the project site).

Table 3.2-3. Sensitive Receptors within 1 Mile of the Project Site[a]

Name of Facility	Type of Facility	Approximate Distance from Project Site (mile)
28th Street Landing - Viewing Tower	Park	0.2
28th Street Landing	Park	0.2
West End Playfield	Park	0.3
Anna's Playhouse	Child care facility	0.5
Pacific Ave Play Park	Park	0.6
Pacific Care and Rehabilitation Center	Health care facility	0.6
Grays Harbor Podiatry Clinic	Health care facility	0.6
Washington Elementary School	School	0.7
YMCA of Grays Harbor	Facility	0.7
Olympic Stadium	Park	0.7
Grays Harbor County RSN	Health care facility	0.7
Wunderland Childcare Inc. #4	Child care facility	0.7
Batting Cages at Olympic Stadium	Park	0.8
A.J. West Elementary School	School	0.8
Hallak Medical Group	Health care facility	0.8
Grays Harbor Community Hospital	Health care facility	0.8
Sea Mar Aberdeen Medical	Health care facility	0.9
Family Medicine Grays Harbor	Health care facility	0.9
Harbor High School	School	0.9
Harbor Internal Medicine Clinic	Health care facility	1.0
Harborean	Roller skating rink	1.0

[a] The sensitive receptors were identified using internet data sources and were not field-verified.

PS&P Rail Line

Sensitive receptors within 0.25 mile of the PS&P rail line are presented in Table 3.2-4.

Table 3.2-4. Sensitive Receptors within 0.25 Mile of the PS&P Rail Line[a]

Name	City
Child/Day Preschool Care	
Snug Harbor Child Care Center	Aberdeen
Creative Hands Child Care	Aberdeen
Central Park Co-Op Preschool	Aberdeen
Careland Playschool	Montesano
Montesano Co-Op Preschool	Montesano
Tee Time Playschool	Montesano
Raykowski Eileen Day Care	Montesano

Name	City
Learning To Grow Child Care	Elma
Prairie Patch Preschool	Rochester
Precious Years	Rochester
Dell's Children's Center	Centralia
Schools	
Central Park Elementary School	Aberdeen
Beacon Avenue Elementary School	Montesano
Satsop Elementary School	Elma
Hunters Prairie School	Elma
Elma Elementary School	Elma
Elma High School	Elma
East Grays Harbor High School	Elma
Elma Middle School	Elma
Elma Head Start	Elma
Oakville High School	Oakville
Oakville Elementary School	Oakville
Rochester Head Start	Rochester
Rochester Middle School	Rochester
Rochester High School	Rochester
Rochester Primary School	Rochester
Rochester Elementary School	Centralia
Maple Lane High School	Centralia
Hospital/Medical Facilities	
Summit Pacific Medical Center	Elma
NW Indian Treatment Center	Elma
Senior Centers/Skilled Nursing	
Avalon Healthcare	Aberdeen
Silvia Center (long term/hospice care)	Montesano
Montesano Senior Center	Montesano
Parks	
John W. Vessey Memorial Ball Park	Montesano
Fleet Park	Montesano
Gladys Smith Park	Elma
Lloyd Murrey Park	Elma
Oakville Baseball Field	Oakville
Oregon Trail Park	Centralia

[a] The sensitive receptors were identified using internet data sources and were not field-verified.

Grays Harbor

There are several communities along the shoreline of Grays Harbor. The vessels calling at the project site would traverse a more southerly route, avoiding the shoreline along most of the route.

Table 3.2-5 shows 12 sensitive receptors within 0.5 mile of the shoreline along the southern portion of Grays Harbor.

Table 3.2-5. Sensitive Receptors within 0.5 Mile of the Grays Harbor Shoreline[a]

Name	City
Child/Day Preschool Care	
Rosie Day Care	Westport
Schools	
Ocosta Elementary	Westport
Ocosta Junior/Senior High	Westport
Grays Harbor College	Aberdeen
Senior Centers/Skilled Nursing	
Westport South Beach Senior Center	Westport
Parks	
Westhaven State Park	Westport
Westport City Park	Westport
Bottle Beach State Park	Aberdeen
Spinnaker Park	Ocean Shores
Washington Parks: Ocean City Beach Access Area	Ocean City

[a] The sensitive receptors were identified using internet data sources and were not field-verified.

3.2.4.4 Current Greenhouse Gas Emissions

GHG emissions trap heat in the atmosphere and increase surface temperatures on the Earth. Although some emissions occur through natural processes, emissions from human activities have increased substantially over the last 150 years. The impacts of climate change, such as sea level rise, changes in precipitation patterns, ocean acidification, and surface temperatures are experienced locally and result from global increase in GHG concentration in the atmosphere. Climate change is addressed further in Chapter 6, *Cumulative Impacts.* GHG emissions calculations are characterized in terms of carbon dioxide equivalent (CO_2e)[11] emissions based on the global warming potential factors consistent with the Intergovernmental Panel on Climate Change Fifth Assessment Report (2013) for carbon dioxide (CO_2), methane, and nitrous oxide.[12]

World Resources Institute maintains an online database of global GHG emissions that is based on a consistent method to estimate emissions for the key GHGs. It is based on inventory data provided by EPA, Department of Energy, Food, and Agriculture Organization of the United Nations, and the

[11] Carbon dioxide equivalent (CO_2e) is a metric used to compare the emissions of the different greenhouse gases based on their global warming potential. It represents the amount of carbon dioxide emission that would cause the same integrated radiative forcing, over a given time horizon, as an emitted amount of a greenhouse gas or a mixture of greenhouse gases. The equivalent carbon dioxide emission is obtained by multiplying the emission of a greenhouse gas by its global warming potential for the given time horizon (Intergovernmental Panel on Climate Change 2013).

[12] The U.S. GHG Emissions Inventory covers six GHGs; however, since this proposed action does not include refrigeration hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride were not included in the estimate of GHG emissions.

International Energy Agency. In 2011, global emissions were estimated to be 43,372.71 million metric tons of CO_2e and U.S. emissions were 6,550.10 million metric tons of CO_2e, (World Resources Institute 2014). In 2011, Ecology reported that Washington State was responsible for contributing 91.7 million metric tons of CO_2e, a decrease from the peak of 101.6 million metric tons in 2007 (Washington State Department of Ecology 2014a).

3.2.5 What are the potential impacts on air quality?

This section describes impacts on air quality that could occur in the study area. Potential impacts of the no-action alternative are described first, followed by potential impacts of the proposed action, including impacts on sensitive receptors.

3.2.5.1 No-Action Alternative

Under the no-action alternative, the applicant would continue to operate its existing facility as described in Chapter 2, Section 2.1.3.2, *Existing Operations*. Continued operation of the existing facility consistent with the terms of its current air quality permit and in compliance with Ecology's toxic air pollutant program is not anticipated to result in the exceedance of applicable air quality standards. Although the proposed action would not occur, it is assumed that growth in the region would continue under the no-action alternative. This growth could lead to development of another industrial use at the project site, which could result in impacts similar to those described for construction and routine operation of the proposed action. However, for the purposes of this analysis, it is assumed that no future development would occur at the project site.

3.2.5.2 Proposed Action

This section describes the impacts that could occur in the study area as a result of construction and routine operation of the proposed action. First, this section describes impacts from construction of the proposed action. It then describes impacts of routine operation at the project site and of routine rail and vessel transport to and from the project site.

Construction

As noted in Chapter 2, *Proposed Action and Alternatives*, construction would likely occur in two phases and would include the use of various types of construction equipment, such as heavy-duty trucks, welders, excavators, and backhoes. Use of this equipment would result in emissions of criteria air pollutants, toxic air pollutants, and GHGs.

Criteria Air Pollutants

The study area is in attainment for all criteria pollutants and therefore not subject to federal air quality regulations.[13] However, federal regulations provide emission *de minimis* levels[14] that can be used for evaluating emissions from the construction of the proposed action.

The estimated annual average construction-related emissions for Phase 1 and Phase 2 are well below the *de minimis* levels established by EPA, as provided in Appendix D, *Air Data*. Although

[13] General Conformity rules (40 CFR 93) only apply to areas considered in nonattainment or maintenance of federal and state ambient air quality standards.
[14] *De minimis* levels are emission levels below which no significant contamination of the air will occur.

emissions of criteria pollutants would occur, they would not be expected to cause a significant contamination of the air and are unlikely to affect sensitive receptors surrounding the project site.

Toxic Air Pollutants

Construction of the proposed action could result in emissions of toxic air pollutants, primarily associated with diesel particulate matter (DPM).

DPM[15] is a known human carcinogen and is linked to numerous health effects including:

- Lung inflammation
- Inflammation and irritation of the respiratory tract
- Eye, nose, and throat irritation along with coughing, labored breathing, chest tightness, and wheezing
- Decreased lung function
- Worsening of allergic reactions to inhaled allergens
- Asthma attacks and worsening of asthma symptoms
- Heart attack and stroke in people with existing heart disease
- Lung cancer and other forms of cancer
- Increased likelihood of respiratory infections
- Male infertility
- Birth defects
- Impaired lung growth in children

The construction-related emissions would be short-term and intermittent, with total DPM of less than 0.17 ton per year, which would be less than 0.2% of total 2011 DPM emissions for Grays Harbor County (9.5 tons per year) (Washington State Department of Ecology 2014a). Acute exposure may irritate the eyes, nose, throat, and lungs. All DPM emissions are associated with mobile sources and because of their relatively low release height, construction personnel could be subject to the highest exposures from construction of the proposed action. Offsite exposure at air quality sensitive receptors would likely be well below any level of concern because of the relatively short-term construction period and intermittent operation of the construction equipment.

Greenhouse Gas Emissions

Construction would generate the following GHG emissions.

- Phase 1: 704 metric tons CO_2e
- Phase 2: 183 metric tons CO_2e.

[15] The PM10 emissions from any diesel-fueled equipment are considered. Here the vast majority of construction equipment was considered as diesel fueled.

Operations

This section describes impacts that would occur as a result of routine operations at the project site, rail transport along the PS&P rail line, and vessel transport through Grays Harbor.

Criteria Air Pollutants

Onsite

Onsite emissions include those from stationary sources (e.g., emissions from storage tank cleaning, combustion of vapors from vessel loading) and from mobile sources (e.g., emissions from rail locomotives and vessel engines that would occur onsite). Appendix D, *Air Data*, provides the estimated annual average emissions of criteria air pollutants from operations of the proposed action at maximum throughput. Table 3.2-6 provides a summary of estimated annual average emissions of criteria air pollutants emitted onsite; detailed emissions data are provided in Appendix D, *Air Data*.

Table 3.2-6. Estimated Onsite Emissions of Criteria Air Pollutants—Proposed Action (pounds per year)

Pollutant	Emissions from Stationary Sources	Total Emissions (Stationary and Mobile Sources)
NO_X	4,934	17,514
PM10	499	742
PM2.5	499	726
VOC	71,677	72,145
CO	11,985	13,340
SO_2	33	330

Source: Appendix D, *Air Data.*
NO_X = nitrogen oxides; PM10 = particulate matter with a diameter of 10 micrometers or less; PM2.5 = particulate matter with a diameter of 2.5 micrometers or less; VOC = volatile organic compound; CO = carbon monoxide; SO_2 = sulfur dioxide

Based on air quality dispersion modeling performed for onsite stationary sources as part of the applicant's air permit application process (Trinity Consultants 2015), the most potentially problematic air pollutant is nitrogen oxides (NO_X). Accounting for the additional NOx emissions from onsite operation of rail locomotives and tank vessels, total estimated emissions from onsite source could reach 81 μg/m^3. Considering background concentrations, the 1-hour nitrogen dioxide concentration could reach nearly 81% of the national ambient air quality standards (NAAQS). This estimate was conservatively reached by adding the simultaneous occurrence of emissions associated with bringing rail cars on site and vessel operation during loading. Further, it was assumed that 80% of the NO_X was emitted as nitrogen dioxide concentrations and that the highest NO_X emissions from the rail and vessel operations would be received at the same location as the highest NO_X emissions modeled for the stationary sources. Even under these conservative assumptions, the 1-hour nitrogen dioxide concentrations on site would not exceed the NAAQS.

Average annual emissions of criteria air pollutants from onsite operations of stationary sources under the proposed action at maximum throughput were also compared to total 2011 emissions in Grays Harbor County (Appendix D, *Air Data*). The following are stationary sources.

- Fugitive emissions (emissions from losses during filling and draining)
- Storage tanks (leaks from valves and flanges)

- Tank cleaning
- Marine vapor combustion unit (vessel loading emissions)

For each of the criteria air pollutants, the onsite stationary emissions would range from less than 1 to 26% of the county total emissions for each pollutant. The maximum incremental increase is for volatile organic compound emissions.

Rail

Operation of the proposed action at maximum throughput would add 458 unit train trips[16] per year (1.25 trips per day on average) along the PS&P rail line to the approximately 1,100 train trips per year (three train trips per day on average) under the no-action alternative (Section 3.15, *Rail Traffic*). This increase in rail traffic would result in increased emissions of all criteria air pollutants. The most notable increase is predicted for NO_X. Table 3.2-7 summarizes the annual operational emissions of criteria pollutants emitted within Grays Harbor County under the proposed action compared to Grays Harbor County emissions. Total additional annual NO_X emissions from rail within Gray Harbor County are predicted to be 14.9 tons per year, followed by carbon monoxide emissions at 3.5 ton per year, with all other predicted emissions less than1 ton per year.

Table 3.2-7. Annual Operations Emissions of Criteria Air Pollutants emitted in Gray Harbor County—Proposed Action Compared to 2011 Gray Harbor County Emissions (tons per year)

		Source Categories[a]					
Criteria Air Pollutant	**Sources**	**Facility Operations[b]**	**Rail [c,d]**	**Vessel[d]**	**On-Road Mobile**	**Other Sources**	**Total Emissions**
NO_X	Proposed Action	2.5	14.9	44.0	0.1	-	**61.5**
	Grays Harbor County	643.7	41.4	297.9	2,224.3	484.2	**3,691.5**
PM10	Proposed Action	0.25	0.4	0.6	<0.01	-	**1.3**
	Grays Harbor County	410.2	1.0	9.9	82.5	1,681.4	**2,185.0**
PM2.5	Proposed Action	0.25	0.4	0.6	0.0	-	**1.3**
	Grays Harbor County	375.0	0.9	9.5	66.0	722.8	**1,174.2**
VOC	Proposed Action	35.8	0.6	1.8	0.0	-	**38.2**
	Grays Harbor County	140.7	1.6	7.8	1,138.6	19,451.3	**20,740.1**
CO	Proposed Action	6.0	3.5	2.7	0.2	-	**12.4**
	Grays Harbor County	730.8	4.1	55.8	13,786.3	12,562.9	**27,139.9**
SO_X	Proposed Action	0.02	0.0	0.9	<0.01	-	**0.9**
	Grays Harbor County	227.7	0.3	14.7	7.1	21.5	**271.3**

Sources: Grays Harbor County emissions: Washington State Department of Ecology 2014a; proposed action facility operations emissions: Trinity Consultants 2015.

[a] Source categories based on Washington State Department of Ecology 2014a.

[b] The proposed action onsite emissions include only those from stationary sources. The county emissions represent those from all industrial stationary sources.

[16] A trip represents one-way travel; in other words, an inbound trip and an outbound trip are counted as two trips.

[c] Based on estimate that 68% of the fuel consumption from rail transit along the PS&P occurs within Grays Harbor County.

[d] Rail and vessel emissions for the proposed action include emissions from on-site rail and vessel operations.

CO = carbon monoxide; NO_X = nitrogen oxides; SO_X = sulfur oxides; VOC = volatile organic compound; PM10 = particulate matter with a diameter of 10 micrometers or less; PM2.5 = particulate matter with a diameter of 2.5 micrometers or less

Emissions of criteria pollutants from rail traffic related to the proposed action would increase carbon monoxide emissions by 85%, while most of the other criteria pollutants would increase by 45% or less, relative to the existing levels for the County's inventory associated with rail activity. However, rail emissions are mobile and would be spread out along the 59-mile PS&P rail line, making it unlikely that a localized concentration of emissions would occur that could exceed the 1-hour standard with the exception of NO_X.

As noted previously, the predicted NO_X rail emissions associated with the proposed action would represent the highest level of emissions and are substantially greater than the other criteria pollutants. The initial screening modeling shows that the 1-hour nitrogen dioxide standard could be exceeded. For these reasons, NO_X emissions are considered the primary criteria air pollutant of concern. In other words, it is the criteria air pollutant most likely to exceed the NAAQS. However, because no violation of the nitrogen dioxide NAAQS is anticipated at the project site based on the air quality modeling, emissions from locomotives during transit are not expected to violate air quality standards. This is because rail emissions would be emitted across the entire 59-mile PS&P rail line, making it unlikely that a localized concentration of emissions would exceed the 1-hour standard. Additionally, total NO_X emissions attributed to the proposed action, including increased vessel traffic emissions, would represent less than 2% of the county's total NO_X inventory.

Vessel

Operation of the proposed action at maximum throughput would add 238 tank vessel trips per year (0.7 trip per day on average) along the navigation channel to the projected large commercial vessel[17] trips in 2017 and 2037, respectively, or approximately one trip per day on average, under the no-action alternative (Section 3.17, *Vessel Traffic*).

NO_X emissions from vessel operations would be 44.0 tons per year, followed by carbon monoxide emissions at 2.7 tons per year (Table 3.2-7). All other predicted emissions would be less than 2.0 tons per year (Table 3.2-7). In general, emissions of criteria air pollutants related to increased vessel traffic would increase the existing levels of the county's vessel-related emissions between 5 and 23%.

Because predicted vessel NO_X emissions would be approximately 15 to 70 times greater than the other criteria air pollutants, and because initial air quality screening modeling shows a possible exceedance of the 1-hour nitrogen dioxide standard, NO_X emissions are considered the primary criteria air pollutant of concern. In other words, it is the criteria air pollutant most likely to exceed the NAAQS. However, because no violation of the NAAQS is anticipated at the project site based on air quality modeling, even under the conservative conditions described above, it is not anticipated that emissions from vessels during transit would violate air quality standards. This is because vessel emissions would be emitted away from shore and would spread out over the navigation channel, making it unlikely that a localized concentration of emissions would occur that could exceed the

[17] The term *large commercial vessel* refers collectively to tank and cargo vessels.

1-hour standard. Additionally, total NO_X emissions attributed to the proposed action, including increased vessel traffic emissions, would represent less than 2% of the county's total NO_X inventory.

Toxic Air Pollutants

Onsite

Onsite operations of the proposed action would also result in emissions of toxic air pollutants (DPM, PM10, benzene, formaldehyde, and toluene) and air toxics (includes all hazardous air pollutants as well as hydrogen sulfide, sulfuric acid mist, n-hexane, cyclohexane, nitrogen dioxide, sulfur dioxide, and carbon monoxide). Potential impacts from onsite sources, with the exception of DPM, were assessed using the methods outlined in the WAC 173-460-020 (Controls for New Sources of Toxic Pollutants).

In Washington State, all new stationary sources emitting toxic air pollutants are required to show compliance with the Washington toxic air pollutant program pursuant to WAC 173-460. Ecology has established a small quantity emission rate (SQER) and an ASIL for each listed toxic air pollutant. If the toxic air pollutant emissions rate from a source is above its respective small quantity emission rate, further determination of compliance with the ASIL is required.

All of the toxic air pollutants emitted from onsite stationary source operations would be either under their respective SQER or in compliance with their respective ASIL. Of the three toxic air pollutants that are above their SQERs—hydrogen sulfide, benzene, and nitrogen dioxide—all are within their ASILs. The highest is hydrogen sulfide at 75.63%, followed by benzene at 56.35% and nitrogen dioxide at 3.73% ASILs.

The impacts of DPM emissions from rail car unloading at the project site are described below.

Rail

The dominant air toxic emissions (both a hazardous and toxic air pollutant) from rail transport are DPM emissions from the burning of diesel fuel. Air dispersion modeling of DPM was conducted using EPA's AERMOD[18] dispersion model for the proposed action's rail activities between Poynor Yard and the project site. This area would have the highest emissions along the PS&P rail line from rail switching and unloading activities, as described in Section 3.15, *Rail Traffic*. Rail switching and unloading activities were modeled using 5 years (2007 to 2011) of Hoquiam area meteorological data, and a 5-year average annual DPM cancer risk was determined. Total emissions of DPM were estimated at 0.03 ton per year.

Figures 3.2-1 and 3.2-2 show the average increased inhalation cancer risk from DPM for the proposed action in 2017 and 2037[19] by illustrating the 10 per million and 1 per million risk levels. The air quality sensitive receptors within these risk levels are also shown. Under WAC 173-460 (Controls of New Sources of Toxic Air Pollutants), Ecology may recommend approval for a stationary source project likely to cause an exceedance of ASILs for one or more toxic air pollutants if the increase of toxic air pollutant emissions (such as DPM) would not likely increase cancer risk to more

[18] AERMOD is a dispersion model recommended by EPA for estimating the impact of industrial sources of emissions on ambient air quality.

[19] Years 2017 and 2037 were modeled to assess the risk from DPM emissions over time because locomotives that emit less DPM than in 2017 will be in operation by 2037.

than 10 in 1 million. However, this regulation applies to stationary sources, not mobile sources such as rail locomotives. There are no local or state regulations for DPM emissions from mobile sources. For this reason, the 10-per-million increase risk level is not a threshold to determine significance of the impact. However, to provide context of the average increased inhalation cancer risk from DPM, the 10-per-million increase risk level is shown in Figures 3.2-1.[20] The 1-per-million risk level is also shown in Figures 3.2-1 and 3.2-2. This is the screening level for acceptable increased risk for DPM.

The analysis indicates that the 10-per-million and above risk level from rail operations would be limited to the project site in 2017 and be below that level at all locations in 2037. The 1-per-million risk level from rail operations would extend up to approximately 0.5 mile from the project site in 2017 and approximately 0.1 mile from the project site in 2037. The West End Playfield, a sensitive receptor, would be just within the 1-per-million risk level in 2017. Some residential land uses north of the project site would be also within the 1-per-million increase risk level in 2017. By 2037 no sensitive receptors would be within the 1-per-million-risk level. As shown in Figures 3.2-1 and 3.2-2, the increase inhalation risk from DPM action above 1 per million from rail operations at Poynor Yard would extend to approximately 0.2 mile (1,000 feet) from the PS&P rail line at Poynor Yard in 2017 and to 150 feet from the rail line in 2037.

DPM emissions from rail transport along the PS&P rail line in the initial year of full operation (2017) are estimated at 2,353 pounds per year. Based on the length of the PS&P rail line (59 miles between Centralia and project site), this represents approximately 48 grams of DPM per day per mile.

Washington State Department of Transportation prepares yearly summaries of annual average daily traffic volume and percentage of heavy-duty truck traffic on state and federal highways. According to the most recent summary of 2013 traffic data, traffic along US Highway 12 (US 12) (approximately 12.3 miles east of its junction with US Highway 101 [US 101]) had an average heavy-duty daily truck activity level of 1,900 vehicles (Washington State Department of Transportation 2013). These types of trucks are almost entirely diesel fueled. Assuming these are all diesel fueled and using the fleet average DPM emission factor from the EPA MOVES 2010 model for heavy-duty trucks results in an average daily DPM emission rate of 760 grams per mile. Based on a comparison of the predicted fuel usage of trains related to the proposed action, the increase in DPM associated with rail transport along the PS&P rail line under the proposed action would be the equivalent of a 3.5% increase in heavy-duty truck traffic or about the equivalent of 67 heavy-duty trucks per day. This increase in emissions from rail transport between Aberdeen and Centralia is not expected to result in a significant increase in DPM exposure for any sensitive receptors along the PS&P rail line or to the public.

[20] The 10-per-million risk increase level would be shown in Figure 3.2-2 but the increase risk was below that level for all receptors.

Figure 3.2-1. Average Diesel Particulate Matter Inhalation Risk (2017)

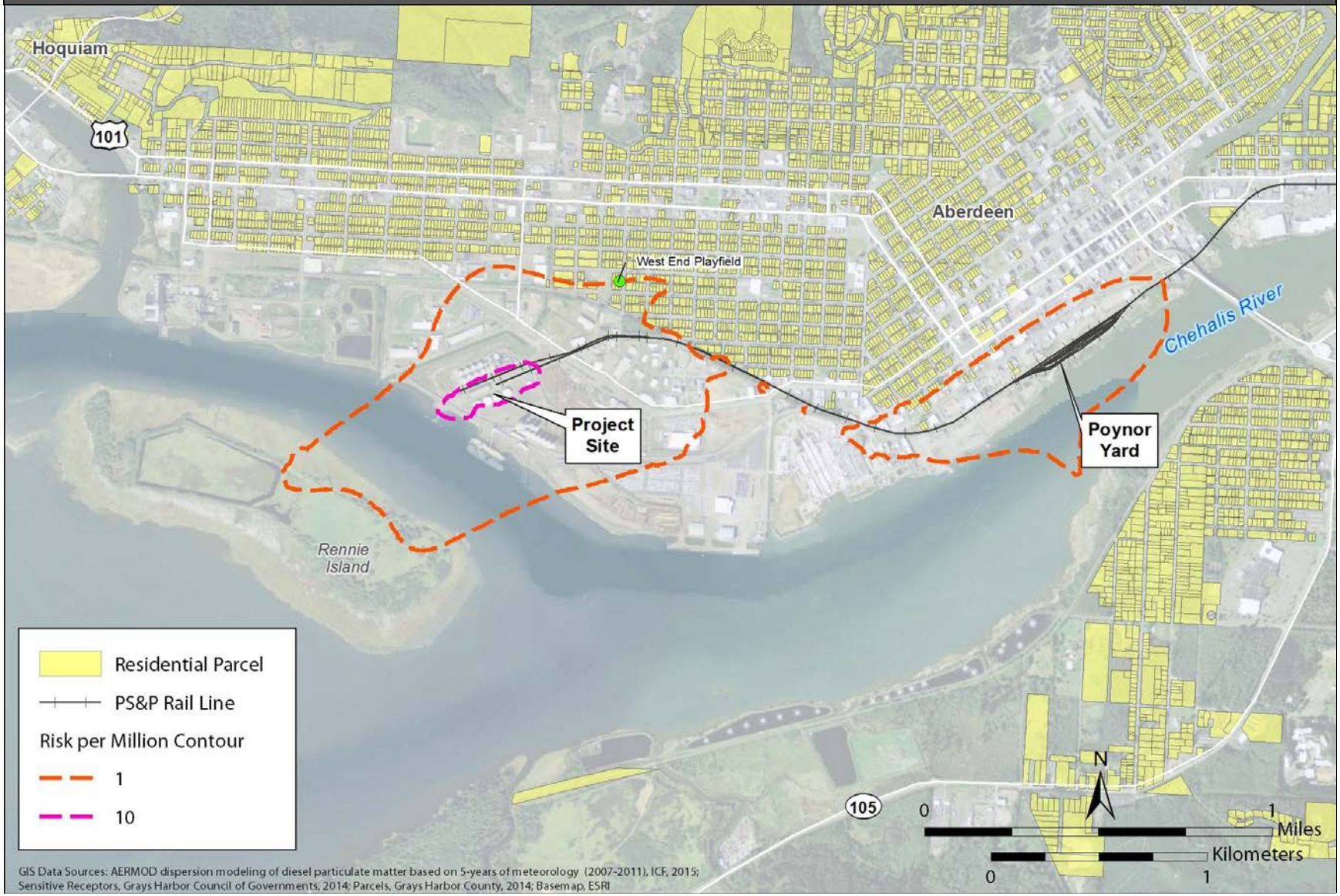
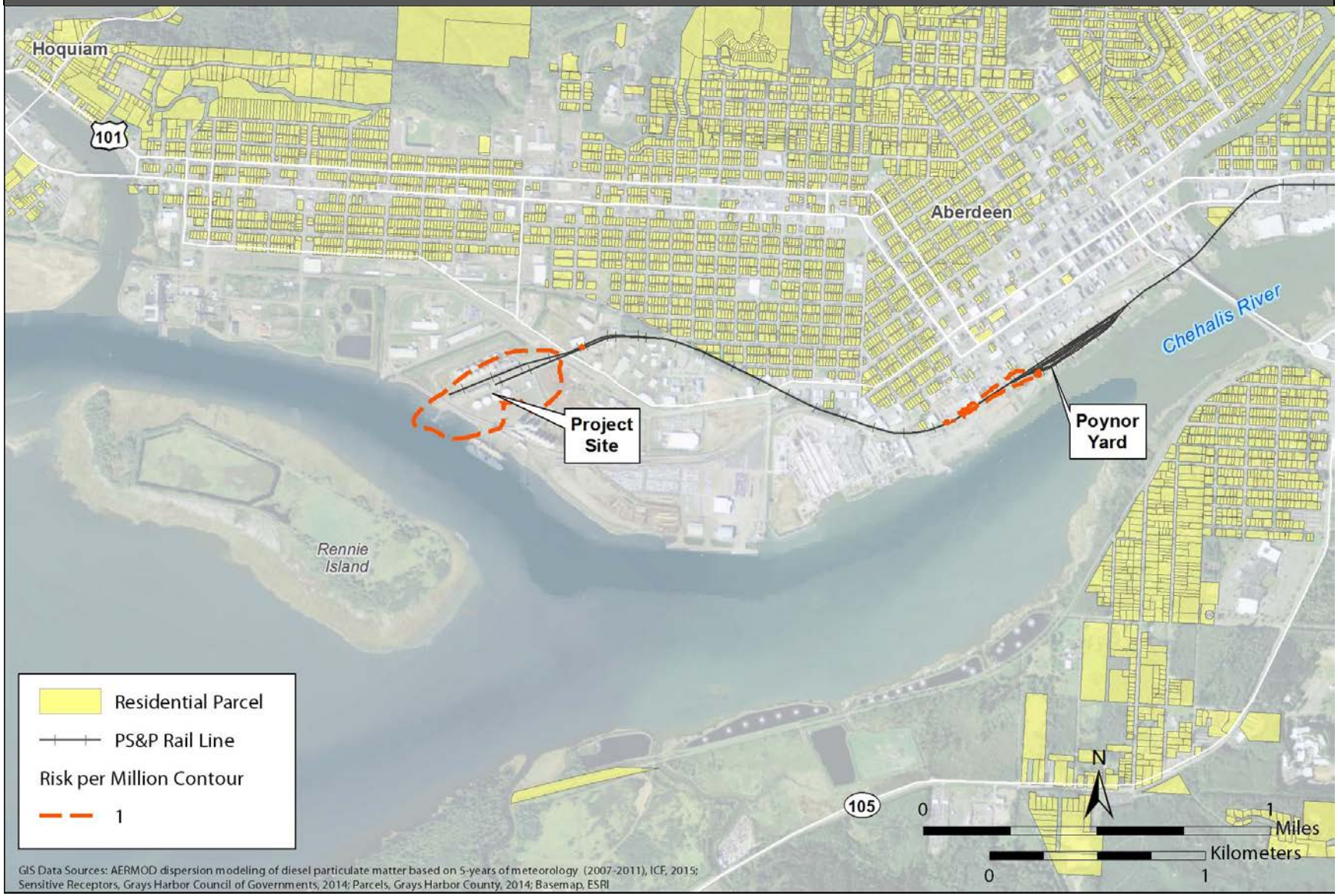


Figure 3.2-2. Average Diesel Particulate Matter Inhalation Risk (2037)



Vessel

Under the proposed action, tank vessels calling at Terminal 1 would include tank barges and tankers. These tank vessels typically burn marine distillate fuel oil, which is a slightly heavier fuel oil than diesel but shares most of the same chemical properties and composition. Assuming the same cancer risk for marine distillate fuel oil as diesel fuel oil to approximate the air toxic health risk from vessel transport in the study area, the dominant air toxic emission (both a hazardous and toxic air pollutant) would be DPM.

In a recent study examining the impact of these emissions during vessel transit, nearshore cancer risks of about 100 in 1 million were determined within a distance of 1.1 miles of the shipping corridor (California Air Resources Board 2008: Figure D-25). This result was based on 1,916 vessels calling per year, with most ships weighing between 40,000 and 80,000 dead weight tons and traveling at a speed of 13.5 knots. Under the proposed action, up to 119 vessels per year, mostly the smaller tank barges (20,000 dead weight tons) assisted by pilot boats and a tug, would call at Terminal 1. The emissions from the pilot boat and assist tug are about 30% of the emissions of the tank barges. Conservatively, assuming that the emissions from the tank barges are roughly equivalent to the larger vessels in the California Air Resources Board study, the estimated projected transit activity would be equivalent to 155 tank barges. Thus, the estimated increase in nearshore risk across the inlet to Grays Harbor would be less than eight in a million, likely less given the wider inlet and smaller vessels and engines. This increase in risk is less than the Ecology acceptable threshold increase in cancer risk and, therefore, considered a negligible impact on sensitive receptors along the shoreline of Grays Harbor.

Greenhouse Gas Emissions

Emission of GHGs would result from onsite operation of the proposed action. Other sources of GHG emissions that could be attributable to the proposed action are the extraction of crude oil, transport of the crude oil to and from the project site, and end use of the crude oil (e.g., combustion). These sources of GHG emissions are discussed below.

Crude Oil Production

Crude oil production (drilling) results in the emission of GHGs. If the proposed action were to induce production of crude oil, GHGs gas emissions for this activity could be deemed attributable to the proposed action. Based on the analysis presented in Appendix Q, *Crude Oil Market Analysis,* the proposed action would not likely induce oil production. Therefore, GHG emissions related to extraction activities are not quantified.

Onsite Operations and Offsite Transport

Onsite operation of the proposed action at maximum throughput would result in the emission of approximately 5,736 metric tons of CO_2e each year (Table 3.2-8). This includes emissions from operation of the marine vapor combustion unit, onsite rail switching operations, and vessels at the dock during loading.

Rail and vessel transportation would also result in GHG emissions. Based on the analysis presented in Appendix Q, *Crude Oil Market Analysis,* crude oil transloaded at the proposed facility is expected to be shipped to West Coast refineries. It is anticipated that much of this crude oil would replace crude oil that was previously transported to these refineries by other means. The Washington 2014

Marine & Rail Oil Transportation Study stated the following (Washington State Department of Ecology 2014b):

> …historically, 90% of crude oil bound for Washington's refineries was delivered here by tank ship from Alaska or from other international sources of oil. Today pipeline and rail delivery of crude oil make up more than 30% of our imports, while vessel delivery is reduced to less than 70%. Crude oil transportation is rapidly shifting to delivery by rail and pipeline.

Table 3.2-8 presents estimates of GHG emissions from rail transport from the likely source, Williston Basin,[21] and vessel transport to the farthest likely destination, Port of Long Beach, California.[22] Table 3.2-9 presents estimates of GHG emissions from transport of Alaska North Slope crude oil, which is expected to be offset by any crude oil transloaded under the proposed action. The emission estimates from transport of Alaskan crude do not include emissions related to loading and movement of crude oil from the North Slope to Valdez; therefore, they are understated and conservative for the purposes of calculating offset emissions. If crude oil transloaded through the proposed facility were to be transported to California refineries, it could replace crude oil from international sources, which would have higher relative GHG emissions due to distance.

Statewide GHG emissions from onsite operations and offsite transport within the state would be 32,868 metric tons of CO_2e per year (Table 3.2-8). The largest contribution of statewide operations GHG emissions under the proposed action would result from rail transport and would represent an approximately 2.7% increase in 2011 statewide rail GHG emissions (1 million metric tons of CO_2e per year). However, between 2017 and 2037, improvements in the efficiency of locomotives may decrease the total GHG emissions resulting from the proposed action.

Appendix D, *Air Data*, provides a more detailed comparison of average annual statewide GHG emissions and emissions from proposed operations.

Table 3.2-8. Annual Average GHG Emissions from Operations—Proposed Action (metric tons of CO_2e per year)

Source Type	Proposed Action
Rail transit (Washington State)	26,593[a]
Rail transit (outside Washington State)	51,219[b]
Rail switching (onsite)	1,580
Vessel transit (Washington State)	539
Vessel transit (outside Washington State)[c]	39,161
Vessel at dock during loading (onsite)	104
Industrial sources (onsite)	4,052[d]
Total	123,248

[a] Includes emissions from offsite rail transport within Washington State.
[b] Includes emissions from rail transport from the Washington State border to Enbridge, North Dakota.
[c] Includes emissions from vessel transport via from 3 nautical miles of the Washington coast to the Port of Long Beach, California.
[d] Trinity Consultants 2015.

[21] Enbridge, North Dakota, was used as the source point.

[22] Refer to Appendix Q, *Crude Oil Market Analysis,* for a discussion of why West Coast refineries are considered the most likely destination of crude oil transloaded through the proposed facility, despite the lifting of the ban on exports of U.S. crude oil.

Table 3.2-9. Estimated Annual Greenhouse Gas Emissions Related to Offset Vessel Transport of Alaskan Crude Oil (metric tons of CO_2e per year)

Source	Emissions
Vessel transit[a]	47,049

[a] Assumes 17 Suezmax vessels (195,000 deadweight tons). Loaded vessels from Valdez, Alaska, to Long Beach, California, and returning empty. Does not include emissions from loaded and movement of crude oil from North Slope to Valdez, Alaska.

These statewide GHG emissions represent approximately 0.036% of 2011 statewide GHG emissions.[23]

RCW 70.235.020 sets the following GHG statutory reduction levels for GHG emissions.

- By 2020, reductions to 1990 emission levels.
- By 2035, reductions to 25% below 1990 levels.
- By 2050, reductions to 50% below 1990 levels or 70% below Washington State's expected emissions that year.

In order to meet these reductions, Washington State must reduce emissions to 88.4 million metric tons of CO_2e per year by 2020, 66.3 million metric tons of CO_2e by 2035 and approximately 44.2 million metric tons of CO_2e by 2050.[24] Statewide GHG emissions from the proposed action—32,868 metric tons of CO_2e per year from onsite operations and offsite transport within the state—would be approximately 0.07% of Washington State's statutory reduction of 44.2 million metric tons of CO_2e per year (half of the 1990 level) by 2050.

Adding emissions from rail and vessel transport beyond Washington State (rail transport from the Williston Basin, North Dakota, to the state line, and vessel transport from state waters to Long Beach, California) would result in an additional 90,380 metric tons of CO_2e per year (Table 3.2-8). Combining GHG emissions from onsite operations and from offsite transport of maximum throughput from crude oil source to refinery totals 123,248 metric tons of CO_2e per year. Considering offset emissions of 47,049 metric tons of CO_2e per year related to Alaskan crude oil, estimated net GHG emissions would be 76,199 metric tons of CO_2e per year.

In November 2014, the United States entered into a nonbinding agreement with China to reduce emissions to 26 to 28% below 2005 levels (White House 2014). This national goal translates to annual emissions between 4,628 and 4,756 million metric tons of CO_2e by 2025. The estimated average annual net GHG emissions related to the proposed action represent approximately 0.002% of these national targets.

According to the Intergovernmental Panel on Climate Change (IPCC), cumulative GHG emissions should be limited to 1 trillion metric tons (total) by 2050 or the planet will exceed the 2°C warming threshold. Currently, the amount of GHGs that have been emitted worldwide since the Industrial Age is estimated to be 592 billion metric tons (Oxford E-Research Center 2015). Cumulative world emissions should be limited to 408 billion metric tons to meet the 2050 target. The estimated

[23] 2011 statewide GHG emissions from stationary industrial sources and rail and vessel transport were 91.7 million metric tons of CO_2e per year.
[24] Total emissions needed to reach the Washington State statutory reductions were calculated based on the required reduction from the statewide inventory of 91.7 million metric tons of CO_2e in 2011 (Washington State Department of Ecology 2014a).

average annual net GHG emissions related to the proposed action represent approximately 0.00002% of this limit.

Combustion

In addition to GHG emissions from onsite operations and offsite rail and vessel transport, the combustion of crude oil would result in GHG emissions. To the extent that crude oil transloaded through the proposed facility would replace oil shipped to West Coast refineries by other means and from other sources (e.g., Alaska or international ports), combustion emissions would not be entirely additive. Crude oil may be refined into multiple other products that may or may not have substantial GHG emissions (e.g., asphalt is not combusted and is a crude oil product) and the end use would vary based on the product and market. Because crude oil can be broken down into a variety of products and their end use varies, the end-use combustion calculation, which assumes that all of the oil will be combusted, is conservative and likely overstates total GHG emissions. For purposes of disclosure, GHG emissions from the combustion of the maximum throughput of crude oil per year under the proposed action are quantified using the emissions factors presented in Table 3.2-10.

Using EPA's average heat content of crude oil of 5.80 million British thermal units (mmBtu) per barrel (U.S. Environmental Protection Agency 2014) and the more conservative emissions factor for diluted bitumen listed in Table 3.2-10, the maximum CO_2 emissions from end use of products shipped through the proposed facility in a given year would be 7.8 million metric tons of CO_2 per year.

Table 3.2-10. Estimated CO_2 Emissions Factors for Crude Oil Combustion

Product	CO_2 Emissions Factors (kg CO_2 per mmBtu)
Bakken crude oil	73.96
Diluted bitumen	75.10

Source: U.S. Environmental Protection Agency 2014.
kg CO_2 per mmBtu = kilograms of carbon dioxide per million British thermal unit.

Regardless of the end-use emissions scenario, the proposed action would represent a very small segment of the crude oil market in the United States. The U.S. Energy Information Administration provides data for U.S. petroleum flows (U.S. Energy Administration 2013, 2015). In 2013, 7.45 million barrels of crude oil were produced in the United States, and 7.72 million barrels of crude oil were imported every day. Together, this equals 15.17 million barrels of crude oil supplied to the United States every day. Based on maximum throughput, operation of the proposed action would transport approximately 49,041 barrels per day on average 0.32% of the U.S. daily crude oil supply.

For information on cumulative GHG emissions and climate change, see Chapter 6, *Cumulative Impacts*.

Odor

The only compound with sufficient emissions to have the potential to have a perceptible odor is hydrogen sulfide. As reported in Appendix D, *Air Data*, Table 5, emissions for this compound are estimated at 79 pounds per year. As described under *Toxic Air Pollutants,* air quality modeling for hydrogen sulfide conducted by the applicant showed the maximum offsite 24-hour concentration at 1.51 μg/m^3. This was compared against its ASIL of 2 μg/m^3 per 24-hour averaging period. The lowest level of odor threshold for the most sensitive individual is 14 μg/m^3 (10 parts per billion).

Although it is possible that, at the right location and operational and meteorological conditions, the odor could be detectable for a brief period, the short-term concentration (less than 1 hour) is expected to be below the odor threshold for the most sensitive individual. Therefore, odor is considered a negligible impact.

3.2.6 What required permits and plans apply to air quality?

The proposed action is subject to compliance with an air permit issued by the Olympic Region Clean Air Agency, which would include enforceable requirements specifying emission limits, reporting, and record keeping requirements for onsite stationary sources. Air emissions would be controlled using best available control technology as required by the agency as part of the proposed action's Notice of Construction Air Permit. The following permit conditions are expected to reduce impacts on air quality.

- To reduce the potential for fugitive emissions associated with rail transport during site operations, the applicant will ensure via contract that rail cars are equipped with vacuum breakers designed to prevent escape of vapors from headspace of rail cars during unloading operations.
- To reduce the potential for tank emissions, the applicant will design tanks to reduce tank emissions using the following method.
    - Storage tanks with internal floating roofs and both primary and secondary seals based on applicable requirements.
- To reduce the potential for site operations emissions, the applicant will undertake the following actions.
    - Control displaced vapors during loading of marine vessels and barges with a marine vapor combustion unit having a minimum of 98% destruction efficiency. The applicant proposes a marine vapor combustion unit equipped with a vapor blowing staging unit that would increase capture efficiency to approximately 100% to control emissions from marine loading.
    - Implement good operating practices for fugitive equipment leaks.

3.2.7 What mitigation measures would reduce impacts on air quality?

This section describes the applicant mitigation measures that would reduce impacts on air quality from construction and routine operation of the proposed action.

3.2.7.1 Applicant Mitigation

The applicant will implement the following mitigation.

- The applicant will ensure that all engine-powered equipment and vehicles used in construction, operation, and maintenance at the facility are subject to a regular inspection and maintenance schedule in order to minimize air pollutant emissions, GHG emissions, and fuel consumption. Preventive maintenance activities will include but not be limited to the following actions.
    - Replacing oil and oil filters as recommended by manufacturer instructions.

  - Maintaining proper tire pressure in on-road vehicles.
  - Replacing of worn or end-of-life parts.
  - Scheduling routine equipment service checks.
- The applicant will develop and implement an anti-idling policy for both construction and operation and ensure that equipment operators receive training on best practices for reducing fuel consumption in order to reduce project-related GHG emissions. The anti-idling policy will include required warmup periods for equipment and prohibit idling beyond these periods. The policy will define any exemptions where idling is permitted for safety or operational reasons, such as when ambient temperatures are below levels required for reliable operation. In addition, the use of technologies such as idle management systems or automatic shutdown features will be considered part of the policy.
- To minimize idling from trains and vessels and resulting emissions, the applicant will coordinate with the Port of Grays Harbor and PS&P to manage waiting times for rail and vessel arrivals or departures.

3.2.8 Would the proposed action have unavoidable and significant adverse impacts on air quality?

Compliance with the applicable regulations along with implementation of the mitigation measures described above would reduce impacts on air quality. There would be no unavoidable and significant adverse impacts.

3.3 Water

Water resources in Washington State include surface waters, groundwater, floodplains, and wetlands. Surface waters such as rivers, wetlands, lakes, and coastal waterways provide natural beauty and sustain the health of human and natural communities. Groundwater, often stored in aquifers formed of permeable rock or loose material, provides water for human and environmental well-being. The quality of surface waters and groundwater refers to the physical, chemical, biological, and aesthetic characteristics of water, which are used to measure the ability of water to support aquatic life and human uses. Groundwater and surface-water quality can be eroded by contaminants introduced by domestic, industrial, and agricultural practices.

Wetlands form a regularly saturated transition between surface waters and uplands. These wet soils support a diversity of plants that are adapted to these conditions. Floodplains are also lowland areas adjacent to lakes, wetlands, and rivers, but they are periodically covered by water during a flood. Floodplains carry and store floodwaters, thus protecting human life and property from flood damage. Undeveloped floodplains provide many other natural and economic resource benefits. Floodplains often contain wetlands and other areas vital to a diverse and healthy ecosystem. Undisturbed, they have high natural biological diversity and productivity, and support many waterfowl species and migrating birds.

This section describes water in the study area, including hydrology and water quality related to surface waters, wetlands, floodplains, and groundwater. It then describes impacts on water that could result under the no-action alternative or as a result of the construction and routine operation[1] of the proposed action. Finally, this section presents any measures identified to mitigate impacts of the proposed action and any remaining unavoidable and significant adverse impacts.

3.3.1 What is the study area for water?

The study area for water consists of water resources on and near the project site that could be affected by construction and routine operation at the project site. The study area also includes water that could be affected during routine rail transport along the Puget Sound & Pacific (PS&P)[2] rail line and vessel transport through Grays Harbor out to 3 nautical miles from the mouth of the harbor.

3.3.2 What laws and regulations apply to water?

Laws and regulations for determining potential impacts on water are summarized in Table 3.3-1. More information about these laws and regulations is provided in Appendix B, *Laws and Regulations*.

[1] Chapter 4, *Environmental Health and Safety*, addresses the potential impacts from increased risk of incidents (e.g., storage tank failure, train derailments, vessel collisions) and related consequences (e.g., release of crude oil).
[2] The PS&P rail line refers to the rail line between Centralia and the project site.

Table 3.3-1. Laws and Regulations for Water

Laws and Regulations	Description
Federal	
Clean Water Act (33 U.S.C. 1251 et seq.)	Establishes the basic structure for regulating discharges of pollutants into navigable waters of the United States by regulating point pollution sources, such as stormwater discharges, and contains specific provisions related to the accidental release of oil and other hazardous substances into U.S. waters.
Oil Pollution Act of 1990 (33 U.S.C 40 et seq.)	Expands the federal government's ability to prevent and respond to oil spills and preserves state authority to establish laws governing oil spill prevention and response.
National Flood Insurance Act of 1968 (42 U.S.C. 4001 et seq.)	Establishes the NFIP, a federal floodplain management program designed to reduce future flood losses through the implementation of community-enforced building and zoning ordinances.
Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990, as amended by the National Invasive Species Act of 1996 (16 U.S.C. 4711 et seq.)	Establishes regulations enforced by the U.S. Coast Guard regarding the discharge into U.S. waters of aquatic nuisance species from ship ballast water.
State	
Water Pollution Control Act (RCW 90.48)	Regulates the discharge of pollutants into waters of the state with the goal of preventing and restoring the quality and integrity of these resources.
NPDES Permit Program (WAC 173-220)	Establishes a state permit program applicable to the discharge of pollutants and other wastes and materials to the surface waters of the state.
Water Rights—Oil and Hazardous Substance Spill Prevention and Response (RCW 90.56)	Establishes programs to reduce risks and develop a response to oil and hazardous substance spills; provides a process to calculate damages from an oil spill and holds responsible parties liable for damages resulting from injuries to public resources.
Oil Spill Natural Resources Damage Assessment (WAC 173-183)	Establishes procedures for convening a resource damage assessment committee, preassessment screening of damages, and selecting the damage assessment method.
Ballast Water Management Law (RCW 77.120)	Regulates discharge of ballast water into waters of the state for vessels of 300 gross tons or more.

Laws and Regulations	Description
Local	
Critical Areas Ordinance (HMC 11.06 and AMC 14.100)	Sets forth the definitions and process for designating and protecting critical areas within the city limits of Hoquiam and Aberdeen, respectively.
Stormwater Management Regulations (HMC 10.05.120 and AMC 13.70)	HMC 10.05.120 requires all new industrial development to provide for the control and management of stormwater runoff. AMC 13.70 establishes minimum requirements and procedures to control the adverse impacts associated with increased storm and surface water runoff.

U.S.C. = United States Code; NPDES = National Pollutant Discharge Elimination System; NFIP = National Flood Insurance Program; RCW = Revised Code of Washington; WAC = Washington Administrative Code; HMC = Hoquiam Municipal Code; AMC = Aberdeen Municipal Code

3.3.3 How were impacts on water evaluated?

This section describes the sources of information and methods used to evaluate impacts.

3.3.3.1 Information Sources

Information used to complete the impact analysis included the following sources.

- Environmental permitting documents prepared for the proposed action by the applicant, the City of Hoquiam, the City of Aberdeen, and Washington State Department of Ecology (Ecology).
- U.S. Geological Survey National Hydrography Dataset for information on rivers, streams, and drainages.
- Northwest Area Committee's Grays Harbor Geographic Response Plan for information on the Grays Harbor estuary and its hydrologic characteristics.
- U.S. Fish and Wildlife Service National Wetland Inventory maps for information on potential wetlands.
- Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps for Hoquiam, Aberdeen, Ocean Shores, Westport, Cosmopolis, Montesano, Elma, Oakville, Centralia, and unincorporated portions of Grays Harbor, Thurston, and Lewis Counties for information on flood hazard areas and mapped floodplains.
- Ecology's Chehalis Basin Area Water Quality Improvement Project website for information on general water quality issues in the basin.
- Ecology's 2012 U.S. Environmental Protection Agency-approved Water Quality Assessment and Clean Water Act Section 303(d) List for information on water quality-impaired surface waters.
- Ecology's Permit and Reporting Information System for information on existing National Pollutant Discharge Elimination System (NPDES) and state-issued stormwater and industrial discharge permits.
- U.S. Geological Survey scientific investigations reports for information on regional groundwater resources.

Information obtained from these sources was augmented with information collected during a September 10, 2014, site visit and facility tour.

3.3.3.2 Impact Analysis

Potential impacts on water resources were assessed qualitatively. The analysis identifies potentially affected resources located on, adjacent to, and within 1 mile of the project site. Potentially affected resources within 0.5 mile of the PS&P rail line, portions of Grays Harbor farther than 1 mile from the project site, and in the Pacific Ocean up to 3 nautical miles from the harbor entrance are discussed more generally.

Impacts on water resources in the study area were determined by examining the information sources above. Impacts related to construction and onsite operations were determined by determining how construction would affect mapped water resources and how stormwater received at the project site would connect to water resources.

3.3.4 What water resources are in the study area?

This section describes water in the study area that could be affected by construction and operation of the proposed action. This section describes the general hydrologic setting of the study area and describes the location, characteristics, and quality of water resources at the project site, along the PS&P rail line, and in and along the shoreline of Grays Harbor. These water resources include surface waters, wetlands, groundwater, and floodplains. This section also provides a brief discussion of the existing stormwater system at the project site and describes how it connects to local waters.

3.3.4.1 General Hydrologic Setting

The study area is located in the Chehalis River watershed, which is composed of two Washington State Watershed Resources Inventory Areas (WRIAs): WRIA 22, lower Chehalis River and WRIA 23, upper Chehalis River. WRIAs are formalized water resource management and planning areas that represent the 62 major watersheds in Washington State. The project site, the portion of the PS&P rail line that goes to the town of Porter, and Grays Harbor are all located in WRIA 22. The remaining portions of the rail line between Porter and Centralia are in WRIA 23.

The Chehalis River is one of the primary drainage features in WRIAs 22 and 23. It terminates in Grays Harbor, which is connected to the Pacific Ocean at its western end. Tributaries to the Chehalis River include the Newaukum River, Skookumchuck River, Black River, Satsop River, Wynoochee River, and Wishkah River, as well as numerous other creeks and drainages. The headwaters of the upper Chehalis River originate in the Willapa Hills and foothills of the Cascade Range, while those of the lower Chehalis River originate in the foothills of the Olympic Range. Other tributaries that feed directly into Grays Harbor include the Hoquiam River, Humptulips River, Elk River, and Johns River. Headwaters for these drainages originate in the Willapa Hills and Olympic foothills. Much of the land in these basins consists of evergreen forests on the upper and middle slopes in active forestry use; mixed coniferous/deciduous forests on mid- to lower slopes and along the edges of river valleys; and agricultural lands in river valleys and associated lowlands. Agricultural land use is more extensive in the area of the upper Chehalis River.

Annual precipitation in the Chehalis River watershed is approximately 40 inches in the lowland valleys and over 100 inches in the Willapa Hills and Olympic foothills, with most of the precipitation occurring during the winter months when water demands are the lowest. Summers are typically dry, with little to no rainfall, so naturally low streamflows are primarily dependent on groundwater inflow. These conditions coincide with the highest water demands for human uses, including

irrigation and municipal water supply, as well as the state's requirements to maintain instream flows to ensure adequate water quality and fish migration under the instream flow rule for the Chehalis River Basin (Washington Administrative Code 173-522). Consequently, there is very little water available for new uses (Washington State Department of Ecology 2012a:1–2).

3.3.4.2 Surface Waters

Surface waters are bodies of open water that flow and collect on the surface of the earth. They include streams, rivers, lakes, estuaries, and the ocean. For the purposes of this report, they do not include wetlands, which are generally considered transitional areas between open waters and uplands and are discussed in Section 3.3.4.3, *Wetlands*. This section describes the location, general hydrologic characteristics, and water quality of surface water in the study area.

Project Site

This section addresses surface waters located on, adjacent to, or within 1 mile of the project site.

The project site is located in a developed industrial area owned by the Port of Grays Harbor (Port) (Figure 3.3-1). It is situated at Terminal 1, a bulk liquid loading facility located in Grays Harbor adjacent to the Cow Point Reach of the Grays Harbor Navigation Channel. It is within 0.5 mile of Fry Creek and within 0.6 mile of the mouth of the Chehalis River (Figure 3.3-1).

Water Bodies

This section describes the location and general characteristics of the surface waters on, adjacent to, or within 1 mile of the project site including Grays Harbor Navigation Channel, Fry Creek, and the Chehalis River.

Grays Harbor Navigation Channel

The Grays Harbor Navigation Channel provides shipping access between the Pacific Ocean and Cosmopolis on the Chehalis River. It is divided into nine discrete reaches—five inner harbor and four outer harbor—based on physical characteristics and dredging requirements. The project site is adjacent to the Cow Point Reach, an inner harbor reach that extends from Terminal 1 to the mouth of the Chehalis River. It includes the Cow Point Turning Basin, which lies just upstream of the project site, off the shorelines of Port Terminals 2 and 4. To maintain navigational depths, Cow Point Reach and Cow Point Turning Basin are typically dredged annually by the U.S. Army Corps of Engineers using contractor mechanical dredges. Channel dimensions in the Cow Point Reach are maintained at a minimum depth of -36 feet mean lower low water, with a channel width varying from 350 to 550 feet. Channel dimensions in the Cow Point Turning Basin are maintained at a minimum depth of -36 feet mean lower low water, with a channel width varying between 350 to 950 feet. Annual maintenance dredging typically takes 5 to 6 months to complete and is conducted by clamshell dredge between July and February. The average annual volume of material removed is approximately 750,000 cubic yards for the Cow Point Reach and approximately 215,000 cubic yards for the Cow Point Turning Basin. Dredged material is typically characterized by sandy silt and disposed of at the South Jetty or Point Chehalis in-water disposal sites (U.S. Army Corps of Engineers 2011:1–10).

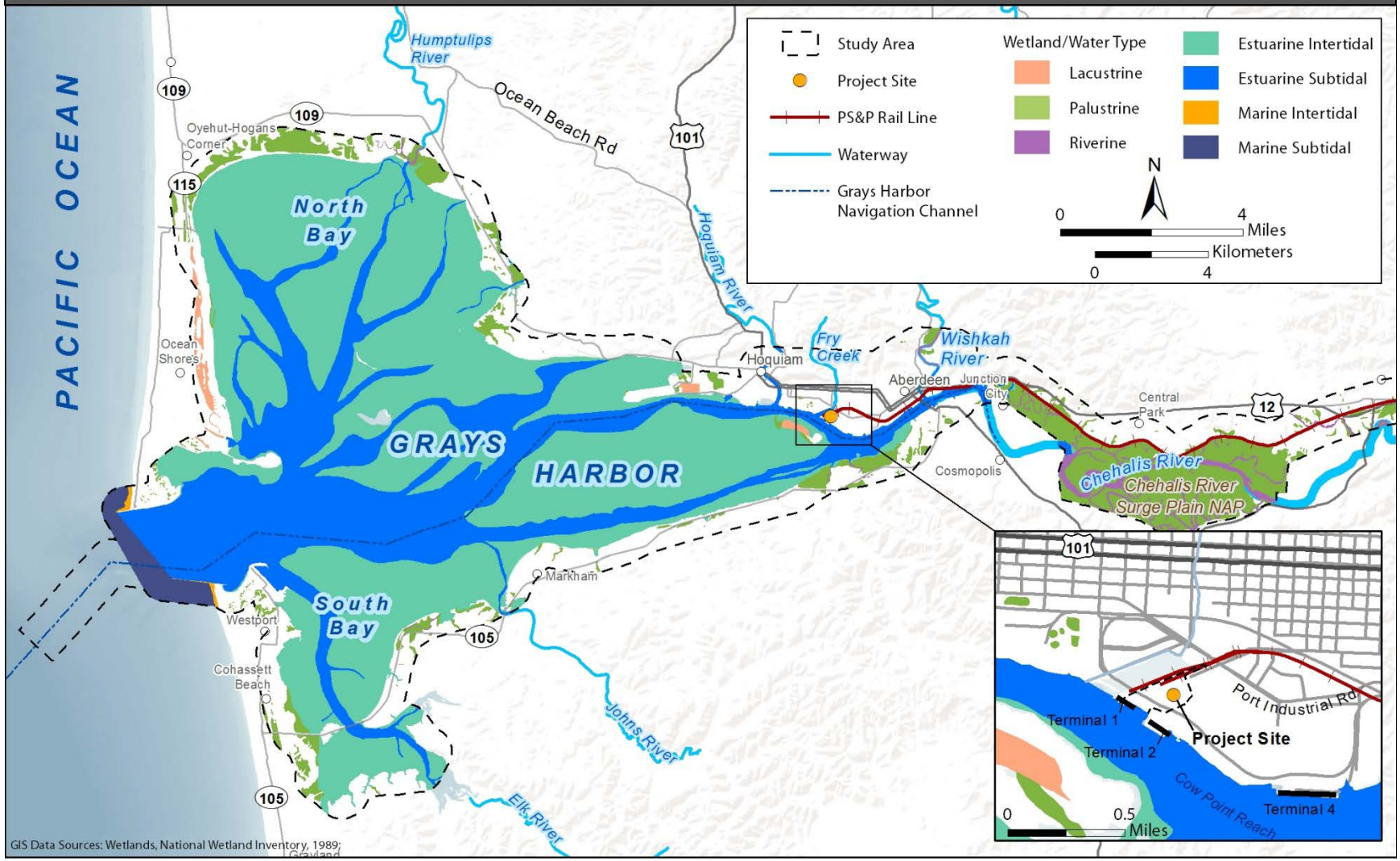
Fry Creek

Fry Creek is approximately 0.15 mile northwest of the project site, just south of John Stevens Way (Figure 3.3-1). It consists of an excavated, trapezoidal channel that connects Fry Creek to the Chehalis River and Grays Harbor through property owned by the Port. Fry Creek is a small headwater stream that drains approximately 3.75 square miles of residential/commercial areas and forested slopes to the north of the proposed expansion site. It enters the diversion channel just north of the project site via a culvert located under Port Industrial Road. The diversion channel is subject to tidal action and known to support the presence of coho salmon, winter steelhead, and fall Chinook salmon (Washington Department of Fish and Wildlife 2014).

Chehalis River Mouth

The convergence of Chehalis River and Grays Harbor is approximately 0.8 mile upstream of the project site (Figure 3.3-1). At the mouth, the Chehalis River is approximately 0.5 mile wide. The river experiences large diurnal tidal fluctuations and minor impacts from regulation of water flow of the Skookumchuck River from the Skookumchuck Dam (U.S. Geological Survey 2013). Tidal influence extends up to the Satsop River east of Montesano, Washington (Northwest Area Committee 2013:2-5).

Figure 3.3-1. Wetlands, Water Bodies, and Waterways—Project Site and Grays Harbor



Water Quality

According to Ecology's current Water Quality Assessment (i.e., 305(b) list), no portions of the surface waters adjacent to the project site are identified as Category 5 impaired waters (Washington State Department of Ecology 2012b). Category 5-listed waterbodies (i.e., the 303(d) list) are polluted waters where water quality standards have been violated for one or more pollutants (Washington State Department of Ecology 2006:3). Category 5-listed waters require the development and implementation of Total Maximum Daily Loads projects (TMDL).

TMDLs establish pollutant load and wasteload allocations (for nonpoint and point sources, respectively) that will reduce or eliminate pollutant loading so that a waterbody will eventually meet water quality standards for those pollutants. Category 4a-listed waterbodies are those that have a TMDL. The Grays Harbor bacteria TMDL established fecal coliform bacteria wasteload allocations for urban stormwater from Aberdeen, point sources including wastewater treatment plants and pulp mills, and for nonpoint sources to meet both the applicable fresh water and marine water quality standards. High bacteria concentrations can cause human illnesses and trigger commercial shellfish harvest closures.

In their current water quality assessment, Ecology identifies a portion of the navigation channel just downstream from the project site as a Category 2 water of concern for water column bioassay. A Category 2 listing indicates that there is evidence of a water quality problem, but not enough to require the development of a TMDL (Washington State Department of Ecology 2006:3). In this location, Ecology's determination was based on a bioassay study showing that effluent from the ITT-Rayonier paper mill did not have adequate dilution in the receiving water (Grays Harbor) to meet the *no effect* level for certain aquatic organisms (Washington State Department of Ecology 2012b). Another Category 2-listed site is located upstream from the project site, near the Port's Terminal 4 facilities. This site is listed as a water of concern for copper. Neither of these listed sites is covered by a TMDL.

Ecology also identifies several portions of the navigation channel adjacent to the project site as having sediments that meet sediment quality standards (i.e., Category 1 sediments or uncontaminated sediments[3]) for such contaminants as arsenic, bis (2-ethylhexyl) phthalate, cadmium, chromium, copper, fluoranthene, lead, mercury, high-molecular weight polycyclic aromatic hydrocarbons, silver, and zinc (Washington State Department of Ecology 2012b).

PS&P Rail Line

This section describes surface waters located on, adjacent to, or within 0.5 mile of the PS&P rail line.

The PS&P rail line extends along the Chehalis River Valley, running adjacent to the river in many locations but never crossing it (Figure 3.3-2). Along this route, the rail line crosses approximately 37 named and unnamed tributaries to the Chehalis River in both WRIAs 22 and 23, including the Wishkah River, Elliot Slough, Higgins Slough, Wynoochee River, Sylvia Creek, Camp Creek, Satsop River, Sherwood Creek, Newman Creek, Vance Creek, McDonald Creek, Cloquallum Creek, Mox Chehalis Creek, Porter Creek, Gibson Creek, Cedar Creek, Harris Creek, Roundtree Creek, Black River, Scatter Creek, Prairie Creek, and Skookumchuck River. The rail line runs within 1 mile of but

[3] Specific standards and classification categories relative to the standards are identified in WAC 173-240 for the purposes of managing sediment quality in the state. Category 1 sediments meet applicable sediment quality standards.

does not cross several other named and unnamed tributaries including Mox Chuck Slough, Gaddis Creek, Davis Creek, Coffee Creek, and China Creek. Within 1 mile beyond the project site to the west, the rail line continues, crossing both Fry Creek and the Hoquiam River.

Water Bodies

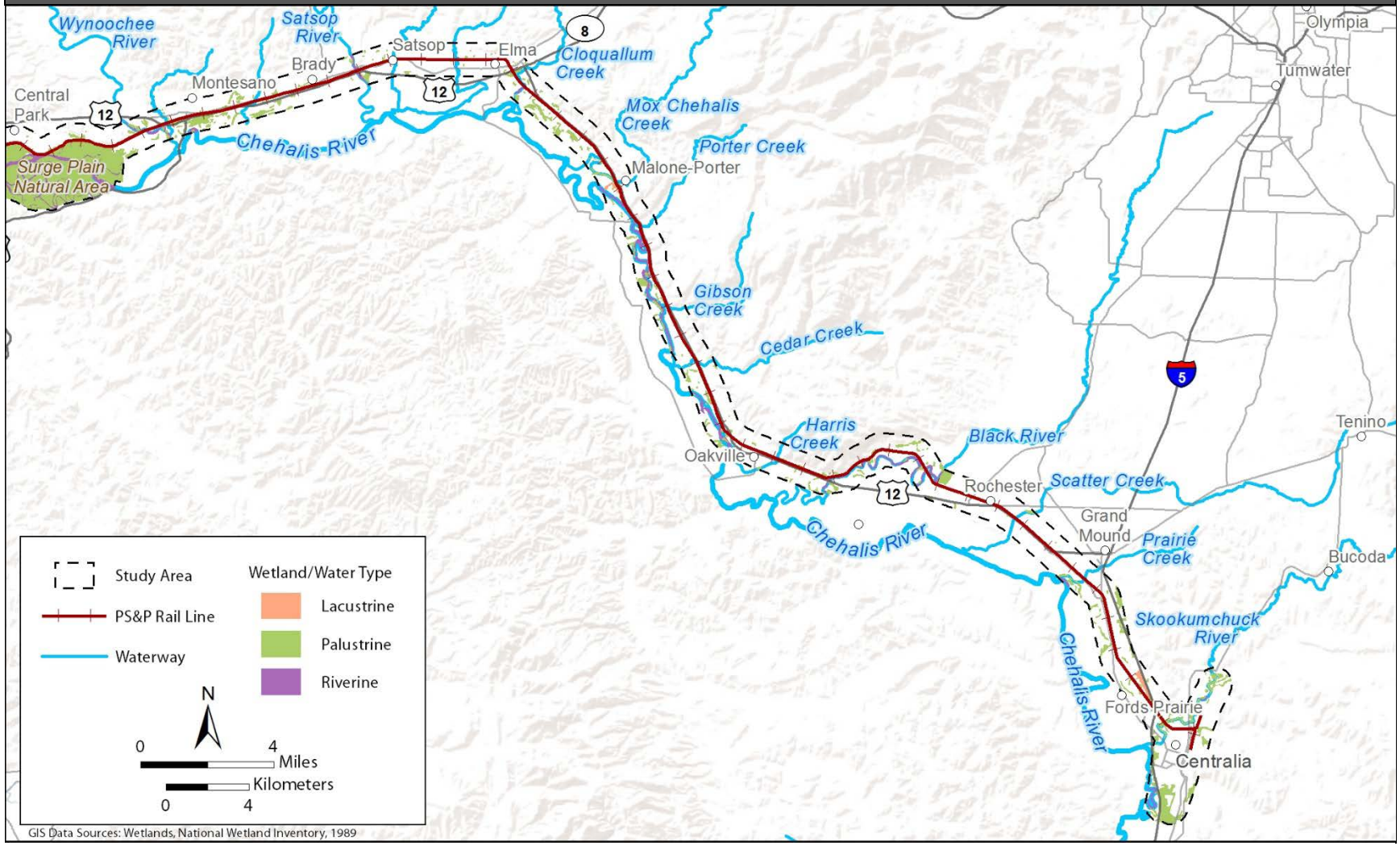
The mainstem Chehalis River and its tributaries form the Chehalis River Basin, which drains approximately 2,700 square miles (Figure 3.3-2). The basin is bounded by the Pacific Ocean to the west, the Deschutes River Basin to the east, the Olympic Mountains to the north, and the Willapa Hills and Cowlitz River Basin to the south. Elevations in the basin range from sea level at Grays Harbor to over 3,000 feet in the Willapa Hills and Olympic foothills (Chehalis River Basin Flood Authority 2010:7). Peak discharges from the Chehalis River (greater than 50,000 cubic feet per second [cfs]) occur during winter (December and January), and minimum flows (600 to 800 cfs) occur from June through September (Washington State Department of Ecology 2000a:3).

The mainstem and South Fork Chehalis drain uplands south and west of Chehalis. The Chehalis Basin includes WRIA 22 and 23. Two major tributaries in mid-basin, the Newaukum and Skookumchuck Rivers, have their headwaters in the foothills of the Cascade Range. Another mid-basin tributary, the Black River, originates in wetlands near Black Lake, in Thurston County. The largest tributaries, the Satsop and Wynoochee Rivers, arise in southern extensions of the Olympic Mountains and join the mainstem shortly before its terminus at Grays Harbor. The Humptulips, Hoquiam, and Wishkah Rivers also have their headwaters in the southern Olympic Mountains and flow into Grays Harbor. The Humptulips River flows into North Bay, the Hoquiam River into the inner estuary of Grays Harbor just downstream from the project site, and the Wishkah River into the Chehalis River near the mouth. The Johns and Elk Rivers flow into the South Bay of Grays Harbor. The terminus of all rivers is where they enter another river or Grays Harbor (saltwater influence) (Chehalis Basin Partnership 2004:III–3).

The following dams and diversion structures are on the rivers of the Chehalis River Basin.

- The Hoquiam and Wishkah Rivers have diversion structures to supply municipal and industrial water to the Hoquiam/Aberdeen area. These structures allow Hoquiam to remove 2.5 cfs from the Hoquiam River and Aberdeen to divert 10 cfs from the Wishkah River.
- The Wynoochee Dam on the Wynoochee River provides water for fish and wildlife habitat, irrigation, recreation, flood control, and municipal and industrial water supply for Aberdeen. The reservoir has a maximum retention capacity of 70,000 acre-feet.
- The Bloody Run Dam on the Skookumchuck River supplies up to 54 cfs for use in the Centralia Steam Electric plant.

Figure 3.3-2. Wetlands, Water Bodies, and Waterways—PS&P Rail Line



Water Quality

Water quality issues in the Chehalis River and its tributaries have been recognized in studies since the early 1990s. Land use in the basin is mostly forestlands, interspersed with agricultural and residential areas. Intensive agriculture and irrigation occur in the low-lying valleys along the river and its tributaries. The most common water quality issues experienced in the basin are high water temperature, low dissolved oxygen, and fecal coliform (bacteria) exceedances of water quality standards (Washington State Department of Ecology 2014a). The major causes of these problems include degraded or inadequate riparian conditions, agricultural activities that do not incorporate best management practices (BMP) to protect water quality, failing septic systems, and urban stormwater runoff. High water temperatures and low dissolved oxygen levels negatively affect the growth and development of different life stages of salmon, including spawning, rearing, and migration. Fecal coliform contains human pathogens and high concentrations can make people sick when they are exposed to contaminated water.

According to Ecology's current U.S. Environmental Protection Agency-approved 303(d) Category 5 list, water quality impaired river segments are present in both the lower and upper Chehalis River watersheds (WRIAs 22 and 23). These include sections in the lower portion of the river that are considered impaired by mercury and polychlorinated biphenyl, and sections in the upper portion of the river that are considered impaired due to elevated levels of polychlorinated biphenyls, dioxin, and turbidity (Washington State Department of Ecology 2012b). As previously described, Category 5 impaired waters are those where water quality standards have been violated for one or more pollutants and TMDL action is required (Washington State Department of Ecology 2006:3).

Under Category 2, Ecology currently lists the lower Chehalis River as a water of concern for dioxin (specifically 2,3,7,8-tetrachlorodibenzo-para-dioxin).Sources of dioxins were addressed in the 1992 Grays Harbor Dioxin TMDL and this listing has not been reevaluated since. Portions of the upper Chehalis Watersheds are listed as a water of concern for temperature bacteria, pH, dissolved oxygen, and turbidity (Washington State Department of Ecology 2014b). These listings are addressed by the existing TMDLs.

Ecology lists multiple waterbodies in WRIA 22 and 23 on the 305(b) list under Category 4a for bacteria, temperature, and dissolved oxygen in water (Washington State Department of Ecology 2012b). Category 4a includes impaired waters that have TMDLs already in place (Washington State Department of Ecology 2006:3). The U.S. Environmental Protection Agency has approved TMDLs in Grays Harbor for dioxin and fecal coliform bacteria, and in the Upper Chehalis River Watershed for dissolved oxygen, temperature, and fecal coliform bacteria (Washington State Department of Ecology 1992, 2000b, and 2004a).

In 2004, Ecology published a detailed implementation (cleanup) plan for these pollutants in the Chehalis River/Grays Harbor watershed. The plan identified responsible entities for implementation of BMPs that will meet the TMDL goals (Washington State Department of Ecology 2004b). Implementation of BMPs to reduce or eliminate nonpoint sources of pollution covered by the Upper Chehalis River and Grays Harbor TMDLs is a coordinated effort between Ecology and stakeholders in the basin.

Limiting Factors to Fisheries

The mainstem Chehalis River has been severely affected by channel incision, sedimentation, and reduction in streamflow, and many of these problems are seen in its tributaries. Increased peak flows due to urbanization, disconnected floodplains, lack of channel complexity, extensive loss of riparian habitat due to agriculture and urbanization, and improperly managed upland forestry practices are believed to be causes of the changes in river geomorphology. These changes have resulted in adverse water quality conditions for fish, particularly warm water temperatures and low dissolved oxygen levels.

High stream temperature problems are related to increased erosion altering channel dimensions and loss of riparian vegetation exposing rivers and creeks to direct solar radiation. Low dissolved oxygen levels are caused by increased nutrients in runoff from agricultural and residential land uses, increased primary productivity due to lack of shade, and urban stormwater pollution. It is also likely that the reduction in wetlands has contributed to degraded water quality.

Additionally, lower baseflows and higher peak flows threaten fish habitat. Since 1953, Chehalis River flows have decreased 19% whereas annual precipitation decreased by only 6% (Washington State Conservation Commission 2001:17). Lower stream flows are the result of climate change and increased water use for irrigation, power generation, and domestic water use. Increases in groundwater withdrawals are also thought to lower summer baseflow conditions (Washington State Conservation Commission 2001:17).

Grays Harbor

This section briefly describes the location, general characteristics, and water quality of surface waters located in the portions of Grays Harbor that are greater than 1 mile away from the project site, including surface waters within 0.5 mile of the shoreline of Grays Harbor (Figure 3.3-1).

Water Bodies

Grays Harbor is a large estuary fed by a 2,600-square-mile drainage basin. The estuary was formed by sedimentation and erosion caused by the Chehalis River, which enters the east end of the harbor, and the Pacific Ocean, which connects with the harbor to the west through a 1.8-mile-wide inlet. Grays Harbor is approximately 15 miles long and 13 miles across at its widest point, narrowing to fewer than 100 yards in some places. Grays Harbor is in the Chehalis River Valley, and is continually filled in with river-borne sediments and marine deposits. Shorelines inside Grays Harbor consist primarily of marsh and sheltered tidal flats (Northwest Area Committee 2013:2-1–2-2).

Water depths throughout most of Grays Harbor are usually less than 20 feet. However, depths up to 80 feet have been measured at the mouth of the harbor. Grays Harbor has three main channels: the north channel, middle channel, and south channel. The north channel contains the Grays Harbor Navigation Channel, a 27.5-mile channel that extends from the Pacific Ocean to Cosmopolis. Its nine reaches are the Entrance Channel, Point Chehalis, South, Outer Crossover Channel, Inner Crossover Channel, North Channel, Hoquiam, Cow Point, and Aberdeen Reaches. The majority of the navigation channel is 350 feet wide, increasing to 1,000 feet wide at the harbor entrance. It is currently maintained at an authorized depth of -36 feet mean lower low water up to the Terminal 1 and 2 docks and at 32 feet mean lower low water between the Terminal 4 dock and South Aberdeen (U.S.

Army Corps of Engineers 2015)[4]. The middle and south channels remain shoaled by erosion and sediment deposits. Numerous shallow channels created by ebb tide flows and river discharges are present throughout the harbor (Northwest Area Committee 2013:2-2).

Net surface flow in the harbor is seaward and dominated by tidal currents, with a mean tide rise of about 9 feet (National Oceanic and Atmospheric Administration 2015:257). Tides of this height typically cover up to 94 square miles in Grays Harbor, while at mean lower low water, low tides typically cover fewer than 38 square miles, exposing large areas of mudflats, sandbars, and low islands dissected by multiple shallow channels (U.S. Army Corps of Engineers 2014:58). High flows on the Chehalis River can control currents in the upper portion of the harbor, especially during the winter when storms increase the flow in rivers and streams that feed Grays Harbor. The largest source of fresh water is from the Chehalis River. Other significant sources of fresh water from the north include the Hoquiam, Humptulips, and Wishkah Rivers and Chenois and Grass Creeks. The major contributing freshwater sources from the south are Elk River and Johns River (and tributaries), and Andrews, Barlow, Gold, O'Leary, Stafford and Chapin Creeks. Seasonal freshwater input creates a range of salinity from 5 parts per thousand during the winter to 20 parts per thousand in the summer (Northwest Area Committee 2013:2-2).

The form and structure of Grays Harbor are largely determined by differences in the capacity of harbor inflows (flood currents) and ocean waves that transport sediment into the harbor and outflows (ebb currents) that transport sediment out of the harbor. Sediment accumulation in the seaward portion of the harbor is controlled primarily by redistribution of harbor silt by wind and waves and deposition of ocean sands by tidal action; sediment accumulations in the interior harbor are controlled by river inputs (U.S. Army Corps of Engineers 2014: 59).

Beyond the harbor to the west, the connection to the Pacific Ocean extends between two low-lying peninsulas. The ocean side of the inlet is protected by two rock jetties (north and south) that include above-water and submerged sections. As defined in 33 Code of Federal Regulations (CFR) 80.1375 (International Regulations for Preventing Collisions at Sea Demarcation Lines, Grays Harbor, WA) the regulatory transition between inland waters and the territorial sea is demarcated by a line extending between seaward extremities of the above-water portion of these jetties. The Bar Channel Reach, which is approximately 1,000 feet wide with a minimum maintained depth of 46 feet, approaches the entrance from the southwest then turns eastward into the Entrance Channel Reach of the navigation channel. Outside of the harbor entrance, open, fine-grained sandy beaches extend along the coastline for several miles to the north and south. To the west, the Pacific Ocean overlies the continental shelf extending out and beyond the 3-nautical-mile limit of state jurisdiction. Within the 3-nautical-mile zone, a relatively shallow (2 to 18 feet deep) area extends approximately 0.25 to 0.5 nautical mile seaward from the beach, with a deeper (19 to 78 feet deep) area extending from there to the 3-nautical-mile limit.

Water Quality

Water quality in Grays Harbor is affected by discharges of effluents from multiple wastewater treatment facilities and pulp and paper mills; runoff from chemical usage for pest control and wood preservation usage; and loss of estuarine habitat from diking and filling to promote urban development and shipping and railroad access in tidally affected areas. The introduction and spread

[4] The U.S. Army Corps of Engineers was recently authorized to increase the minimum depth to -38 feet mean lower low water in a 14.5- mile section of the navigation channel under the Grays Harbor Navigation Improvement Project.

of invasive exotic plants and animals have also contributed to water quality degradation in the harbor.

The industrial use of Grays Harbor shoreline and waterways has led to past water quality problems for the Chehalis River and inner harbor[5] near Hoquiam and Aberdeen. Inner Grays Harbor remains listed as a Category 4a impaired water under Clean Water Act Section 303(d) for dioxin (Washington State Department of Ecology 2012b).

A portion of outer Grays Harbor[6] north of Westport in the mouth of the harbor is listed on the Section 303(d) list as a Category 5 impaired water for dieldrin, an organochloride insecticide (Washington State Department of Ecology 2012b). As of 2014, no TMDL had been developed for this impairment.

Both inner and outer Grays Harbor (and the lower Chehalis River) were listed as impaired under Clean Water Act Section 303(d) for fecal coliform bacteria on the 1996 and 1998 Section 303(d) lists due to inadequate controls of point or nonpoint sources in the harbor and its freshwater tributaries (Washington State Department of Ecology 2000a:1; 2002:1, 3). Identified point sources of fecal coliform bacteria included the sewage treatment plants in Hoquiam, Aberdeen, Ocean Shores, and Westport; multiple sewage lift stations and collection systems associated with these facilities; various industrial wastewater treatment plants; and two local marinas (Washington State Department of Ecology 2000a:3–7). Potential nonpoint sources included onsite septic systems, and agricultural activities. The Grays Harbor Chehalis Watershed Fecal Coliform Bacteria TMDL was approved by the U.S. Environmental Protection Agency in 2003 (Washington State Department of Ecology 2002). Wasteload allocations for permitted point sources of fecal coliform are include municipal sewage treatment plants and industrial permittees including Ocean Spray Cranberries, Grays Harbor Paper, Weyerhaeuser, Merino's Seafoods, and Washington Crab. With this TMDL in place, bacteria listings in Grays Harbor and its freshwater tributaries remain Category 4a (Washington State Department of Ecology 2012b).

Several portions of both inner and outer Grays Harbor are listed in the current water quality assessment as Category 4c due to the presence of green crab (*Carcinus maenas*), an invasive exotic species (Washington State Department of Ecology 2012b). Category 4c waters are those that are impaired by a nonpollutant such as an invasive exotic species or a type of pollution that is not appropriately addressed through the TMDL process (Washington State Department of Ecology 2006:14–15). Additional information on green crab is provided in Section 3.5, *Animals*.

Ecology currently identifies inner Grays Harbor as a water of concern (category 2) for copper and temperature and outer Grays Harbor as a water of concern for dissolved oxygen, temperature, and bacteria (Washington State Department of Ecology 2012b). Category 2 listing indicates that there is some evidence of a water quality problem, but no TMDL has been developed to address these at this time. An assessment of water quality is being developed by Ecology. Inner Grays Harbor is listed for ammonia-nitrogen under Category 1, which indicates that water quality monitoring shows that the waterbody has met standards for this pollutant.

Outer Grays Harbor is listed as impaired due to fecal coliform under Category 4a. Bacteria load allocations for inner and outer Grays Harbor are contained within the same TMDL (Washington State Department of Ecology 2002). The majority of this area has been classified as approved for

[5] The inner region of Grays Harbor is east of longitude 123°59’ W to longitude 123°45’45” W.

[6] The outer region of Grays Harbor is west of longitude 123 degrees 59’ W.

commercial shellfish harvest. The National Shellfish Sanitation Program (NSSP), the federal/state cooperative program recognized by the US Food and Drug Administration and implemented by the Washington Department of Health, sets fecal coliform bacteria criteria for marine waters that can determine whether a growing area remains open for harvest or not.

Limiting Factors to Fisheries

Severe water quality problems were documented in 1992 in Grays Harbor that resulted in a significant loss of coho smolt production (Washington State Conservation Commission 2001:16).

Since the 1990s, shellfish growers in outer Grays Harbor have experienced repeated temporary closures from elevated levels of fecal coliform bacteria (Washington State Department of Ecology 2014b). Much of this contamination has been attributed to permit effluent limit violations as well as to nonpoint sources of fecal coliform from onsite septic systems, agricultural operations, and stormwater runoff.

Sediment Quality and Contamination

Dioxin has been found in the sediments immediately downstream of the outfalls from the pulp mills; historical accumulations of this and other persistent bioaccumulative toxics (related to industrial and urban activities) could be released from sediments during dredging activities. Testing of the sediments prior to dredging indicates dioxin concentrations are below the current guidelines for Grays Harbor.

The U.S. Army Corps of Engineers conducted sediment fecal coliform tests and analyses to assess potential impacts on commercial shellfish beds from dredging/disposal operations in Grays Harbor. Findings of this study show that the Chehalis River is the primary source of sediment in Grays Harbor. Peak winter loads of sediment from the Chehalis River carry bacteria as attached particles from livestock waste and municipal sewer discharges (Washington State Department of Ecology 2000a).

3.3.4.3 Wetlands

Wetlands are transitional areas between areas of open water (e.g., streams, rivers, lakes) and uplands. For regulatory purposes under the Clean Water Act (33 U.S.C. 1251), wetlands are defined as “those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions” (Protection of Environment Definitions, 40 CFR 230.3(t)). Common examples of wetlands are swamps, marshes, and bogs. This section describes wetlands in the study area.

No wetlands are present on or within 300 feet of the project site. The closest wetlands are located on and around Rennie Island, which lies approximately 1,500 feet to the southwest across the Chehalis River channel. Rennie Island is surrounded by a band of tidally exposed mudflats, salt marsh, and tidally influenced forested and scrub-shrub wetlands (Vincent 1978:23–26). The interior of the island also contains emergent wetlands and open water areas associated with a former effluent pond from the now defunct ITT Rayonier pulp mill. Several artificially created treatment ponds are also present to the northwest of the project site, the site of the former pulp mill. Although these constructed features are mapped as wetlands by National Wetland Inventory, they are not likely to be considered waters of the United States under the Clean Water Act (33 U.S.C. 1251).

According to the Protection of Environment Definitions (40 CFR 122.2), waste treatment ponds designed to meet the requirements of the Clean Water Act are not waters of the United States.

Wetlands in Grays Harbor include widespread intertidal estuarine wetlands and special aquatic sites including both low and high salt marshes, subtidal open waters, large eelgrass beds, extensive mudflats, and scattered macroalgae beds on rocky shoreline and jetty substrates. Forested, scrub-shrub, and emergent wetlands are also present around the perimeter of Grays Harbor, both along the shoreline and extending inland along contributing rivers, streams, and drainages. A few rare types of wetlands are also present, including low-elevation freshwater wetlands that support bog-like conditions and interdunal wetlands. The wetlands and special aquatic sites of the estuary provide many important functions, including floodwater retention, sediment and pollutant filtration and removal, shoreline erosion control, groundwater recharge, carbon sequestration, and fish and wildlife habitat provision.

The Chehalis River surge plain consists of a 3,018-acre area that extends upstream along the river from the eastern side of Aberdeen to the river's confluence with the Wynoochee River. In this area, heavier saltwater from incoming high tides forms a wedge under the fresh river water, lifting it up and forcing it to surge out over low-lying floodplain areas. This hydrologic regime forms a unique type of wetland system known as a freshwater tidal surge plain, which is characterized by tidal sloughs, intermittently flooded areas, and regularly flooded areas. This diversity of hydrologic regimes supports a variety of forested, scrub-shrub, and emergent wetlands including the largest Sitka spruce-dominated coastal surge plain wetland in Washington State (Washington State Department of Natural Resources 2009:3). Because of its large size, flat topography, and minimal development, the surge plain provides important ecosystem services to the surrounding communities by slowing and storing floodwaters and filtering sediments as they move downstream toward the Grays Harbor estuary. It also provides extensive wildlife habitat for a variety of amphibians, reptiles, various small and large mammals, and a variety of birds, including bald eagle and other special status species. The surge plain also provides important habitat for anadromous fish and critical spawning habitat for resident fish. Approximately 2,345 acres of this area are managed and protected by the Washington State Department of Natural Resources as part of the Chehalis River Surge Plain Natural Area Preserve. The PS&P rail line runs just outside the northern edge of the surge plain and Natural Area Preserve for 5.5 miles.

Multiple wetlands of varying types are also present along the segment of the PS&P rail line that extends between the upstream end of the Chehalis River surge plain and Centralia. Such areas occur in association with the rivers, streams, and former channels crossed by the rail line, and in adjacent riparian and agricultural areas. Wetland types include palustrine (freshwater forested, scrub-shrub, and emergent wetlands) as well as open-water areas (riverine and lacustrine), some of which support aquatic vegetation (Figure 3.3-2). Hydrology for these areas is typically provided by overbank flooding, overland flow, groundwater seepage, or direct precipitation.

3.3.4.4 Floodplains

Floodplains are lowlands adjacent to rivers and streams that are subject to flooding from instream flows that overtop the channel banks. This section describes floodplains in the study area.

The project site does not lie within a designated Special Flood Hazard Area or a 100-year floodplain (e.g., Zone A or V) per the FEMA mapping currently in effect for this area (Appendix E, *FEMA Flood Insurance Rate Maps*). It is mapped as an *area of minimal flooding* (Zone C) on the original and

revised Flood Insurance Rate Maps for Hoquiam and Aberdeen, Washington (Federal Emergency Management Agency 1979, 1984, 2006a, 2006b). Areas of minimal flooding are defined by FEMA as being outside the Special Flood Hazard Area and higher than the elevation of the 0.2% annual chance (i.e., 500-year) flood (Federal Emergency Management Agency 2011:29). The portion of Chehalis River bordering the project site is mapped as *areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined* (Zone V2), which is considered a Special Flood Hazard Area (Federal Emergency Management Agency 1979, 1984, 2006a, 2006b). Many of the urban areas north and east of the project site are also within the 100-year floodplain Special Flood Hazard Area (Zone A), including the PS&P rail line from the west end of the Hoquiam River rail bridge to the US Route 12 (US 12) crossing of Wilson Creek. The Poynor Yard in Aberdeen and the rail bridge over the Wishkah River also lie within this zone.

Since 2012, FEMA has been working with a contractor, Strategic Alliance for Risk Reduction, Washington State Department of Natural Resources, and other state and local agencies to complete a multihazard risk assessment for Grays Harbor County under its Risk Mapping, Assessment, and Planning program. The purpose of this study is to identify potential building losses due to floods, earthquakes, tsunamis, and landslides so that local communities can better plan their development policies and enhance their natural disaster mitigation plans. As part of this study, the Flood Insurance Rate Maps for coastal communities in the county, including those for the project site, have been updated and reissued as preliminary maps pending public review and final approval by FEMA. The October 25, 2013 preliminary Flood Insurance Rate Map issued by FEMA shows the entire project site as being in Zone X, which is defined as *areas determined to be outside the 0.2% annual chance flood* (Federal Emergency Management Agency 2013). The portion of Grays Harbor that borders the project site is mapped as Zone AE (EL 13). This zone is defined by FEMA as a Special Flood Hazard Area subject to inundation by the 1% annual chance flood, where the base flood elevation has been determined at 13 feet National Geodetic Vertical Datum of 1988.

Outside of the project site, most of the surrounding shoreline of Grays Harbor is within the 100-year floodplain (Zones A and V on the effective maps and Zones AE and VE on the preliminary maps), which also extends up several of the contributing rivers and streams. The PS&P rail line crosses several mapped flood hazard areas between its origin in Centralia, Washington and terminus at the project site. These include the 100-year floodplains (Zone A) of Skookumchuck River, Scatter Creek, Black River, Roundtree Creek, Harris Creek, Cedar Creek, Gibson Creek, Porter Creek, Mox Chehalis Creek, Delezene Creek, Newman Creek, Satsop River, Sylvia Creek, Wynoochee River, Higgins Slough, Elliot Slough, Wishkah River, and Chehalis River (Washington State Department of Ecology 2014c). The rail line also crosses the 100 to 500-year floodplains (Zone B) of Dry Bed Creek and Vance Creek.

3.3.4.5 Groundwater

Groundwater is the water that flows and collects beneath the Earth's surface in the cracks and spaces in soil, sand, and rock. The geologic features that store and transmit groundwater are known as aquifers. Groundwater interfaces with surface waters via springs and as baseflow in streams and rivers. This section describes groundwater resources in the study area.

Project Site

As described in Section 3.1.4.1, *Regional Geology*, the project site is located on top of a former marine slip (Port of Grays Harbor Slip 2) that was filled with hydraulically placed dredged material from the

Chehalis River by the Port and the U.S. Army Corps of Engineers between 1983 and 1994. Geotechnical investigations conducted by Hart Crowser in 2013 characterized the fill as gravel mixed with sand and silt to approximately 40 feet deep below ground surface. The upper 5 to 15 feet of the soil column generally consists of varying fill types that are primarily characterized as sandy gravel fill overlying a sand and silt mixture with some wood waste and/or peat present in the northeastern portion of former slip (Hart Crowser 2013:3–4). Groundwater occurs at approximately 5 to 15 feet below ground surface and likely fluctuates with tide stage, as well as variations in rainfall, temperature, season and other factors. The direction of groundwater flow under the project site is not explicitly known but the inferred direction of movement is to the southwest towards Grays Harbor (Conestoga-Rovers & Associates 2013:20).

According to federal and state database searches, no drinking water wells are located on or within 1 mile of the project site. Underlying groundwater quality is largely unknown. No specific uses or incidents of potential groundwater contamination were identified during the 2009 and 2013 Phase I Site Assessments performed for the project site by Corrigan Consulting (2009) and Conestoga-Rovers & Associates (2013), respectively. However, both studies noted the lack of information on the potential hazardous constituents of the historic fill placed in the former ship slip.

PS&P Rail Line

The majority of the PS&P rail line between Centralia and Grays Harbor runs through the Chehalis River Valley, which is underlain by glacial drift and alluvial (water deposited) sediments from the Chehalis River and its tributaries. Many of these sediments support surficial aquifers[7] within thick glacial and alluvial deposits (Washington State Department of Ecology 1998:9). The two principal alluvial aquifers present in the Chehalis River Valley are informally known as the East Chehalis Surficial Aquifer and the West Chehalis Surficial Aquifer. Both consist of laterally extensive deposits of interbedded clay, silt, sand, and gravel laid down in former floodplains, alluvial fans, and low river terraces (Washington State Department of Ecology 1998:1). Groundwater flow within these aquifers generally spreads from upland recharge areas along their perimeter toward natural discharge points along streams and tributaries, as well as moving downward to recharge regional aquifers (Washington State Department of Ecology 1998: v).

The East Chehalis Surficial Aquifer extends upstream from the Scatter Creek confluence with the mainstem Chehalis River south of Rochester to the confluence of the South Fork Chehalis River beyond Centralia. Depth to groundwater in this aquifer varies from 10 to 30 feet below ground surface, with the aquifer thickness being around 90 feet near Fords Prairie (Washington State Department of Ecology 1998:14).

The West Chehalis Surficial Aquifer extends from the river mouth at Grays Harbor to the Scatter Creek confluence with the mainstem of the Chehalis River. Groundwater throughout this aquifer is directly coupled to the Chehalis River. Between Aberdeen and Elma, the aquifer consists of two zones: an upper zone that extends to approximately 100 feet below ground surface, and a lower, more permeable zone located between 100 to 200 feet below ground surface (Washington State Department of Ecology 1998:15). The lower layer is the principal aquifer in the area due to its better

[7] Surficial aquifers are defined as the uppermost saturated zone, typically an unconfined aquifer, or mapable extreme (Washington State Department of Ecology 1998: v). Surficial aquifers in the Chehalis River watershed typically lie only a few feet below land surface and extend to a depth no more than 100 feet.

water quality and yield. In general, the water table is less than 20 feet below ground surface throughout most of this reach.

From Elma upstream to Oakville, the West Chehalis Surficial Aquifer is limited to one shallow zone composed of highly permeable course-grained alluvium and reworked glacial drift (Washington State Department of Ecology 1998:15). Water table depths are typically less than 20 feet below ground surface and fluctuate closely with the water level in the Chehalis River. Percolation of water to the water table is rapid and horizontal hydraulic conductivity is high, supporting highly productive wells. Deposits in the former floodplain (terraces) of the Chehalis River in this reach also yield significant amounts of groundwater, although they are not as thick as the adjacent alluvium (Washington State Department of Ecology 1998:15).

These aquifers provide a local water source for farms, private residences, and public water systems. Along the PS&P rail line, several wells within 0.25 mile of the rail line provide domestic and municipal drinking water, as well as water for irrigation and industrial uses (Washington State Department of Ecology 2014b). Because of the shallow water table and hydraulic connection to the Chehalis River and other waterbodies, these aquifers are susceptible to groundwater contamination due to several hydrogeological factors including the depth to groundwater, highly conductive soils, presence or absence of near-surface clay layers, and the nature and rate of contaminant loading (Washington State Department of Ecology 1998:16). Thurston County has designated much of the Black River and Scatter Creek subwatersheds as a Critical Aquifer Recharge Area under its Critical Areas Ordinance (Thurston County Washington 2010). While Grays Harbor County and Lewis County have not designated any such recharge areas in their jurisdictions, similar hydrogeological conditions exist along the Chehalis River in those counties.

3.3.4.6 Stormwater

Stormwater is water that falls on the Earth's surface during precipitation events (e.g., rainfall, snow, and ice melt). It includes the portion of this water that infiltrates into the ground and that which accumulates on or flows over the ground surface on its way to a receiving water (stormwater runoff).

The project site has been extensively modified by industrial development. Currently, 15 acres of the 16-acre project site are covered with impervious asphalt and concrete. Consequently, most precipitation that falls at the project site runs off as sheet flow.[8] Stormwater that falls outside of the existing tank containment area flows into catch basins that drain into the Port's stormwater conveyance system, which discharges to Grays Harbor via the Port outfall located next to the Terminal 1 dock (Chapter 2, *Proposed Action and Alternatives*, Figure 2-2). Stormwater that falls within the tank containment area and in railcar unloading areas is directed to containment sumps. Although the existing facility does not currently hold an industrial stormwater permit, stormwater is visually inspected before being manually released to the Port's stormwater conveyance system and discharged to the harbor via the same outfall consistent with applicable regulations. If water in the sumps is contaminated, it can be treated in place, or if necessary, pumped out, by a certified wastewater hauler and taken to an appropriate treatment facility.

[8] The form runoff takes when it is uniformly dispersed across a surface.

3.3.5 What are the potential impacts on water?

This section describes impacts on water that could occur in the study area. Potential impacts of the no-action alternative are described first, followed by the potential impacts of the proposed action.

3.3.5.1 No-Action Alternative

Under the no-action alternative, impacts on water from the construction of the proposed action would not occur. The applicant would continue to operate its existing facility as described in Chapter 2, Section 2.1.3.2, *Existing Operations*. Although the proposed action would not occur, it is assumed that growth in the region would continue under the no-action alternative. This growth could lead to development of another industrial use at the project site, which could result in impacts similar to those described for construction and routine operation of the proposed action. However, for the purposes of this analysis, it is assumed that no future development would occur at the project site.

3.3.5.2 Proposed Action

This section describes the impacts that could occur in the study area as a result of construction and routine operation of the proposed action. First, this section describes impacts from construction of the proposed action. It then describes impacts of routine operation at the project site and of routine rail and vessel transport to and from the project site.

Construction

As described in Chapter 2, *Proposed Action and Alternatives*, construction of the proposed action would be limited to the project site, with no construction activities occurring in either Grays Harbor or along the existing PS&P rail line. Construction would not affect wetlands because wetlands are not present on or within 300 feet of the project site. Although onsite construction would occur within 200 feet of the shoreline of Grays Harbor, no dredge or fill operations or other in-water construction work would be required in these waters or any other surface waters, wetlands, or floodplains. Consequently, construction of the proposed action is not expected to result in any permanent impacts on water resources in the study area. Temporary impacts on water resources could occur from construction activities that involve soil disturbance, equipment and material use, and storage tank hydrostatic testing.

Soil Disturbance

Construction of the proposed action would include ground-disturbing activities that would require exposure of soils and soil stockpiling. Rainfall on these areas could transfer sediments into adjacent waterways via stormwater runoff. Such flows could enter Grays Harbor by flowing from the project site over the shoreline or through the Port's stormwater conveyance system. The potential for erosion during most cut and fill activities is considered to be relatively low because the construction site is level; however, placement of stockpiles in proximity to storm drain inlets or the shoreline could increase the potential for sediment-laden runoff to enter adjacent waterbodies. Such discharges could temporarily increase the total suspended solids in these waters, increasing turbidity and potentially affecting surface water quality through interference with photosynthesis, oxygen exchange, and the respiration, growth, and reproduction of aquatic species. Other pollutants, such as nutrients, trace metals, and hydrocarbons, could adsorb to sediment and be transported to other locations within Grays Harbor, potentially degrading water quality in these areas.

Construction projects in Washington that engage in clearing, grading, and excavating activities that disturb one or more acres and discharge stormwater to surface waters of the state are required to obtain and comply with an NPDES Construction Stormwater General Permit from Ecology (NPDES Permit Program, Washington Administrative Code [WAC] 173-220]).

The NPDES permit will require the preparation of a temporary erosion and sedimentation control plan, a stormwater pollution prevention plan for construction, and BMPs to control the risk of erosion. These actions would reduce sedimentation of waterways and loss of topsoil. As a performance standard, the BMPs would represent the best available technology that is economically achievable and the best conventional pollutant control technology to reduce pollutants. Commonly practiced BMPs may consist of a variety of measures taken to reduce pollutants in stormwater and other nonpoint-source runoff consistent Ecology directives (Washington State Department of Ecology 2012c).

The Cities of Hoquiam and Aberdeen also require critical areas (Critical Areas Ordinance Hoquiam Municipal Code [HMC] 11.06 and Aberdeen Municipal Code [AMC] 14.100) and local land use development permits prior to construction. Implementing the plans and BMPs required by these permits is expected to reduce the potential for impacts resulting from soil disturbance.

Equipment and Material Use

The delivery, handling, and storage of construction materials and wastes, as well as the use of heavy construction equipment during construction could provide potential sources for stormwater contamination. Use and maintenance of heavy equipment could result in leaks or accidental spills of vehicle fluids on exposed parts of the equipment or onto the ground, where it could enter the groundwater aquifer via infiltration or nearby surface waterbodies through surface runoff. Constituents in vehicle fluids such as fuel, oil, hydraulic fluid, and grease could be acutely toxic to aquatic organisms and could bioaccumulate in the environment. Chemicals used during construction including paints, solvents, and cleaning agents could also enter surface water and groundwater through infiltration and stormwater runoff if such substances are spilled or exposed to precipitation. These substances can also be toxic to aquatic organisms and can degrade water quality.

Waste materials such as metals, welding wastes (e.g., scrap electrodes, slag, flux), and uncured concrete can pollute water resources. Waste metals and welding wastes contain heavy metals and other chemicals and uncured concrete has a high pH, all of which can be harmful to water quality and aquatic organisms (Washington State Department of Ecology 2012c).

As discussed above, the applicant would be required to develop and implement a site-specific stormwater pollution prevention plan for construction that includes BMPs for material handling and construction waste management, which would reduce the potential for water resource impacts from these sources.

Hydrostatic Testing

As part of construction, all new storage tanks would need to undergo hydrostatic testing. The hydrostatic testing process involves completely filling each tank with water and allowing it to sit for a period to check for leaks or defects in the tank structure. Upon completion of the test, this water is typically discharged to a nearby surface water body, released to a stormwater/sanitary sewer system, allowed to infiltrate into ground, or hauled off to a licensed disposal facility. If discharged to a surface water or onto the ground, impacts could include the transport of residual chemicals and

other materials from tank construction, as well as any additives added to the water for testing (e.g., dyes, biocides), into surface waters or groundwater, potentially affecting their water quality. Depending on the discharge method and rate, the discharge of several million gallons of hydrostatic testing water could also cause erosion and increase turbidity in the receiving waters. Potential impacts on water quality by the introduction of contaminants and increased turbidity would be similar to those previously discussed.

The applicant would use potable water from the City of Aberdeen's water supply system for hydrostatic testing of the new storage tanks. No dyes or other additives would be used during this testing. Only one tank would be tested at a time, with the testing water pumped to each of the remaining tanks in succession as each test is completed. As a result, the volume of water used would be limited to the capacity of the largest tank, which in this case is 200,000 barrels (8.4 million gallons). Once testing of all tanks has been completed, the hydrotest water would be tested to confirm compliance with Ecology's discharge requirements. Special treatment of the hydrotest water prior to discharge is not expected but if it is found that the water exceeds discharge requirements, the water would be treated appropriately (e.g., filtering, pH adjustment) on site prior to discharge or shipped for offsite disposal if it cannot be handled on site. If no contamination issues are found, a hose would be attached to a valve on the last tank and routed into the stormwater sump of the new tank farm containment for release into Grays Harbor through the Port's stormwater system. Water would be discharged to the harbor at a controlled rate to reduce the potential for erosion and increased turbidity around the outfall. Because these activities would occur during the construction period, they would be covered under the facility's NPDES Construction Stormwater General Permit and would be subject to the terms and conditions of that permit including any applicable BMPs.

Operations

This section describes impacts that would occur as a result of routine operations at the project site, rail transport along the PS&P rail line, and vessel transport through Grays Harbor. More specifically, this section addresses the potential for the proposed action to result in water quality impacts from contaminated stormwater runoff. Chapter 4, *Environmental Health and Safety*, addresses the potential impacts on water from increased risk of crude oil spills. Any spills of oil or hazardous materials to water require notification and response as described in Chapter 4, *Environmental Health and Safety.* All oil or hazardous material spills must be reported by the spiller, who must respond appropriately. Under Washington Water Rights—Oil and Hazardous Substance Spill Prevention and Response law (Revised Code of Washington [RCW] 90.56.370).

Onsite

Routine operation at the project site could result in leaks or spills of various petrochemicals and other fluids used for facility operations and maintenance that could adversely affect water resources from contaminated stormwater runoff. For example, diesel fuel, oil, hydraulic fluid, or antifreeze would be used to operate and maintain vehicles and equipment. Additionally, operation of the bulk liquid transfer operations could result in leaks or spills of crude oil as the result of equipment failure or human error during unloading or loading activities. Other potential stormwater contaminants include vehicle residues (e.g., tire and brake dust) that accumulate in parking lots and material handling areas; airborne particulates from vehicle and vessel exhaust and facility emissions that are deposited on pavement and other impervious surfaces of the facility; and residues of herbicides from areas where vegetation management (e.g., weed control in tank containment area) occurs.

These chemicals could enter adjacent surface waters by transport in stormwater runoff. Stormwater flowing across the facility during and after precipitation events could pick up contaminants from a variety of sources and carry these pollutants into Grays Harbor via the Port's stormwater conveyance system.

The introduction of such substances to surface waters could degrade water quality and adversely affect both aquatic vegetation and aquatic life near the facility or transport these substances to other portions of Grays Harbor. The potential for these impacts to occur would be similar to but slightly greater than under the no-action alternative because of the increased impervious surface area and increased activity associated with the bulk liquid transfer facilities (e.g., crude oil unloading and loading).

Although spills or leaks could occur as the result of human error or minor equipment failure, the potential for these incidents to occur would be reduced by appropriate training and the implementation of prevention and control measures. This includes processes and procedures as described in the federally and state approved site-specific spill prevention, control, and countermeasures plan, facility response plan, and the oil spill prevention plan (which may be consolidated into an integrated contingency plan). These requirements and their applicability to the proposed action are discussed in greater detail in Chapter 4, Section 4.4*, Environmental Health Risks*—Terminal (Onsite). Prior to the commencement of bulk liquid loading operations at the facility, all personnel involved in liquid transfer operations would be trained in proper operating and spill prevention procedures. All pipelines and loading equipment would be regularly inspected for leaks and wear and promptly repaired if necessary. During loading operations, the dock would be constantly attended by the terminal operator who would have the ability to stop a transfer immediately if a leak or spill occurred from the dock.

Additionally, as described in Chapter 2, *Proposed Action and Alternatives*, the containment areas underlying the rail unloading area and storage tanks are designed to contain accidental spills or leaks to reduce the conveyance of chemicals to waterways. Further, all stormwater discharges from the project site will be subject to the terms and conditions of a facility-specific NPDES Industrial Stormwater Discharge Permit. This permit will include requirements for the development, implementation, and maintenance of a stormwater pollution prevention plan, which will include BMPs to protect water quality; routine maintenance, inspection, and monitoring practices; and benchmarks for the pollutants in the facility's stormwater discharge.

The primary method of reducing stormwater runoff contamination on the facility will be the stormwater conveyance system. As with the applicant's current stormwater system, all precipitation that falls within the tank and rail containment areas will be routed to collection sumps where it will be visually inspected prior to being released to the Port's stormwater system. If contamination is found, the stormwater will either be treated in place or pumped out by a certified wastewater hauler and taken to an appropriate treatment facility. All stormwater that leaves the facility via the Port's stormwater system, including runoff from all parking lots and other impervious surfaces, will also pass through an oil/water separator before being discharged to Grays Harbor, further reducing the potential of the release of contaminated stormwater. An oil/water separator is designed to separate oil from stormwater for normal operations and in the case of a spill, can contain small spills by isolating the spill runoff from the stormwater system.

With these design features, including containment structures and the oil/water separator, and the implementation of prevention and control measures and stormwater BMPs required by state and

federal law and applicable permits, contaminated stormwater would have a low impact on water resources.

Requirements for facility spill prevention and response are described in Chapter 4, *Environmental Health and Safety*. The potential for larger spills during terminal (onsite) operations (e.g., storage tank failure) to directly affect water resources and the related environmental consequences (e.g., release of crude oil) are addressed in Section 4.4, *Environmental Risks—Terminal (Onsite)*. Potential impacts from such spills are presented in Section 4.7, *Impacts on Resources*.

Rail

Operation of the proposed action at maximum throughput would add 458 unit train trips[9] per year (1.25 trips per day on average) along the PS&P rail line to the approximately 1,100 train trips per year (three trips per day on average) under the no-action alternative (Section 3.15, *Rail Traffic*). This increased rail traffic would result in the increased potential for leak and spills that could affect water quality of surface waters and groundwater along the PS&P rail line as the result of contaminated stormwater runoff. An analysis of impacts from increased risk of incidents (e.g., train derailments) and related consequences (e.g., oil spills) is presented in Chapter 4, *Environmental Health and Safety.*

Diesel fuel, oils, grease, and other fluids required for the operation and maintenance of railroad engines and rail cars could leak directly into surface waters and wetlands through the openings on bridges and trestles. Fuels could also be deposited onto the rail bed where they could be exposed to precipitation and storm flows that could carry them into adjacent surface waters and wetlands. Such discharges could degrade water quality and adversely affect aquatic vegetation, aquatic animals, birds, and wildlife in these and other downstream waterways. Sensitive areas that could be affected by such releases include the Chehalis River Surge Plain and the designated Critical Aquifer Recharge Area in the Black River and Scatter Creek subwatersheds in Thurston County.

The potential for these types of leaks and spills to occur would be minimized by regularly inspecting and maintaining railroad engines and rail cars and by implementing standard good housekeeping BMPs. These releases would be limited to minor drips and leaks that would be captured in the underlying ballast rock such that under typical conditions, there would be relatively limited risk of exposing water resources to contaminated stormwater. Although the proposed action would result in a slight increase in leaks and spills of petrochemicals due to the increased frequency of rail traffic and maintenance activities compared to the no-action alternative, the overall impacts on water quality are anticipated to remain low. The potential for larger spills to occur during rail transport that could directly affect water resources is addressed in Section 4.5, *Environmental Health Risks—Rail Transport*. Potential impacts from such spills are presented in Section 4.7, *Impacts on Resources*.

Vessel

Operation of the proposed action at maximum throughput would result in 238 tank vessel trips[10] per year (0.7 trip per day on average) along the navigation channel to projected large commercial vessel trips under the no-action alternative—between 338 and 436 trips per year in 2017 and 2037, respectively, or approximately one trip per day on average (Section 3.17, *Vessel Traffic*). This increased traffic and associated routine operation could result in water quality impacts related to

[9] A trip represents one-way travel; in other words, an inbound trip and an outbound trip are counted as two trips.
[10] A trip represents one-way travel.

ballast water discharge, propeller wash vessel wake, and spills. These impacts would be similar to but slightly greater compared with the no-action alternative.

An analysis of impacts from increased risk of incidents (e.g., vessel collision) and related consequences (e.g., oil spills) is presented in Chapter 4, *Environmental Health and Safety.*

Ballast Water

As described in Chapter 2, *Proposed Action and Alternatives*, tank vessels calling at the project site would likely discharge ballast water during the loading process. Ballast water discharge could contain a variety of materials that could harm surface waters. Primary among these contaminants are invasive marine plants and animals, bacteria, and pathogens that could displace native populations and harm aquatic life (Sections 3.4, *Plants*, and 3.5, *Animals*). This contaminated water could be discharged into Grays Harbor during loading where it could degrade water quality and harm aquatic organisms.

Under federal regulations (*Nuisance Prevention and Control Act of 1990*, as amended by the *National Invasive Species Act of 1996* 16 U.S.C. 4711 et seq.), crude oil tankers engaged in coastwise trade would be exempt from requirements to install and operate U.S. Coast Guard approved ballast water management systems and are not required to conduct mid-oceanic exchanges of ballast water. However, the Washington Department of Fish and Wildlife is responsible for implementing ballast water regulations under Revised Code of Washington (RCW) 77.120, Ballast Water Management Law. According to RCW 77.120.030, discharge of ballast water into waters of the state is not allowed unless there has been an open sea exchange, or if the vessel has treated its ballast water to meet state and federal standards. Vessels voyaging to Washington State from a port in Puget Sound or the Columbia River do not have to conduct an open sea exchange if the ballast water is from these waters. Under the proposed action, all tanks vessels, including tank barges, must file a ballast water reporting form to Washington Department of Fish and Wildlife 24 hours before entering Washington State waters.

A review of the ballast water delivery and management data compiled by the National Ballast Information Clearinghouse indicates that of the 66 tank vessels that operated in Grays Harbor during the past 7 years, all of those that discharged ballast water in the harbor had previously performed an open-sea exchange prior to entering the harbor (National Ballast Information Clearinghouse 2014). However, a number of studies has shown that mid-ocean ballast water exchanges are only partially effective (Verling et al. 2005; Minton et al. 2005; Ruiz and Smith 2005; Cordell et al. 2015). The increase in the number of vessels related to the proposed action (a maximum of 119 per year) would increase the risk of introducing invasive aquatic plans and other organisms. Potential impacts on plants and animals are addressed in Section 3.4, *Plants*, and 3.5, *Animals*.

Propeller Wash and Vessel Wake

As noted in Section 3.1, *Earth*, operation of the proposed action could increase the potential for erosion within and along the harbor related to increased vessel traffic. The location and extent of these impacts would depend on a variety of factors, including climatic conditions, tidal conditions, vessel type, vessel location, and vessel speeds. There would be an incremental increase in the potential for impacts associated with wake compared with the no-action alternative, because operation of the proposed action would result in additional tank vessel trips in the harbor.

Overall, any water quality impacts caused by propeller wash and vessel wake would likely be short-term. Both Terminal 1 and the Cow Point Turning Basin are located in a portion of Grays Harbor that has a high existing baseline for turbidity (Federal Highway Administration and Washington Department of Transportation 2010:3.1–3-3). Consequently, vessel operations under the proposed action are not expected to increase turbidity levels substantially above existing conditions.

Leaks and Spills

Diesel fuel, oils, grease, and other fluids required for the operation and maintenance of vessels could be deposited onto vessel surfaces where precipitation and storm flows could carry them into adjacent surface waters and wetlands. However, the potential for these types of leaks and spills to occur would be reduced by regular inspections and by implementing standard good housekeeping BMPs. These releases would be limited to minor drips and leaks from equipment located within contained areas of the vessel such that there would be limited risk of exposing water resources to contaminated stormwater. Although the proposed action would result in a slight increase in leaks and spills of petrochemicals due to the increased frequency of vessel traffic and maintenance activities compared to the no-action alternative, the overall impacts on water quality are anticipated to remain low. The potential for larger spills to occur during vessel transport that could directly affect water resources are addressed in Section 4.6, *Environmental Health Risks—Vessel Transport*. Potential impacts from such spills are presented in Section 4.7, *Impacts on Resources*.

3.3.6 What required permits and plans apply to water?

The following permit conditions and required plans are expected to reduce impacts on water. Additional requirements specific to the handling, storage, and transport of crude oil are discussed in Chapter 4, *Environmental Health and Safety.*

- City of Hoquiam and City of Aberdeen Critical Areas Review for fish and wildlife habitat and geologically hazardous areas
  - Critical area review report
  - Buffer establishment and protection requirements
  - Buffer mitigation and monitoring requirements
  - Buffer activity limits and restrictions
- City of Hoquiam Shoreline Substantial Development Permit
- City of Hoquiam Conditional Land Use Permit
- City of Hoquiam and City of Aberdeen Building Permits
- City of Hoquiam and City of Aberdeen Grade and Fill Permits
- City of Hoquiam Demolition Permit
- Washington State Department of Ecology National Pollutant Discharge Elimination System Construction Stormwater General Permit
  - Discharge/effluent limit requirements
  - Monitoring, sampling and reporting requirements
  - Onsite spill control material provision requirements

  - Stormwater pollution prevention plan preparation requirement
  - Stormwater BMP development and implementation
- Washington State Department of Ecology National Pollutant Discharge Elimination System Industrial Stormwater Permit
  - Discharge/effluent limit requirements
  - Monitoring, sampling, and reporting requirements
  - Operations and maintenance plan
  - Stormwater pollution prevention plan
  - Onsite spill control material provision requirements
  - Spill Prevention Control and Countermeasures Plan preparation requirement
  - Industrial discharge BMP development and implementation
- Spill prevention, contingency, and response plans to satisfy federal and state oil spill prevention and contingency planning and facility operations requirements
  - Evaluation of onsite safety and health hazards
  - Pre-emergency planning and coordination with outside organizations
  - Roles and responsibilities in an emergency
  - Evacuation routes and emergency alert and response protocols
  - Oil and hazardous material transfer operation protocols
  - Containment and countermeasures to prevent oil spills from entering navigable waterways
  - Notification procedures
  - Spill mitigation procedures
  - Facility response activities
  - Training and exercise procedures
  - Equipment descriptions: emergency shutdown system, containment, fire fighting

3.3.7 What mitigation measures would reduce impacts on water?

With implementation of the permit conditions and required plans described above, impacts from construction and routine operation of the proposed action are not considered significant and would not necessitate mitigation.

Mitigation measures to reduce impacts on environmental health and safety from increased risk of incidents (e.g., storage tank failure, train derailments, vessel collisions) and related consequences (e.g., release of crude oil) are presented in Chapter 4, *Environmental Health and Safety*.

3.3.8 Would the proposed action have unavoidable and significant adverse impacts on water?

Compliance with the applicable regulations and permits described above would reduce impacts on water. There would be no unavoidable and significant adverse impacts from construction and routine operation. Potential impacts related to increased risk of incidents and related consequences are addressed in Chapter 4, *Environmental Health and Safety*.

3.4 Plants

Plants are the foundation of most aquatic and terrestrial ecosystems. Among other functions, plants release oxygen and sequester carbon, provide wildlife habitat and food, affect soil development, and can increase slope stability. Plants are also involved in the regulation of biogeochemical cycles such as the movement and filtration of water, carbon, and nitrogen. Plants can also have cultural, spiritual, and psychological benefits for humans.

This section describes plants in the study area, including high-quality vegetation and special-status species. It then describes impacts on plants that could result under the no-action alternative or as a result of the construction and routine operation[1] of the proposed action. Finally, the section presents any measures identified to mitigate impacts of the proposed action and any remaining unavoidable and significant adverse impacts.

3.4.1 What is the study area for plants?

The study area for plants consists of plants on and near the project site that could be affected during construction and routine operations at the project site. The study area also includes plants that could be affected during rail transport along the Puget Sound & Pacific Railroad (PS&P)[2] rail line and vessel transport through Grays Harbor out to 3 nautical miles from the mouth of the harbor.

3.4.2 What laws and regulations apply to plants?

Laws and regulations for determining potential impacts on plants are summarized in Table 3.4-1. More information about these laws and regulations is provided in Appendix B, *Laws and Regulations*.

Table 3.4-1. Laws and Regulations for Plants

Laws and Regulations	Description
Federal	
Clean Water Act, Section 301 (33 U.S.C. 1251 et seq.)	Prohibits the discharge of any pollutant to a water of the United States without a permit.
Clean Water Act, Section 401 (33 U.S.C. 1251 et seq.)	Ensures that projects within the waters of the United States comply with water quality and related aquatic resource protection requirements.
Clean Water Act, Section 402 (33 U.S.C. 1251 et seq.)	Establishes the NPDES permitting program, under which discharges of pollutants are regulated.
Endangered Species Act (16 U.S.C. 1531 et seq.)	Established with the intent of providing protections for imperiled species and the ecosystems upon which they depend.

[1] Chapter 4, *Environmental Health and Safety*, addresses the potential impacts from increased risk of incidents (e.g., storage tank failure, train derailments, vessel collisions) and related consequences (e.g., release of crude oil).
[2] The PS&P rail line refers to the rail line between Centralia and the project site.

Laws and Regulations	Description
State	
Natural Area Preserves Act (RCW 79.70)	Establishes a framework for identifying and cataloging special-status plant species and regionally important or unique plant communities in Washington State.
Noxious Weed Law (RCW 17.10) and Noxious Weed List and Schedule of Monetary Penalties (WAC 16-750)	Establishes the list of noxious weeds within classes that reflect the level of concern and are related to specific mandatory control and prevention measures that are required for managing the spread of those weeds.
Growth Management Act (RCW 36.70Aand WAC 365-190-080–180)	Requires the counties and cities of the state to prepare and adopt comprehensive plans that keep with the Growth Management Act planning goals. Identifies critical areas of Washington State and establishes minimum regulatory standards for local governments to implement.
Water Pollution Control (RCW 90.48)	Regulates the discharge of pollutants into waters of the state, including streams, lakes, rivers, ponds, inland waters, salt waters, watercourses, and other surface and underground waters.
Water Rights—Oil and Hazardous Substance Spill Prevention and Response "Oil Spill Act" (RCW 90.56)	Provides a simplified process to calculate damages from an oil spill and holds responsible parties liable for damages resulting from injuries to public resources.
Oil Spill Natural Resources Damage Assessment (WAC 173-183)	Establishes procedures for convening a resource damage assessment committee, preassessment screening of damages, and selecting the damage assessment methodology.
Local	
Critical Areas Ordinance (HMC 11.06 and AMC 14.100)	Sets forth the definitions and process for designating and protecting critical areas within the city limits of Hoquiam and Aberdeen, respectively.
Hoquiam: Landscaping and Screening Ordinance (HMC 10.05.65)	Requires that 18 inches total caliper of new trees be planted per gross acre of new development.

U.S.C. = United States Code; NPDES = National Pollutant Discharge Elimination System; RCW = Revised Code of Washington; WAC = Washington Administrative Code; HMC = Hoquiam Municipal Code; AMC = Aberdeen Municipal Code

3.4.3 How were impacts on plants evaluated?

This section describes the sources of information and methods used to evaluate impacts.

3.4.3.1 Information Sources

Washington Natural Heritage Program (WNHP) manages the state's only comprehensive database of rare plant species and high-quality native plant communities. WNHP's 2014 global information system (GIS) data, as well as information from the WNHP's online Reference Desk, were used to determine known occurrences of special-status plant species and high-quality native plant communities (including their characteristic plant species) in the study area. A list of special-status plant species for Grays Harbor, Lewis, and Thurston Counties was also generated from the iPAC online system (U.S. Fish and Wildlife Service 2014a).

Special-status plant species are those species regulated by the U.S. Fish and Wildlife Service (USFWS) as threatened, endangered, sensitive, or candidate species under the Endangered Species Act (ESA), and plant species regulated or tracked by the Washington State Department of Natural Resources as state threatened, endangered, or sensitive.

Terrestrial plant communities were characterized using aerial photographs available through GoogleEarth and the 2011 National Land Cover Dataset (Multi-Resolution Land Characteristics Consortium 2014), as well as information gathered from references cited herein. Plants in the study area were characterized during a reconnaissance-level visit conducted in September 2014 at the project site and vicinity, Grays Harbor National Wildlife Refuge, and along publicly accessible portions of the PS&P rail line corridor near Hoquiam.

3.4.3.2 Impact Analysis

Impacts on vegetation at the project site were determined by examining the vegetation relative to proposed construction plans. Impacts on vegetation within 0.5 mile of the PS&P rail line and both in and within 0.5 mile of Grays Harbor were qualitatively assessed using the information sources described above.

3.4.4 What plants are in the study area?

This section describes plants in the study area that could be affected by construction and operation of the proposed action. This section provides the general context for plants in the study area and describes plants at the project site and plant communities along the PS&P rail line and in and along the shoreline of Grays Harbor, including possible resources out to 3 nautical miles from the mouth of Grays Harbor.

The study area is in the Northwest Coast ecoregion. This region is characterized by a temperate climate with summer fog and generally cool temperatures, particularly along the coastline and adjacent estuaries, such as Grays Harbor and river valleys such as the Chehalis River (Washington State Department of Natural Resources 2007; Franklin and Dyrness 1973).

Undeveloped lowland areas in this ecoregion are typically coniferous forests, characterized by western hemlock (*Tsuga heterophylla*), Douglas-fir (*Pseudotsuga menziesii*), and western red cedar (*Thuja plicata*) as the dominant tree species. Sitka spruce (*Picea sitchensis*) is also a dominant tree in

the lowlands adjacent to the coastline and in areas immediately surrounding Grays Harbor (Washington State Department of Natural Resources 2007; Franklin and Dyrness 1973). Undeveloped lowland floodplains and forested wetlands in this ecoregion (as described in Section 3.3, *Water*) are typically characterized by deciduous and mixed forest communities dominated by red alder (*Alnus rubra*), western red cedar, Sitka spruce, black cottonwood (*Populus balsamifera*), and willow (*Salix* spp.) trees.

Relative to special-status species, five of the six plants listed under the ESA have been documented in Grays Harbor, Thurston, and Lewis Counties (Washington Natural Heritage Program 2014a).

- Marsh sandwort (*Arenaria paludicola*): historically documented in Grays Harbor County
- Golden Paintbrush (*Castilleja levisecta*): documented in Thurston County
- Water howellia (*Howellia aquatilis*): documented in Thurston County
- Kincaid's lupine (*Lupinus sulphureus* ssp*. kincaidii*): documented in Lewis County
- Nelson's checker-mallow (*Sidalcea nelsoniana*): documented in Lewis County

However, the WNHP database contains no records of these ESA-listed plant species having been documented in the portions of these counties in the study area (Washington Natural Heritage Program 2014b).

3.4.4.1 Project Site

The project site does not support a native vegetation community. It was created as a result of the filling of former boat slip #2 with dredge material in 1994 (Conestoga-Rovers & Associates 2013:10). This dredge material fill was covered with crushed rock and paved. Fifteen of the project site's 16 acres are currently paved with asphalt, supporting no vegetation of any kind (Chapter 2, *Proposed Action and Alternatives*, Figure 2-2). No landscaping is present around the existing storage tanks. The 1-acre unpaved portion of the project site exists as scattered areas around the periphery of the project site that support upland grasses.

The industrialized shoreline along Terminal 1, including the shoreline adjacent to the project site, is heavily rocked or riprapped and thus lacks the intertidal marsh communities that characterize the undeveloped portions of the Grays Harbor shoreline. Scattered beach logs are lodged on top of the riprap along the approximate elevation of mean higher high water (MHHW). Blackberry canes are interspersed with the riprap and beach logs above MHHW.

The WNHP database contains no records of any federal or state special-status plant species having been documented at the project site. The nearest documented current occurrence[3] of a special-status plant is approximately 7 miles to the west-northwest of the project site along the shoreline of Grays Harbor (Washington Natural Heritage Program 2014b).

3.4.4.2 PS&P Rail Line

Four special-status plant species have been recorded in the WNHP database within the 0.5-mile study area along the PS&P rail line (Washington Natural Heritage Program 2014b).

[3] The WNHP database defines a current occurrence as an occurrence in which the most recent record was after 1977. Species for which the most current occurrence was prior to 1977 are considered historic occurrences.

- Four 1991 occurrences of the white-topped aster (*Sericocarpus rigidus;* USFWS Species of Concern, WNHP Sensitive), in four locations along the north side of the PS&P rail line near Rochester and to the east of Scatter Creek. Two of these occurrences are recorded as adjacent to the rail line.
- A 1995 occurrence of tall bugbane (*Cimicifuga elata;* USFWS Species of Concern, WNHP Sensitive), approximately 1 mile southeast of the PS&P rail yard in Centralia.
- A 1997 occurrence of the western wahoo (*Euonymus occidentalis var. occidentalis;* WNHP Sensitive), along the south side of the PS&P rail line near Rochester.
- Eight 2007 occurrences of the small-flowered trillium (*Trillium parviflorum;* WNHP Sensitive). Six of these are recorded 1.5 to 2.5 miles northwest of the Centralia PS&P rail yard (three of which are recorded near the rail line itself) and two occurrences are recorded to the north of the PS&P rail line near US Route 12 (US 12) and Prairie Creek.

Six general types of terrestrial vegetation communities occur along the PS&P rail line based on the 2011 National Land Cover Data Set (Multi-Resolution Land Characteristics Consortium 2014).

Coniferous, Deciduous, and Mixed Forests

Much of the area along the PS&P rail line between approximately Malone-Porter and Oakville is a mixture of coniferous, deciduous, and mixed forests characteristic of the broader region. These forests are generally dominated by Douglas-fir, western red cedar, Sitka spruce, red alder, and black cottonwood trees with an understory that varies depending on the type of overstory vegetation and local soil and moisture conditions. Forested wetlands also occur along the PS&P rail line in areas hydrologically influenced by the Chehalis River and its tributaries and in areas influenced by high groundwater conditions. Wetlands are described in more detail in Section 3.3, *Water*.

Shrub-Scrub Vegetation

Some areas along the PS&P rail line, including northwest of Malone-Porter, are characterized by a shrub-scrub vegetation community. Shrub-scrub areas are generally dominated by a dense mixture of young trees and shrubs less than 20 feet tall, intermixed with multiple-stemmed small trees, such as willows. Recently harvested timberlands are also frequently characterized as shrub-scrub while they are in the early stages of revegetating after trees have been harvested. Scrub-shrub wetlands also occur along the PS&P rail line in areas hydrologically influenced by the Chehalis River and its tributaries and in areas influenced by high groundwater conditions. Wetlands are described in more detail in Section 3.3, *Water*.

Herbaceous Vegetation

Small, generally scattered areas along the PS&P rail line are characterized as herbaceous (i.e., non-woody) vegetation. These areas are typically low-lying areas dominated by grasses such as invasive, but well-established, reed canarygrass (*Phalaris arundinacea*) and emergent wetlands associated with the floodplain of the Chehalis River, as described in more detail in Section 3.3, *Water*.

Cultivated Crops

Some areas along the PS&P rail line, including areas south of the rail line between Centralia and Oakville and west of Malone-Porter, are cultivated as cropland. These areas are generally in or near the Chehalis River floodplain and typically no longer support a native plant community.

Hay and Pasture Land

Several areas along the PS&P rail line, including south of the rail line between Grand Mound and Oakville and between Malone-Porter and Montesano, are characterized as hay or pasture. These areas are also in or near the Chehalis River floodplain and typically no longer support a native plant community. They are dominated by herbaceous vegetation, a mixture of grasses palatable to cattle, horses, and sheep.

Developed Land

The urbanized areas associated with the Cities and Towns of Centralia, Fords Prairie, Grand Mound, Rochester, Chehalis Village, Oakville, Elma, Satsop, Brady, Montesano, Central Park, Cosmopolis, Aberdeen, and Hoquiam are characterized as developed. These areas generally support a mixture of nonnative and native plants, typically associated with residential and commercial landscaping, public open spaces (such as parks), and small extents of otherwise protected sensitive areas (such as floodplain wetlands) that lie within the cities' urbanized areas but are too small to be mapped separately.

3.4.4.3 Grays Harbor

The WNHP database includes one historically documented special-status plant along the Grays Harbor shoreline near Pt. New and Brackenridge Bluff: a 1982 occurrence of the pink fawn-lily (*Erythronium revolutum*), a plant species classified by the WNHP as Sensitive (Washington Natural Heritage Program 2014b).

Several types of high-quality aquatic and intertidal vegetation communities occur in and along the Grays Harbor shoreline. Eelgrass, macroalgae, salt marshes, and dunegrass, as well as low-elevation freshwater wetlands and tidal surge plain wetlands, are present in the study area along the Grays Harbor shoreline. These vegetation communities provide habitat for a variety of fish, shellfish, benthic invertebrates, shorebirds, and other wildlife that use the study area and are critical elements of both primary production and the benthic/detrital foodweb of the estuary.

The portion of the study area that extends 3 nautical miles into the Pacific Ocean from the mouth of Grays Harbor is characterized by shifting sands and other soft sediments, which are influenced by the Bar Channel and South Jetty Reaches of the Grays Harbor Navigation Channel. These features concentrate flows into and out of Grays Harbor and create an environment that is generally not conducive to the establishment of plants. However, kelp, a group of large seaweeds in the Order *Laminariales*, occurs along the Pacific coast of Washington (as well as in Puget Sound), and has been documented near the mouth of Grays Harbor (Washington State Department of Natural Resources 2001).

Aquatic Vegetation

Grays Harbor supports vast areas of intertidal mudflats that support native eelgrass (*Zostera marina*) and both high-and low-elevation intertidal salt marshes, as well as scattered areas of rocky substrate that support a variety of macroalgae and nonfloating kelp species. These vegetation communities create patches of intertidal and shallow subtidal habitat that are important to a variety of wildlife species, including juvenile salmonids, Dungeness crabs, and migratory shorebirds. Per Washington Administrative Code (WAC) 220.110.250(3)(a,b), eelgrass, macroalgae, and kelp are defined as saltwater habitats of special concern. According to WAC 365-190-130, kelp and eelgrass beds are critical saltwater habitat for forage fish spawning areas.

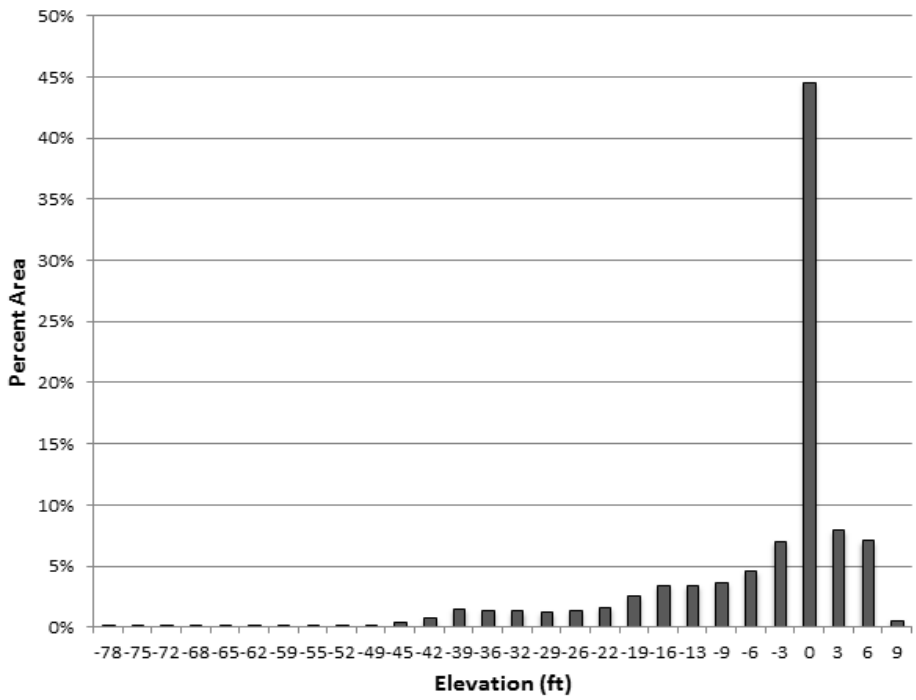
Eelgrass

Eelgrass beds support the thousands of ducks and geese that winter in Grays Harbor, and the vast numbers of shorebirds that stop in Grays Harbor to rest and feed during their annual spring migration to artic breeding grounds (U.S. Fish and Wildlife Service 2014b). Eelgrass flourishes in shallow, sunlit environments with unconsolidated substrate that are protected from strong currents and heavy, repeated wave action. Eelgrass prefers currents less than 3.5 knots, depths less than 22 feet, and salinity greater than or equal to 20 parts per thousand (Phillips 1984:14).

These environmental parameters (i.e., current speed, water depth, salinity, and low turbidity) are not found in the navigation channel, along the shoreline, or in the immediate vicinity of the project site. The landscape that drains to the Chehalis River is high in clay content and, as such, the Chehalis River is highly turbid with suspended sediments. Turbidity levels in the waters of the inner harbor near the project site and at the mouth of the Chehalis River tend to fluctuate, particularly near the middle and bottom of the water column. Turbidity ranging from 3 to 233 nephelometric turbidity units was documented during water quality sampling conducted in January 2008 (U.S. Army Corps of Engineers 2008:6). The shoreline of the inner harbor and the shoreline adjacent to the project site do not support eelgrass (ICF Jones & Stokes 2009:4-1–4-4).

As the turbid waters of the Chehalis River are diluted farther from the river mouth, the increased water clarity creates conditions for eelgrass to grow where substrate, current, and elevation conditions are appropriate. Geospatial analysis conducted in 2003 found an increase in potential eelgrass habitat (based on elevation) in Grays Harbor of approximately 4,430 acres compared to historic (1883) conditions. At least 7,605 acres of Grays Harbor were estimated to lie at elevations found suitable for eelgrass meadows (i.e., between 0 feet and 3.9 feet mean lower low water) (Borde et al. 2003:1109). Similarly, bathymetric analysis of Grays Harbor indicates that nearly 60% of the harbor (approximately 15,000 acres) is between −6 feet and +3 feet elevation, elevations that typically support eelgrass (Figure 3.4-1).

Figure 3.4-1. Percentage of Grays Harbor Estuary by Elevation



Macroalgae

Because most of Grays Harbor is unconsolidated sand and mud, macroalgae distribution is limited to rocked shoreline areas and the rocked surface of the jetties where macroalgae can find hard substrates for attachment. Low densities of leafy green sea lettuce (*Ulva lactuca*), rockweed (*Fucus distichus*), and green gut weed (*Enteromorpha intestinalis*) have been found distributed sparsely in the inner margins of the harbor near the project site close to Cow Point. Small amounts of sea lettuce and rockweed were also found attached to derelict pilings and on boulder riprap armoring the shoreline (ICF Jones & Stokes 2009:4-1–4-4).

Salt Marsh and Dunegrass

Salt marshes are essential elements of the estuarine landscape and represent an important intertidal component of the aquatic vegetation community in the Grays Harbor estuary. They provide habitat for a variety of fish, bird, and other animal species and are sources of both primary production and benthic foodweb support for the larger estuarine system (Seliskar and Gallagher 1983:37–41). Historically, this type of marsh extended many miles upstream of the estuary, becoming progressively dominated by freshwater species at the upper extent of tidal influence.

Salt marsh plants are generally categorized by their elevational range as low-marsh or high-marsh species. Species such as seaside arrowgrass (*Triglochin maritima*) and pickleweed (*Salicornia virginica*) are generally characterized as low-marsh species, and species such as Baltic rush (*Juncus balticus*), tufted hairgrass (*Descampsia cespitosa*), and Lyngby's sedge (*Carex lynbyei*) are generally characterized as high-marsh species (Seliskar and Gallagher 1983:17–19). Both low-marsh and

high-marsh habitats provide important resting and foraging habitat for migrating birds and rearing juvenile fishes. They also contribute to the benthic productivity of the system by seasonally contributing large amounts of organic material as their leaves and stems die back in the winter.

Although diking of intertidal areas has transformed many areas of salt marsh into wet pasturelands removed from tidal influence, Grays Harbor retains large areas of intact native salt marshes in the Grays Harbor National Wildlife refuge. The harbor also has numerous high-quality salt marshes documented in the WNHP database along the northern shoreline of Grays Harbor, including along the shorelines of the North Bay, of the South Bay near the mouth of the Elk River, and at the mouth of the Johns River (Figure 3.4-2) (Washington Natural Heritage Program 2014b; Northwest Area Committee 2013:6-3–6-8). These marshes are characterized by high quality, characteristic native salt marsh communities dominated by Baltic rush, seaside arrowgrass, pickleweed, tufted hairgrass, and Lyngby's sedge.

Salt marsh is also present along the shoreline of Rennie Island, approximately 1,500 feet to the southwest across the navigation channel from the project site. As described in Section 3.3, *Water*, Rennie Island is surrounded by a band of tidally exposed mudflats and salt marsh, and supports tidally influenced forested and scrub-shrub wetlands. The interior of the island also contains emergent wetlands and open water areas that are remnants of the now defunct ITT Rayonier pulp mill effluent pond.

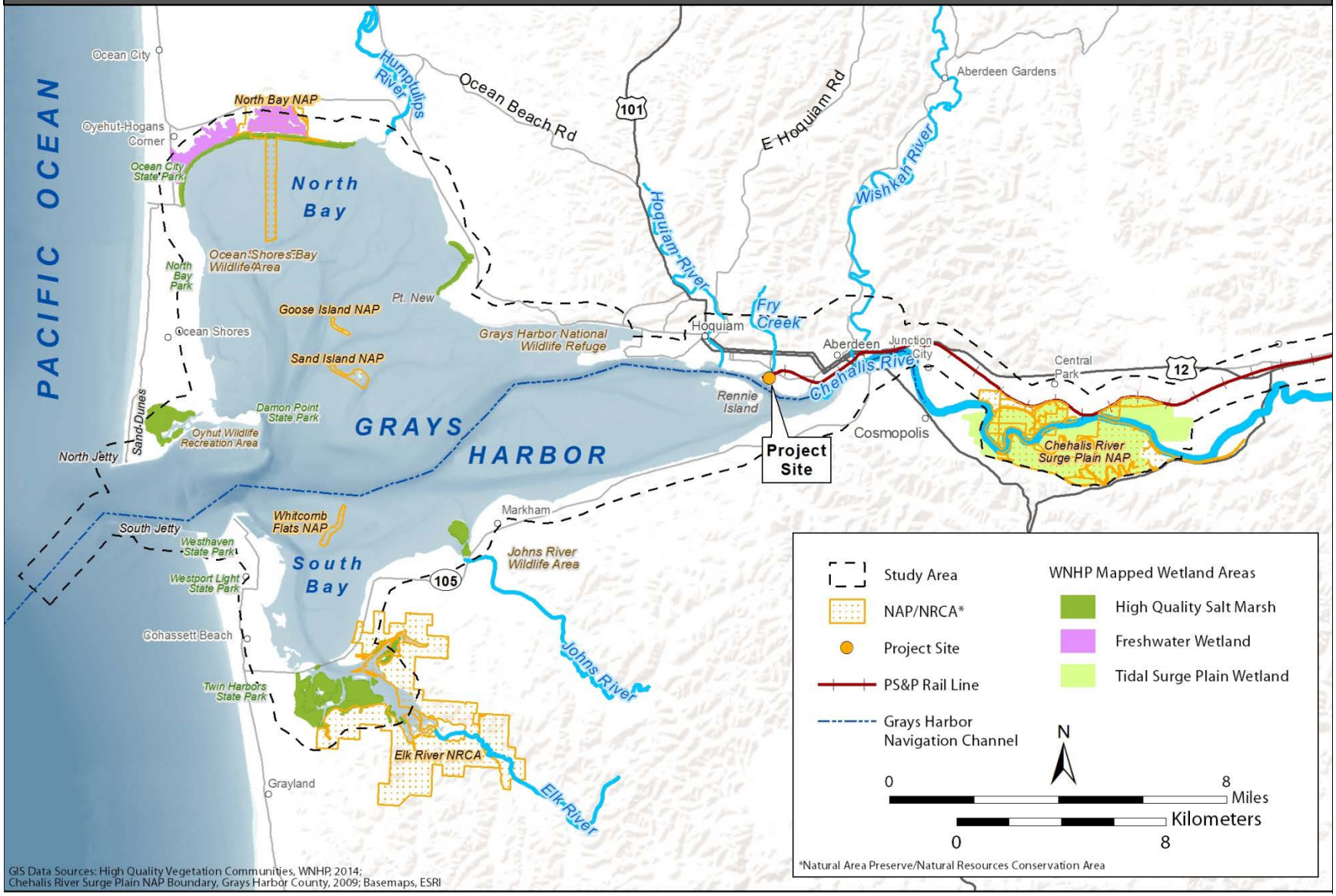
Native dunegrass (*Elymus mollis*) and the introduced European beach grass (*Ammophila arenaria*) occur on sand dunes above MHHW upslope of the South Jetty and Half Moon Bay, where they stabilize the sand dunes and provide nesting habitat for some species of shorebirds, and foraging habitat and shelter for a variety of wildlife. Dunegrass in the Damon Point area provides one of three critical nesting habitat areas for the snowy plover (*Charadrius alexandrius nivosus)*, a federally listed shorebird (Northwest Area Committee 2013:6-3–6-8).

Kelp

Twenty-six species of kelp occur along Washington's shorelines; they are categorized as *floating* or *nonfloating*. Floating kelp species include the familiar bull kelp (*Nereocystis luetkeana*) and giant kelp (*Macrocystis integrifolia*) that form the offshore kelp forests common in rocky, high-energy environments (Mumford 2007). The soft sediments and relatively low-energy waters of Grays Harbor do not support floating kelp forests (Washington State Department of Natural Resources 2001).

Nonfloating kelp, of which 21 species are found in Washington waters, are widely distributed along the northern Pacific coast and the waters of Puget Sound. Approximately 6% of Gray Harbor County's shoreline supports nonfloating kelp (Mumford 2007). Nonfloating kelp species require some solid substrate for growth, but can anchor on rocks as small as pebbles; they tend to grow in areas of high to moderate wave energy or currents. Nonfloating kelp has been documented in Grays Harbor, on the intertidal and shallow subtidal areas of the South Bay/Whitcomb Flats (Mumford 2007; Washington State Department of Natural Resources 2015).

Figure 3.4-2. High-Quality Vegetation Communities in and along the Shoreline of Grays Harbor



Low-Elevation Freshwater Wetlands

The north shore of Grays Harbor also supports a high quality, low-elevation wetland community dominated by species associated with acidic soils and bog-like conditions (Figure 3.4-2). This plant community is dominated by shrubby areas of Labrador tea (*Ledum groenlandicum*), sweetgale (*Myrica gale*), *Sphagnum* moss, and skunk cabbage (*Lysichiton americanum*), interspersed with forested areas of western red cedar, shore pine (*Pinus contorta*), and Sitka spruce trees (Washington Natural Heritage Program 2014b).

Low-elevation freshwater wetlands also support numerous plants that are culturally important for Native American inhabitants of Grays Harbor such as several species of trees and shrubs (e.g., vine maple (*Acer circinatum*), Sitka spruce, western red cedar, willows, rushes and reeds (e.g., species in the genus *Juncus*, *Scirpus*, and *Schoenoplectus*), and cattail (*Typha latifolia*), which were used in basket making (James and Martino 1986:76–83).

Grays Harbor Protected Areas

Grays Harbor National Wildlife Refuge

The Grays Harbor National Wildlife Refuge is located approximately 3 miles west of the project site (Figure 3.4-2) and managed by USFWS. As described in Section 3.5, *Animals*, the refuge was developed to preserve 1,500 acres of high-quality native terrestrial and intertidal communities, as well as crucial habitat foraging and resting habitat for migratory shorebirds, raptors, and waterfowl (U.S. Fish and Wildlife Service 2014b). Native terrestrial plants such as red alder, salmonberry (*Rubus spectabilis*) and red elderberry (*Sambucus racemosa*) present along the higher elevation portions of the refuge provide habitat for terrestrial animals such as neotropical[4] songbirds, raptors, and resident mammals such as black–tailed deer (U.S. Fish and Wildlife Service 2014b).

Native aquatic vegetation communities protected in the Grays Harbor National Wildlife refuge include high-quality low and high marshes dominated by salt marsh species such as pickleweed (*Salicornia virginica*), Lyngby's sedge (*Carex lyngbyei*), and coastal saltgrass (*Distichlis spicata*) (Washington Natural Heritage Program 2014b; U.S. Fish and Wildlife Service 2014b).

In addition, basket grass, also known as American or common three-square or chair-maker's rush (*Schoenoplectus pungens* [formerly classified as *Scirpus americanus*]), is a common, relatively tall sedge. It is a culturally important plant for regional basket makers of the Chehalis, Quileute, Hoh, Quinault, and Makah Tribes, as well as basket makers of several Puget Sound tribes (Natural Resources Conservation Service 2000; James and Martino 1986:71–76). Sweet grass grows in either freshwater or brackish marshes on the flats of the intertidal zone and exists in the area along the shoreline of Bowerman Basin in the Grays Harbor National Wildlife Refuge, where it has been harvested for generations by Native American inhabitants of Grays Harbor (Natural Resources Conservation Service 2000; James and Martino 1986:71–76).

Johns River Wildlife Unit

The 6,700-acre Johns River Wildlife Unit is composed of 15 separate units, each managed to protect or restore particular estuarine and wetland habitats.

[4] *Neotropical* is a common term for songbirds that migrate between the tropics and North America.

The 683-acre Oyhut Wildlife Recreation Area and adjacent Damon Point are located at the south end of the Ocean Shores Peninsula at the mouth of Grays Harbor (Figure 3.4-2) (Washington Department of Fish and Wildlife 2014). High-quality salt marsh plant communities characterized by pickleweed and coastal saltgrass, as well as associated mudflats that are protected in this area (Washington Natural Heritage Program 2014b). Sand dune habitats protected in this area support one of only four remaining nesting areas for snowy plovers in Washington State (Section 3.5, *Animals*).

The 63-acre South Grays Harbor unit along the south shore of Grays Harbor is managed to protect shoreline and estuarine habitats. Inclusion of an additional 800 acres is pending.

The 1,500-acre Johns River Wildlife Area, also along the south shore of Grays Harbor, is managed for waterfowl habitat and hunting and protects areas of high-quality low marsh, dominated by seaside arrowgrass (*Triglochin maritima*) and pickleweed (Figure 3.4-2) (Washington Natural Heritage Program 2014b). This area also protects a high-quality western red cedar swamp (Washington Department of Fish and Wildlife 2014).

The 41-acre Elk River unit, located at the mouth of the Elk River at the southwestern corner of Grays Harbor, protects estuary, tide flat and salt marsh habitats, including extensive areas of high-quality low and high marsh dominated by Baltic rush, coastal saltgrass, tufted hairgrass, and Lyngby's sedge (Figure3.4-2) (Washington Natural Heritage Program 2014b).

Chehalis River Surge Plain Natural Area Preserve

The Chehalis River Surge Plain Natural Area Preserve is located just upstream of Cosmopolis near the downstream end of the Chehalis River approximately between river miles 3.8 and 10.8 (Figure 3.4-2). The Washington State Department of Natural Resources manages approximately 2,345 acres to protect the largest and highest quality Sitka spruce-dominated coastal surge plain wetland in Washington State. There are only four other known wetlands of this type in Washington, all smaller and in poorer ecological condition (Washington State Department of Natural Resources 2009).

The plant community in the Chehalis River Surge Plain Natural Area Preserve is characterized by WNHP as a high-quality/rare plant community (Washington Natural Heritage Program 2014c). The forested areas are characterized by deep, organic alluvium soils over clay and are dominated by Sitka spruce trees. Mature trees in the preserve range from about 50 to more than 200 years old. The forested areas are also dominated by red alder and western red cedar trees, with a dense understory of red-osier dogwood (*Cornus sericea*), salmonberry, slough sedge (*Carex obnupta*) and skunk cabbage (*Lysichiton americanum*). Shrub-scrub areas are characterized by a mixture of red-osier dogwood and willow trees, interspersed with dense patches of Douglas spirea (*Spiraea douglasii*); lady-fern (*Athyrium filix-femina*) and skunk cabbage dominate the herbaceous layer. Mixed herbaceous areas are characterized by species such as soft-stem bulrush (*Schoenoplectus tabernaemontani*), small-fruited bulrush (*Scirpus microcarpus*), Lyngby's sedge, and common cattail. Lyngby's sedge forms vast swaths of native intertidal marsh along the low banks of the river and sloughs (Washington State Department of Natural Resources 2009; Washington Natural Heritage Program 2014b).

3.4.5 What are the potential impacts on plants?

This section describes impacts on plants that could occur in the study area. Potential impacts of the no-action alternative are described first, followed by potential impacts of the proposed action.

3.4.5.1 No-Action Alternative

Under the no-action alternative, impacts on plants from the construction of the proposed action would not occur. The applicant would continue to operate its existing facility as described in Chapter 2, Section 2.1.3.2, *Existing Operations*. Although the proposed action would not occur, it is assumed that growth in the region would continue under the no-action alternative. This growth could lead to development of another industrial use at the project site, which could result in impacts similar to those described for construction and routine operation of the proposed action. However, for the purposes of this analysis, it is assumed that no future development would occur at the project site.

3.4.5.2 Proposed Action

This section describes the impacts that could occur in the study area as a result of construction and routine operation of the proposed action. First, this section describes impacts from construction of the proposed action. It then describes impacts of routine operation at the project site and of routine rail and vessel transport to and from the project site.

Construction

No construction activities would occur outside of the project site; therefore, no construction activities would remove vegetation along Grays Harbor, in Grays Harbor, or along the PS&P rail line. Although construction would occur within 200 feet of Grays Harbor, no in-water work or shoreline work would be required, and thus, no impacts on shoreline or aquatic vegetation would occur. Therefore, the potential for construction to affect vegetation would be limited to onsite vegetation removal and impacts related to increased erosion from ground disturbance and the use of chemicals during construction and hydrostatic testing of the storage tanks as the result of exposure to contaminated stormwater runoff.

Ground disturbance related to construction of the proposed action would result in the loss of approximately 1 acre of vegetation in the form of the scattered grasses and weeds around the periphery of the project site. These scattered grassy areas are early successional and weedy areas that do not support native plant species or provide valuable wildlife habitat. Such ground disturbance would also remove any noxious weeds from the project site. Additionally, vegetation loss would be mitigated through tree planting required under the City of Hoquiam's Landscaping and Screening Ordinance (Hoquiam Municipal Code [HMC] 10.05.065) based on the gross area of construction. The permit requirements specific to the proposed action are detailed in Section 3.4.6.

As described in Section 3.3, *Water*, construction activities could temporarily affect biological resources, including shoreline and aquatic vegetation near the project site, through soil disturbance, stockpiling and erosion of sediment, stormwater contamination from equipment and material usage, and temporary increases in turbidity during release of storage tank hydrostatic testing waters. These disturbances could temporarily increase total suspended solids near the project site and result in the release of construction vehicle fluids or construction materials. Such releases could result in increased turbidity and impacts on surface water quality. Depending on the extent and duration of the impairment, vegetation could be affected through interference with photosynthesis, respiration, growth, and reproduction.

As further discussed in Section 3.3, *Water*, the potential for water quality impacts during construction would be reduced by the implementation of permit conditions required by the NPDES Construction Stormwater General Permit from Ecology and Grade and Fill Permit issued by the city.

Compliance with these permits would require implementation of the Stormwater Drainage Control Plan, Temporary Erosion and Sedimentation Control Plan, and best management practices (BMP) to reduce the potential for water quality and associated biological impacts resulting from soil disturbance. This would also require developing and implementing a spill prevention, control, and countermeasures plan, an oil spill prevention plan, and a site-specific Construction Stormwater Pollution Prevention Plan that includes BMPs for material handling and construction waste management would reduce the potential for impacts from these sources.

Upon completion of hydrostatic testing of each newly constructed storage tank, the volume of water of the largest tank (200,000 barrels [8.4 million gallons]) would be discharged into Grays Harbor. Such activities could carry residual chemicals and other materials from tank construction into the harbor, potentially affecting water quality and increasing turbidity and thus affecting biological resources, including shoreline and aquatic vegetation near the project site.

No dyes or other additives would be used during this testing. Only one tank would be tested at a time, with the testing water pumped to each of the remaining tanks in succession as each test is completed. The potential for any impacts on vegetation along the shoreline of Grays Harbor or within Grays Harbor or the Chehalis River would be reduced by testing of the hydrotest water to confirm compliance with Ecology's discharge requirements. Special treatment of the hydrotest water prior to discharge is not expected but if it is found that the water exceeds discharge requirements, the water would be treated appropriately (e.g., filtering, pH adjustment) onsite prior to discharge or shipped for offsite disposal if it cannot be handled onsite. The water would be released into Grays Harbor through the Port of Grays Harbor stormwater system at a controlled rate to reduce the potential for erosion and increased turbidity around the outfall. Because these activities would occur during the construction period, they would be covered under the applicant NPDES Construction Stormwater General Permit and would be subject to the terms and conditions of that permit including any applicable BMPs, as describe in Section 3.3*, Water*.

Operations

This section describes impacts that would occur as a result of routine operations at the project site, rail transport along the PS&P rail line, and vessel transport through Grays Harbor.

Impacts on plants could occur as direct disturbance or exposure to contaminants, as discussed below. Potential impacts of exposure to crude oil spills[5] are addressed in Chapter 4, *Environmental Health and Safety*.

Onsite

Operation of the proposed action would not affect plants at the project site, because the project site would be completely paved and no plants would be expected to colonize the developed site. Because the project site would be completely paved, colonization by noxious weeds would not likely occur during operations. The proposed action could affect plants in and around the harbor as the result of impacts on water quality and pollutant emissions associated with routine operations.

[5] All oil or hazardous material spills must be reported by the spiller, who must respond appropriately. Under Washington Water Rights—Oil and Hazardous Substance Spill Prevention and Response law (Revised Code of Washington [RCW] 90.56.370), anyone responsible for spilling oil into state waters is liable for damages resulting from injuries to public resources, including plants. The process for determining damages for an oil spill is called a Natural Resource Damage Assessment, as defined in WAC 173-183.

As discussed in detail in Section 3.3, *Water*, stormwater runoff collected at the project site could contain contaminants associated with the operation and maintenance of vehicles and equipment (e.g., diesel fuel, oil, hydraulic fuel, antifreeze, tire and brake dust, exhaust particulates) and associated with spills or leaks of crude oil related to the bulk loading transfer facilities. However, as discussed in Section 3.3, the proposed design features, including containment structures and the oil/water separator, and the implementation of prevention and control measures and stormwater BMPs required by state and federal law and applicable permits, would ensure that impacts from contaminated stormwater would be low and would present a very low risk to plants likely to be present along the shoreline near the project site. The potential for larger spills during terminal (onsite) operations (e.g., storage tank failure) to directly affect plants and the related environmental consequences (e.g., release of crude oil) are addressed in Section 4.4, *Environmental Risks—Terminal (Onsite)*. Potential impacts from such spills are presented in Section 4.7, *Impacts on Resources*.

Air pollutant emissions from onsite operations are estimated in Section 3.2, *Air*. Emissions of nitrogen dioxide (NO_2) and nitrogen oxides (NO_X) from rail-unloading operations would have the greatest potential to affect plants near the project site. According to Honour et al. (2009), impacts on vegetation are documented at NO_X concentrations ranging from 77 to 98 micrograms per cubic meter (μg/m^3) and NO_2 concentrations ranging from 57 to 67 μg/m^3. Other studies had similar conclusions (Davies et al. 2007; Bignal et al. 2007). Under worst-case conditions (maximum 1-hour concentration), NO_2 concentrations are estimated to be 114 μg/m^3 from the proposed facility at approximately 30 feet from the rail-loading area on the project site; however, under annual average conditions the NO_2 concentrations would be in the range of 33 to 43 μg/m^3 at approximately 30 feet. Therefore, under worst-case conditions, onsite emissions could result in some impacts on vegetative growth and physiology, but these would be short-term and limited to areas near the project site, which include the industrial shoreline, roadways, and developed uses.

Rail

Operation of the proposed action at maximum throughput would add 458 unit train trips[6] per year (1.25 trips per day on average) along the PS&P rail line, compared to the approximately 1,100 train trips per year (three trips per day on average) under the no-action alternative (Section 3.15, *Rail Traffic*). This increased traffic and the associated routine operations activities could affect vegetation along the PS&P rail line as the result of increased exposure to pollutants from leaks and spills and pollutant air emissions.

Leaks and Spills

An increase in leaks and spills of petrochemicals used in routine rail operations could occur due to the increased frequency of rail traffic and associated maintenance; the increase would be slightly higher compared to the no-action alternative. Diesel fuel, oils, grease, and other petrochemicals required for rail operation and maintenance could reach vegetation along the rail line through a small-scale spill or dripping from the train. These materials could be carried short distances by precipitation or surface waters to more sensitive areas such as streams and wetlands through the openings on bridges and trestles.

As noted in Section 3.3, *Water*, the potential for leaks and spills to occur would be minimized by regularly inspecting and maintaining railroad engines and rail cars and by implementing standard

[6] A trip represents one-way travel; in other words, an inbound trip and an outbound trip are counted as two trips.

good housekeeping BMPs. Additionally, impacts from a minor spill would be expected to be localized to the area of the spill adjacent to the rail line and would not be expected to spread across a wide area and would be likely captured in the underlying ballast rock. Although the proposed action would result in a slight increase in leaks and spills of petrochemicals due to the increased frequency of rail traffic and maintenance activities compared to the no-action alternative, the overall impacts on plants are anticipated to remain low. The potential for larger spills to occur during rail transport that could directly affect plants is addressed in Section 4.5, *Environmental Health Risks—Rail Transport*. Potential impacts from such spills are presented in Section 4.7, *Impacts on Resources*.

Air Emissions

As described above for onsite operations, emissions of NO_2 and NO_X can result in impacts on vegetative growth and physiology depending on the concentration of emission and distance from plants. Rail transport along the PS&P rail line would also emit NO_2 and NO_X; however, typical concentrations would be considerably lower (approximately 10 to 15 $\mu g/m^3$) than described for onsite operations (Section 3.2, *Air*) and are not anticipated to result in impacts on plant growth and physiology.

Vessel

Operation of the proposed action at maximum throughput would 238 tank vessel trips per year (0.7 trip per day on average) along the navigation channel to projected large commercial vessel trips under the no-action alternative—between 338 and 436 large commercial vessel[7] trips per year in 2017 and 2037, respectively, or approximately one trip per day on average (Section 3.17, *Vessel Traffic*). This increased traffic and associated routine operation could result in potential impacts on plants through ballast water discharge, propeller wash and vessel wake, vessel shading, and increased potential for leaks and spills. These impacts would be similar to, but slightly greater than, conditions under the no-action alternative.

Ballast Water

Vessels calling at the Terminal 1 berth would be required to discharge ballast water during the loading process. Ballast water is carried by empty vessel to provide stability during transit. As a vessel is loaded with cargo, ballast water is discharged to balance the weight of the new cargo. Ballast water discharge could contain a variety of materials that could harm aquatic plants. Primary among these contaminants are invasive marine plants and animals, bacteria, and pathogens that could displace native populations and harm aquatic life. Should an introduced species become a successful invader in a new environment, it can cause a range of ecological impacts. These include competing with native species and altering environmental conditions (e.g., increased water clarity due to mass filter-feeding), altering the foodweb and the overall ecosystem and displacing native species, reducing native biodiversity and even causing local extinctions (Ibrahim and El-naggar 2012). These aquatic system impacts can also lead to economic and public health impacts.

As noted in Section 3.3, *Water*, the likelihood of such occurrences is considered low because vessels calling at Terminal 1 related to the proposed action are required to comply with the federal and state regulatory requirements listed in that section. However, requirements for ballast water treatment or exchange are not 100% effective. While following the ballast water requirements

[7] The term *large commercial vessels* refers collectively to tank and cargo vessels.

would reduce most of the potential for impacts on aquatic plants, the increase in the number of vessels related to the proposed action (a maximum of 119 per year) would increase the risk of introducing invasive aquatic plants and other organisms. Because the consequences of such an event would affect the native vegetation communities in Grays Harbor, additional monitoring requirements have been recommended, as described in Section 3.4.7.1, *Applicant Mitigation*.

Propeller Wash and Vessel Wake

As noted in Section 3.1, *Earth*, vessel activity related to operation of the proposed action could result in increased erosion within and along Grays Harbor related to increased vessel traffic. Propeller wash and wakes that extend farther or are more intense than those already occurring in the navigation channel and turning basin have the potential to cause erosion of sediments and possibly also low-lying intertidal vegetation along the shorelines closest to the navigation channel and turning basin (e.g., salt marsh along the northern shoreline of Rennie Island). Similarly, increased intensity of wash or wakes could uproot aquatic vegetation such as eelgrass and macroalgae if present in shallow areas along the outer boundaries of the navigation channel.

The potential for wake and propeller wash impacts along the shoreline of the turning basin near the project site is limited due to the lack of intertidal and aquatic vegetation along the northern banks of the turning basin. There is a potential for such impacts on intertidal vegetation along the northern shoreline of Rennie Island from large wakes, or wakes oriented perpendicular to the navigation channel or dock.

The actual extent, location, and magnitude of any such shoreline erosion impacts are influenced by the complex interaction of multiple factors that affect when, where, and with what intensity vessel wakes or prop wash turbulence would interact with the shorelines of the turning basin and Grays Harbor. Such factors can include vessel design, hull shape, vessel weight and speed, angle of travel relative to the shoreline, proximity to the shoreline, currents and waves, and water depth (Jonason 1993:29–30). The potential for shoreline erosion can also be influenced by the slope and physical character of the shoreline, as well as its amount and type of vegetation.

As described in Section 3.17, *Vessel Traffic*, transit by deep-draft vessels through the navigation channel is typically planned when tidal elevations are close to high tides and outgoing loaded vessels may wait until the tide is even higher for safety purposes. Moreover, the majority of the Grays Harbor shoreline is thousands of feet or more from the navigation channel (e.g., the farthest point of the North Bay shoreline is 8 miles from the navigation channel).

Further, as described in Section 3.1, *Earth*, a wave modeling study to address concerns about potential wave impacts on aquatic lands caused by vessel traffic in the navigation channel concluded that waves from large vessels made an insignificant contribution to all waves and that natural waves (storm waves and swell from ocean) were the driving force that affected the movement and erosion of these lands (Pacific International Engineering 2003).

For the above reasons, proposed action vessel trips would result in a small, incremental increase in the potential for impacts on plants associated with wake and wash compared to the no-action alternative.

Vessel Shading

Docked large vessels can increase shading in the aquatic environment beneath and adjacent to existing berthing structures (e.g., docks, trestles). Shade can change primary productivity of aquatic

plants, which can in turn affect fish behavior, predation, and migration (additional information about potential impacts on fish is presented in Section 3.5, *Animals*). As reviewed in Carrasquero (2001), light attenuation from overwater structures in freshwater environments can lead to lowered primary productivity in phytoplankton and macrophyte (e.g., eelgrass and macroalgae) producers. Reduced primary productivity, including reduced stock of algae and macrophytes, can in turn influence the epibenthic community on which fish and other aquatic organisms depend, particularly the epibenthic communities prevalent in shallow-water habitats.

The existing Terminal 1 dock generates shade in shallow-water habitat immediately adjacent to the shoreline, but the degree of shading is limited because the dock has a small footprint and is elevated over the water surface, allowing light to penetrate beneath it. Due to the dock's primarily east-west orientation, most of the shading around the dock occurs in the area between the dock and the shoreline and does not extend into the deepwater habitat of the adjacent navigation channel and turning basin.

Vessels berthed at the dock increase the shading of both shallow and deepwater habitat. The extent of this increased shading is determined by the size of the vessel and the length of time it is docked. Under the proposed action, tank vessels calling at Terminal 1 would be either tank barges or tankers (Section 3.17, *Vessel Traffic*). The typical 550-class tank barge is approximately 512 feet in length and a maximum of 78 feet wide and is assisted by a tug that is approximately 127 feet long and a maximum of 42 feet wide, representing approximately 45,270 square feet (1.04 acres) of overwater shading of deepwater habitat.[8] With a maximum overall length of up to 950 feet and a maximum width of approximately 106 feet, Panamax class tankers would add approximately 100,700 square feet (2.31 acres) of overwater shading of deepwater habitat. The operational assumption is that a tank barge would occupy the berth for 24 hours and a tanker would occupy the berth for 48 hours (WorleyParsons 2014). At maximum throughput, a tank vessel related to the proposed action would be docked at Terminal 1 up to 119 days per year.

As described in Section 3.4.4.3, *Grays Harbor*, eelgrass does not occur under the dock or along the adjacent shoreline. Low densities of sparsely distributed macroalgae have been found in the inner margins of the harbor on derelict pilings and boulder riprap armoring the shoreline near the project site. Neither eelgrass nor macroalgae occur in the deepwater habitat of the navigation channel. Macroalgae on derelict pilings and boulder riprap armoring the shoreline would not be affected by vessel shading because these substrates are not located beneath the dock where the vessels would be berthed.

Although some reduction in primary productivity from vessel shading is possible, the combination of tidal currents and the flow of the Chehalis River at Terminal 1 continually circulate water along the shoreline, around berthed vessels and the dock, and within the navigation channel and large body of Grays Harbor. As discussed in Section 3.5.4.1, *Project Site*, approximately 8,088 acres of deepwater habitat (areas that are maintain more than 18 feet of water at mean lower low water) are present in Grays Harbor, including the navigation channel and turning basin. Under the proposed action, the largest vessel size (Panamax) would create shade over 0.03% of the deepwater habitat in Grays Harbor. Deepwater habitats generally have lower primary production potential due to

[8] This estimate is slightly high as the total length of the coupled tank barge is less than the collective lengths of the tank barge and tug.

reduced penetration of sunlight with depth and increased turbidity. Therefore, the proposed action would not reduce the primary productivity of plankton or aquatic plants to any measurable extent.

Leaks and Spills

Diesel fuel, oils, grease, and other fluids required for the operation and maintenance of vessels could be deposited onto vessel surfaces where precipitation and storm flows could carry them into adjacent surface waters and wetlands where they could adversely affect plants. However, the potential for these types of leaks and spills to occur would be reduced by regular inspections and by implementing standard good housekeeping BMPs. These releases would be limited to minor drips and leaks from equipment located within contained areas of the vessel such that there would be limited risk of exposing plants to contaminated stormwater. Although the proposed action would result in a slight increase in leaks and spills of petrochemicals due to the increased frequency of vessel traffic and maintenance activities compared to the no-action alternative, the overall impacts on plants are anticipated to remain low. The potential for larger spills to occur during vessel transport that could directly affect plants are addressed in Section 4.6, *Environmental Health Risks—Vessel Transport.* Potential impacts from such spills are presented in Section 4.7, *Impacts on Resources*.

3.4.6 What required permits and plans apply to plants?

The following permits conditions and required plans are expected to reduce impacts on plants. Additional requirements specific to the handling, storage, and transport of crude oil are discussed in Chapter 4, *Environmental Health and Safety*.

- City of Hoquiam Conditional Land Use Permit
  - Comply with HMC 10.05.065 requiring planting 63 deciduous trees and planting 42 evergreen trees, based on the requirement to achieve 18 inches total caliper inches (i.e., 18 inches worth of tree trunk diameter—a measure of the size of trees at installation) of new deciduous trees and 18 feet total height of new evergreen trees (each tree being 3 feet high) for every gross acre of construction.

3.4.7 What mitigation measures would reduce impacts on plants?

This section describes the applicant mitigation that would reduce impacts on plants from construction and routine operation of the proposed action. Mitigation measures to reduce potential impacts related to increased risk of incidents and related consequences are presented in Chapter 4, *Environmental Health and Safety*.

3.4.7.1 Applicant Mitigation

The applicant will implement the following mitigation.

- To reduce the potential for impacts on aquatic plants from the increase in ballast water discharges during bulk liquid operations, the applicant will prepare an invasive species monitoring plan in consultation with Washington Department of Fish and Wildlife and implement prior to the start of the proposed operation.

3.4.8 Would the proposed action have unavoidable and significant adverse impacts on plants?

Compliance with the applicable regulations and permits along with implementation of the mitigation measure described above would reduce impacts on plants. There would be no unavoidable and significant adverse impacts from construction or routine operation. Potential impacts related to increased risk of incidents and related consequences are addressed in Chapter 4, *Environmental Health and Safety*.

3.5 Animals

Many animal species inhabit the Grays Harbor area, including aquatic invertebrates, fish, and wildlife. The movements of wildlife (foraging, breeding, refuge, dispersal, and migration) affect and are affected by both the built and natural environments. Wildlife can affect habitat by consuming vegetation, insects, fish, or other animals; providing a source of prey and nutrients to other animals; and serving as a mechanism to disperse seeds. The aquatic habitats of Grays Harbor, including marine, estuarine, and freshwater habitat in the surrounding rivers and streams, support a variety of fish and aquatic species, including several types of native salmon, shellfish, and crab. In the Grays Harbor area, wildlife diversity also supports various aspects of the local culture and economy, including tourism.

This section describes animals in the study area, including invertebrates, fish, marine mammals, birds, and terrestrial wildlife, as well as special-status animal species. It then describes impacts on animals that could result under the no-action alternative or as a result of the construction and routine operation[1] of the proposed action. Finally, this section presents any measures identified to mitigate impacts of the proposed action and any remaining unavoidable and significant adverse impacts.

3.5.1 What is the study area for animals?

The study area for animals consists of animals and habitats (terrestrial and aquatic) on and near the project site that could be affected by construction and routine operations at the project site. The study area also includes animals that could be affected during routine rail transport along the Puget Sound & Pacific Railroad (PS&P)[2] rail line and vessel transport through Grays Harbor out to 3 nautical miles from the mouth of the harbor.

3.5.2 What laws and regulations apply to animals?

Laws and regulations for determining potential impacts on animals are summarized in Table 3.5-1. More information about these laws and regulations is provided in Appendix B, *Laws and Regulations*.

Table 3.5-1. Laws and Regulations for Animals

Laws and Regulations	Description
Federal	
Endangered Species Act (16 U.S.C. 1531–1544)	Established with the intent of providing protections for imperiled species and the ecosystems upon which they depend.
The Magnuson-Stevens Fishery Conservation and Management (16 U.S.C. 1801)	Governs marine fisheries management in federal waters of the United States through the establishment of eight regional fishery management councils that are responsible for preparing fishery management plans.

[1] Chapter 4, *Environmental Health and Safety*, addresses the potential impacts from increased risk of incidents (e.g., storage tank failure, train derailments, vessel collisions) and related incidents (e.g., release of crude oil).
[2] The PS&P rail line refers to the rail line between Centralia and the project site.

Laws and Regulations	Description
Marine Mammal Protection Act of 1972, as amended 2007 (16 U.S.C. 31)	Protects marine mammals from take without appropriate authorization, which may only be granted under certain circumstances by NOAA Fisheries.
Migratory Bird Treaty Act of 1918 (16 U.S.C. 703–709)	Makes it illegal for anyone to take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid permit issued pursuant to federal regulations.
Bald and Golden Eagle Protection Act of 1940 (16 U.S.C. 668 et seq.)	Prohibits the take of bald eagles, including their parts, nests, or eggs without a permit issued by USFWS.
Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990, as amended by the National Invasive Species Act of 1996 (16 U.S.C. et seq. 4711)	Establishes and regulations enforced by the U.S. Coast Guard regarding the discharge into U.S. waters of aquatic nuisance species from ship ballast water.
Clean Water Act (33 U.S.C. 1251 et seq.)	Establishes the basic structure for regulating discharges of pollutants into navigable waters of the United States by regulating point pollution sources, such as stormwater discharges, and contains specific provisions related to the accidental release of oil and other hazardous substances into U.S. waters.
Oil Pollution Act of 1990 (33 U.S.C 2701 et seq.)	Establishes provisions that expand the federal government's ability to prevent and respond to oil spills and preserves State authority to establish law governing oil spill prevention and response.
State	
Growth Management Act (RCW 36.70A)	Requires the counties and cities of the state to prepare and adopt comprehensive plans that keep with the Growth Management Act planning goals.
Shoreline Management Act (RCW 90.58)	Establishes regulations for managing the use, environmental protection, and public access of the state's shorelines.
Department of Fish and Wildlife Permanent Regulations (WAC 232-12)	Establishes permanent regulations to manage and protect wildlife listed as endangered, threatened, and candidate species.
Water Resource Act of 1971 (90.54 RCW)	Sets fundamentals of water resource policy for the state to ensure adequate protection and optimal utilization for the people of the state by providing direction to state agencies and local governments.
Water Rights-–Oil and Hazardous Substance Spill Prevention and Response "Oil Spill Act" (RCW 90.56)	Establishes programs to reduce the risk and develop an approach to respond to oil and hazardous substance spills; provides a simplified process to calculate damages from an oil spill and holds responsible parties liable for damages resulting from injuries to public resources.
Oil Spill Natural Resources Damage Assessment (WAC 173-183)	Establishes procedures for convening a resource damage assessment committee, pre-assessment screening of damages, and selecting the damage assessment methodology.
Ballast Water Management Law (RCW 77.120)	Regulates discharge of ballast water into waters of the state for vessels of 300 gross tons or more.
Local	
Critical Areas Ordinance (HMC 11.06 and AMC 14.100)	Sets forth the definitions and process for designating and protecting critical areas within the city limits of Hoquiam and Aberdeen, respectively.
Shoreline Management (HMC 11.04 and AMC 16.20)	Carries out responsibilities imposed by the Shoreline Management Act of 1971.

U.S.C. = United States Code; NOAA = National Oceanic and Atmospheric Administration; USFWS = U.S. Fish and Wildlife Service; RCW = Revised Code of Washington; WAC = Washington Administrative Code; WDFW = Washington Department of Fish and Wildlife; HMC = Hoquiam Municipal Code; AMC = Aberdeen Municipal Code

3.5.3 How were impacts on animals evaluated?

This section describes the sources of information and methods used to evaluate impacts.

3.5.3.1 Information Sources

The Washington Department of Fish and Wildlife (WDFW) Priority Habitat and Species database provides comprehensive information on important fish, wildlife, and habitat resources in Washington. It is the principal means by which WDFW provides wildlife and habitat information to public and private entities. Priority habitats are habitat types with unique or significant value to many fish or wildlife species. Priority species are fish and wildlife species that require special efforts to ensure their perpetuation because of their low numbers, sensitivity to habitat alteration, tendency to form vulnerable aggregations, or because they are of commercial, recreational, or tribal importance.

WDFW maintains a priority habitat and species geospatial database that maps locations of priority species occurrences and priority habitats (Washington Department of Fish and Wildlife 2014a). These data were reviewed for documented occurrences of priority species and habitats in the study area. The priority habitat and species database includes Washington State species of concern, which are state-listed endangered, threatened, sensitive, and candidate species; and federally listed threatened, endangered, proposed, and candidate species. The priority habitat and species database also includes state-monitored species, which are not considered special-status but are monitored for status and distribution.

Special-status animal species described in this section are those listed as threatened, endangered, proposed, or candidate species under the federal Endangered Species Act (ESA) or listed as a WDFW species of concern. The U.S. Fish and Wildlife Service (USFWS) Information, Planning, and Conservation online planning tool (2014a) provided a list of federally listed animal species for Grays Harbor, Lewis, and Thurston Counties. The National Oceanic and Atmospheric Fisheries website provided a list of special-status marine species (National Oceanic and Atmospheric Administration 2014a, 2014b, 2014c). In addition, the EIS considers potential impacts on USFWS Birds of Conservation Concern. While these bird species are not special-status species as defined in the EIS, they are migratory nongame birds that, without additional conservation actions, are at high risk of becoming candidates for listing under the federal ESA.

A site visit was conducted in September 2014 at the project site, Grays Harbor National Wildlife Refuge, and along publicly accessible portions of the railroad corridor near Hoquiam.

3.5.3.2 Impact Analysis

The impact analysis for animals considered animals and habitats in the study area, specifically in and within 1 mile of the project site, within 0.5 mile on either side of the PS&P rail line, in and along the shoreline (0.5 mile inland) of Grays Harbor, and in the Pacific Ocean within 3 nautical miles of the entrance to Grays Harbor. Animal species likely to occur in the study area were identified based on known occurrences and the presence of appropriate habitat and geographic range using the information sources described above with a focus on the priority habitat and species database. Potential impacts on animals in the study area were determined by evaluating how construction and operation could affect habitats or disturb animals that may be present in the study area.

3.5.4 What animals are in the study area?

This section describes animals and habitats in the study area that could be affected by construction and operation of the proposed action. This section addresses animals and habitats at the project site, along the PS&P rail line, and in and along the shoreline of Grays Harbor. A complete list of all special-status species and Birds of Conservation Concern known to occur in the study area counties is found in Appendix F, *Special-Status Species*.

3.5.4.1 Project Site

Terrestrial Habitats

The project site is located in an already disturbed industrialized area adjacent to the Grays Harbor shoreline. Of the site's 16 acres, 15 are currently paved with asphalt, supporting no vegetation of any kind and providing no natural habitat for terrestrial species. The 1-acre unpaved portion of the site consists of scattered areas around the periphery of the site that support upland grasses. The project site is entirely fenced, restricting some access to the site. Animals likely to be found at the project site include common rodents, birds, invertebrates, and other small animals that are habituated to developed environments. Similarly, the lands surrounding the project site are largely disturbed and developed with industry, small businesses, and residences, and lack in natural areas that would provide quality habitat for terrestrial animals. Larger and highly mobile mammal species that are habituated to developed environments may also be present in and around the project site, including Columbian black-tailed deer (*Odocoileus hemionus columbianus*), raccoon (*Procyon lotor*), and striped skunk (*Mephitis mephitis*).

The closest undeveloped area to the project site is located approximately 0.75 mile to the north. This area consists of forested land, including evergreen, deciduous, and mixed forests. Animals that are likely to be found in these forested habitats include, in addition to the species named above, black bear (*Ursus americanus*), squirrels, raccoon, owls, and various species of hawks and songbirds.

Shoreline and Aquatic Habitats

The industrialized shoreline of Grays Harbor along Terminal 1 and the project site is armored with rock and riprap. It lacks the intertidal marsh communities that characterize the undeveloped portions of the Grays Harbor shoreline to the west and south of the project site. Along the approximate elevation of mean higher high water line, scattered beach logs are lodged on top of the riprap. Above the mean higher high water line, blackberry (*Rubus armeniacus*, *Rubus laciniatus*) canes are interspersed with the riprap and beach logs. Riprap provides habitat for various invertebrate species that inhabit rocky surfaces, including barnacles, limpets, anemones, seastars, crabs, and snails.

The aquatic habitat adjacent to the shoreline of the project site, referred to as the Cow Point Reach and Cow Point Turning Basin of the Grays Harbor Navigation Channel, provides deepwater habitat. The U.S. Army Corps of Engineers annually dredges the navigation channel and turning basin to maintain a bottom depth of -36 feet mean lower low water and is currently seeking authorization to deepen the navigation channel and turning basin to its authorized depth of -38 feet mean lower low water (U.S. Army Corps of Engineers 2014). Grays Harbor contains approximately 8,088 acres of deepwater habitat (areas with more than 18 feet of water at mean lower low water) that could be

used by multiple species of fish and other aquatic organisms. This includes both natural channel habitats and areas within the maintained navigation channel and turning basins.

Fry Creek is located approximately 600 feet northwest of the project site and provides habitat for aquatic species, including coho salmon and Chehalis coastal cutthroat trout (Washington Department of Fish and Wildlife 2014a) (both state and federal species of concern), and sculpin (*Cottus* spp.), three-spined stickleback (*Gasterosteus aculeatus*), and various invertebrates. Coho and cutthroat trout use the stream for migration and coho rear in the lower portion of the stream. The lower section of the stream is a straight, open channel lacking aquatic species habitat features such as large woody debris, boulders, riffles, and canopy cover. Coho outmigration occurs in the spring, peaking in May. Cutthroat outmigration begins as early as March, peaks from late May to early June, and continues through mid-July (Simenstad and Eggers 1981).

Special-Status Species

The priority habitat and species database lists no occurrences of terrestrial special-status species in the study area near the project site. However, a pair of nesting peregrine falcons (state-sensitive species and federal species of concern) was recorded in 2006, approximately 0.75 mile from the site (Washington Department of Fish and Wildlife 2014a). According to the priority habitat and species database, the study area also includes breeding and wintering areas for peregrine falcons (Washington Department of Fish and Wildlife 2014a). Peregrine falcons nest on cliff ledges but also use tall, engineered structures such as bridges and power poles. Courtship begins as early as January, eggs are laid in the spring, and hatching occurs about a month later. Human disturbance is most likely to affect peregrines during courtship and incubation (Oregon Department of Transportation 2000: 7). In addition to providing suitable breeding habitat for peregrine falcons, Rennie Island (located 0.3 mile southwest of the project site) provides suitable breeding habitat for two other special-status species: the great blue heron (*Ardea Herodias)* (state monitored) and bald eagles (*Haliaeetus leucocephalus*) (state-listed sensitive species and federal species of concern).

Critical habitat for green sturgeon and bull trout has been designated in Grays Harbor, which overlaps the aquatic portion of the study area. In addition, several fish species and other aquatic animals could occur in the aquatic portion of the study area, including salmonids, sturgeon, forage fish, groundfish, invertebrates, and potentially river otter. For additional information on these species, see Section 3.5.4.3, *Grays Harbor*.

3.5.4.2 PS&P Rail Line

The PS&P rail line between Centralia and the project site extends through four general terrestrial vegetation communities: forests (coniferous, deciduous, and mixed), scrub-shrub, agriculture (cultivated crops, hay, pasture), and developed and barren lands (see Section 3.4.4.2, *Puget Sound & Pacific Railroad*, for descriptions of these vegetation communities). Residential and commercial developments are scattered along the majority of the corridor, with higher concentrations near Centralia and Elma into Aberdeen and Hoquiam (Figure 2-1). The PS&P rail line follows the Chehalis River Valley and in some areas is adjacent to the Chehalis River. Other habitats along the corridor include wetlands and surface waters.

Terrestrial Habitats

Forested habitats are found along much of the northern/eastern portions of the PS&P rail line between approximately Malone-Porter and Oakville, 25 to 30 miles southeast of the project site (Figure 2-1). Common mammal species such as bear, deer, raccoon, and squirrels are found in these areas, as well as owls, hawks, songbirds, reptiles, and invertebrates.

Scrub-shrub habitat is found along portions of the PS&P rail line northwest of Malone-Porter (Figure 2-1). Scrub-shrub wetlands also occur along the PS&P rail line in areas hydrologically influenced by the Chehalis River and its tributaries and in areas influenced by high groundwater conditions. Common species such as songbirds, rodents, and reptiles are found in scrub-shrub habitats. Scrub-shrub and emergent wetlands support large concentrations of wintering waterfowl, cavity nesting ducks, and nesting Canada goose (Washington Department of Fish and Wildlife 2014a).

Agricultural lands are found along several areas of the PS&P rail line, generally in or near the Chehalis River floodplain. These areas typically no longer support a native plant community and consist of cultivated croplands, hay, and pasture. Some of these agricultural lands support high concentrations of wintering waterfowl (Washington Department of Fish and Wildlife 2014a). Areas along the rail line containing cultivated crops include lands south of the rail line between Centralia and Oakville and west of Malone-Porter (Figure 2-1). Areas along the rail line containing hay or pasture include lands south of the rail line between approximately Grand Mound and Oakville and approximately Malone-Porter and Montesano.

Aquatic Habitats

Aquatic habitats along the PS&P rail line include 26 salmon-bearing streams that intersect the rail line (Bilhimer pers. comm.) Tributaries to the Chehalis River (from west to east) include the Wishkah River, Wynoochee River, Satsop River, Black River, and Skookumchuck River, as well as numerous other creeks, drainages, and associated wetlands. The Skookumchuck River is one of the main tributaries to the Chehalis River.

Special-Status Species

Based on priority habitat and species data, special-status species that may occur along the PS&P rail line include northern spotted owl (*Strix occidentalis*), marbled murrelet (*Brachyramphus marmoratus*), and three subspecies of western (Mazama) pocket gopher (*Thomomys mazama* ssp.). USFWS has designated critical habitat for the threatened bull trout (*Salvelinus confluentus*) in four streams either crossed by or adjacent to the PS&P rail line. In addition, USFWS has proposed critical habitat for the threatened Oregon spotted frog (*Rana pretiosa*) near the rail line along the Black River, a tributary to the Chehalis River near Oakville, Washington.

Suitable habitat for northern spotted owl is located within forested habit along the rail line (Washington Department of Fish and Wildlife 2014a), however this habitat is not designated critical habitat under the ESA. The northern spotted owl is a state-listed endangered and federally listed threated species. The owl's range is associated with the presence of coniferous forests and it is strongly associated with structurally complex forests, such as old growth, but also uses mature and some younger forests. Habitat loss is an important threat to spotted owls (Washington Department of Fish and Wildlife 2013: 63-68). Designated critical habitat for the marbled murrelet occurs in a

small area of forested habitat along the rail line, approximately 30 miles southeast of the project site, just east and northwest of Oakville, Washington (Washington Department of Fish and Wildlife 2014a).

Three subspecies of western (Mazama) pocket gopher have recently been listed as threatened under the ESA: Olympia Mazama pocket gopher (*Thomomys mazama pugetensis*), Tenino Mazama pocket gopher (*T. mazama tumuli*), and Yelm Mazama pocket gopher (*T. mazama yelmensis*). These species are known to occur in Thurston County (approximately 10 miles of the PS&P rail line occurs in Thurston County) near Rochester and Grand Mound, Washington (Figure 2-2). However, there is no designated critical habitat in this area of the county.

USFWS has listed the threatened bull trout (*Salvelinus confluentus*) as occurring in streams in Grays Harbor, Lewis, and Thurston Counties, Washington. The rail line crosses several streams with documented bull trout presence, including the Wishkah River, Satsop River, and Wynoochee River, all three of which are designated as critical habitat for the species (Figures 3.3-1 and 3.3-2). In addition, the rail line is adjacent to the Chehalis River in some places, particularly around Porter, Washington, where the rail line is less than 50 feet from the river. The Chehalis River is also designated critical habitat for the species in this area.

USFWS has listed the threatened Oregon spotted frog as occurring or potentially occurring in Thurston County, Washington. The species inhabits emergent wetland habitats in forested landscapes, although it is not typically found under forest canopy (78 *Federal Register* [FR] 53586). USFWS has proposed critical habitat for the Oregon spotted frog near the rail line along the Black River. Based on the USFWS National Wetland Inventory, the proposed critical habitat near the rail line is forested wetland. Final designation of critical habitat may include this proposed area, or USFWS may decide that the area does not provide habitat critical to the species' survival and that it does not contain the primary constituent elements that are the physical and biological features required for species survival and reproduction.

Chehalis River Surge Plain Natural Area Preserve

The Chehalis River Surge Plain Natural Area Preserve (Figure 3.4-1) is located south of and adjacent to the rail line for approximately 5 miles. It is the largest and highest-quality coastal surge plain wetland in Washington State (Washington State Department of Natural Resources 2009: iii). The preserve supports two priority animal species: the bald eagle and the Olympic mudminnow (*Novumbra hubbsi*). Olympic mudminnows are endemic to Washington State and only occur in the southern and western lowland drainages of the Olympic Peninsula, the Chehalis River and Deschutes River drainages, and southern Puget Sound. They have been observed in a portion of the preserve and likely occur throughout the abundant areas of suitable habitat (Washington State Department of Natural Resources 2009: 20).

Most of the preserve provides high-quality nesting and foraging habitat for bald eagles. In addition, the preserve supports at least eight other species recognized by WDFW as conservation priorities in the priority habitat and species database: pileated woodpecker (*Dryocopus pileatus*) state-listed candidate species, Vaux's swift (*Chaetura vauxi*) state-listed candidate species, osprey (*Pandion haliaetus*) state-monitored species, reticulate sculpin (*Cottus perplexus*) state-monitored species, western brook lamprey (*Lampetra richardsoni*) state-monitored and federal species of concern, band-tailed pigeon (*Columbia fasciata*) state priority species, wood duck (*Aix sponsa*) state priority species, and mink (*Mylocheilus caurinus*) state priority species.

The preserve contains important osmoregulation and rearing habitat for anadromous salmonids, including spring and fall Chinook, coho, fall chum, and summer and winter steelhead. The surge plain also forms important winter rearing and refuge habitat for Chinook and coho that may be forced downriver during high winter flows in the river and its tributaries. Seventy-five different species of birds have been documented in the preserve, including 50 species that likely breed there, 16 that could breed there, and nine that are migrants or vagrants. There are several active bald eagle and osprey nests, as well as areas where band-tailed pigeons find important mineral salts early in the breeding season and again in late summer. Mammals observed in the preserve include black bear, beaver, raccoon, deer, river otter, Douglas squirrel, varying (or snowshoe) hare, and harbor seal. No formal amphibian surveys have been completed; however, red-legged frogs are known to occur and garter snakes and other common amphibians and reptiles are likely to be present given the diversity and quality of habitats (Washington State Department of Natural Resources 2009: 22).

3.5.4.3 Grays Harbor

Grays Harbor is a large estuary that supports diverse species of fish, shellfish, benthic invertebrates, marine mammals, shorebirds, and other wildlife that use the study area. Several types of aquatic and intertidal vegetation communities occur in and along the shoreline of Grays Harbor, providing habitat for the various animal species. These vegetation communities are described in Section 3.4, *Plants*. The following description of Grays Harbor species and habitats is primarily based on a recently published analysis (U.S. Army Corp of Engineers 2014).

General Habitats and Associated Animal Species

Washington State considers native eelgrass (*Zostera marina*) beds a saltwater habitat of special concern (Washington Administrative Code [WAC] 220.110.250(3)(a,b)). Eelgrass habitat is important to many species of fish, invertebrates, and birds. Eelgrass provides shelter from predation and foraging areas and is an important nursery for several fish and invertebrate species, including salmonids and Dungeness crab (*Cancer magister*). Pacific herring (*Clupea pallasii*) spawn in eelgrass beds, depositing their eggs on the blades of vegetation. Spawning occurs between mid-January and early April (Washington Department of Fish and Wildlife undated: 1). Eelgrass beds support waterfowl that overwinter in Grays Harbor as well as migrating shorebirds that stop to rest and feed during their annual spring migrations. Expansive beds of eelgrass are found in the north bay; the south bay and Elk River estuary area support smaller beds of eelgrass and herring spawning areas (Figure 3.4-1). Eelgrass is not found in the navigation channel or the Cow Point Turning Basin adjacent to the project site.

Other important habitats surrounding the harbor include intertidal salt marsh, dune grass, and low-elevation freshwater wetlands. Salt marsh habitats provide important resting and foraging habitat for migrating birds and rearing juvenile fishes. Salt marsh habitat is located in the Grays Harbor National Wildlife Refuge, along the northern shoreline of Grays Harbor (including much of the shoreline of the north bay), and along the shoreline of the south bay near the mouth of the Elk River and at the mouth of the Johns River (Figure 3.3-1) (Northwest Area Committee 2013: 6-3, 6-7; Washington Natural Heritage Program 2014). Dune grass habitat is found along the sandy beaches and on the upland sand dunes along the shoreline of Grays Harbor and along the north shore of Damon Point.

Grays Harbor National Wildlife Refuge in located on the northeast corner of Grays Harbor. It is approximately 3 miles from the project site (Figure 3.4-1). The refuge includes approximately 1,500

acres of intertidal mudflats, salt marsh, and uplands and occupies approximately 2% of the estuary's intertidal habitat. Grays Harbor National Wildlife Refuge was established in 1990 to protect shorebird habitat. In 1996, Grays Harbor was designated a hemispheric reserve by the Western Hemisphere Shorebird Reserve Network as a site of international significance. The refuge hosts up to 50% of shorebirds that stage in the estuary (U.S. Fish and Wildlife Service 2014b, 2014c). The Audubon Society has also designated the refuge as an Important Bird Area called Bowerman Basin. Other designated Important Bird Areas the study area are Damon Point/Oyhut, Elk River Estuary, Bottle Beach, Center Islands, and Humptulips Estuary.

Special-Status Species

Many of the animals in Grays Harbor are special-status species. Appendix F, *Special-Status Species,* lists the animal species that may occur in or around Grays Harbor and their federal and state statuses.

Aquatic Habitats

Fish

Grays Harbor and its tributaries provide habitat for various fish species, including salmonids, sturgeon, lamprey, groundfish, and forage fish. Table 3.5-2 presents the salmonid species that may occur in Grays Harbor and its tributary streams and lists which are considered special-status species. As noted in the table, several special-status salmonid species are present in Grays Harbor and tributary streams.

The Chehalis River is the largest tributary that drains directly into Grays Harbor. Other tributaries that empty into Grays Harbor are the Humptulips River, Hoquiam River, Johns River, and Elk River. Six species of salmonids are known to migrate and rear in portions of Grays Harbor and its tributaries. The salmon and trout of the Grays Harbor basin spawn in freshwater streams, rear for a portion of their life in their natal streams, emigrate to the marine environment where they rear for months or years depending upon the species, and then return to their natal stream to spawn. Grays Harbor, the Chehalis River, and tributaries to these waters accessible to salmon are designated as essential fish habitat under the Magnuson-Stevens Fishery Conservation and Management Act for Pacific salmon, including Chinook and coho salmon.

Chum Salmon

Chum salmon found in Grays Harbor belong to the Pacific Coast chum evolutionary significant unit, but National Marine Fisheries Service (2009 in U.S. Army Corps of Engineers 2014: 79) also believes that Lower Columbia River chum evolutionary significant unit juveniles may rear in nearshore areas of Grays Harbor. Adult chum salmon of the Pacific Coast chum evolutionary significant unit migrate into rivers in the fall after the onset of heavy rains. These adults do not generally travel long distances to spawn and select reaches immediately upstream of tidal influence to build nests in gravelly substrate and lay their eggs. Immediately after hatching in the spring, juveniles move downstream into the estuary to rear in the nearshore environment. Their early outmigration to the estuary and the lengthy juvenile rearing that takes place there make chum salmon heavily reliant upon beneficial estuarine conditions.

Coho Salmon

Coho salmon found in Grays Harbor belong to the southwest Washington coho evolutionary significant unit. According to survey data, juvenile coho salmon of this evolutionary significant unit peak in mid-April to late May in the upper estuary near Cow Point and peak in the lower estuary 1 to 2 months later in mid- to late June. Thus, coho spend at least a portion of their juvenile rearing stage in the Grays Harbor estuary (Moser et al. 1991 in U.S. Army Corps of Engineers 2014: 80). Coho salmon adults returning to spawn pass through Grays Harbor from August to October with the peak river entry typically occurring in September.

Chinook Salmon

Chinook salmon found in Grays Harbor belong to the Washington coast Chinook salmon evolutionary significant unit. Two Chinook salmon runs, spring and fall, refer to the timing when adults return to the rivers to spawn. Juveniles of the fall run are typically ocean-type, and emigrate to marine waters as subyearlings. Stream-type juveniles of the spring run rear for a longer time in fresh water and emigrate the following year as yearlings. There are very few reports of yearlings being captured in the estuary (Sandell et al. 2011 in U.S. Army Corps of Engineers 2014: 80), indicating that they move quickly through the system to reach marine waters outside of Grays Harbor. Juvenile Chinook salmon have been captured in the estuary from January through November (Tokar et al. 1970, Simenstad and Eggers 1981 in U.S. Army Corps of Engineers 2014: 80) with peak catches occurring from May to June. There is evidence of Chinook salmon juveniles residing in the estuary nearly year round, but numbers decline rapidly after June (Simenstad and Eggers 1981 in U.S. Army Corps of Engineers 2014: 80).

Fall-run adults return to Grays Harbor as early as mid-August, when they can spend weeks feeding in the estuary prior to moving up into the river system. Adult presence in the estuary can extend through October. River entry can start in early September and last through early November, and spawning in the river system takes place from early October through November (Washington Department of Fish and Wildlife 1994). Spring-run adults pass through Grays Harbor beginning in late January or early February. Spring Chinook salmon spawning typically begins in early September, peaks in late September or early October, and is generally completed by mid-October (Washington Department of Fish and Wildlife 1994).

In addition to the Washington coast Chinook salmon evolutionary significant unit, National Marine Fisheries Service (2009 in U.S. Army Corps of Engineers 2014: 80) believes that juveniles of the Lower Columbia River Chinook salmon evolutionary significant unit and Upper Willamette River Chinook salmon evolutionary significant unit may be present in Grays Harbor at various times of the year depending on prevailing ocean currents.

Steelhead Trout

Steelhead trout are the anadromous form of rainbow trout. Steelhead found in Grays Harbor belong to the Washington coast distinct population segment. Steelhead exhibit a very diverse range of life histories, and can include both anadromous and resident type populations. Anadromous juvenile steelhead leave the freshwater system for marine waters anywhere from 1 to 5 years after hatching. While some steelhead exhibit an anadromous life history, fish of the same population may choose to rear for the entirety of their lives in fresh water (in which case they are not steelhead, but rainbow trout).

Anadromous steelhead in Grays Harbor are winter-run, returning to the Grays Harbor estuary and river system between November and May or early June (Washington Department of Fish and Wildlife 2008). Winter-run steelhead spawn shortly after reaching their spawning grounds, usually between January and March in the Chehalis River, and as late as June in freshwater tributaries to the Chehalis River. Resident steelhead may be found in freshwater tributaries to Grays Harbor and not in the marine or estuarine waters of Grays Harbor.

Bull Trout

Bull trout found in Grays Harbor belong to the coastal/Puget Sound distinct population segment, and Grays Harbor is designated critical habitat for this distinct population segment. No bull trout populations have been documented in the tributaries to Grays Harbor (U.S. Fish and Wildlife Service 2004d in U.S. Army Corps of Engineers 2014: 80), and major tributaries to Grays Harbor do not support bull trout spawning, rearing, or local populations. However, current and historical data indicate the presence of bull trout in Grays Harbor and the lower Chehalis River from mid-February through early July. Nearby Olympic Peninsula rivers support bull trout that are known to use Grays Harbor for foraging as adults. Habitat in Grays Harbor maintains connectivity between the Olympic Peninsula Management Unit's bull trout core areas and local populations (U.S. Fish and Wildlife Service 2014e: 5).

Coastal Cutthroat Trout

Coastal cutthroat found in Grays Harbor belong to the southwestern Washington/Lower Columbia River distinct population segment. Similar to steelhead trout, coastal cutthroat trout have both anadromous and resident life-history forms. Anadromous forms migrate from freshwater areas in late winter and spring to feed in the highly productive nearshore coastal and estuarine environments. In winter, they re-enter fresh waters to feed and spawn. Coastal cutthroat trout may repeat this spawning/rearing cycle multiple times. Resident cutthroat trout may be found in the freshwater tributaries to Grays Harbor but would not be found in the marine or estuarine waters of Grays Harbor.

Table 3.5-2. Salmonid Species in Grays Harbor and Tributary Streams

Salmonid Species	Scientific Name	NOAA Fisheries or USFWS-Designated ESU or DPS	Listing Under the Federal Endangered Species Act	Listing Under Washington State Regulations	Life Stage Likely Found in Grays Harbor
Chum	*Oncorhynchus keta*	Pacific Coast Chum ESU	Not warranted	Not Listed	Outmigrating juveniles, returning adults
		Columbia River Chum ESU	Threatened	Candidate	Rearing juveniles
Coho	*Oncorhynchus kisutch*	Southwest Washington Coho ESU	Not warranted	Not Listed	Outmigrating juveniles, returning adults
Chinook	*Oncorhynchus tshawytscha*	Lower Columbia River Chinook ESU	Threatened	Candidate	Rearing juveniles

Salmonid Species	Scientific Name	NOAA Fisheries or USFWS-Designated ESU or DPS	Listing Under the Federal Endangered Species Act	Listing Under Washington State Regulations	Life Stage Likely Found in Grays Harbor
		Upper Willamette River Chinook ESU	Threatened	N/A	Rearing juveniles
		Washington Coast Chinook ESU	Not warranted	Not Listed	Outmigrating juveniles, rearing juveniles, returning adults
Steelhead trout	*Oncorhynchus mykiss*	Washington Coast DPS	Not warranted	Not Listed	Outmigrating juveniles, returning adults
Bull trout	*Salvelinus confluentus*	Coastal/Puget Sound DPS	Threatened	Candidate	Rearing juveniles, foraging adults
Coastal cutthroat trout	*Oncorhynchus clarkia*	Southwestern Washington/ Lower Columbia River DPS	Species of Concern	Not Listed	Outmigrating juveniles, rearing juveniles, foraging adults, returning adults

Source: U.S. Army Corps of Engineers 2014: 79
NOAA = National Oceanic and Atmospheric Administration; ESU = evolutionary significant unit; DPS = distinct population segment; USFWS = United States Fish and Wildlife Service

Green Sturgeon

The northern and southern populations of green sturgeon are found in Grays Harbor and are federally listed as a threatened species. Both populations originate from large coastal river systems including the Sacramento, Klamath, and Rogue Rivers. Northern and southern green sturgeon occurrence and habitat preferences in Grays Harbor are essentially identical. Subadult and adult green sturgeon are known to regularly use Grays Harbor during the summer and early fall months, primarily May through October. (Lindley et al. 2011 in U.S. Army Corps of Engineers 2014: 195).The green sturgeon does not spawn in Grays Harbor tributaries and only occurs as foraging adults and subadults (National Marine Fisheries Service 2005 in U.S. Army Corps of Engineers 2014: 81). Southern green sturgeon are currently listed as threatened under the ESA, and critical habitat has been designated in the study area, including Grays Harbor and coastal waters offshore to 60 fathoms depth.

White Sturgeon

The white sturgeon is the largest North American sturgeon and a species of interest for the local tribes. It is found along the west coast from Alaska to north-central California, including in Grays Harbor (Scott and Crossman 1973 in U.S. Army Corps of Engineers 2014: 81). White sturgeon is a slow-growing anadromous fish with reported estimated ages of up to 100 years (Environmental Protection Information Center et al. 2001 in U.S. Army Corps of Engineers 2014: 81). White sturgeon are known to occur in Willapa Bay (located just south of Grays Harbor on the Pacific coast of Washington) (Emmett et al. 1991 in U.S. Army Corps of Engineers 2014: 81). Quinault Indian Nation members harvested 3,111 white sturgeon in Grays Harbor in 2008 and 1,107 in 2009 (Jorgensen pers. comm. in U.S. Army Corps of Engineers 2014: 81).

Forage Fish, Groundfish, and Other Fish Species

Grays Harbor and adjacent nearshore marine areas provide habitat for a variety of forage fish, groundfish, and other fish species. Forage fish provide a prey base (forage) for numerous fish, birds, and marine mammals, including several threatened salmonids. The majority of these forage fish and groundfish are protected under the essential fish habitat provisions of the Magnuson-Stevens Act (Pacific Fishery Management Council 2011a, 2011b in U.S. Army Corps of Engineers 2014: 81). A total of eight forage fish, 21 groundfish, and five other fish species are found in Grays Harbor and adjacent coastal nearshore habitats (Table 3.5-3).

Table 3.5-3. Forage Fish, Groundfish, and other Fish Species in Grays Harbor and Adjacent Coastal Nearshore Habitats

Forage Fish Species		
Pacific sand lance	Pacific herring	Northern anchovy
Market squid	Surf smelt	Pacific sardine
Pacific mackerel	Eulachon	
Groundfish Species		
Arrowtooth flounder	Pacific sanddab	Petrale sole
Pacific cod	Flathead sole	Soupfin shark
Spotted ratfish	Rock sole	Pacific staghorn sculpin
Dover sole	Pacific tomcod	Lingcod
English sole	Starry flounder	Brown rockfish
Sand sole	California skate	Copper rockfish
Black rockfish	Redstripe rockfish	Spiny dogfish
Other Fish Species		
American shad	Arrow goby	Shiner perch
Three-spine sickleback	Surfperch	
Source: U.S. Army Corps of Engineers 2014: 83–84		

One forage fish, the southern eulachon distinct population segment, is listed as a threatened species under the ESA. The eulachon is a type of smelt that spawns in fresh water, is transported by river currents to estuarine and marine habitats as larvae, and lives the remainder of its life in the ocean before returning to spawn as an adult. The primary spawning habitats for the southern eulachon distinct population segment are in the lower Columbia River and its tributaries, but they occasionally spawn in river systems to the north of Grays Harbor on the Olympic Peninsula (Gustafson et al. 2010 in U.S. Army Corps of Engineers 2014: 94). Eulachon commonly return to spawn in late winter and early spring, near the seasonal flow minimum (Lewis et al. 2002 in U.S. Army Corps of Engineers 2014: 94). In many rivers, eulachon spawning appears to be timed so that egg hatching will coincide with peak spring river discharge (Flory 2008 in U.S. Army Corps of Engineers 2014: 94). The juveniles are flushed rapidly downstream into the river estuary where they rear for weeks to months prior to entering the Pacific Ocean (Hay and McCarter 2000 in U.S. Army Corps of Engineers 2014: 94). Adult eulachon typically reside in the upper third of the water column, whereas juveniles are found in higher densities near the bottom (Spangler 2002 in U.S. Army Corps of Engineers 2014: 94). McCarter and Hay (2003 in U.S. Army Corps of Engineers 2014: 94-95) note that larval eulachon are typically abundant at depths ranging from 0 to 15 meters (0 to 49 feet) below the surface.

Eulachon are not regularly observed in Grays Harbor or its tributaries and there is sporadic evidence as to their occurrence. Deschamps et al. (1970 in U.S. Army Corps of Engineers 2014: 95) reported the capture of a single adult eulachon in March 1966 and stated that, "It is unlikely that the Chehalis system has a run of any consequence, although strays or feeding fish from other areas probably visit the upper harbor at times." However, Willson et al. (2006 in U.S. Army Corps of Engineers 2014: 95) identified several Grays Harbor tributaries (Humptulips, Chehalis, Aberdeen, and Wynoochee Rivers) as supporting eulachon spawning runs. Eulachon have been reported sporadically in the tributary rivers to Grays Harbor, specifically the Wynoochee River (Washington Department of Fish and Wildlife and Oregon Department of Fish and Wildlife 2001; Willson et al. 2006 in U.S. Army Corps of Engineers 2014: 95). Simenstad et al. (2001 in U.S. Army Corps of Engineers 2014: 95) recorded eulachon as a rare occurrence in sloughs of the Chehalis River estuary in 1990 and 1995. Their occurrence in Grays Harbor in recent years has been classified as rare (Gustafson et al. 2010 in U.S. Army Corps of Engineers 2014: 94). Based on these studies, eulachon appear to be sporadic visitors to Grays Harbor and to spawn occasionally in the rivers that are tributary to Grays Harbor. Critical habitat is designated for the southern eulachon distinct population segment, but it does not include Grays Harbor or its tributaries.

Invertebrates

A variety of invertebrates uses Grays Harbor, including Dungeness crab (*Cancer magister*), clams, oysters, and a diverse epibenthic community. These invertebrates provide forage for the fish, birds, and other wildlife in Grays Harbor. Commercial harvest of Dungeness crab and farming of oysters provide substantial inputs to the local economy of the communities surrounding Grays Harbor. In addition, the Dungeness crab fishery is important to four coastal tribes, including the Quinault Indian Nation, which has usual and accustomed fishing grounds in Grays Harbor.

Dungeness Crab

The expansive mudflats and dendritic tidal channels of Grays Harbor provide highly productive habitat for juvenile Dungeness crabs, and the structural complexity of eelgrass beds provide cover, rearing, and foraging habitats (Armstrong et al. 2003 in U.S. Army Corps of Engineers 2014: 70). The inner harbor reaches, with more mud and silt, are not as suitable to rearing crabs as the sandier outer harbor reaches. Unstructured littoral habitats are important foraging areas for juvenile and subadult Dungeness crabs (Holsman et al. 2006: 183). Holsman et al. (2006: 193) also suggests that these unstructured habitats, including mud and sandflats in the intertidal areas, may be primary foraging areas critical to crab production. Armstrong et al. (1991 in U.S. Army Corps of Engineers 2014: 69) found that crab abundance in Grays Harbor ranged from about 3 to 28 million crabs, depending on season. Crab populations are highest during mid spring through early summer, and begin to decline toward the end of summer through fall. Trawl surveys in the Grays Harbor Navigation Channel reported an average Dungeness crab density of 678 crabs per hectare (Armstrong et al. 1991 in U.S. Army Corps of Engineers 2014: 69).

Grays Harbor Dungeness crabs are harvested commercially and by the Quinault Indian Nation. WDFW nontreaty commercial Dungeness crab landings data indicate that 9,247 pounds of crab were harvested in Grays Harbor (catch reporting area 60B) in 2013/2014, with an overall average of 91,372 pounds per year between 1997 and 2014 (Washington Department of Fish and Wildlife 2014b; U.S. Army Corps of Engineers 2014: 73). Quinault Indian Nation-reported harvest in the Dungeness crab fishery (2004 to 2013) averaged 2.6 million pounds of crab annually (Resource

Dimensions 2015: 80). Harvest is the large anthropogenic stressor on crab populations in Grays Harbor.

Other Invertebrates

A variety of invertebrates, including worms, nematodes, copepods, amphipods, crustaceans, and mollusks, inhabit Grays Harbor and provide forage for numerous species of birds and fish. Oysters and clams (mollusks) are farmed over 900 acres in Grays Harbor (Green et al 2009 in U.S. Army Corps of Engineers 2014: 76), and Pacific oysters are found in the intertidal or shallow subtidal zones of Grays Harbor attached to hard substrates. Oyster beds are located primarily in the south and central portions of Grays Harbor; there are also some beds in areas of the North Bay (Washington Department of Fish and Wildlife 2014a). Oysters feed on small organisms that they filter from the water column. Spawning occurs annually in July or August when water temperatures rise above 19.5°C. Water temperature greatly influences development rates, but typically, young oysters attach to hard substrate approximately 2 weeks after fertilization, where they will stay attached for the remainder of their lives.

Marine Mammals

Marine mammals are frequently observed in Grays Harbor. California sea lions (*Zalophus californianus*) and harbor seals (*Phoca vitulina*) are the most common species. Harbor seal haulout sites are located throughout the estuary, primarily in the north and central bays (Washington Department of Fish and Wildlife 2014a). Many of the haulouts are used during the pupping season (mid-April through June) when peak abundances occur (Jeffries et al. 2000: vii; Washington Department of Fish and Wildlife 2014a). The harbor seal haulout closest to the navigation channel is located approximately 200 meters away, which is twice the distance recommended by the National Marine Fisheries Service (100 meters) to avoidance disturbance related to vessel traffic. Harbor seal abundance also peaks during the annual molt July through August (Jeffries et al. 2000: 12). Fewer male California sea lions use the estuary seasonally, from the fall through late spring (Jeffries et al. 2000: viii). Steller sea lions (*Eumetopias jubatus*) use the Pacific Ocean near Grays Harbor and may enter the estuary on occasion.

Several ESA-listed whale species may occur off the Washington coast near Grays Harbor. These include blue, fin, and sei whales (*Balaenoptera musculus, B. physalus,* and *B. borealis,* respectively), sperm whale (*Physeter macrocephalus*), and humpback whale (*Megaptera novaengliae*), all of which are federally listed and state-listed as endangered. Killer whale (*Orcinus orca*) also occurs in these waters and includes two types: southern resident killer whales, which are federally listed as endangered, and transient killer whales, which are not listed as threatened or endangered. Other whale species that may occur in the waters off Grays Harbor are the pygmy sperm (*Kogia breviceps*), common minke (*Balaenoptera acutorostrata*), and the state-listed sensitive gray whale (*Eschrichtius robustus)*. The occurrence of these species in the coastal waters of Washington State ranges from exceptionally rare (blue whales) to relatively common (humpback whales) (Carretta et al. 2011 in U.S. Army Corps of Engineers 2014: 88).

With the exception of humpback whales, gray whales, and killer whales, the probability of the whale species listed above occurring in the study area (including Grays Harbor) is remote because these other whale species are rarely seen within 10 miles of shore (Calambokidis et al. 2004; Carretta et al. 2011 in U.S. Army Corps of Engineers 2014: 89). The Orca Network (2013 in U.S. Army Corps of Engineers 2014: 88) reports many sightings of humpback whales travelling along the coast near the

mouth of Grays Harbor but rarely reports humpbacks entering the bay itself, indicating that they infrequently use Grays Harbor. Gray whales pass through Washington waters twice annually, migrating between breeding grounds in Baja California and feeding grounds in Alaska. Gray whale use of Grays Harbor is well documented and they are known to enter Grays Harbor during migrations along the coast (Washington Department of Fish and Wildlife 1997). Their migration peaks during March, April, and May in Washington, when gray whales swim in large numbers close enough to the Washington coastline to be seen from shore (U.S. Army Corps of Engineers 2014: 89). During a 1996 survey, gray whales were seen consistently in Grays Harbor; at least 27 different whales were observed using the harbor, mostly for extended periods (Washington Department of Fish and Wildlife 1997).

Killer whales are also known to occur in Washington coastal waters and near Grays Harbor. These killer whales represent both southern resident killer whales, which feed primarily on salmon, and transient killer whales, which feed primarily on marine mammals. Killer whales are considered only occasional visitors to the waters around Grays Harbor (U.S. Army Corps of Engineers 2014: 89); they have been sighted and tracked in Washington coastal waters near Grays Harbor during March and April (Krahn et al. 2004; National Marine Fisheries Service 2008 in U.S. Army Corps of Engineers 2014: 96), but have not been observed inside Grays Harbor. This is consistent with documented whale sightings in the Orca Network (2016) database, which includes several records of both southern resident and transient killer whales observed within 5 miles offshore of Grays Harbor, but none within the harbor itself.

Other marine mammals common to Grays Harbor include harbor porpoise (*Phocoena phocoena*), Dall's porpoise (*Phocoenoides dalli*), and Pacific white-sided dolphin (*Lagenorhynchus obliquidens*); these species are year-round inhabitants of Grays Harbor and the surrounding coastline. The Orca Network (2013 in U.S. Army Corps of Engineers 2014: 89) reports many sightings of these species in and around Grays Harbor annually. Common dolphin (*Delphinus delphinus*) are occasionally sighted around Grays Harbor but typically frequent warmer waters to the south.

Sea Turtles

Sea turtles that occur in Washington coastal waters include the leatherback (*Dermochelys coriacea*), loggerhead (*Caretta caretta*), green (*Chelonia mydas*), and olive ridley (*Lepidochelys olivacea*) sea turtles (National Oceanic and Atmospheric Administration 2014c). The loggerhead sea turtle is listed as threatened; the remaining species are listed as endangered. All four turtle species occur in Washington waters at varying frequencies but only as adults. They are highly unlikely to occur in Grays Harbor or the nearshore areas.

Leatherback and loggerhead sea turtles are occasionally observed in productive coastal waters, but nearshore sightings are rare in Washington State (Washington Department of Fish and Wildlife 2012; Conant et. al. 2009 in U.S. Army Corps of Engineers 2014: 97). Adults have occasionally been found stranded on the Washington coast (Bowlby et. al. 1994 in U.S. Army Corps of Engineers 2014: 97), but none have been recorded in the last decade (Washington Department of Fish and Wildlife 2012 in U.S. Army Corps of Engineers 2014: 97). Leatherback sea turtle critical habitat has been designated in the coastal marine waters of the study area; this critical habitat includes the prey species essential to the conservation of the species. The critical habitat does not include nesting habitat.

Green and olive ridley sea turtles are rare visitors to Washington waters (U.S. Army Corps of Engineers 2014: 97). These species are occasionally found stranded on the Washington coast or tangled in nearshore gillnets. The likelihood of these species occurring in Grays Harbor or adjacent nearshore areas is considered remote (U.S. Army Corps of Engineers 2014: 98).

Shorebirds and Waterfowl

Grays Harbor estuary is located along the Pacific Flyway, a migratory flight corridor between Alaska and South America. It is one of four major staging areas for migrating shorebirds in North America, with shorebirds congregating in the mudflats to feed and rest during spring and fall migrations. Approximately 24 species of shorebirds use the Grays Harbor National Wildlife Refuge during migrations, which begin in late April and continue through mid-May. The spring migration is concentrated, with hundreds of thousands of shorebirds arriving for a brief stay during their northern migrations. Fall migrations begin in July and continue through September. The fall migration is less concentrated, as shorebirds leave their breeding grounds at different times. In the winter, lesser numbers of shorebirds can be found at the refuge; dunlin (*Calidris alpina*) is one species that overwinter at the refuge. Waterfowl and raptors are abundant during the winter months (U.S. Fish and Wildlife Service 2014f).

Western sandpiper (*Calidris mauri*) and dunlin are the most abundant shorebird species found at the refuge, with semipalmated plover (*Charadrius semipalmatus*), least sandpiper (*Calidris minutilla*), red knot (*C. canutus*), and black bellied plover (*Pluvialis squatarola*) common during migration. Other birds that commonly use the refuge include the peregrine falcon, bald eagle, northern harrier (*Circus cyaneus*), Caspian tern (*Hydroprogne caspia*), great blue heron, songbirds, and various waterfowl (U.S. Fish and Wildlife Service 2014f).

Marbled murrelet is a seabird that feeds on forage fish in open marine waters. While extensive survey data of marbled murrelets in and around Grays Harbor are lacking, murrelets likely occur in low numbers in the Grays Harbor area throughout the year, particularly during the fall, winter, and spring (Pearson et al. 2011; Speich and Wahl 1995 in U.S. Army Corps of Engineers 2014: 95).

Dune grass habitat around Damon Point is one of three critical nesting habitat areas used by snowy plover (*Charadrius alexandrius nivosus)* in Washington State and is designated as critical habitat under the ESA. Snowy plover is a federally listed threatened and state-listed endangered shorebird with a breeding season that extends from March through September (U.S. Fish and Wildlife Service 2014g).

The streaked horned lark (*Eremophila alpestris strigata*) is a ground-dwelling songbird that is federally listed as threatened and state-listed as endangered. Designated critical habitat includes Damon Point, where a breeding population is located. In Washington, nesting areas for the streaked horned lark include grasslands and sparsely vegetated areas at airports, sandy islands, and coastal spits (Washington Department of Fish and Wildlife 2013: 69-73). The nesting season begins in late March and continues through August (U.S. Fish and Wildlife Service 2014h).

As noted above, peregrine falcon breeding and wintering areas are known to occur in the study area. Additionally, peregrine falcon overwintering areas are located near Grays Harbor, including in Grays Harbor National Wildlife Refuge approximately 4 miles to the west, in the south bay approximately 12 miles to the southwest, and in a large portion of the north bay approximately 10 miles to the northwest (Washington Department of Fish and Wildlife 2014a).

Two priority species habitats were identified near the project site on Rennie Island, but outside of the study area: a great blue heron (*Ardea Herodias*) rookery in 2002 and a bald eagle (*Haliaeetus leucocephalus*) nest in 2005. Great blue herons nest in large groups. Their foraging, breeding, and prenesting habitats are usually close to each other: most colonies are within 1.9 miles of key foraging grounds (Larsen et al. 2004: 3-1 to 3-18). During the breeding season, coastal herons can find most of their required nutrition in eelgrass meadows and other estuarine habitats (Larsen et al. 2004: 3-1 to 3-18). Herons are especially susceptible to human disturbance, predation, and competition for nesting habitat (Larsen et al. 2004: 3-1 to 3-18). Bald eagles are known to feed and nest in and around Grays Harbor and along the Chehalis River near the PS&P rail line. Bald eagle habitat includes estuaries, large lakes, reservoirs, rivers, and some seacoasts. They require nesting sites, perching areas, and a good food base primarily of fish and carrion (U.S. Fish and Wildlife Service 2007).

One additional documented special-status species was identified nearby but outside of the study area: purple martins (*Progne subis*) were documented as nesting near the mouth of the Hoquiam River in 1988. Purple martin is a state-listed species of concern and further identified as a priority for breeding areas. Grays Harbor is a breeding area for purple martins. They nest in natural cavities found in tree snags and crevices and in artificial nest boxes and gourds provided by humans for this purpose (Larsen et al. 2004: 31-1 to 31-4).

Washington State Department of Natural Resources Marine Protected Areas

Five WDNR Marine Protected Areas managed by the Washington State Department of Natural Resources are found in Grays Harbor.

- Whitcomb Flats Natural Area Preserve
- North Bay Natural Area Preserve
- Goose Island Natural Area Preserve
- Sand Island Natural Area Preserve
- Elk River Natural Resources Conservation Area

The Whitcomb Flats Natural Area Preserve is a small accretion island that is seasonally overtopped, and where island sands shift continually. The accretion island supports nesting seabird colonies including western gulls and Caspian terns, as well as nonbreeding bald eagles and black-bellied plover. The Whitcomb Flats Natural Area Preserve protection level is *No Impact*, which allows human access but prohibits all activities that could harm the site's resources or disrupt the ecological or cultural services it provides (Washington State Department of Natural Resources 2015a). The Whitcomb Flats Natural Area Preserve is about one third of a mile south of the navigation channel.

The North Bay Natural Area Preserve contains one of the highest quality coastal freshwater and sphagnum bog systems remaining in Washington, and supports priority habitat features including shorebird and waterfowl concentration areas, harbor seal haulout and pupping areas, and Roosevelt elk and peregrine falcon wintering areas. The North Bay Natural Area Preserve protection level is *No Access*, which restricts human access to prevent potential ecological disturbance (Washington State Department of Natural Resources 2015b). The North Bay Natural Area Preserve is on the north side of Grays Harbor along and in the North Bay and is over 5 miles from the navigation channel.

The Goose Island Natural Preserve Area is a small, sandy accretion island that is seasonally overtopped, and where island sands shift continually. The accretion island supports a large colony of nesting seabirds including gulls, brants, long bill curlew, and historically, Caspian terns. Brown pelicans use the island after breeding season. Following submersion during severe winter storms, the shifting dunes on this island have been recolonized by vegetation and nesting birds as the ecosystem rebuilds (Washington State Department of Natural Resources 2015c). The Goose Island Natural Preserve Area is in the North Bay of Grays Harbor more than 3.5 miles from the navigation channel.

The Sand Island Natural Area Preserve is a small, sandy accretion island that is seasonally overtopped, and where island sands shift continually. The accretion island protects nesting seabird colonies, historically including Caspian terns. Bald eagles, double-crested cormorants, brown pelicans, brants, ring-billed gulls, sandpipers, and many other birds use the island. The island supports sand dune vegetation and provides a haulout site for seals (Washington State Department of Natural Resources 2015d). The Sand Island Natural Area Preserve is in the North Bay of Grays Harbor more than 2.5 miles from the navigation channel.

The Elk River Natural Resources Conservation Area is the largest high-quality estuarine system remaining in Washington. The area supports diverse habitats that include tide flats, sloughs, saltmarsh wetlands, freshwater wetlands, and forested uplands. The shoreline area is an important stopover area for migrating shorebirds and waterfowl, including common loon, tundra swan, and various species of ducks, plovers, and sandpipers. It is estimated that up to 1 million shorebirds utilize the area annually. The habitats also support nesting bald eagles, elk, bear, beaver, river otter, and other mammals (Washington State Department of Natural Resources 2015e). The protection level for the conservation area is *Uniform Multiple Use*, which provides a consistent level of protection and allowable activities, including certain extractive uses, across the entire area. The Elk River Natural Resources Conservation Area is just more than 3 miles south of the navigation channel at its closest point, along the shoreline of South Bay of Grays Harbor.

3.5.5 What are the potential impacts on animals?

This section describes impacts on animals that could occur in the study area. Potential impacts of the no-action alternative are described first, followed by impacts of the proposed action.

3.5.5.1 No-Action Alternative

Under the no-action alternative, impacts on animals from the construction of the proposed action would not occur. The applicant would continue to operate its existing facility as described in Chapter 2, Section 2.1.3.2, *Existing Operations*. Although the proposed action would not occur, it is assumed that growth in the region would continue under the no-action alternative. This growth could lead to development of another industrial use at the project site, which could result in impacts similar to those described for construction and routine operation of the proposed action. However, for the purposes of this analysis, it is assumed that no future development would occur at the project site.

3.5.5.2 Proposed Action

This section describes impacts that could occur in the study area as a result of construction and routine operation of the proposed action. First, this section describes impacts from construction of

the proposed action. It then describes impacts of routine operation at the project site and of routine rail and vessel transport to and from the project site.

Construction

Construction of the proposed action could affect animals at or around the project site by removing habitat, causing animal mortality, increasing noise disturbance, and temporarily causing water quality impacts that would affect aquatic habitat as the result of exposure to contaminated stormwater runoff.

Terrestrial Habitat Impacts and Animal Mortality

Construction of the proposed action would be limited to the project site. No construction activities would occur outside of the project site and construction activities would not remove habitat along or within Grays Harbor or along the existing PS&P rail line. Although project site construction would occur within 200 feet of Grays Harbor, no in-water construction work or shoreline construction work would be required, and no loss of shoreline or aquatic habitat would occur.

Construction would result in the permanent loss of approximately 1 acre of scattered grass and weed areas around the edge of the project site. These areas do not support native plant communities and do not provide valuable habitat to animals. In addition, the project site is surrounded by a chain-link fence with barbed wire along the top, which is a barrier to most animals. Animals that could pass through or over the top of the fence—common rodents, birds, invertebrates, and other small animals—would be displaced to other habitat areas outside the project site if present during construction. However, these animals are already habituated to the developed conditions of the project site and surrounding area, and larger areas of equivalent or higher quality habitat outside of the project site are available and accessible.

Construction activities could also increase the mortality of animals that may get into the project site during construction, resulting from construction equipment collisions. However, animals are mobile and are typically able to avoid construction areas; the risk of this impact would be temporary and would last only the duration of construction. Given the low quality and small amount of habitat that would be removed, the low probability of animals accessing the site, the existence of equivalent or higher quality habitat outside of the site and beyond, and the short-term use of construction equipment, potential construction impacts on animals from land-disturbance activities would not affect species populations or fitness (the ability of a population to maintain or increase its numbers in succeeding generations).

A potential beneficial impact on habitat and animals that would result from the proposed action would be the City of Hoquiam's requirement to provide mitigation for new development in the form of a landscaping plan. Construction of the proposed action would result in the development of the project site, and per the City of Hoquiam's municipal code (10.05.065), mitigation for this new development would be planting a required number of trees based on the gross area of construction. The quantity of trees is based on the requirement to achieve 18 total caliper inches (18 inches of tree trunk diameter—a measure of the size of trees at installation) of new deciduous trees and 18 feet total height of new evergreen trees for every gross acre of construction. This required landscaping would provide a new habitat type and a habitat that would exceed the quality of habitat (1 acre of nonnative grass and weeds) removed during construction. Because the project site would be completely developed, that landscaping plan would be implemented outside of the project site.

Noise

While animals in and around the project site are already habituated to noise levels associated with industrial and developed areas, noise would increase above ambient levels for the duration of the construction activity. The Federal Railroad Administration provides guidance for characterizing the potential impacts on the people and terrestrial animals that may be exposed to increased noise levels. The threshold above which noise would disturb wildlife is 100 A-weighted decibels (dBA) sound exposure level. Construction noise associated with all activities other than pile driving is anticipated to fall below this threshold within 50 feet of the activities; therefore, construction noise is not likely to affect animals present in the surrounding area.

As indicated in Section 3.7, *Noise and Vibration*, noise from pile driving is anticipated to be greater than 100 dBA sound exposure level within 0.85 mile of the project site. However, as indicated in the discussion of the affected environment (Section 3.5.4), no special-status species has been recently documented in the study area and although there is suitable habitat for the bald eagle, blue heron, and peregrine falcon, it is unlikely that these species would be found near the project site. Regardless, if any terrestrial animals are present near the site during pile driving, they could be affected during construction.

An animal's reaction to elevated noise levels could range from mild annoyance to escape behavior, causing it to expend energy, or to move into a new, less-familiar area, which can lead to a greater exposure to predation and other risks. However, noise impacts would be short-term and temporary, lasting only the duration of project construction. Given that the species present near the project site are already habituated to noise levels associated with industrial areas and are generally mobile, and given that any elevated noise would be temporary, it is anticipated that noise impacts would not affect species populations or fitness.

Pile driving on land and near water can result in high underwater sound pressures. The mechanism for fish injury is related to high pressures created when a pile is struck with an impact pile driver. The repeated exposure of fish to cumulative sound energy over the course of a day is also thought to result in injury. When the pile is struck, the pile vibrates and radiates sound energy directly into the water. Energy is also imparted into the ground and sound energy is radiated into the water from the ground. Aquatic species, including bull trout, green sturgeon, eulachon, and chum and Chinook salmon could be affected by noise from pile driving. Although occurrence of these species is limited to certain times of the year and in some cases may be rare, if any aquatic animals are present near the site during pile driving, there is a potential for impact.

Guidance issued by the Fisheries Hydroacoustic Working Group[3] indicates peak and accumulated noise thresholds greater than 206 decibels peak or 183 dBA sound level exposure (as measured underwater) have the potential to harm fish. The peak threshold refers to the maximum sound level produced by any single strike. The accumulative thresholds refer to the accumulated sound energy associated with a series of pile strikes for a 24-hour period. The peak threshold is not predicted to be exceeded beyond 33 feet. The 183-dBA threshold would be exceeded at 210 feet. Because the closest waterbody, the Chehalis River, is located approximately 235 feet away from the nearest pile, underwater noise from pile driving is not anticipated to be an issue and no mitigation is required.

[3] The Hydroacoustic Working Group was established in 2000 to direct research, develop analysis methods, and develop thresholds for injury. Participants include Washington, Oregon, and California departments of transportation, the National Marine Fisheries Service, and the Federal Highway Administration.

Aquatic Habitat Impacts

No in-water construction would be required, but ground-disturbing activities, equipment and material use, and hydrostatic testing could result in contaminants reaching nearby surface waters and affecting aquatic habitat (see Section 3.3, *Water*, for description of pathways of contaminant discharge to surface waters). These potential impacts would be completely avoided or reduced through the requirements of the grade and fill permits that would be needed for construction. Compliance with these permits would require implementation of a stormwater drainage control plan, temporary erosion and sedimentation control plan, and best management practices (BMP) to reduce the potential for water quality and associated biological impacts resulting from soil disturbance. This would also require developing and implementing a spill prevention, control, and countermeasures plan, an oil spill prevention plan, and a site-specific construction stormwater pollution prevention plan that includes BMPs for material handling and construction waste management would reduce the potential for impacts from these sources.

Although unlikely given the conditions and requirements to obtain this permit, any contaminant that reaches a surface water body could affect aquatic habitat and aquatic animals near the contaminant discharge. These contaminants could have toxic acute or subacute impacts on aquatic organisms and could affect photosynthesis, oxygen exchange, and the respiration, growth, and reproduction of aquatic species. These impacts would be short-term and temporary, lasting only the duration of construction.

Operations

This section describes impacts that would occur as a result of routine operations at the project site, rail transport along the PS&P rail line, and vessel transport through Grays Harbor.

Impacts on animals could occur as direct disturbance or exposure to contaminants, as discussed below. Potential impacts of exposure to crude oil spills[4] are addressed in Chapter 4, *Environmental Health and Safety*.

Onsite

Routine operations at the project site could affect animals as a result of increased noise and spills or leaks. Increased noise could affect animals in a manner similar to increased construction noise by causing disturbance and avoidance behaviors. Spills or leaks could affect water quality and aquatic habitat in and around the Grays Harbor shoreline. Both of these impacts are discussed below.

Operations of the proposed action would result in noise that could affect animals near the project site. Although additional activity (related to the transfer of bulk materials) would occur under the proposed action, as discussed in Section 3.7, *Noise and Vibration*, noise levels are anticipated to be similar to existing operations. Additionally, as noted above, animals in the area are already habituated to noise levels associated with industrial areas. For these reasons, operational noise related to the proposed action is not anticipated to affect animals in or surrounding the project site.

[4] All oil or hazardous material spills must be reported by the spiller, who must respond appropriately. Under Washington Water Rights—Oil and Hazardous Substance Spill Prevention and Response law (Revised Code of Washington [RCW] 90.56.370), anyone responsible for spilling oil into state waters is liable for damages resulting from injuries to public resources, including plants. The process for determining damages for an oil spill is called a Natural Resource Damage Assessment, as defined in WAC 173-183.

As discussed in Section 3.3, *Water*, the proposed action could slightly increase the potential for water quality impairment related to routine operations. Stormwater runoff could contain contaminants associated with routine operations (e.g., chemicals used to operate and maintain vehicles and equipment, tire and brake dust, exhaust particulates, and small spills or leaks of crude oil associated with the bulk loading transfer facility). However, as discussed in Section 3.3, *Water*, the proposed design features, including containment structures and the oil/water separator, and the implementation of prevention and control measures and stormwater BMPs required by state and federal law and applicable permits, would ensure that impacts from contaminated stormwater would be low and would present a very low risk to animals likely to be present along the shoreline near the project site.

Requirements for facility spill prevention and response is described in Chapter 4, *Environmental Health and Safety*. The potential for larger spills during terminal (onsite) operations (e.g., storage tank failure) to directly affect animals and the related environmental consequences (e.g., release of crude oil) are addressed in Section 4.4, *Environmental Risks—Terminal (Onsite)*. Potential impacts from such spills are presented in Section 4.7, *Impacts on Resources*.

Rail

Operation of the proposed action at maximum throughput would add 458 unit train trips[5] per year (1.25 trips per day on average) along the PS&P rail line, compared to the approximately 1,100 train trips per year (three trips per day on average) under the no-action alternative (Section 3.15, *Rail Traffic*). This increased traffic and the associated routine operational activities could affect animals along the PS&P rail line as the result of increased noise, increased potential for animal mortality (collisions with moving trains), and increased exposure to pollutants (leaks and spills).

Noise

Operational noise (primarily train horns at PS&P rail line grade crossings) could affect animals along the PS&P rail line during rail operations. As with any sound in the atmosphere, the intensity of noise and the distance it travels can vary and depends on many factors, including atmospheric conditions (e.g., wind, temperature, humidity) at the time of rail operations. While animals along the PS&P rail line are already habituated to noise levels associated with existing train operations, increased train traffic would increase the frequency of train noise. Increased noise frequency from train operations could displace animals that may be in or around the rail corridor during operations. A species' reaction to operations noise could range from mild annoyance to escape behavior, causing it to expend energy or to move into a new area that is less familiar, which can lead to a greater exposure to predation and other risks.

However, rail operation noise impacts would be short-term, lasting only the duration of the train passing. In addition, the distances from the track where rail noise reaches the Federal Railroad Administration wildlife noise disturbance threshold (100 dBA sound exposure level) are estimated to be small: 50 feet for wayside noise (locomotive and car/wheel noise) and between 100 and 200 feet from grade crossings where horns are sounded. The species along the rail line are already habituated to noise levels associated with rail operations and are generally mobile. Furthermore, the noise and short distances from the tracks where the Federal Railroad Administration's wildlife noise disturbance threshold would be reached would be temporary. Therefore, the noise impacts from the additional trains would likely be imperceptible and would not affect species populations or fitness.

[5] A trip represents one-way travel; in other words, an inbound trip and an outbound trip are counted as two trips.

Animal Mortality

Additional rail trips on the PS&P rail line could increase mortality of animals because of collisions with trains and increased predation risk. This potential impact would be more likely to occur in areas where high-value habitat intersects the rail line (e.g., a riparian corridor); however, much of the rail line in the study area travels through developed areas (e.g., agricultural lands, developed areas) and along and adjacent to other transportation corridors (e.g., U.S. Route 12 [US 12] and Monte Elma Road). While animals along the PS&P rail line may be habituated to the movement of existing trains, increased train traffic would be expected to proportionally increase strikes on animals. Animals that feed on carrion, use the rail line as a movement corridor, or use habitats adjacent to the rail line could have an increased incidence of collision mortality. A potential secondary effect of animal collision mortality is the loss of any dependent offspring. While the risk of animal mortality is expected to increase compared to the no-action alternative, the proportional increase in rail traffic on the existing rail line is not likely to measurably alter species populations or fitness.

Leaks and Spills

An increase in leaks and spills of petro-chemicals used in routine rail operations could occur due to the increased frequency of rail traffic and associated maintenance, and would be slightly greater than the no-action alternative. Diesel fuel, oils, grease, and other petrochemicals required for rail operation and maintenance could reach vegetation along the rail line through a spill or dripping from the train. These materials could be carried short distances by precipitation or surface waters to more sensitive areas such as streams and wetlands through the openings on bridges and trestles.

As noted in Section 3.3, *Water*, the potential for leaks and spills to occur would be minimized by regularly inspecting and maintaining railroad engines and rail cars and by implementing standard good housekeeping BMPs. Additionally, impacts from a minor spill would be expected to be localized to the area of the spill adjacent to the rail line and would not be expected to spread across a wide area and would be likely captured in the underlying ballast rock. Although the proposed action would result in a slight increase in leaks and spills of petrochemicals due to the increased frequency of rail traffic and maintenance activities compared to the no-action alternative, the overall impacts on animals are anticipated to remain low. The potential for larger spills to occur during rail transport that could directly affect animals is addressed in Section 4.5, *Environmental Health Risks—Rail Transport*. Potential impacts from such spills are presented in Section 4.7, *Impacts on Resources*.

Vessel

Operation of the proposed action at maximum throughput would add 238 tank vessel trips per year (0.7 trip per day on average) along the navigation channel to projected large commercial vessel[6] trips under the no-action alternative—between 338 and 436 large commercial vessel trips per year in 2017 and 2037, respectively, or approximately one trip per day on average (Section 3.17, *Vessel Traffic*). This increased traffic and associated routine operations could result in water quality concerns related to ballast water and biofouling, propeller wash and vessel wake, vessel shading, vessel strikes, increased noise disturbance, and leaks and spills. These impacts would be similar to but somewhat greater compared with the no-action alternative.

[6] The term *large commercial vessels* refers collectively to tank and cargo vessels.

Ballast Water and Biofouling

As noted in Section 3.3, *Water*, tank vessels calling at the Terminal 1 berth would be required to discharge ballast water during the loading process. Ballast water is carried by empty vessels to provide stability during transit. As a vessel is loaded with cargo, ballast water is discharged to balance the weight of the new cargo. Vessels calling at Terminal 1 can also transport biofouling organisms (e.g., algae and invertebrates) that settle onto submerged surfaces (e.g., vessel hulls) between waters.

Ballast water discharge and vessels supporting biofouling organisms could transfer a variety of materials into Grays Harbor that could harm aquatic ecosystems. Primary among these contaminants are invasive marine plants and animals, bacteria, and pathogens that could displace native populations and harm aquatic life. Should an introduced species become a successful invader in a new environment, it can cause a range of ecological impacts. These include competing with native species and altering environmental conditions (e.g., increased water clarity due to mass filter-feeding), altering food web and the overall ecosystem and displacing native species, reducing native biodiversity and even causing local extinctions (Ibrahim and El-Naggar 2012). These aquatic system impacts can also lead to economic and public health impacts.

Although the total number of vessel arrivals and the related volume of ballast water discharged are important components of the risk, vessel numbers may not be a directly proportional indicator of risk of nonindigenous species invasion (Verling et al. 2005; Cordell et al. 2015). Other factors include the densities of organisms surviving in ballast water (Verling et al. 2005), which is influenced by the geographic source, season, and environmental conditions during transport; increased mortality with increased voyage length; and population dynamic differences within and between different taxonomic groups of organisms (Verling et al. 2005; Marine Invasions Research Lab 2012). The risks are also influenced by environmental factors independent of the number of individuals discharged into the receiving water, such as availability of suitable habitat, patch size, and seasonal conditions at time of discharge (Verling et al. 2005). Similarly, the risk of introduction of nonindigenous organisms through biofouling is influenced by factors such as vessel design (e.g., surface complexity), vessel maintenance (e.g., age of antibiofouling paint, maintenance methods and frequency), and vessel voyage pattern (Davidson et al. 2014).

Shorter, coastwise voyages where survival is more variable and final densities are higher may pose a greater risk of successful establishment of a nonindigenous species from ballast water discharge (Marine Invasions Research Lab 2012; Verling et al. 2005). This risk is greater if ballast water held for a short duration is discharged into waters and environments with similar conditions, such as can occur during coastwise transport. Cordell et al. (2015) found that coastwise transport in oil tankers traveling relatively short distances between California ports and Puget Sound had densities of zooplankton in their ballast water that would place them in the higher risk category relative to the U.S. Coast Guard's density standards for retained organisms. Similarly, Verling et al. (2005) found that plankton survival was inversely correlated with voyage duration (i.e., shorter voyages resulted in greater survival in the ballast water).

As noted in Section 3.3, *Water*, vessels calling at Terminal 1 related to the proposed action are required to comply with the federal and state regulatory requirements listed in Section 3.6.2. However, although midocean exchange of ballast water is an accepted (and required) method to limit the introduction of nonindigenous aquatic species into Washington State waters, it is not 100% effective. This is due to variations in vessel design, density of the plants and animals present in the intake water, ballast water age or duration of voyage, and exchange procedures (Verling et al. 2005;

Minton et al. 2005; Ruiz and Smith 2005; Cordell et al. 2015). Research indicates that midocean exchange of ballast water, when correctly implemented, removes more than 80% of coastal zooplankton from a ballast tank, depending on ship type, duration of the voyage, density of zooplankton in the intake water, and ballast tank design (Minton et. al. 2005; Ruiz and Smith 2005). Studies in Puget Sound indicate that oil tankers are one of the vessel types for which ballast water exchange can be highly effective, but also that tug barges and tankers retain the highest densities of nonindigenous zooplankton, particularly those that travel over relatively short distances up or down the coast from heavily invaded estuaries in California (Cordell et al. 2015). Such vessels can pose a substantial risk for introducing nonindigenous species into receiving waters such as Grays Harbor. WDFW requires and monitors ballast water discharges and conducts inspections of vessel ballast water for vessels operating in Washington State waters.

Similarly, although vessel maintenance and cleaning to remove biofouling organisms is required under federal law, specific requirements are largely undefined with little enforcement of these requirements in the United States or in Washington State (Davidson et al. 2014). In Washington, WDFW and Washington State Department of Ecology (Ecology) require vessel operators to receive approval for in-water hull cleaning (Washington Department of Fish and Wildlife 2015).

While following the ballast water requirements and maintenance procedures to reduce biofouling would reduce the potential for impacts on aquatic plants (and animals), the increase in the number of vessels related to the proposed action (a maximum of 119 per year) and the likely use of short-distance coastal transit of oil tankers between California ports and Terminal 1 would increase the risk of introducing invasive aquatic plants and other organisms. Because the consequences of such an event would affect the native ecosystems and animals in Grays Harbor, additional monitoring requirements have been recommended, as described in Section 3.5.7.1, *Applicant Mitigation*.

Propeller Wash and Vessel Wake

Section 3.1, *Earth*, describes how vessel activity related to operation of the proposed action could increase the potential for erosion within and along the harbor as a result of vessel wake and propeller wash. The location and extent of these effects would depend on a variety of factors, including climatic conditions, tidal conditions, vessel type, vessel location, and vessel speeds.

Wakes generated by vessels related to the proposed action could reach shoreline areas and potentially affect nearshore aquatic species, especially juvenile fish, by washing them ashore and stranding them on the shoreline. Juvenile fish tend to reside in nearshore waters where warmer water and food as well as cover from higher velocity flows and predation in the harbor are abundant (Vehanen et al. 2000 in Irvine et al. 2014: 1). Consequently, this puts young fish at risk of being stranded on shallow, sloped beaches, in isolated pools, or in the open spaces of dry substrate by sudden changes in water levels, such as the wake waves generated by passing vessels.

The U.S. Army Corps of Engineers (USACE) studied vessel-induced juvenile salmon stranding along three shallow, sloped Columbia River beaches. USACE considered 19 variables that could affect fish stranding due to vessel wakes, including tidal stage, tidal height, river flow, current velocity, ship type, ship direction, ship condition (loaded/unloaded), ship speed, ship size, and ship kinetic energy. Different types of vessels were found to produce wakes leading to different patterns of drawdown and run-up on the shore. USACE observed fish strandings from four vessel types (bulk carriers, container ships, tankers, and car carriers), but not tug boats. The frequency of stranding events differed by vessel type; the order from highest frequency was tanker, container ship, car carrier, and

bulk carrier. USACE observed various fish species stranded along the study beaches, with Chinook salmon the predominant stranded species (U.S. Army Corps of Engineers 2006: 47).

The impacts on a stranded fish vary and would depend on several factors (e.g., the species of fish, stranding location, tide cycle). When a fish strands, it can either succumb to mortality through direct effects of stranding, such as drying (Bradford et al. 1995 in Irvine et al. 2014: 1), or be rewetted (Beck and Associates 1989 in Irvine et al. 2014: 1). Those fish that do not incur mortality may suffer nonlethal stress effects such as decreased growth (Korman and Campana 2009 in Irvine et al. 2014: 1) or depletion of energy reserves (Cunjak et al. 1998 in Irvine et al. 2014: 1; Scruton et al. 2008 in Irvine et al. 2014: 1), or may habituate to the stress of the fluctuating environment (Taylor et al. 2012 in Irvine et al. 2014: 1). A stranded fish may also make easy prey for bird species that feed on fish, especially certain raptors or shoreline and sea birds.

Vessels approaching Terminal 1 would operate in the North Channel Reach of the navigation channel. Several small islands and mudflats occur throughout Grays Harbor, and, depending on the tide, could be exposed to wave action and could be locations for fish strandings. The nearest island to the navigation channel is Whitcomb Flats (about 800 feet south of the navigation channel), which is a small but growing sandy island. Should small fish be present in areas exposed to vessel wakes, fish could be washed ashore (on a mud flat or other shallow shoreline area) and become stranded. However, as discussed in Section 3.17, *Vessel Traffic*, incoming and outgoing vessels would most likely transit the harbor when tidal heights are at least 5 feet above the mean lower low waterline. Outgoing loaded vessels may wait until the tide is even higher for safety purposes (higher tides would provide deeper waters for heavier vessels that would be traveling lower in the water). This would reduce the potential for fish strandings because of the reduced exposure of mud flat and shallower sloped beach areas where stranding would most likely occur. In addition, any speed restrictions for vessels would reduce the size of the vessel wake. Based on the USACE study (2006:111), tugboat wakes would be expected to generate wakes that would not result in fish strandings.

As described in Section 3.1, *Earth*, there would be a small, incremental increase in the potential for impacts associated with wake and propeller wash compared with the no-action alternative.

Vessel Shading

Docked large vessels can increase shading in the aquatic environment beneath and adjacent to existing berthing structures (e.g., docks, trestles). This can result in changes to productivity as well as fish behavior, predation, and migration. As reviewed in Carrasquero (2001), shading from overwater structures in freshwater environments can lead to lowered primary productivity (phytoplankton and macrophyte producers; e.g., eelgrass and macroalgae). Reduced primary productivity, including reduced stock of algae and macrophytes, can in turn influence the epibenthic community on which fish and other aquatic organisms depend, particularly the epibenthic communities prevalent in shallow-water habitats.

The existing Terminal 1 dock generates shade in shallow-water habitat immediately adjacent to the shoreline, but the degree of shading is limited because the dock has a small footprint and is elevated over the water surface, allowing light to penetrate beneath it. Due to the dock's primarily east-west orientation, most of the shading occurs in the shallow area between the dock and the shoreline and does not extend into the deepwater habitat of the adjacent navigation channel and turning basin. As described in Section 3.4.4.3, *Grays Harbor*, eelgrass habitat does not occur under the dock or along the adjacent shoreline. Neither eelgrass nor macroalgae occur in the deepwater habitat of the

navigation channel. Macroalgae on derelict pilings and boulder riprap armoring the shoreline would not be affected by vessel shading because these substrates are not located beneath the dock where the vessels would be berthed.

Vessels berthed at the dock increase the shading of both shallow habitat closer to the dock and shoreline, and deepwater habitat under the vessel in the navigation channel. The extent of this increased shading is determined by the size of the vessel and the length of time it is docked. Under the proposed action, tank vessels calling at Terminal 1 would be either tank barges or tankers (Section 3.17, *Vessel Traffic*). The typical 550-class tank barge that is approximately 512 feet in length with a maximum width of 78 feet and a tug that is approximately 127 feet long with a maximum width of 42 feet, adding a total of approximately 45,270 square feet (1.04 acres) of overwater surface area over deepwater habitat.[7] With a maximum overall length of up to 950 feet and maximum width of approximately 106 feet, Panamax class tankers would add approximately 100,700 square feet (2.31 acres) of overwater shading area above deepwater habitat. The operational assumption is that a tank vessel would occupy the berth for 24 hours and a tanker would occupy the berth for 48 hours (WorleyParsons 2014). At the maximum proposed annual throughput, the applicant would have a tank vessel docked at Terminal 1 approximately 119 days per year.

Although some reduction in primary productivity from vessel shading is possible, the combination of tidal currents and the flow of the Chehalis River at Terminal 1 continually circulate water along the shoreline, around berthed vessels and the dock, and within the navigation channel and large body of Grays Harbor. As noted in Section 3.5.4.1, *Project Site*, approximately 8,088 acres of deepwater habitat are present within Grays Harbor, including the navigation channel and turning basin. Under the proposed action, the largest vessel size (Panamax) would create shade over 0.03% of the deepwater habitat in Grays Harbor. Deepwater habitats generally have lower primary production potential due to reduced penetration of sunlight with depth and increased turbidity. Therefore, the proposed action would not reduce primary productivity.

Shading could affect fish migration, prey capture, or predation. The extent to which an increase in shading may alter the predator-prey relationship is unknown, but it is assumed that the relationship would change and an increase in predation would be likely. Vessels would be located over deepwater habitat and could provide shaded habitat for larger predatory fishes (e.g., bass and northern pikeminnow) as well as roosting sites for piscivorous birds (Carrasquero 2001). Salmon fry tend to migrate along the edges of shadows rather than penetrate them (Simenstad et al. 1999). Studies in the northwest have documented this behavioral tendency to use shadow edges for cover during migration (Shreffler and Moursund 1999). Salmon fry are also known to use darkness and turbidity for refuge. The underwater light environment could affect the ability of fishes such as bass to see and capture their prey, which could include juvenile salmonids. Foraging opportunities for most juvenile fish are generally associated with shallow-water habitat (above -20 feet), which provide more benthic organisms than deepwater habitat (below -20 feet). Juvenile salmon primarily migrate in shallow-water habitat, although larger juvenile salmon do migrate in deepwater habitat. Juvenile salmon migrating in deepwater habitat are likely migrating relatively quickly and not rearing for extended periods in any particular area.

[7] This estimate is slightly high as the total length of the coupled tank vessel is less than the collective lengths of the barge and tug.

Vessel Strikes

Collisions with ships are one of the primary threats to marine mammals, particularly large whales, along the U.S. west coast, and around the world. There is some potential for vessels related to the proposed action to strike marine animals in the study area, particularly during transits outside the mouth of the harbor. Depending on the circumstances (i.e., vessel speeds, vessel type, type of animal, animal behavior), the impacts could vary widely, but could include bone fractures, organ damage, and internal hemorrhages (National Oceanic and Atmospheric Administration 2008a: 4). There are cases in which small marine mammals survived strikes but sustained injuries and disfigurement to dorsal fins and other body parts (National Oceanic and Atmospheric Administration 2008a: 17). In Sarasota Bay, Wells and Scott (1997 in National Oceanic and Atmospheric Administration 2008a: 17) documented four cases of vessel strikes on bottlenose dolphins in which all four animals survived the strike.

Marine mammals that occur more commonly in the study area—humpback whales, gray whales, killer whales, sea lions, seals, porpoises, and dolphins—would be at risk from vessel strikes, which can result in injury or death. However, the number of marine mammal collisions with vessels reported along the West Coast makes up a very small percentage of the populations of many marine mammals (National Oceanic and Atmospheric Administration 2015). For example, the gray whale population is estimated to be around 20,125 whales and the number of vessel strikes reported over a 5-year period along the West Coast was approximately 10 whales (or two whales per year). The potential for strikes in the study area would be slightly greater compared with the no-action alternative because of the increase in vessel trips, but the likelihood of vessel strikes and the potential for population-level impacts would remain low.

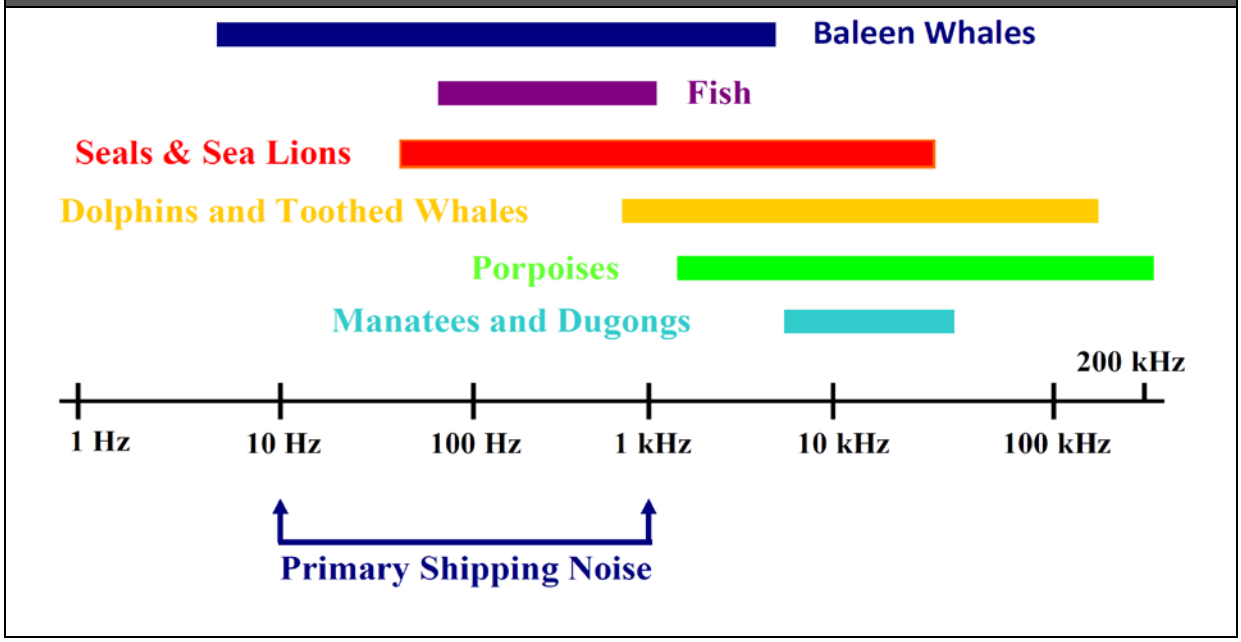
Underwater Vessel Noise

Increased vessel traffic related to the proposed action would generate increased underwater noise that could affect aquatic animals, especially marine mammals because they rely on sound as a means of communication, for finding food and mates, and for detecting predators. Increasing background noise levels decrease communication ranges, and may modify behavior and induce stress responses (Wright 2008: 13). The effects of increased noise associated with vessel trips would depend on many factors, including vessel type, size of vessel, species of animal, vessel location, and location of animal relative to vessel and the intervening environment. Complex behavioral responses to the same noise source can range from mild to severe and can vary dramatically among species and individuals, making it challenging to broadly characterize impacts of shipping noise on marine mammal species (Ellison et al. 2012 in Joint Working Group on Vessel Strikes and Acoustic Impacts 2012: 9). The potential for impacts in the study area would increase somewhat under the proposed action, as a result of increased vessel trips.

Underwater noise levels associated with vessels are typically between 10 Hertz (Hz) and 1 kilohertz (kHz) (Wright 2008: 6). Tankers, such as those likely to be used for the proposed action, exhibit noise frequencies at the lower end of the spectrum (40 Hz) compared to bulk carriers (100 Hz). Additionally, tank barges with tugs, the vessels most likely to be used under the proposed action, typically produce less near-surface sound than other vessels. This is not because they are quieter but because the propellers of the typical tug are recessed to protect the propeller from damage in case of grounding. With the propeller in this position, propeller noise is blocked by the ship's hull. Thus, the propeller noise cannot be heard ahead of the tug and barge (University of Rhode Island 2013).

As shown in Figure 3.5-1, many marine animals, including those listed in Section 3.5.4, *What animlas are in the study area?* hear within a range of a higher frequency than vessel-generated underwater noise, including the killer whale. Killer whales produce a variety of sounds including clicks, whistles, and pulsed calls. Individual clicks have been estimated to range in frequency from 8 kHz to 80 kHz; whistles from 500 Hz to 10.2 Hz; and pulsed calls from 1 kHz to 10 kHz (National Oceanic and Atmospheric Administration 2008b: 6). With respect to vessel noise, NOAA Fisheries (2008b: 49, 52) has described the relevant frequency range of killer whale hearing from 1kHz to 100 kHz, which is outside of the range of primary shipping noise (Figure 3.5-1). Marine mammals have also adapted to varying levels of natural sound, and the adaptive mechanisms may allow them to function normally in the presence of many anthropogenic sounds. The unknown variable is when introduced sounds exceed the adaptive capacity of marine mammals and pose a threat to individual animals or their populations (Marine Mammal Commission 2007: 12).

Figure 3.5-1. Frequency Relationship between Marine Animals Sounds and Sounds from Shipping



Source: Wright 2008: 6.

Effects of underwater noise exposure on marine organisms have been generally characterized by the following range of physical and behavioral responses (Richardson et al. 1995 in BOEM 2012: 87).

- **Behavioral reactions.** Range from brief startle responses to changes or interruptions in feeding, diving, or respiratory patterns, to cessation of vocalizations, to temporary or permanent displacement from habitat.
- **Masking.** Reduction in ability to detect communication or other relevant sound signals due to elevated levels of background noise.
- **Temporary threshold shift.** Temporary, recoverable reduction in hearing sensitivity caused by exposure to sound.

- **Permanent threshold shift.** Permanent, irreversible reduction in hearing sensitivity due to damage or injury to ear structures caused by prolonged exposure to sound or temporary exposure to very intense sound.
- **Nonauditory physiological effects.** Effects of sound exposure on tissues in nonauditory systems either through direct exposure or because of changes in behavior (e.g., resonance of respiratory cavities or growth of gas bubbles in body fluids).

Leaks and Spills

Diesel fuel, oils, grease, and other fluids required for the operation and maintenance of vessels could be deposited onto vessel surfaces where precipitation and storm flows could carry them into adjacent surface waters and wetlands where they could adversely affect animals. However, the potential for these types of leaks and spills to occur would be reduced by regular inspections and by implementing standard good housekeeping BMPs. These releases would be limited to minor drips and leaks from equipment located within contained areas of the vessel such that there would be limited risk of exposing animals to contaminated stormwater. Although the proposed action would result in a slight increase in leaks and spills of petrochemicals due to the increased frequency of vessel traffic and maintenance activities compared to the no-action alternative, the overall impacts on animals are anticipated to remain low. The potential for larger spills to occur during vessel transport that could directly affect animals are addressed in Section 4.6, *Environmental Health Risks—Vessel Transport.* Potential impacts from such spills are presented in Section 4.7, *Impacts on Resources*.

3.5.6 What required permits and plans apply to animals?

The following permit conditions and required plans are expected to reduce impacts on animals. Additional requirements specific to the handling, storage, and transport of crude oil are discussed in Chapter 4, *Environmental Health and Safety*.

- City of Hoquiam and City of Aberdeen Critical Areas Review for fish and wildlife habitat and geologically hazardous areas
  - Critical area review report
  - Buffer establishment and protection requirements
  - Buffer mitigation and monitoring requirements
  - Buffer activity limits and restrictions
- City of Hoquiam Shoreline Substantial Development Permit
  - Consistency with the Shoreline Management Master Program
  - Protection of shoreline resources and functions
- Washington State Department of Ecology National Pollutant Discharge Elimination System Construction Stormwater General Permit
  - Discharge/effluent limit requirements
  - Monitoring, sampling, and reporting requirements
  - Onsite spill control material provision requirements

  - Stormwater pollution prevention plan preparation requirement
  - Stormwater BMP development and implementation
- Washington State Department of Ecology National Pollutant Discharge Elimination System Industrial Stormwater Permit
  - Discharge/effluent limit requirements
  - Monitoring, sampling, and reporting requirements
  - Operations and maintenance plan
  - Stormwater pollution prevention plan
  - Onsite spill control material provision requirements
  - Spill prevention control and countermeasures plan preparation requirement
  - Industrial discharge BMP development and implementation

3.5.7 What mitigation measures would reduce impacts on animals?

This section describes applicant mitigation measures that would reduce impacts on animals from construction and routine operation of the proposed action. Mitigation measures to reduce potential impacts related to increased risk of incidents and related consequences are presented in Chapter 4, *Environmental Health and Safety*.

3.5.7.1 Applicant Mitigation

The applicant will implement the following mitigation.

- To reduce the potential for impacts on sensitive aquatic animals from the increase in ballast water discharges during bulk liquid operations, the applicant will prepare an invasive species monitoring plan in consultation with WDFW and will implement the plan prior to the start of the proposed operations.

3.5.8 Would the proposed action have unavoidable and significant adverse impacts on animals?

Compliance with the applicable regulations and permits along with implementation of the mitigation measure described above is expected to reduce impacts on animals. There would be no unavoidable and significant adverse impacts from construction and routine operation. Potential impacts related to increased risk of incidents and related consequences are addressed in Chapter 4, *Environmental Health and Safety*.

3.6 Energy and Natural Resources

The availability and conservation of energy and nonrenewable natural resources[1] are important factors to consider when implementing a large project, such as the proposed action. Construction, operations, and transportation to and from the project site would require the consumption of electricity, natural gas, fuel, and other natural resources. General information related to sources and consumption of crude oil is addressed in Chapter 5, *Extended Rail and Vessel Transport*.

This section describes energy and natural resources in the study area, including electricity, natural gas, fuel, and nonrenewable construction materials. It then describes impacts on energy and natural resources that could result under the no-action alternative or as a result of the construction and routine operation[2] of the proposed action. Finally, this section presents any measures identified to mitigate impacts of the proposed action and any remaining unavoidable and significant adverse impacts.

3.6.1 What is the study area for energy and natural resources?

The study area for energy and natural resources consists of the energy provider service areas that encompass the project site and sources or providers of natural resources that could be affected by energy and natural resource consumption resulting from construction and routine operation at the project site. The study area also includes energy and natural resources used during routine rail transport along the Puget Sound & Pacific Railroad (PS&P)[3] rail line and vessel transport through Grays Harbor out to 3 nautical miles from the mouth of the harbor.

3.6.2 What laws and regulations apply to energy and natural resources?

No federal, state, or local laws or regulations pertaining to the use of energy and natural resources apply to the proposed action or industrial facility. The Washington State Energy Code (Chapter 51-11C, Washington State Administrative Code [WAC]), adopted pursuant to Chapter 19.27A.020, requires a minimum level of energy efficiency but allows flexibility in building, design, construction, and heating equipment efficiencies for commercial and residential buildings.

3.6.3 How were impacts on energy and natural resources evaluated?

This section describes the sources of information and methods used to evaluate impacts.

[1] Resources that, once consumed, cannot be replaced.
[2] Chapter 4, *Environmental Health and Safety*, addresses the potential impacts from increased risk of incidents (e.g., storage tank failure, train derailments, vessel collisions) and related consequences (e.g., release of crude oil).
[3] The PS&P rail line refers to the rail line between Centralia and the project site.

3.6.3.1 Information Sources

The following sources provided information on existing energy resources and consumption.

- Grays Harbor Public Utility District (PUD)
- Grays Harbor County
- Westway Terminal Company LLC
- U.S. Energy Information Administration

3.6.3.2 Impact Analysis

Energy Consumption

Energy consumption was evaluated quantitatively. Potential impacts on energy were evaluated based on the estimated energy consumed during construction and onsite operation of the proposed action and the estimated change in fuel consumption from rail and vessel transport in the study area. Estimated hours of operation and types of fuel consumed were used to quantify energy consumption.

Baseline energy usage was estimated using data provided by the applicant (Shoemake pers. comm. [a]). Historical electrical power usage data from 2008 through 2014 for three power meters at the terminal were used to determine annual consumption of electrical power. Monthly natural gas usage for 2014 was provided to determine annual natural gas usage.

Natural Resource Consumption

Nonrenewable natural resource consumption was evaluated qualitatively. Potential impacts on nonrenewable natural resources were estimated based on their proposed consumption during construction of the proposed action. It was assumed that heavy construction materials, such as gravel, sand, concrete, and timber would be sourced locally to the extent possible; that quantities adequate to support the needs of the proposed action are readily available; and that long-distance transport of these materials would be undesirable due to associated transportation costs. The analysis assumed that steel used in construction would be available from a combination of local and regional sources.

3.6.4 What energy and natural resources are in the study area?

This section describes the current provision and use of energy and natural resources in the study area that could be affected by construction and operation of the proposed action. This section addresses energy and natural resources at the project site, along the PS&P rail line, and in and along the shoreline of Grays Harbor.

3.6.4.1 Project Site

The supply of electricity and gas to the project site, types and sources of fuel used for employee trips and maintenance vehicles, and sources and availability of natural resources that would be required for construction of the proposed action are described below.

Electricity

The project site is located in the Grays Harbor PUD electrical service area, which encompasses all of Grays Harbor County and small, adjacent areas of Jefferson, Thurston, Lewis, and Pacific Counties.

Grays Harbor PUD obtains the majority of its electricity from hydroelectric power; however, additional sources include a mix of wind, gas, biomass, and nuclear generation resources (Grays Harbor Public Utility District 2014). In 2012, Grays Harbor PUD sold 975,944 megawatt hours to 41,413 customers (U.S. Energy Information Administration 2015). Industrial customers accounted for 18% (176,342 megawatt hours) of the electricity consumption in the Grays Harbor PUD electrical service area in 2012 (U.S. Energy Information Administration 2015). Under existing conditions, the Westway Terminal Company LLC facility uses approximately 43 megawatt hours of electricity annually (Shoemake pers. comm. [a]); this represents less than 0.01% of electricity supplied by Grays Harbor PUD to industrial customers in the service area.

Grays Harbor PUD is expected to supply enough energy so that demand is balanced by supply on an average annual basis through 2034 (Grays Harbor Public Utility District 2014). The annual energy and summer peak forecasts are projected to grow at about 1% per year over the next 10 years. The utility has sufficient capacity to meet this demand because of current energy efficiency programs but will need to continue to incorporate conservation measures and new supplies to meet peak demand in the future (Pacific Northwest Utilities Conference Committee 2014).

Natural Gas

Natural gas is provided to the project site by Cascade Natural Gas. Cascade Natural Gas supplies residential, commercial, and industrial users throughout Grays Harbor County and beyond, with additional service areas throughout Washington and Oregon.

In 2013, Cascade Natural Gas supplied a total of 94.6 billion cubic feet of natural gas to residential, commercial, industrial, and electric power recipients in Washington State (U.S. Energy Information Administration 2015). Of that total, 45.3 billion cubic feet, or 47.9%, were consumed by industrial uses. Under existing conditions, the Westway Terminal Company LLC facility uses approximately 400,000 cubic feet of natural gas annually (Shoemake pers. comm. [a]); this represents 0.0001% of the natural gas supplied by Cascade Natural Gas to industrial users in 2013.

Fuel

Existing fuel use at the project site primarily consists of employee vehicle trips to and from the project site. Employees of the existing facility use gasoline and petroleum diesel for their personal vehicles. The applicant has no designated maintenance vehicles. All types of fuels used at the project site are readily available throughout the Grays Harbor vicinity.

Natural Resources

Nonrenewable natural resources in Grays Harbor County consist primarily of sand, gravel, and timber extracted from local sources. The primary consumption of these resources is likely related to construction activities, including the use of sand, gravel, and other mineral resources in support of the manufacturing of steel, aluminum, concrete, and other building materials.

Sand and gravel suppliers in the county include Northwest Rock, Inc. and Bayview Redi Mix, which are located in Aberdeen and provide crushed rock materials to customers throughout western

Washington. Similarly, numerous lumber suppliers are located in the Grays Harbor vicinity, with many more in the region.

Steel and metal suppliers in Grays Harbor include Western Steel and Supply located in Aberdeen. These suppliers provide steel products to manufacturers, contractors, and other businesses locally and throughout western Washington. The nearest foundries are located in Chehalis and Tacoma, Washington, approximately 57 and 78 miles from the project site, respectively.

3.6.4.2 PS&P Rail Line

Along the PS&P rail line, freight locomotives are primarily powered by diesel fuel. As of 2013, 88.22 million gallons of diesel fuel were sold annually to railroad-related uses in Washington State (U.S. Energy Information Administration 2015). This represents approximately 9% of total diesel sales for all uses in the state.

3.6.4.3 Grays Harbor

Tank vessels (tankers and tank barges) transiting through Grays Harbor primarily use marine distillate fuel oil. In 2013, sales volume of marine distillate fuel oil was 60.87 million gallons for Washington State (U.S. Energy Information Administration 2015).

3.6.5 What are the potential impacts on energy and natural resources?

This section describes the use of energy and natural resources that could occur in the study area. Potential impacts of the no-action alternative are described first, followed by the potential impacts of the proposed action.

3.6.5.1 No-Action Alternative

Under the no-action alternative, impacts on energy and natural resource use related to construction of the proposed action would not occur. The applicant would continue to operate its existing facility as described in Chapter 2, Section 2.1.3.2, *Existing Operations.* Annual onsite energy use under the no-action alternative would remain similar to existing energy use in the study area, described in Section 3.6.4.1, *Project Site*. Offsite transport, including transport of methanol, would be similar to transport described for existing operations (Section 2.1.3.2), although the mode of offsite transport would depend on market conditions and would vary from year to year. Although the proposed action would not occur, it is assumed that growth in the region would continue under the no-action alternative. This growth could lead to development of another industrial use at the project site, which could result in impacts similar to those described for construction and routine operation of the proposed action. However, for the purposes of this analysis, it is assumed that no future development would occur at the project site.

3.6.5.2 Proposed Action

This section describes the impacts that could occur in the study area as a result of construction and routine operation of the proposed action. First, this section describes impacts from construction of the proposed action. It then describes impacts of routine operation at the project site and of routine rail and vessel transport to and from the project site.

Construction

The proposed action would be constructed of manufactured materials that require energy and natural resources to produce. Energy also would be consumed transporting these materials to the project site. Further, energy would be used to operate onsite construction equipment. The proposed action's energy consumption during construction would be primarily in the forms of electricity, natural gas, and fuel.

Energy

During construction of the proposed action, electricity would be consumed to provide temporary construction site lighting, to heat buildings, and to power tools and equipment. Consumption of natural gas is not anticipated. A temporary increase in fuel usage would result from the transport of employees and materials to the project site and for the operation of construction equipment. During construction, total running time of construction equipment using diesel fuel is estimated to be 12,205 hours, while total running time of equipment using gasoline is estimated to be 22 hours. The demand for diesel and gasoline needed to fuel construction equipment is anticipated to be met by existing local supply.

Natural Resources

Nonrenewable natural resources consumed during the construction of the proposed action would include sand, aggregates, and gravel for concrete in the construction of storage tank and rail loading/unloading containment areas and building foundations. Aggregates and gravel would also be used as general fill material and in asphalt to pave surfaces. Steel would be used in the construction of storage tanks, pipelines, new buildings, rebar, the marine vapor control system, and rail spurs. Timber and concrete would be used for buildings. The entire rail area would be built on a solid concrete slab; there would be no wood ties or ballast rock in the rail area.

Estimates for the construction materials required to construct the proposed action are not available at this stage; however, the quantities are anticipated to be met by existing regional supply, as described for natural resources in Section 3.6.4.1, *Project Site*.

Operations

This section describes impacts that would occur as a result of routine operations at the project site, rail transport along the PS&P rail line, and vessel transport through Grays Harbor.

Onsite

Electricity

Operation of the proposed action would contribute to the existing electrical consumption at the project site to heat and light indoor and outdoor areas and to power pumps, equipment, control systems, and storage tank heaters. The pumps used for unloading rail cars and loading vessels would have higher horsepower motors under the proposed action and would consume more power (Shoemake pers. comm. [a]).

Estimated annual electricity usage related to onsite operation of the proposed action is anticipated to be approximately 1,173 megawatt hours, which would be approximately 27 times more than existing usage (Shoemake pers. comm. [a]). This amount represents approximately 0.67% of the

total electricity supplied to industrial users in the Grays Harbor PUD service area based on 2012 data and is anticipated to be met by existing regional supply, as described in Section 3.6.4.1, *Project Site*.

Natural Gas

During operation, natural gas would be used to power the marine vapor combustion unit, which would be used to incinerate hydrocarbon vapors displaced during loading of tank vessels. The amount of natural gas that would be needed to operate the unit would vary depending on the loading rate and volatility/energy content of the material being loaded. Less natural gas would be needed when loading liquids with high vapor pressures, such as light crude oil, than would be needed for those with low vapor pressures, such as methanol.

At maximum throughput, the marine vapor combustion unit would use approximately 54.8 million cubic feet of natural gas (Trinity Consultants 2014: Table D-10) annually, 0.12% of the total natural gas supplied by Cascade Natural Gas to industrial users in 2013. Natural gas usage under the proposed action is expected to be met by forecast regional supply.

Fuel

During operations, annual employee vehicle round trips would increase by up to 6,250 round trips from 1,000 round trips under the no-action alternative, for 7,250 round trips (Shoemake pers. comm. [b]). Two vehicles would likely be acquired by the applicant and assigned to terminal employees for commuting and facility maintenance (Shoemake pers. comm. [c]). The increase in fuel consumption associated with the incremental increase in vehicle trips under the proposed action is anticipated to be met by existing local fuel supply.

Rail

At full capacity, the proposed action would result in a maximum of 458 unit train trips[4] per year, representing diesel fuel consumption of 138,583 gallons per year. This estimated annual consumption represents less than 1% of the total diesel fuel sales to railroad-related uses in Washington State during 2013. The demand for diesel under the proposed action is anticipated to be within regional planning assumptions, as described in Section 3.6.4.2, *PS&P Rail Line*, and would be met by regional supply.

Vessel

Under the proposed action, all tank vessels would likely use marine distillate fuel with less than 1,000 parts per million of sulfur (40 Code of Federal Regulations [CFR] 80.1). At full capacity, the proposed action would result in a maximum of 238 tank vessel trips per year, which would increase marine distillate fuel consumption by approximately 93,961 gallons per year, compared to the no-action alternative.[5] This estimated annual consumption represents approximately 0.15% of the total marine distillate fuels sales in Washington State during 2013. The demand for marine distillate fuel under the proposed action is anticipated to be within regional planning assumptions, as described in Section 3.6.4.3, *Grays Harbor*, and would be met by regional supply.

[4] A trip represents one-way travel; in other words, an inbound trip and an outbound trip represent two trips.
[5] Assumes average vessel trips over 20 years.

3.6.6 What required permits and plans apply to energy and natural resources?

No required permits or plans apply to energy and natural resources.

3.6.7 What mitigation measures would reduce impacts on energy and natural resources?

Impacts resulting from the proposed action are not considered significant and would not necessitate mitigation that exceeds the minimum requirements specified by applicable laws and regulations.

Voluntary measures that would further reduce impacts on energy and natural resources from construction and routine operation of the proposed action are described below.

3.6.7.1 Voluntary Measures and Design Features

The following voluntary measures and design features would reduce impacts on energy and natural resources.

- To minimize energy use, the applicant will employ the most energy-efficient systems for all pumps, motors, electrical equipment, and process technology equipment as practicable.
- To minimize energy use, the applicant will apply U.S. Green Building Council Leadership in Energy and Environmental Design (LEED) Silver Standards to the design of new buildings.

3.6.8 Would the proposed action have unavoidable and significant adverse impacts on energy and natural resources?

There would be no unavoidable and significant adverse impacts.

3.7 Noise and Vibration

Sound is a fundamental component of daily life. When sounds are perceived as desired, beneficial, or otherwise pleasing, they are typically considered as having a positive effect on daily life. When sounds are perceived as unpleasant, unwanted, or disturbingly loud, they are considered noise. Noise may interfere with a broad range of human activities in a way that degrades public health and welfare, important activities such as communication or sleep. Noise disturbance varies depending on the conditions and on the particular land uses and activities near the sound source and the sensitivity of those land uses.

Vibration is a motion described in terms of displacement, velocity, or acceleration. In contrast to airborne noise, ground-borne vibration is not a phenomenon that most people experience every day because background vibration usually well below the threshold of perception. People are usually sensitive to perceptible vibration. An increase in noise or vibration can affect the peacefulness, serenity, and sacredness of residential, commercial, recreational, and cultural locations.

This section describes noise and vibration in the study area. It then describes impacts on noise and vibration that could result under the no-action alternative or as a result of the construction and routine operation[1] of the proposed action. Finally, this section describes potential measures to mitigate impacts of the proposed action and any remaining unavoidable and significant adverse impacts.

3.7.1 What is the study area for noise and vibration?

The study area for noise and vibration consists of sensitive receptors near the project site that could be affected by noise and vibration from construction and routine operation. The study area also includes sensitive receptors that could be affected during routine rail transport along the Puget Sound & Pacific Railroad (PS&P)[2] rail line and vessel transport through Grays Harbor out to 3 nautical miles from the mouth of the harbor.

3.7.2 What laws and regulations apply to noise and vibration?

Laws and regulations for determining potential impacts on noise and vibration are summarized in Table 3.7-1. More information about these laws and regulations is provided in Appendix B, *Laws and Regulations*.

[1] Chapter 4, *Environmental Health and Safety*, addresses the potential impacts from increased risk of accidents (e.g., storage tank failure, train derailments, vessel collisions) and related consequences (e.g., release of crude oil).
[2] The PS&P rail line refers to the rail line between Centralia and the project site.

Table 3.7-1. Laws and Regulations for Noise and Vibration

Laws and Regulations	Description
Federal[3]	
EPA Railroad Noise Emission Standards (40 CFR 201) and FRA's Railroad Noise Emission Compliance Regulations (49 CFR 210)	Govern railroad noise levels at the source, specify noise level limits for locomotives and rail cars.
State	
Maximum Environmental Noise Levels (WAC 173-060)	Sets standards for permissible noise levels. However, surface carriers engaged in interstate commerce by railroad are exempt from these regulations.
Local	
Hoquiam: Public Noise Nuisances (HMC 3A.30)	Defines local noise ordinances, including those for construction.

EPA = U.S. Environmental Protection Agency; FRA = Federal Railroad Administration; CFR = Code of Federal Regulations; WAC = Washington Administrative Code; HMC = Hoquiam Municipal Code.

3.7.3 How were noise and vibration impacts evaluated?

This section describes the sources of information and methods used to evaluate impacts.

3.7.3.1 Information Sources

Noise-sensitive receptors were identified around the project site and along the PS&P rail line by survey of aerial orthophotography and development of geographic information system (GIS) data.

The following sources of input and information on construction equipment, facility operations, and railroad and vessel operations were incorporated into the analysis.

- Types of anticipated construction equipment.
- Distances from construction activity to residential areas.
- General noise characteristics of onsite operational equipment.
- PS&P line train operational data and number of trips.
- Vessel operational data and number of trips.
- Ambient noise monitoring data collected along the PS&P rail line.

3.7.3.2 Impact Analysis

The methods for the noise and vibration impact analysis are described as follows.

[3] No federal regulations are applicable to noise from onsite construction or operation of the proposed action, Federal Railroad Administration/Federal Transit Administration noise and vibration analysis methods were used for informational purposes.

Noise

For construction on site and for rail operations along the PS&P rail line, Federal Railroad Administration (FRA)-adopted noise assessment methods developed by the Federal Transit Administration (FTA) were used to calculate potential noise levels from construction and operation of the proposed action. These methods are documented in the *Transit Noise and Vibration Impact Assessment* (FRA/FTA Manual) (Federal Transit Administration 2006). FRA generally relies on this manual for analysis of potential noise impacts from construction activities and the analysis of noise from conventional rail vehicles traveling at speeds below 90 miles per hour (Federal Railroad Administration 2012). To supplement guidance in the FRA/FTA Manual, freight rail source levels from the FRA *High Speed Ground Transportation Noise and Vibration Assessment* were used to characterize noise from freight rail vehicles (Federal Railroad Administration 2012).

Construction noise was assessed using the methods outlined in the FRA/FTA Manual. Construction noise levels for each type of equipment were determined at a distance of 50 feet from the source. These values were compared to the FRA/FTA Manual 30-day construction noise threshold to qualitatively assess the likelihood that construction activities for the proposed action would affect sensitive receptors around the project site.

Per the FRA/FTA Manual, noise impacts from increased rail traffic are determined by the increase in ambient noise level (day-night average sound level [L_{dn}][4] or hourly equivalent sound level [L_{eq}h][5] depending on the type of receptor). The amount of increase that is needed to result in an impact depends on the existing ambient noise level. To establish the existing ambient noise level along the PS&P rail line, ambient noise data were collected during short-term and 24-hour intervals between March 28 and April 27, 2015.

FRA/FTA Manual noise impact criteria are based on the land use category of the receiving properties. The FRA/FTA Manual identifies three land use categories for assessing potential noise impacts.

- **Category 1**: Tracts of land where quiet is an essential element of their intended purpose, such as outdoor amphitheaters, concert pavilions, and national historic landmarks with significant outdoor use.
- **Category 2**: Residences and buildings where people normally sleep, including homes, hospitals, and hotels.
- **Category 3**: Institutional land uses (schools, places of worship, libraries) that are typically available during daytime and evening hours. Other uses in this category can include medical offices, conference rooms, recording studios, concert halls, cemeteries, monuments, museums, historical sites, parks, and recreational facilities.

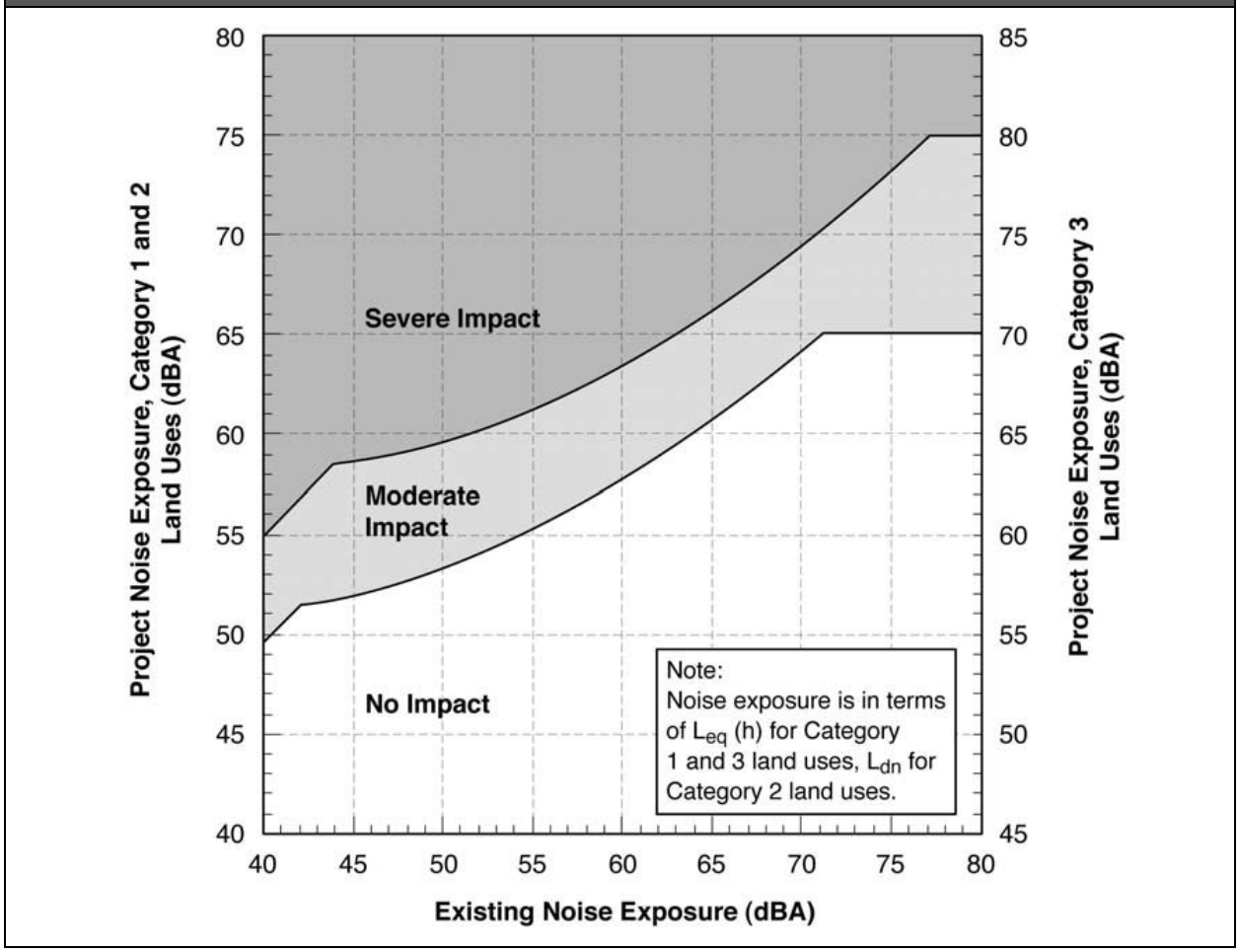
Noise exposure values are reported as hourly equivalent sound level (L_{eq}[h]) for Category 1 and 3 land uses, and L_{dn} for residential land uses (Category 2).

[4] The day-night sound level (L_{dn}) is essentially a 24-hour average noise level (in A-weighted decibels [dBA]) with a 10-decibel upward adjustment of noise levels occurring at night. This adjustment is made to account for most peoples' increased sensitivity to noise at night.
[5] The L_{eq}(h) is a noise metric representing a constant sound level containing the same sound energy as the actual fluctuating sound over an hour. As such, the L_{eq} can be considered an energy-average sound level.

A GIS survey was conducted to identify noise-sensitive land uses within approximately 500 feet of the PS&P rail line for wayside noise and within 1,000 feet of grade crossings (where the rail line and roadway cross at the same grade; no underpass or overpass) that could be subject to noise impacts from train horns. Although all developed land uses were evaluated, the focus of this study was on outdoor locations with frequent human use and façades of residential buildings where people normally sleep (Category 2 land uses). Commercial and industrial land uses were not included because most of these land uses are compatible with higher noise levels.

The FRA/FTA Manual defines two levels of potential impact, *moderate impact* or *severe impact*. The level of impact is determined by the existing level of noise exposure and the change in noise exposure that would result from a proposed action using a sliding scale according to the land uses affected. Noise impacts are assessed by comparing the existing outdoor noise exposure with future proposed action-related outdoor noise levels, as illustrated in Figure 3.7-1. The criterion for each degree of impact is based on a sliding scale that is dependent on the existing noise exposure and noise exposure with the proposed action. As the existing level of noise exposure increases, the proposed action-related increase in noise that is considered to result in a moderate or severe impact decreases.

Figure 3.7-1. FRA/FTA Manual Noise Impact Criteria



Source: Federal Transit Administration 2006.

The noise impact categories are as follows.

- **No impact.** The change in the noise level would result in an insignificant increase in the number of instances where people are highly annoyed by new noise.
- **Moderate impact.** The change in the noise level would be noticeable to most people but may not be enough to cause strong adverse community reactions.
- **Severe impact.** A significant percentage of people would be highly annoyed by the noise.

The contribution of the proposed action relative to the existing noise levels (Figure 3.7-1) would differ according to the level of existing noise exposure. This sliding scale recognizes that people who are already exposed to high levels of noise in the ambient environment are expected to tolerate smaller increases in noise in their community relative to locations with lower existing ambient levels. For example, a proposed action-related exposure of 55 dBA L_{dn} would result in no impact on a receptor with an existing noise exposure of 55 dBA L_{dn}. However, a proposed action-related exposure of 70 dBA L_{dn} would result in a severe impact for a receptor with an existing noise exposure of 70 dBA L_{dn}.

A general assessment-level analysis identified in the FRA/FTA Manual was conducted to compute noise from the increased rail traffic related to the proposed action at maximum throughput. Unlike passenger trains, freight trains do not run on a schedule. U.S. railroads evaluate each situation and dispatch trains based on a number of criteria, including available crew, number of cars, cost of fuel, and overall revenue. For this reason, rail events under the proposed action were assumed to be evenly distributed over a 24-hour day. Rail vehicles were assumed to operate at a speed of 25 miles per hour. Calculated noise levels associated with the proposed action trains were then compared with the moderate impact and severe impact criteria according to the existing ambient conditions recorded for a given sensitive receptor location. FRA/FTA Manual methods were then used to calculate the distances for moderate and severe impacts from the PS&P rail line to locations of moderate and severe impact. Residential structures and associated outdoor use areas in impact zones were counted using GIS analysis methods.

Noise generated from onsite operation of the proposed action was qualitatively compared to noise from existing operations.

Vessel noise levels were estimated by using measurements of vessel noise for both docked vessels and vessels underway. Measured vessel noise levels were extrapolated to distances to sensitive receptors. Calculated vessel noise levels were compared with calculated existing vessel noise levels to determine the relative magnitude of increased noise levels.

Vibration

Data and information provided in the *Transit Noise and Vibration Impact Assessment* (Federal Transit Administration 2006) were used to analyze the potential vibration impacts from construction of the proposed action, routine operations on site, and proposed action rail traffic along the PS&P rail line.

3.7.4 What sensitive receptors are in the study area?

This section provides a general description of the noise and vibration sensitive receptors in the study area that could be affected by construction and routine operation of the proposed action. This

section describes sensitive receptors located near the project site, along the PS&P rail line, and in and along the shoreline of Grays Harbor.

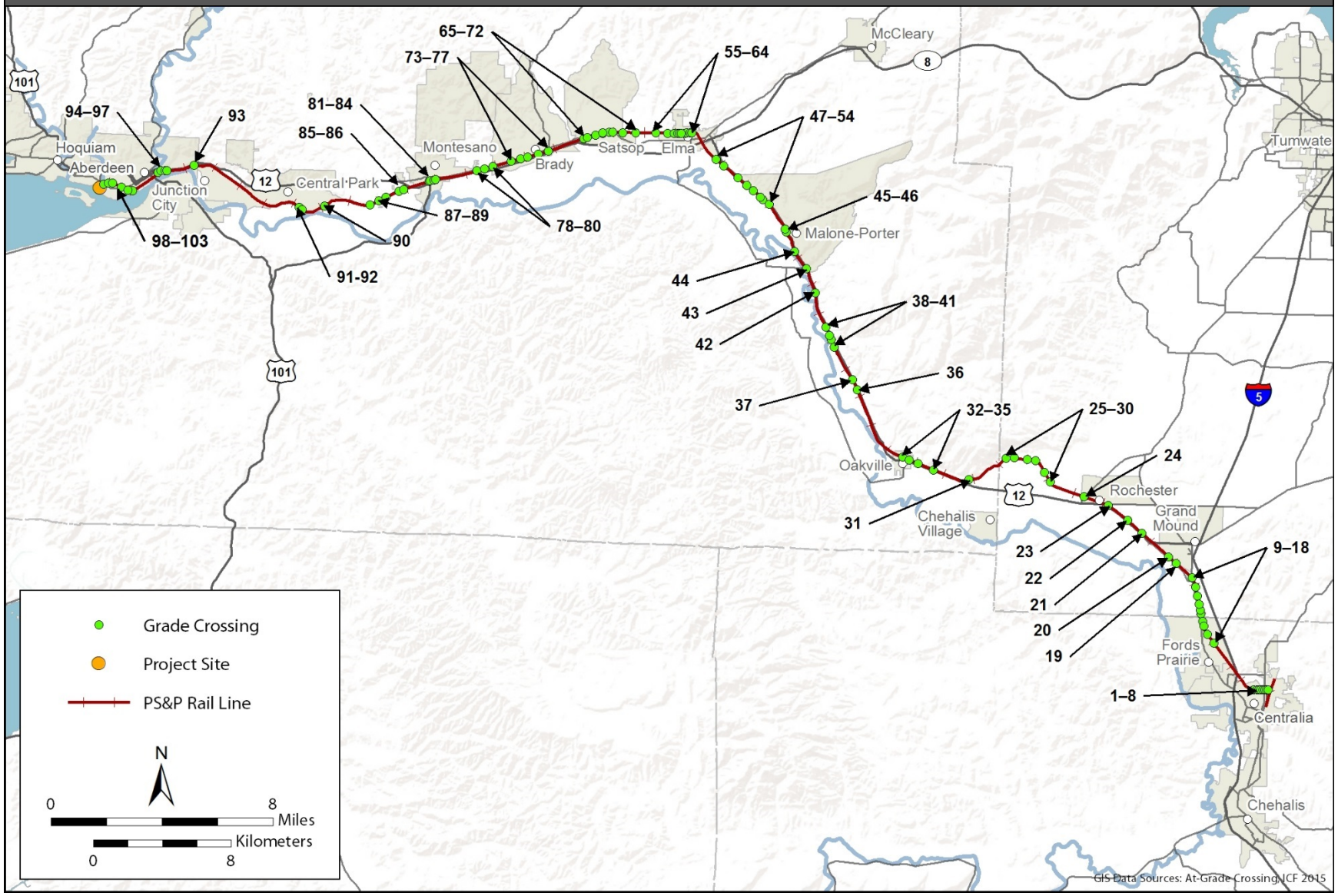
3.7.4.1 Project Site

Sensitive receptors near the project site include residences approximately 1,750 feet northeast from the project site.

3.7.4.2 PS&P Rail Line

The PS&P rail line crosses through several population centers and rural areas with varying densities of sensitive receptors between Centralia and the project site. Locations of grade crossings on the PS&P rail line are shown in Figure 3.7-2.

Figure 3.7-2. PS&P Rail Line Grade Crossings



As described in Section 3.7.3.2, *Impact Analysis*, the focus of this analysis was on residential land uses. Section 3.8, *Land and Shoreline Use*, describes the general land uses along the PS&P rail line. In summary, both the more densely populated areas and rural areas of the PS&P rail line include residential land uses, including residences near grade crossings. The PS&P rail line was subdivided into 10 segments according to land use characteristics and major nearby roadways to assess potential impacts. A summary of the analysis segments and the land use characteristics within each segment is shown in Table 3.7-2.

Table 3.7-2. Analysis Segments and Land Use Characteristics along the PS&P Rail Line[a]

Analysis Segment	Location	PS&P Rail Line Grade Crossing	General Land Use Characteristics	Distance From Rail to Receptor[b]
A	Centralia	1–8	Higher-density single family residential and commercial	45 feet
B	Unincorporated Centralia, Rochester (south of US Route 12)	9–20	Single-family residential and commercial	60 feet
C	Rochester (between US Route 12 and Littlerock Road SW)	21–24	Single-family residential and commercial	100 feet
D	Rochester (west of Littlerock Road SW)	25–30	Single-family residential and commercial	80 feet
E	Oakville	31–42	Lower-density single-family residential and commercial	80 feet
F	Malone-Porter	43–54	Lower-density single-family residential	50 feet
G	Elma-Satsop	55–72	Medium-density single-family residential	45 feet
H	Montesano	73–84	Medium-density single-family residential	45 feet
I	West of Montesano/east of Aberdeen	85–92	Medium-density single-family residential	50 feet
J	Aberdeen	93–103	Single-family residential and commercial	70 feet

[a] Additional information provided in Appendix G, *Noise Data*.
[b] Closest distance of a sensitive receptor from the centerline of the PS&P rail line.

3.7.4.3 Grays Harbor

The nearest sensitive receptor close to vessel activity at the Terminal 1 dock is a residential area approximately 2,900 feet to the northeast. The sensitive receptor (residential area) nearest to the Grays Harbor Navigation Channel is located approximately 1,800 feet away from vessel routes.

3.7.5 What is the existing noise and vibration environment in the study area?

This section describes the existing noise and vibration environment in the study area.

3.7.5.1 Noise

Existing noise sources at the project site are routine operations (including switching operations from the delivery and release of rail cars), operations at adjacent industrial facilities, operations from other industrial facilities in the Port of Grays Harbor area, vehicular traffic from Industrial Road and other nearby roadways, and occasional aircraft overhead. Existing noise sources around the Grays Harbor area includes noise generated by vessel operations, the natural environment including birds, and occasional aircraft overhead.

A field noise study was conducted to characterize existing ambient noise levels at sensitive receptors along the PS&P rail line. Long-term measurement sites were selected to capture daily noise level patterns and statistics continuously over 1-hour intervals. Day-night noise levels in terms of L_{dn} were calculated from hourly sound level data. Short-term measurement locations were selected to supplement the long-term measurements at surrounding land uses. These measurements were 10 minutes in duration and were attended by an observer to characterize noise levels based on audible sources during measurement intervals.

Based on the field noise study, the average noise level at sensitive receptors along the rail line ranged from 62 L_{dn} to 81 L_{dn} (Table 3.7-3). The dominant sources in the study area are wayside and horn noise[6] from rail events on the PS&P rail line; automobile and truck traffic on highways such as Interstate 5, US Route 12 (US 12), and State Route 8 (SR 8); infrequent automobile and truck traffic on local roads; and light industrial noise. A summary of long-term measurements is shown in Table 3.7-3. Technical noise survey reports are included in Appendix G, *Noise Data*.

Table 3.7-3. Noise Levels at Long-Term Monitoring Locations

Location	Analysis Segment	Approximate Distance from PS&P Rail Line Centerline	Range of L_{dn} Values Measured	Average L_{dn} Value	Observed Noise Sources	Time of Measurement
1023 B Street, Centralia	A	50	72 to 86	81	PS&P rail line, frequent traffic on local roads	12:00 a.m. April 4 to 12:00 a.m. April 10, 2015
1102 G Street, Centralia	A	45	72 to 83	80	PS&P rail line, frequent traffic on local roads	12:00 a.m. April 4 to 12:00 a.m. April 10, 2015
1103 J Street, Centralia	A	45	71 to 82	77	PS&P rail line, frequent traffic on local roads	12:00 a.m. April 4 to 12:00 a.m. April 10, 2015
3900 Kuper Road, Centralia	B	110	70 to 74	72	PS&P rail line, frequent traffic on local roads	12:00 a.m. April 11 to 12:00 a.m. April 17, 2015
Old Hwy 9 & Tea Street SW, Rochester	B	130	68 to 74	70	PS&P rail line, frequent traffic on local roads	12:00 a.m. April 11 to 12:00 a.m. April 17, 2015

[6] Train engineers are required by FRA rules to begin to sound locomotive horns at least 15 seconds and not more than 20 seconds in advance of public grade crossings.

Location	Analysis Segment	Approximate Distance from PS&P Rail Line Centerline	Range of L_{dn} Values Measured	Average L_{dn} Value	Observed Noise Sources	Time of Measurement
19318 Grand Mound Way, Rochester	C	45	69 to 72	71	PS&P rail line, US Route12, truck traffic	12:00 a.m. April 4 to 12:00 a.m. April 10, 2015
180th at Little Rock, Rochester	C	180	66 to 70	68	PS&P rail line, US Route 12, truck traffic	12:00 a.m. April 4 to 12:00 a.m. April 10, 2015
205 Murrey, Oakville	E	185	61 to 72	68	PS&P rail line, US Route 12, truck traffic	12:00 a.m. March 28 to 12:00 a.m. April 3, 2015
22 Evergreen Village Lane, Elma	F	260	62 to 73	70	PS&P rail line, US Route 12, truck traffic	12:00 a.m. March 28 to 12:00 a.m. April 3, 2015
513 N 13th Street, Elma	G	190	62 to 70	67	PS&P rail line, infrequent traffic on local roads, light industrial	12:00 a.m. March 28 to 12:00 a.m. April 3, 2015
502 N 13th Street, Elma	G	25	66 to 76	71	PS&P rail line, infrequent traffic on local roads, light industrial	12:00 a.m. March 28 to 12:00 a.m. April 3, 2015
57 Hurd Road, Elma	G	85	64 to 71	68	PS&P rail line, infrequent traffic on local roads, light industrial	12:00 a.m. March 28 to 12:00 a.m. April 3, 2015
510 Foss Avenue, Satsop	G	65	67 to 75	72	PS&P rail line, infrequent traffic on local roads, light industrial	12:00 a.m. March 28 to 12:00 a.m. April 3, 2015
78 Devonshire, Montesano	H	90	67 to 73	69	PS&P rail line, US Route 12, truck traffic	12:00 a.m. March 28 to 12:00 a.m. April 3, 2015
140 S Chehalis Street, Aberdeen	J	230	67 to 75	72	PS&P rail line, truck traffic, local traffic, light industrial	12:00 a.m. March 28 to 12:00 a.m. April 3, 2015
2100 1st Street, Aberdeen	J	95	65 to 74	69	PS&P rail line, truck traffic, local traffic, light industrial	12:00 a.m. March 28 to 12:00 a.m. April 3, 2015

Location	Analysis Segment	Approximate Distance from PS&P Rail Line Centerline	Range of L_{dn} Values Measured	Average L_{dn} Value	Observed Noise Sources	Time of Measurement
11846 170th Avenue, Rochester	D	105	62 to 76	70	PS&P rail line, traffic on local roads	12:00 a.m. April 4 to 12:00 a.m. April 10, 2015
7220 Central Park Drive, Aberdeen	I	295	60 to 64	62	PS&P rail line, infrequent traffic on local roads	12:00 a.m. April 11 to 12:00 a.m. April 17, 2015

Source: Appendix G, *Noise Data*

3.7.5.2 Vibration

Vibration sources at the project site include the vibration created from rail car switching operations (delivery and release of rail cars), and heavy vehicles operating on Industrial Road adjacent to the project site. Vessel and other operations on the waters of Grays Harbor do not create vibration. Vibration sources along the PS&P rail line include existing train traffic (an average of three rail trips per day) as well as trucks and buses operating on highways and local roads.

Groundborne vibration from train passbys may intermittently cause perceptible vibration at locations directly adjacent to the PS&P rail line. Using generalized FRA/FTA Manual surface vibration data, a single passby from a locomotive-powered freight vehicle moving at 25 miles per hour would be expected to produce a vibration level of approximately 78 velocity decibels (VdB) at a distance of 50 feet, which is distinctly perceptible to humans inside of building structures. However, because rail events are infrequent as defined by the FRA/FTA Manual (fewer than 30 events per day), a vibration level of this magnitude is not considered to result in a significant "annoyed" response from people exposed to this level of groundborne vibration (Federal Transit Administration 2006). For these reasons, vibration measurements within the study area were not conducted.

3.7.6 What are the potential noise and vibration impacts?

This section describes noise and vibration impacts that could occur in the study area. Potential impacts of the no-action alternative are described first, followed by potential impacts of the proposed action.

3.7.6.1 No-Action Alternative

Under the no-action alternative, noise and vibration impacts from the construction of the proposed action would not occur. The applicant would continue to operate its existing facility as described in Chapter 2, Section 2.1.3.2, *Existing Operations*. Although the proposed action would not occur, it is assumed that growth in the region would continue under the no-action alternative, which could lead to development of another industrial use at the project site.

As noted in Section 3.15, *Rail Traffic*, the Washington State Department of Transportation (2014:75–76) Freight Mobility Plan projects zero growth in the number of trains along the PS&P rail line over

the next 20 years,[7] although train length may increase. Therefore, existing rail traffic and associated noise from grade-crossing horns are assumed to continue at existing levels (an average of three trips per day) under the no-action alternative. Noise from train horns near grade crossings would still be required and would be the dominant noise source in rural areas along the PS&P rail line. The vibration generated by existing rail operations on the PS&P rail line would continue. Noise generated by existing vessel operations would also continue.

As described in Section 3.17, *Vessel Traffic*, large commercial vessel traffic is projected to increase between 2017 and 2037 in response to increased trade of commodities from 338 trips in 2017 to 436 trips in 2037.

3.7.6.2 Proposed Action

This section describes the impacts that could occur in the study area as a result of construction and routine operation of the proposed action. First, this section describes impacts from construction of the proposed action. It then describes impacts of routine operation at the project site and routine rail and vessel transport to and from the project site.

Construction

Washington State maximum permissible noise level regulations (Washington Administrative Code [WAC] 173-60-040) and local noise regulations do not apply to construction noise during daytime hours. Construction of the proposed action would result in a temporary increase in noise and vibration from construction equipment operations. No nighttime construction is proposed.

Construction activities would involve the use of heavy construction equipment. Table 3.7-4 lists the construction equipment likely to be used during construction of the proposed action and associated typical noise levels, measured 50 feet away from the equipment.

[7] The rail traffic projections in the Freight Mobility Plan do not include the proposed action and the reasonably foreseeable future actions identified in Table 6.4-1 in Chapter 6, *Cumulative Impacts*, which would add new rail traffic to the PS&P rail line.

Table 3.7-4. Typical Construction Equipment Noise Levels at 50 feet

Equipment	Noise Level (dBA)
Crane	88
Dozer Cat® D8 15.3 CY	85
Grader Cat® 14-H/14-foot blade	85
Dump truck 18 ton, 12 CY HWY	88
Excavator	81
Wheel loader cat 966/4.8 CY	85
Backhoe Cat® 345 99k/3 CY	80
Welder (Grp 4)	74
Genset 250 kW	81
Bobcat loader	85
Compactor, Cat® 816, 25 ton	82
Compressor, trailer 1,200 cfm	78
Light Plan/Genset, 6kW, 4/10	73

dBA = A-weighted decibel; CY = cubic yards; HWY = [on] highway; k = thousand; Grp = group; kW = kilowatt; cfm = cubic feet per minute

While construction noise associated with the equipment listed in Table 3.7-4 would likely be audible in nearby residential areas, the construction noise levels would be much lower than those listed in Table 3.7-4. These levels are based on the receptor being 50 feet from the source, while the distance of the project site to the nearest residence is approximately 1,750 feet. At this distance, noise levels from the equipment would range from approximately 42 A-weighted decibels (dBA) to 57 dBA in the adjacent residential areas. These noise levels are below the 30-day construction noise threshold of 75 dBA L_{dn} for residential locations, as defined in the FRA/FTA Manual. Because of the relatively low level and temporary nature of construction noise, impacts from construction equipment operations on sensitive receptors would be low.

Construction of the storage tanks would require impact pile-driving. Pile-driving is expected to be the dominant noise source at the project site, compared with other construction equipment noise sources. Impact pile-driving lasting for approximately 2 to 3 months would be required for the storage tank foundations. Based on FRA/FTA Manual pile-driving noise measurement data, pile-driving noise levels would be approximately 70 dBA at the residential areas closest (approximately 1,750 feet away) to the pile-driving activity.[8] This value is lower than the 30-day construction noise threshold of 75 L_{dn} for residential locations. Therefore, noise impacts on sensitive receptors from pile-driving would be low.

Similarly, no severe pile-driving vibration impacts in the residential areas are expected because of the large distances between pile-driving activity and residential areas. For example, pile-driving vibration velocity levels would be approximately 0.0026 inch per second at the nearest residential areas 1,750 feet away. This value is below FTA's most stringent building damage criterion.[9]

[8] Assuming no nighttime pile-driving and a usage factor of 0.2 L_{dn}, the sound level would be 63 dBA. A usage factor of 0.2 is often used for impact pile-driving to account for the periodic nature of this noise source. See Federal Highway Administration *Roadway Construction Model User's Guide* (January 2006) for more information.
[9] The FTA's "extremely fragile historic building" damage criterion is a vibration velocity of 0.12 inch per second (2006).

Vibration levels associated with the construction equipment listed in Table 3.7-4 would also be low in the nearest residential areas, because vibration caused at the project site would be greatly reduced at the distance of the residential areas. For example, bulldozer vibration velocity levels at the nearest residence 1,750 feet away would be approximately 0.0001 inch per second, which is below most stringent building damage criterion, as documented in the FRA/FTA Manual. Effects of pile driving on aquatic species are discussed in Section 3.5, *Animals*.

Operations

This section describes impacts that would occur as a result of routine operations at the project site, rail transport along the PS&P rail line, and vessel transport through Grays Harbor.

Onsite

Onsite operations would generate noise and vibration from operations of equipment such as various pumps, compressors, and the marine vapor control unit. Loading and unloading of rail cars would also generate operational noise. Noise and vibration levels associated with these sources are expected to be similar to levels generated by other industrial sources. The City of Hoquiam noise ordinance would not apply to onsite operations.

Vessels docked at the Terminal 1 berth would be approximately 2,900 feet from the nearest residential area. Assuming a stationary vessel noise level of 65 dBA at 25 meters (European Commission 2013), vessel noise levels would be approximately 36 dBA[10] at the nearest residential area. This is a relatively low noise level and likely below ambient noise levels; therefore, no meaningful vessel noise impacts are expected.

Rail

Operation of the proposed action at maximum throughput would add 458 unit train trips[11] per year (1.25 unit train trips per day on average) along the PS&P rail line to the o the approximately 1,100 train trips per year (three trips per day on average) under the no-action alternative (Section 3.15, Rail Traffic). This increased frequency of rail traffic and the associated routine operational activities would increase noise and vibration.

Noise

Estimated noise levels with the proposed action were calculated based on the assumptions shown in Table 3.7-5.

[10] Note that this 36-dBA value is not expressed in terms of L_{dn}, but rather as a steady state noise level while the vehicle is docked.
[11] A trip represents one-way travel; in other words, an inbound trip and an outbound trip are counted as two trips.

Table 3.7-5. Railroad Operational Data Assumptions

	Existing Conditions	Proposed Action
Average trips per day	3.1 (west of Elma) 3.0 (east of Elma)	1.25
Number of locomotives per train	2.5	3
Number of cars per train	69.5	120
Speed (miles per hour)	25	25

As previously described, the focus of the noise analysis is on L_{dn} for locations where people sleep. Daytime loudest-hour noise levels (in terms of L_{eq}) were not analyzed, because the loudest hour at grade crossings and wayside locations under the proposed action would generally be characterized by a single train passby, which occurs under existing conditions.

The analysis considered two types of train noise.

- *Wayside* noise refers to the combined effect of locomotive noise and car/wheel noise.
- *Horn* noise refers to the sound of locomotive warning horns, which are sounded at public at-grade road/rail crossings. Because horn sounding is intentionally loud to warn motorists of oncoming trains, the horn noise footprint is often larger than the wayside noise footprint.

According to FRA/FTA Manual, rail noise impacts are determined by the extent to which rail traffic noise related to the proposed action would increase existing ambient noise levels as measured by the 24-hour L_{dn} value (not single train passbys). This relationship is nonlinear and has a lower allowable increase in noise level when existing ambient noise levels are relatively high. The number of receptors exposed to moderate or severe noise impacts by segment of the proposed action is shown in Table 3.7-6. As described previously, counts of moderate and severe impacts are based on FRA/FTA Manual general assessment methods and proposed rail events that were assumed to be evenly distributed over a 24-hour day. Proposed action-related horn and wayside noise levels and counts of noise impacts at all grade crossings are shown in Appendix G, *Noise Data*.

Table 3.7-6 presents the number and general location of noise-sensitive receptors that could be exposed to increased noise from the addition of proposed action rail trips on the PS&P rail line as defined by the FRA/FTA Manual. Based on the analysis, the proposed action would not result in moderate or severe impacts from wayside noise but could result in moderate and severe impacts from train horns sounding at grade crossings.

Based on the analysis, 170 receptors could be exposed to moderate noise impacts from horn noise at grade crossings relatively evenly distributed along the PS&P rail line, with the most affected receptors in the Elma–Satsop area (66), followed by Centralia (37) and the area west of Montesano and east of Aberdeen (23). In addition, 33 receptors could be exposed to severe noise impacts from horn noise at grade crossings; 26 of these affected receptors would be in the Elma–Satsop area.

Table 3.7-6. Estimated Counts of Moderate and Severe Noise Impacts on the PS&P Rail Line—Proposed Action

Analysis Segment	Location	PS&P Rail Line Grade Crossings[a]	Number of PS&P Rail Line Grade Crossings	General Land Use Characteristics	Horn Noise		Wayside Noise	
					Moderate	Severe	Moderate	Severe
A	Centralia	1–8	8	Higher-density single family residential and commercial	37	0	0	0
B	Unincorporated Centralia, Rochester (south of US Route 12)	9–20	12	Single-family residential and commercial	4	1	0	0
C	Rochester (between US Route 12 and Littlerock Road SW)	21–24	4	Single-family residential and commercial	2	0	0	0
D	Rochester (west of Littlerock Road SW)	25–30	6	Single-family residential and commercial	2	0	0	0
E	Oakville	31–42	12	Lower-density single-family residential and commercial	3	0	0	0
F	Malone-Porter	43–54	12	Lower-density single-family residential	12	2	0	0
G	Elma-Satsop	55–72	18	Medium-density single-family residential	66	26	0	0
H	Montesano	73–84	12	Medium-density single-family residential	12	0	0	0
I	West of Montesano/east of Aberdeen	85–92	8	Medium-density single-family residential	23	4	0	0
J	Aberdeen	93–103	11	Single-family residential and commercial	9	0	0	0
Total					**170**	**33**	**0**	**0**

[a] See Figure 3.7-2 for the location of grade crossings.

The determination as to whether or not the average L_{dn} at each of the receptors would result in moderate or severe impacts per FRA/FTA Manual methods would depend on the existing noise level and the predicted increase from additional trains related to the proposed action. As the existing level of noise exposure increases, the additional noise exposure needed to cause a moderate or severe impact decreases. It is not possible to predict when trains would be traveling to and from the project site. Existing and proposed action-related train passages could occur at any time of the day. With the additional 1.25 trains per day (on average) under the proposed action, potentially affected receptors would generally experience an increase in the 24-hour average noise exposure over the course of any given day as measured by L_{dn}. All trains would continue to sound horns consistent with existing operational practices. The horn noise associated with a single passby of a train related to the proposed action would be the same as horn noise related to trains travelling along the PS&P rail line under existing and no-action conditions. The number of events per day would increase by approximately 1.25 trips per day on average, meaning sensitive receptors would experience train horns sounding 1.25 additional times per day, on average.

Table 3.7-7 lists the grade crossings that would be exposed to severe and moderate noise impacts, based on the analysis. The grade crossings with the highest number of severe impacts are listed first.

Table 3.7-7. Estimated Number of Receptors at Grade Crossings with Severe Noise Impacts by Magnitude of Impact

Grade Crossing[a]	PS&P Rail Line Grade Crossing	Location	Severe Impacts	Moderate Impacts
61	North 11th Street	Elma	8	10
62	North 13th Street	Elma	8	6
58	North 6th Street	Elma	4	4
63	North 17th Street	Elma	4	4
91	Private Crossing	Central Park	4	10
47	Dunlap Road	Malone-Porter	2	0
55	N 2nd St, Elma	Elma	2	16
16	216th Ave SW, Centralia	Centralia	1	0
Total			**33**	**50**

[a] See Figure 3.7-2 for location of grade crossings.

As shown in Table 3.7-7, 26 of the 33 receptors (79%) that could be exposed to severe impacts are located in Elma. Other receptors that could be exposed to severe impacts are located in the Central Park area (east of Aberdeen; four receptors), Malone-Porter area (southeast of Elma; two receptors), and Centralia (one receptor).

While no severe impacts are identified for receptors at the grade crossings in central Centralia, as shown in Table 3.7-8, receptors at all eight of these crossings could be exposed to moderate impacts. This is because the grade crossings in this area have very high levels of existing surface transportation noise exposure at densely populated clusters of receptors along the PS&P rail line, many of which are located approximately 50 feet from the existing track and currently experience ambient levels as high as 81 dBA L_{dn}.

Table 3.7-8. Estimated Number of Receptors at Grade Crossings with Moderate Noise Impacts in Central Centralia

Grade Crossing[a]	PS&P Rail Line Grade Crossing	Location	Severe Impacts	Moderate Impacts
1	B Street	Centralia	0	4
2	North Tower Avenue (State Route 507)	Centralia	0	2
3	North Pearl St (State Route 507)	Centralia	0	2
4	E Street	Centralia	0	4
5	F Street	Centralia	0	4
6	G Street	Centralia	0	4
7	H Street	Centralia	0	7
8	J Street	Centralia	0	10
Total			**0**	**37**

[a] See Figure 3.7-2 for location of grade crossings.

Noise from surface carriers engaged in interstate commerce by railroad is exempt from Washington State maximum permissible noise level regulations. While noise barriers or building sound insulation could provide ways to reduce proposed action-related noise exposure for some receptors, elimination of locomotive horn sounding at the affected grade crossings would eliminate and not just reduce increased horn noise. The FRA Final Train Horn Rule (49 Code of Federal Regulations [CFR] 222) provides a safe and effective way to reduce locomotive horn noise through implementation of quiet zones. Quiet zones are areas in which horns are not required to be sounded as long as FRA safety requirements are met. Quiet zones can be established using a procedure established in FRA regulations through installation of enhanced safety measures at grade crossings such that train horns would not be required to be used. Implementation of each quiet zone requires cooperation by all applicable jurisdictions and is contingent on approval by FRA. Section 3.7.8.2, *Applicant Mitigation,* identifies mitigation for the applicant to coordinate with affected communities the creation of quiet zones for areas where noise from proposed action rail traffic would result in severe noise impacts based on the analysis (Table 3.7-7). Additional factors to consider include the number of receptors affected, the effectiveness of the quiet zone, community views, and the extent to which ambient levels are already heavily influenced by noise from surface transportation.

Vibration

Vibration related to PS&P rail traffic is evaluated based on peak passby vibration level. Unlike noise, vibration impacts do not increase with increased train traffic unless the existing line is a heavily used rail corridor with more than 12 trains per day (Federal Transit Administration 2006). With the addition of proposed action trains, approximately 4.25 trips per day on average would occur on the PS&P rail line. Because peak passby vibration levels are primarily a function of train speed, and train speeds are not expected to increase as the result of the proposed action, negligible rail vibration impacts are expected compared to the no-action alternative.

Vessel

Operation of the proposed action at maximum throughput would result add 238 tank vessel trips per year (0.7 trip per day on average) along the navigation channel to projected large commercial vessel trips under the no-action alternative—between 338 and 436 trips per year in 2017 and 2037,

respectively, or approximately one trip per day on average (Section 3.17, *Vessel Traffic*). This increased traffic and associated routine operations could result in increased noise levels.

Vessels underway through the navigation channel pass by residences as close as 1,800 feet. Assuming a vessel noise level of 75 dBA at 25 meters (European Commission 2013) and a speed of 15 miles per hour, the sound exposure level[12] of a vessel passby would be 88 dBA at 25 meters. Using projected vessel traffic under the no-action alternative of 1.2 trips per day, the corresponding L_{dn} value at the nearest residences would be approximately 20 dBA. The proposed action would increase vessel traffic to an average of approximately 1.8 trips per day, resulting in L_{dn} of approximately 30 at the nearest residences. Since this increase in noise level is minor, and because these L_{dn} values are far below ambient L_{dn} values typical for neighboring land uses, negligible noise impacts are expected from vessels underway.

3.7.7 What required permits and plans apply to noise and vibration?

No required permits or plans apply to noise and vibration.

3.7.8 What mitigation measures would reduce noise and vibration impacts?

This section describes the applicant mitigation measures that would reduce noise and vibration impacts from construction and routine operation of the proposed action.

3.7.8.1 Applicant Mitigation

The applicant will implement the following mitigation.

- To reduce construction noise at nearby sensitive receptors, the applicant will maintain construction and maintenance equipment in good working order with properly functioning mufflers to control noise.
- To address increased noise from proposed action-related rail traffic that would result in severe impacts on sensitive receptors, the applicant will fund and support a process for the affected communities to establish quiet zones under the FRA regulations. FRA regulations apply to corridors with more than one crossing within 0.5 mile, in which case all crossings must be considered.[13] Crossings equipped with signage only will be upgraded to active warning devices (light and gates, constant warning train detection) and other required safety standards. Crossings with existing active warning devices will also likely need to be upgraded to meet minimum standards. If FRA does not approve the quiet zones, the applicant will work with PS&P and fund the installation of wayside horns at crossings to reduce noise impacts.

  Elimination of locomotive horn sounding at the affected grade crossings would reduce impacts from increased horn noise. Quiet zones and crossings can be established using a procedure established in FRA regulations. The quiet zone allows the installation of enhanced safety

[12] Sound exposure level normalizes the sound energy of a noise event as if it occurred in 1 second. The sound exposure level is used to compare two different noise events to each other and is also used to compute the L_{dn}.
[13] For example, in Elma, crossings located at 3rd and 5th Street would be included in the within the "corridor" because of this requirement.

measures at grade crossings such that train horns would not be required to be used. Implementation of a quiet zone is subject to FRA approval. Quiet zones include measures to maintain the level of safety while reducing noise. Occasional train horn noise will occur even if quiet zones are established; for example, in situations such as trespassers along the tracks or signal malfunctions.

3.7.9 Would the proposed action have unavoidable and significant adverse noise and vibration impacts?

Implementation of the proposed action would result in increased rail traffic that would result in increases in noise along the PS&P rail line. This increased noise could result in impacts considered severe on sensitive receptors under FRA/FTA criteria. These impacts would occur near eight grade crossings, representing 33 receptors with up to eight receptors affected at any one grade crossing. The impacts would result from train horn noise that is required for public safety.

Local communities can work with the FRA to apply for a quiet zone to limit train horn sounding. Quiet zones would eliminate impacts at crossings where implemented. Where not implemented, train horns would continue to sound for safety at the grade crossings listed in Table 3.7-7, and the potential for exposure to severe impacts at identified grade crossings would remain.

3.8 Land and Shoreline Use

Land use refers to how land is developed for various human uses, including residential, commercial, and industrial uses. It also refers to the preservation or protection of land for natural uses. Shorelines—land along a water body—can also be developed for human purposes or preserved for natural purposes. Large development projects, such as the proposed action, must be compatible with surrounding land uses and must comply with all state and local regulations and policies governing land and shoreline use.

This section describes land and shoreline use in the study area, including zoning and applicable permits. It then describes impacts on land and shoreline use that could result under the no-action alternative or as a result of the construction and routine operation[1] of the proposed action. Finally, this section presents any measures identified to mitigate impacts of the proposed action and any remaining unavoidable and significant impacts.

3.8.1 What is the study area for land and shoreline use?

The study area for land and shoreline use consists of the land on and near the project site that could be affected by construction and routine operation at the project site. The study area also includes land and shoreline that could be affected during routine rail transport along the Puget Sound & Pacific Railroad (PS&P)[2] rail line and vessel transport through Grays Harbor out to 3 nautical miles from the mouth of the harbor.

3.8.2 What laws and regulations apply to land and shoreline use?

Laws and regulations for determining potential impacts on land and shoreline use are summarized in Table 3.8-1. More information about these laws and regulations is provided in Appendix B, *Laws and Regulations*, and Appendix H, *Local Policies Governing Land and Shoreline Use*.

[1] Chapter 4, *Environmental Health and Safety*, addresses the potential impacts from increased risk of incidents (e.g., storage tank failure, train derailments, vessel collisions) and related consequences (e.g., release of crude oil).
[2] The PS&P rail line refers to the rail line between Centralia and the project site.

Table 3.8-1. Laws and Regulations for Land and Shoreline Use

Laws and Regulations	Description
Federal	
No federal laws or regulations apply to land and shoreline use.	
State	
Growth Management Act (RCW 36.70A)	Requires the counties and cities of the state to prepare and adopt comprehensive plans that keep with the Growth Management Act planning goals.
Shoreline Management Act of 1971 (RCW 90.58)	Establishes regulations for managing the use, environmental protection, and public access of the state's shorelines.
Local	
Zoning (HMC 10.03 and AMC 17.00)	Provides descriptions of the zoning criteria for the Cities of Hoquiam and Aberdeen, respectively.
Critical Areas Ordinance (HMC 11.06 and AMC 14.100)	Sets forth the definitions and process for designating and protecting critical areas within the city limits of Hoquiam and Aberdeen, respectively.
Shoreline Management Act (HMC 11.04 and AMC 16.20)	Carries out responsibilities imposed by the Shoreline Management Act of 1971.

RCW = Revised Code of Washington; HMC = Hoquiam Municipal Code; AMC = Aberdeen Municipal Code

3.8.3 How were impacts on land and shoreline use evaluated?

This section describes the sources of information and methods used to evaluate impacts.

3.8.3.1 Information Sources

Information about the land and shoreline use in the study area was obtained through reviews of public scoping comments and local planning documents and conversations with local planners. Additionally, a site visit was conducted to observe and verify land and shoreline use in the study area on August 13, 2014.

3.8.3.2 Impact Analysis

Local land use plans and development regulations were evaluated to assess potential conflicts of the proposed action. Land use impacts occur when project activities are inconsistent with existing land use, most typically characterized by inconsistency with the applicable land use policies or zoning.

3.8.4 What land and shoreline use is in the study area?

This section describes the land and shoreline use in the study area that could be affected by construction and operation of the proposed action. This section addresses land and shoreline use at the project site, along the PS&P rail line, and in and along the shoreline of Grays Harbor.

3.8.4.1 Project Site

Land Uses and Zoning

The project site is within the city limits of Hoquiam and Aberdeen in Grays Harbor County, Washington, and is located along the industrial waterfront at the Port of Grays Harbor (Port). According to the applicable comprehensive plans, land on and directly surrounding the project site is designated and zoned for industrial use (Figure 3.8-1). Imperium Terminal Services, a biodiesel production facility, borders the site to the north, and Ag Processing Inc., a grain and bulk commodity product storage facility, borders the project site to the south. The industrial use zone extends along the shoreline about 2 to 3 miles from the project site on both sides. Approximately 0.3 mile north of the project site, beyond the industrial area, is land designated for commercial, transportation, communications, and utility uses. High-density residential use mixed with some transportation, communications, utilities, and recreational uses occurs approximately 0.4 mile north and 0.3 mile northeast of the project site.

The project site is located within both cities' Industrial District (Zoning, Hoquiam Municipal Code [HMC] 10.03.112; Aberdeen Municipal Code [AMC] 17.48). The current land use and zoning designation for the project site under both cities is Industrial, which is defined in the cities' respective comprehensive plans and municipal codes, current at the time of the permit application,[3] as allowing for intensive industrial uses, including activities involving manufacturing, processing, ship terminals, storage and transport facilities, warehousing, repair facilities, and accessory buildings and uses. Under both Cities' shoreline master programs, the environmental designation for the project site is Urban, which permits water-related industrial and commercial uses and allows the highest density of development and the most intensive human use of the shoreline (Shoreline Management, HMC 11.04.140, and AMC 16.20.140).

Applicable Permits and Approvals

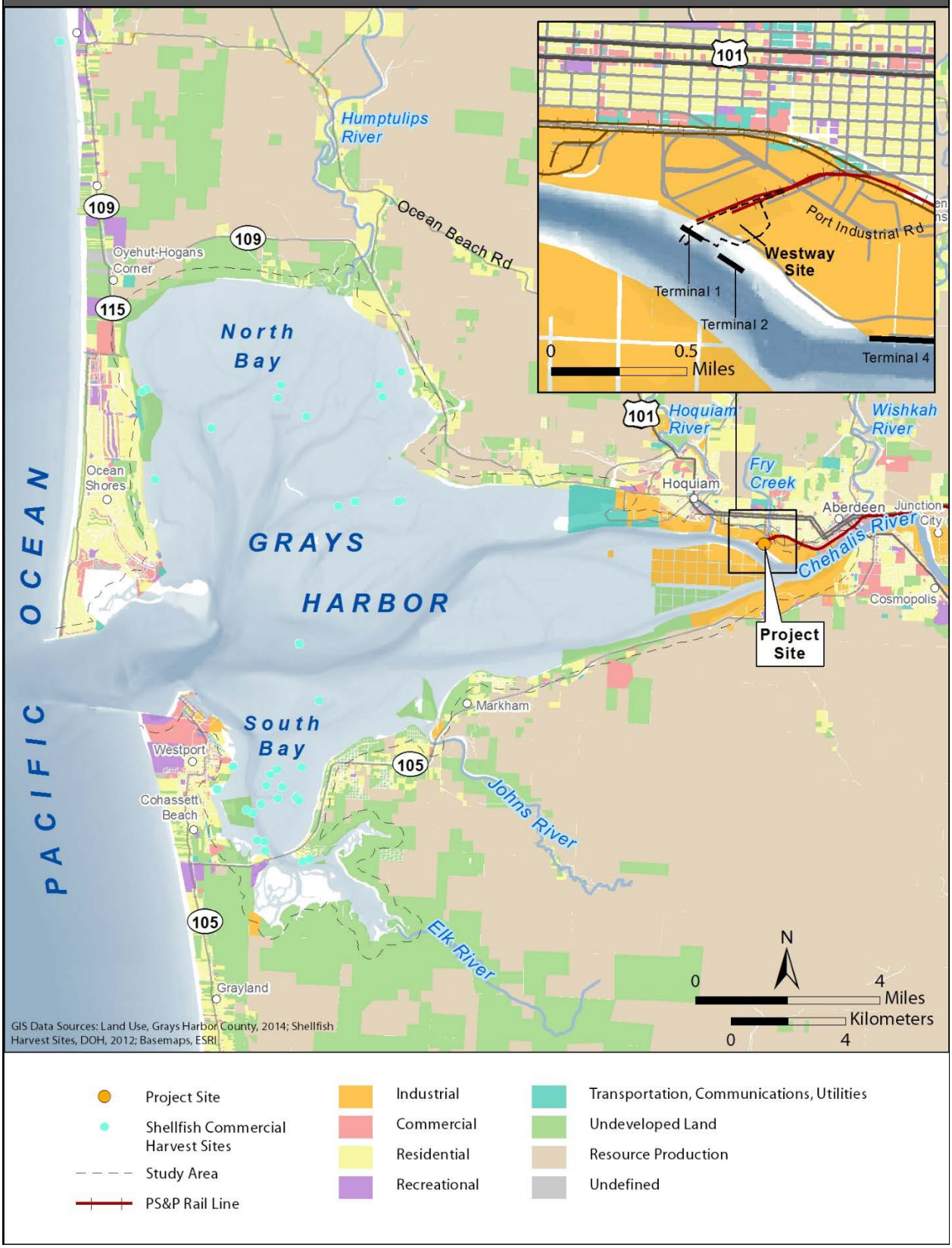
The following land and shoreline use development permits and approvals are required for development of the proposed action prior to construction.

Comprehensive Plan Policies

Prior to issuing the applicable development permits, the Cities of Hoquiam and Aberdeen must ensure the proposed action is consistent with the applicable comprehensive plan policies listed in the corresponding comprehensive land use plan (City of Hoquiam 2009; City of Aberdeen 2001). Specific policies applicable to the proposed action are listed in Appendix H, *Local Policies Governing Land and Shoreline Use*. Policies relevant to the City of Hoquiam address Future Land Use; Environmental Management; Housing, Transportation; Public Facilities and Services; Open Space and Parks; and Economic Development. Elements of the City of Aberdeen Comprehensive Plan address Urban and Rural Areas; Land Use; Economic Development; Housing and Community Development; Transportation; Capital Facilities; Natural Resources; Downtown and Waterfront Development; Open Space and Critical Areas; Utilities; and Plan Implementation.

[3] Per September 14, 2015, and July 13, 2016, zoning ordinances, passed by the City of Hoquiam and the City of Aberdeen, respectively, future bulk crude oil handling facilities are not allowed under the Cities' municipal codes.

Figure 3.8-1. Land and Shoreline Use in and around Grays Harbor



Critical Areas Review

As part of the development permit application process for the Cities of Hoquiam and Aberdeen and to comply with the Growth Management Act (RCW 36.70A), the applicant would be required to submit a report to the Cities for a review of critical areas. Within Hoquiam's jurisdiction, critical areas include fish and wildlife habitat and geologically hazardous areas on or within 300 feet of the project site. Geologically hazardous areas have also been identified on or within 300 feet of the project site within Aberdeen's jurisdiction. These critical areas are identified and evaluated in Section 3.1, *Earth*, and Section 3.5, *Animals*.

Shoreline Substantial Development Permit

To comply with the City of Hoquiam's Shoreline Master Program and the Shoreline Management Act (RCW 90.58), the applicant must apply for a shoreline substantial development permit because the proposed action would be partially constructed within 200 feet of the ordinary high water mark of Grays Harbor (HMC 11.04.040; RCW 90.58.030(d)). A shoreline substantial development permit would not be required for the City of Aberdeen because the proposed action within Aberdeen's jurisdiction would not be within 200 feet of the ordinary high water mark of waters of the state (AMC 16.20.040; RCW 90.58.030(d)).

Conditional Use Permit

As part of Hoquiam's development permit application process, the applicant is required to and has been granted a conditional use permit because the height of the proposed storage tanks (64 feet) would exceed the City's maximum height standard (55 feet) for its Industrial District (HMC 10.03.100.3). A conditional use permit is not required for the City of Aberdeen because Aberdeen's code does not include a maximum height requirement for its Industrial District (Zoning, AMC 17.48).

Development Permits

As part of the development permit application process for the Cities of Hoquiam and Aberdeen, the applicant would be required to obtain a building permit, a grade and fill permit, and fire department approval from both Cities. The applicant would also be required to obtain a demolition permit from the City of Hoquiam because the proposed action would involve demolishing an existing wood-frame warehouse within Hoquiam's jurisdiction. These permits are required prior to construction of the proposed action to comply with the Cities' regulations on land and shoreline management.

3.8.4.2 PS&P Rail Line

As discussed in Chapter 2, *Proposed Action and Alternatives*, and shown in Figure 2-2, the PS&P rail line originates in Centralia, Washington, approximately 70 miles southeast of the project site and terminates at the Port of Grays Harbor loop track, where it splits off into the project site. The PS&P rail line traverses three counties and joins the densely populated cities of Hoquiam and Aberdeen to the west, and Centralia to the east. The area between these cities is interspersed with smaller cities and communities (Table 3.8-2). As discussed in Section 3.3, *Water*, this corridor also largely parallels the Chehalis River (within 0.1 mile) and crosses several waterways.

Table 3.8-2. Cities and Communities along the PS&P Rail Line

Grays Harbor County	
City of Hoquiam	Brady (census-designated place)
City of Aberdeen	Satsop (census-designated place)
Junction City (census-designated place)	City of Elma
Central Park (census-designated place)	Malone-Porter (census-designated place)
Alder Grove (populated place)	City of Oakville
City of Montesano	
Thurston County	
Rochester (census-designated place)	Grand Mound (census-designated place)
Lewis County	
Fords Prairie (census-designated place)	City of Centralia

Land uses along the PS&P rail line in the densely populated areas include industrial, commercial, residential, and recreational uses, as well as areas designated for transportation, communications, and utilities. Through Hoquiam and Aberdeen, the PS&P rail line appears to split land uses with industrial uses to the south and most other uses (mainly commercial and residential) to the north of the line. In this area, the PS&P rail line runs alongside (within 0.1 mile) of the Chehalis River. Moving east outside of Aberdeen, the rail corridor runs directly adjacent to the river. In Centralia, from north to south, the PS&P rail line cuts through an Industrial District, crosses the Skookumchuck River, and traverses a variety of mid-to high-density residential and commercial uses.

Outside of the high-density areas, land along the PS&P rail line is mostly rural, consisting of agricultural land and forested undeveloped areas dotted with small cities and communities (Table 3.8-2). These communities mainly contain low-density residential uses. Some commercial businesses and industrial and recreational uses are located in the larger communities (Montesano, Elma, Oakville, Grand Mound, and Ford's Prairie). South of the PS&P rail line, between Oakville and Rochester, is the 4,438-acre Chehalis Indian Reservation. The reservation is located along the Black River where tribal members live under their own independent government. Additional information on the Chehalis Indian Reservation is provided in Section 3.12, *Tribal Resources*.

A large amount of land area near and along the PS&P rail line consists of undeveloped land, including protected natural areas, state forests, and state parks. South of the Central Park, the PS&P rail line travels adjacent to the Chehalis River Surge Plain, a 3,018-acre designated natural area along the Chehalis River Valley. This area is maintained by the Washington State Department of Natural Resources. It contains the largest high-quality tidal surge plain wetland in Washington. Additional information on the Chehalis River Surge Plain is available in Sections 3.3, *Water*; 3.4, *Plants*; 3.5, *Animals*; and 3.10, *Recreation*. Another notable protected area is the Capitol State Forest, a 91,650-acre working forest located along, and in some areas adjacent to, the PS&P rail line east of Elma, Malone-Porter, and Oakville. This and other open space areas and parks are described further in Section 3.10, *Recreation*.

3.8.4.3 Grays Harbor

Grays Harbor is an estuarine bay approximately 50 miles west of Olympia on the central coast of Washington. It comprises a north and south bay and includes a navigation channel operated by the

U.S. Army Corps of Engineers to accommodate safe passage for large vessel traffic through the harbor. The harbor is surrounded by land to the north, east, and south, and is separated from the Pacific Ocean by two peninsulas (north and south). A majority of the surrounding land includes forested areas that have undergone extensive timber harvest in the past 150 years. This area is sparsely populated except for Aberdeen, Hoquiam, Cosmopolis, Ocean Shores, and Westport, which have populations ranging from approximately 17,000 (Aberdeen) to 1,700 (Cosmopolis).

General land uses surrounding the harbor include residential, industrial, commercial, transportation/communications/utilities, recreation, resource production (i.e., agriculture, fishing, and mining activities and designated forest land), and undeveloped land (Figure 3.8-1). Generally, development is more concentrated on the eastern and western sides of the harbor and the majority of undeveloped land is located along the northern and southern sides.

Residential areas surround Grays Harbor on all sides and are particularly concentrated in and around city and industrial areas. Residential uses are also clustered in the peninsulas in and around Westport and Ocean Shores, which are popular vacation and retirement areas.

Industrial and commercial use is prevalent on the eastern side of Grays Harbor, along the shoreline in Aberdeen, Hoquiam, and Cosmopolis, and along the western side, particularly in Westport. Businesses mainly include lumber production, manufacturing, shipbuilding, food and seafood processing, and commercial fishing (Greater Grays Harbor 2014). Some industrial land uses are located in the harbor's waters because of zoning of intertidal areas. These uses include cranberry cultivation and shellfish farming. Commercial shellfishing in the harbor (Figure 3.8-1) produces oysters and clams for local, national, and global consumption. Commercial crabbing also occurs on the western side of the harbor, between the North and South Bays. Shellfish, fisheries, and other collection areas important to tribes in the study area are discussed in detail in Section 3.12, *Tribal Resources*.

Grays Harbor encompasses many recreational areas, including several state and local parks and designated wildlife areas. Fishing, shellfishing, bird and wildlife viewing, hiking, and boating are popular recreational activities throughout the harbor. Most of Grays Harbor's recreational areas are on the western half of the harbor in and near the northern and southern peninsulas. Closer to the project site is the Grays Harbor National Wildlife Refuge, a 1,500-acre designated wildlife area internationally recognized for its significant shorebird habitat. The refuge is located along the northern shore of Grays Harbor at the western city limits of Hoquiam, approximately 3 miles northwest of the project site. Details on recreational parks and wildlife areas are provided in Section 3.10, *Recreation*.

Land designated for transportation, communication, and utility use occurs in a few areas around Grays Harbor. Most notable is the Bowerman Airport or Bowerman Field, a public-use airport owned by the Port and located along the northern edge of the harbor. This designation also includes two smaller public-use airports and marinas located along the harbor near Westport and Ocean Shores and the Ocean Shores Sewage Treatment Plant, a utility service located near the end of the northern peninsula.

3.8.5 What are the potential impacts on land and shoreline use?

This section describes impacts on land and shoreline use that could occur in the study area. Potential impacts of the no-action alternative are described first, followed by potential impacts of the proposed action.

3.8.5.1 No-Action Alternative

Under the no-action alternative, impacts on land and shoreline use related to construction of the proposed action would not occur. The applicant would continue to operate its existing facility as described in Section 2.1.3.2, *Existing Operations*. Although the proposed action would not occur, it is assumed that growth in the region would continue under the no-action alternative. This growth could lead to development of another industrial use at the project site, which could result in impacts similar to those described for construction and routine operation of the proposed action. However, for the purposes of this analysis, it is assumed that no future development would occur at the project site.

3.8.5.2 Proposed Action

This section describes the impacts that could occur in the study area as a result of construction and routine operation of the proposed action. First, this section describes impacts from construction of the proposed action. It then describes impacts of routine operation at the project site and of routine rail and vessel transport to and from the project site.

Construction

Although construction would result in short-term disturbance (increased noise, air emissions, and localized traffic), as noted in Section 3.8.4.1*, Project Site*, the project site and immediately surrounding land uses are zoned Industrial. Construction would occur in both Hoquiam's and Aberdeen's Industrial Districts, where construction activities are compatible with the land and shoreline use designations of both Cities' comprehensive land use plans and shoreline management programs. The applicant has been granted a conditional use permit by the City of Hoquiam because the tanks would be taller than the 55-foot height restriction listed in the Zoning Code, HMC 10.03.100.3. As discussed in detail in Section 3.9, *Aesthetics, Light, and Glare*, the proposed facility is not expected to substantially block or alter the existing views of residences in the study area.

Furthermore, to ensure the proposed action complies with all applicable federal, state, and local planning requirements throughout construction, the applicant would obtain all appropriate permits and/or approvals prior to construction. Therefore, impacts on land and shoreline use from construction of the proposed action are not anticipated to occur.

Operations

This section describes impacts that would occur as a result of routine operations at the project site, rail transport along the PS&P rail line, and vessel transport through Grays Harbor.

Project Site

Implementation of the proposed action would require the applicant to apply for land use permits from the Cities of Hoquiam and Aberdeen, which require demonstration of consistency with the applicable policies, zoning, and conditions (Appendix H, *Local Policies Governing Land and Shoreline Use*). Therefore, operation of the proposed action at the project site would be consistent with the applicable policies, including consistency with comprehensive plans, zoning ordinances, critical areas ordinances, and shoreline master programs. The proposed action would implement an appropriate and allowable use in Hoquiam's and Aberdeen's Industrial Districts that would be consistent with the land use plans and zoning requirements of both cities. To ensure compliance with these requirements and consistency with the applicable land use and shoreline management programs and ordinances, the applicant would obtain all appropriate permits and approvals.

Rail and Vessel

Increased traffic associated with the proposed action would occur in existing transportation corridors. Rail and vessel transport in these areas is currently ongoing and is consistent with applicable land use plans, policies, zoning, and regulations.

3.8.6 What required permits and plans apply to land and shoreline use?

The following permit conditions and required plans are expected to reduce impacts on land and shoreline use.

- City of Hoquiam and City of Aberdeen Critical Areas Review for fish and wildlife habitat and geologically hazardous areas
  - Critical area review report
  - Buffer establishment and protection requirements
  - Buffer mitigation and monitoring requirements
  - Buffer activity limits and restrictions
- City of Hoquiam Shoreline Substantial Development Permit
  - Permits the proposed action as a reasonable and appropriate use of shoreline
  - Consistency with the Shoreline Management Master Program
  - Protection of shoreline resources and functions
- City of Hoquiam Conditional Use Permit
  - Provides an exception from height restrictions for proposed storage tanks
- City of Hoquiam and City of Aberdeen Building Permits
  - Permits the proposed action as compliant with 2012 International Building Codes
  - Requirement for compliance with American Society of Civil Engineers 7-02 and American Petroleum Institute 650 design and construction standards, including climatic and geologic loading requirements
  - Erosion control plan

  - Geotechnical report
  - Shoreline substantial development permit
  - Critical areas review
- City of Hoquiam and City of Aberdeen Grade and Fill Permits
  - Permits the proposed action as compliant with city practices to prevent flood damage
- City of Hoquiam and City of Aberdeen Fire Department Approvals
  - Approval of the proposed action as meeting fire prevention and suppression requirements
  - Adherence to the International Fire Code, 2012 Edition
- City of Hoquiam Demolition Permit
  - Permits the proposed action as compliant with city practices for demolition

3.8.7 What mitigation measures would reduce impacts on land and shoreline use?

With implementation of the permit conditions described above, impacts of construction and routine operation of the proposed action on land and shoreline use would not be significant and would not necessitate mitigation.

3.8.8 Would the proposed action have unavoidable and significant adverse impacts on land and shoreline use?

Compliance with the applicable regulations and permits described above is expected to reduce impacts on land and shoreline use. There would be no unavoidable and significant adverse impacts.

3.9 Aesthetics, Light, and Glare

The aesthetic value of an area is based on the visual character and quality of the natural and human-made features of the site. It is also a function of viewers' perceptions of these features, which can vary according to how sensitive the viewer is and how much they are exposed to certain views. In a developed area, light and glare can also affect the visual landscape by detracting from the aesthetic quality and by interfering with adjacent land uses. For example, increased nighttime lighting can bother adjacent residents if the lighting is bright enough.

This section describes aesthetics, light, and glare in the study area. It then describes impacts on aesthetics, light, and glare that could result under the no-action alternative or as a result of the construction and routine operation[1] of the proposed action. Finally, this section presents any measures identified to mitigate impacts of the proposed action and any remaining unavoidable and significant adverse impacts.

3.9.1 What is the study area for aesthetics, light, and glare?

The study area for aesthetics, light, and glare consists of aesthetic resources on and near the project site that could be affected by construction and routine operation of the proposed action. The study area also includes aesthetic resources, light, and glare that could be affected during routine rail transport along the Puget Sound & Pacific Railroad (PS&P)[2] and vessel transport through Grays Harbor out to 3 nautical miles from the mouth of the harbor.

3.9.2 What laws and regulations apply to aesthetics, light, and glare?

Laws and regulations for determining potential impacts on aesthetics, light, and glare are summarized in Table 3.9-1. More information about these laws and regulations is provided in Appendix B, *Laws and Regulations*, and Appendix I, *Local Policies Governing Aesthetics, Light, and Glare*.

[1] Chapter 4, *Environmental Health and Safety*, addresses the potential impacts from increased risk of incidents (e.g., storage tank failure, train derailments, vessel collisions) and related consequences (e.g., release of crude oil).
[2] The PS&P rail line refers to the rail line between Centralia and the project site.

Table 3.9-1. Laws and Regulations for Aesthetics, Light, and Glare

Laws and Regulations	Description
Federal	
No federal laws or regulations apply to aesthetics, light, and glare	
State	
Scenic Highways Regulations (RCW 47.39.020)	Dictates that scenic and recreational areas be preserved and protected from inappropriate development.
Shoreline Management Act (RCW 90.58)	Establishes regulations for managing the use, environmental protection, and public access of the state's shorelines.
Local	
Density and Dimensional Requirements (HMC 10.03.100)	Specifies height maximum of 55 feet for structures in the City of Hoquiam Industrial District.
Landscaping and Screening (HMC 10.05 and AMC 17.48)	Contains various ordinances pertaining to aesthetic resources through regulations on landscaping, signs, lighting, and screening.
RCW = Revised Code of Washington; HMC = Hoquiam Municipal Code; AMC = Aberdeen Municipal Code	

3.9.3 How were impacts on aesthetics, light, and glare evaluated?

This section describes the sources of information and methods used to evaluate impacts.

3.9.3.1 Information Sources

Information on aesthetics, light, and glare in the study area was obtained from the following sources.

- Direct field observation from vantage points, including neighboring areas, the project property, and roadways (conducted August 12 and 13, 2014).
- Photographs of key views of and from the project site and of existing sources and levels of light and glare.
- Review of the lighting and features for the proposed action that may cause glare.
- Review of the proposed action and its compliance with state and local ordinances and regulations and professional standards concerning light and glare.

3.9.3.2 Impact Analysis

The methods used in this analysis involved three steps.

1. Objectively identify the aesthetic features (visual resources) of the landscape.
2. Assess the character and quality of those resources relative to overall regional visual character.
3. Determine the importance or sensitivity to people of views of visual resources in the landscape.

3.9.3.3 Visual Concepts and Terminology

The aesthetic value of an area is a measure of its *visual character* and *visual quality*, combined with the viewer response to the area (Federal Highway Administration 1988). Scenic quality is best

described as the overall impression that an individual viewer retains after driving through, walking through, or flying over an area (U.S. Bureau of Land Management 1980). *Viewer exposure* is a function of the number of viewers, number of views seen, distance of the viewers, and viewing duration. *Viewer sensitivity* relates to the extent of the public's concern for a particular viewshed. *Viewer response* is a combination of viewer exposure and viewer sensitivity. These terms and criteria are described below.

Visual Character

Natural and artificial landscape features contribute to the visual character of an area or view. Visual character is influenced by geologic, hydrologic, botanical, wildlife, recreational, and urban features. Urban features include those associated with development, including roads, utilities, structures, earthworks, and the results of other human activities. The perception of visual character can vary seasonally, even hourly, as weather, light, shadow, and elements that compose the viewshed change. The basic components used to describe visual character for most visual assessments are the elements of form, line, color, and texture of the landscape features (U.S. Forest Service 1995; Federal Highway Administration 1988). The appearance of the landscape is described in terms of the dominance of each of these components.

Visual Quality

Visual quality is evaluated using the well-established approach to visual analysis adopted by the Federal Highway Administration, employing the concepts of vividness, intactness, and unity (Federal Highway Administration 1988; Jones et al. 1975), which are described below.

- *Vividness* is the visual power or memorability of landscape components as they combine in striking and distinctive visual patterns.
- *Intactness* is the visual integrity of the natural and human-built landscape and its freedom from encroaching elements; this factor can be present in well-kept urban and rural landscapes, and in natural settings.
- *Unity* is the visual coherence and compositional harmony of the landscape considered as a whole; it frequently attests to the careful design of individual components in the landscape.

Visual quality is evaluated based on the relative degree of vividness, intactness, and unity, as modified by its visual sensitivity. High-quality views are highly vivid, relatively intact, and exhibit a high degree of visual unity. Low-quality views lack vividness, are not visually intact, and possess a low degree of visual unity.

Viewer Exposure and Viewer Sensitivity

The measure of the quality of a view must be tempered by the overall sensitivity of the viewer. Viewer sensitivity or concern is based on the visibility of resources in the landscape, proximity of viewers to the visual resource, elevation of viewers relative to the visual resource, frequency, and duration of views, number of viewers, and type and expectations of individuals and viewer groups.

The importance of a view is related, in part, to the position of the viewer (viewer exposure) to the resource; therefore, visibility and visual dominance of landscape elements depend on their placement within the viewshed. A viewshed is defined as all of the surface area visible from a particular location (e.g., an overlook) or sequence of locations (e.g., a roadway or trail) (Federal

Highway Administration 1988). To identify the importance of views of a resource, a viewshed must be divided into distance zones of foreground, middleground, and background. Generally, the closer a resource is to the viewer, the more dominant it is and the greater its importance to the viewer. Although distance zones in a viewshed may vary between different geographic region and types of terrain, the standard foreground zone is to 0.25 to 0.5 mile from the viewer, the middleground zone is 0.25 to 0.5 mile to 3 to 5 miles from the viewer, and the background zone extends from the middleground to infinity (Litton 1968).

Viewer sensitivity depends on the number and type of viewers and the frequency and duration of views. Viewer sensitivity is also modified by viewer activity, awareness, and visual expectations in relation to the number of viewers and viewing duration. For example, viewer sensitivity is generally higher for views seen by people who are driving for pleasure, people engaging in recreational activities such as hiking, biking or boating, and homeowners. Sensitivity tends to be lower for views seen by people driving to and from work or as part of their work (U.S. Forest Service 1995; Federal Highway Administration 1988; U.S. Soil Conservation Service 1978). Commuters and nonrecreational travelers have generally fleeting views and tend to focus on commute traffic, not on surrounding scenery; therefore, they are generally considered to have low sensitivity. Residential viewers typically have extended viewing periods and are concerned about changes in the views from their homes; therefore, they are generally considered to have high sensitivity. Viewers using recreational trails and areas, scenic highways, and scenic overlooks are usually assessed as having high sensitivity.

Judgments of visual quality and viewer response must be made based in a regional frame of reference (U.S. Soil Conservation Service 1978). The same landform or visual resource appearing in different geographic areas could have a different degree of visual quality and sensitivity in each setting. For example, a small hill may be a significant visual element on a flat landscape but have very little significance in mountainous terrain.

3.9.4 What aesthetic resources are in the study area?

This section describes aesthetics, light, and glare in the study area that could be affected by construction and operation of the proposed action. This section provides the general context for aesthetics, light, and glare in the study area and describes aesthetics, light, and glare at the project site, along the PS&P rail line, and in and along the shoreline of Grays Harbor.

3.9.4.1 Project Site

As discussed in Chapter 2, *Proposed Action and Alternatives*, the project site is developed and currently operates as a methanol distribution facility. Predominant visual features consist of pavement and four white aboveground storage tanks, 120 feet wide and 40 feet tall. There are two rail spurs. An elevated, gray, lattice steel bridge supports offloading pipes and is slightly taller than the railcars. Also at the project site are a covered truck weigh station composed of gray steel, two office trailers, and a large warehouse that is not in use. The ground is either paved with gray asphalt or covered with gravel. Vegetation is sparse and limited to patches of weedy plants and grasses growing in some of the gravel areas, which do not provide any aesthetic benefit in this highly industrialized setting.

The area immediately to the north, east, and south of the project site consists of other industrial. The Hoquiam River and Rennie Island lie to the southwest. The project site is primarily visible to

motorists traveling on roadways surrounding the project site (Chapter 2, *Proposed Action and Alternatives*, Figure 2-2). Individuals participating in recreational activities at the 28th Street Boat Launch and Viewing Tower and recreationalists (Section 3.10, *Recreation*, Figure 3.10-1) and commercial and tribal fishers in the harbor (Section 3.12, *Tribal Resources*, Figure 3.12-1) can also view the site.

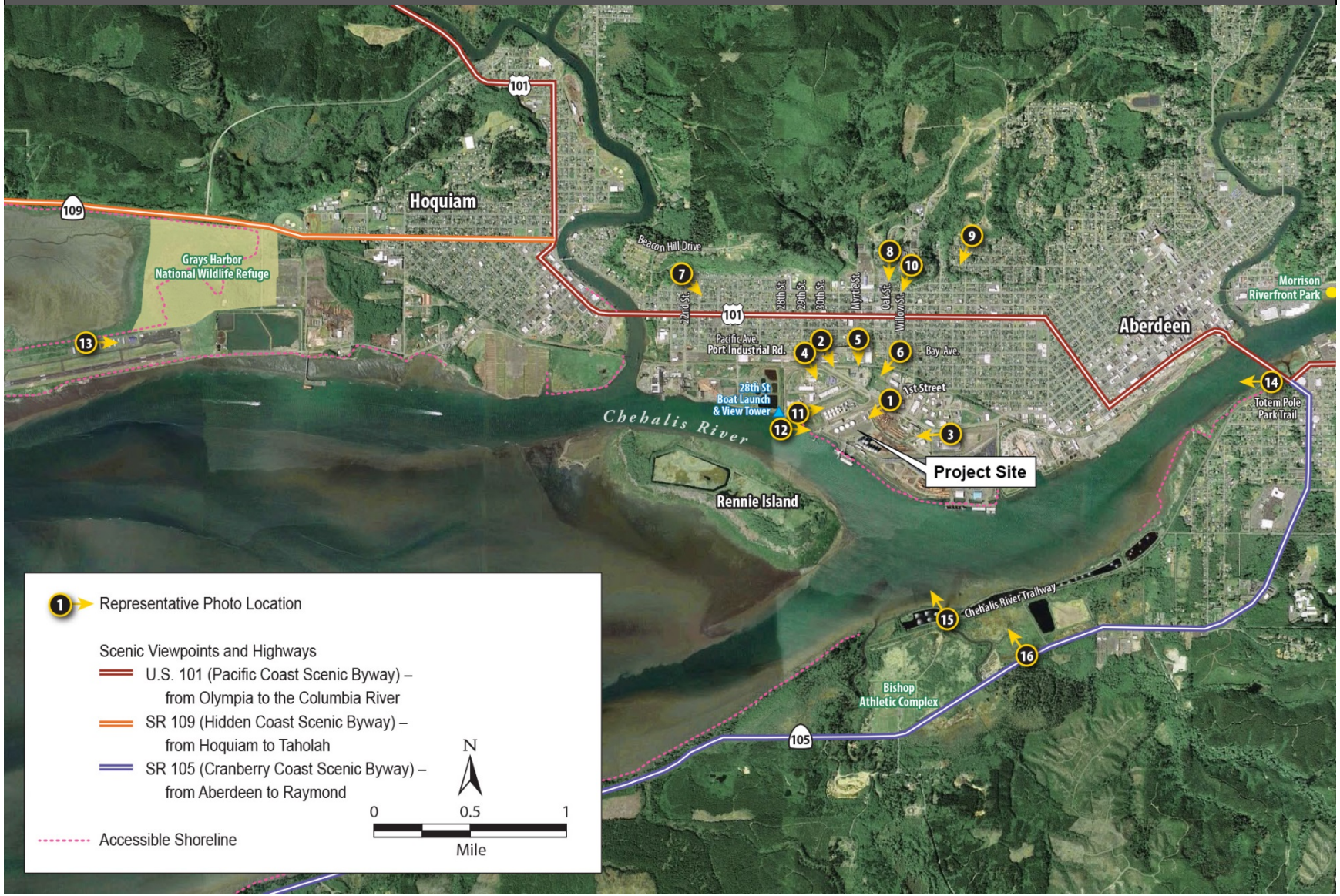
The nearby Ag Processing, Inc. (AGP) facility has eight concrete storage silos, approximately 75 feet wide and 135 feet tall and four clustered, concrete storage silos approximately 40 feet wide and 127 feet tall. The top of the tan-painted steel structure that is on top of the four clustered silos is 280 feet tall. The 12 silos are all composed of gray concrete. AGP also has a large offloading dock along the shoreline and timber storage yards east of the silos and up to Port Industrial Road. AGP's storage tanks and silos are the tallest at the Port of Grays Harbor (Port) and are often the tanks seen rising above the tree line.

Views of the project site include industrial operations and infrastructure. However, from some viewpoints the industrial uses are juxtaposed against the forested hillsides and waterfront. The foreground views of the surrounding area that include the project site exhibit low to moderate visual quality. Residents, recreationalists, and roadway users viewing the project site would all have low to moderate visual sensitivity to changes to the project site because all users are familiar with the industrialized visual conditions and operations associated with the Port. Specific views of the project site are discussed and shown in photographs below. Locations of the photographs are shown in Figure 3.9-1.

- **Ground-level views.** Port Industrial Road and its intersection with 1st Street provide the most direct, least-obstructed foreground views of the project site. Foreground views consist of the timber and mulch piles and the storage tanks at the project site and at the Imperium and AGP facilities. It is also possible to see the associated structures, including rail tracks, office trailers, pipelines, and lights. Sensitive viewers consist primarily of motorists traveling along Port Industrial Road (Figure 3.9-2). Although there is a relatively high number of motorists in this area each day, viewer sensitivity is considered low because motorists are passing by and are exposed to views for only a short time.

  The taller Imperium tanks and AGP silos, industrial buildings and office trailers, and existing trees and shrubs limit views of the Westway tanks even a short distance beyond the immediate vicinity (Figures 3.9-3 and 3.9-4); however, limited foreground views are also visible to residents in this area. While partial views of the taller AGP silos and Imperium tanks are sometimes present, views of the shorter Westway tanks from these roadways are often obscured by the taller tanks and silos, industrial buildings and office trailers, residential and commercial development north of the site, wooden utility poles, and existing trees and shrubs (Figures 3.9-5 and 3.9-6). Some limited views of the tops of the tanks may be seen from nearby residences and businesses and by recreationalists in local parks; however, foreground views of the tanks are mostly obscured or not available (Figure 3.9-7).

Figure 3.9-1. Photo Locations



- **Hillside views.** Views from elevated hillsides north of the project site often allow for views of the project site. Views are also available from hillside roadways and residential, commercial, and institutional uses. Residents can see the project site in the middleground from the elevated hillsides to the north. However, like ground-level views, views of the shorter Westway tanks are fully to partially obscured by intervening trees and shrubs and development, although the tops of the taller Imperium and AGP tanks are visible (Figure 3.9-8). Even when coming downhill, where views of the taller AGP silos and Imperium tanks can be identified, views of the Westway tanks are not discernable (Figure 3.9-9). Partial to full views of the Westway tanks do exist where the viewing location is high enough and trees and development do not intervene (Figures 3.9-10 and 3.9-11).
- **Recreational views**. Nearby recreational areas have limited views of the site. The closest recreational feature is the 28th Street view tower and boat ramp, which has foreground views of the project site. The Imperium tanks are most visible with views of the Westway tanks most visible from the view tower (Figure 3.9-12). Views from the boat ramp primarily focus is on the AGP silos and structures associated with the Terminal 1 berth (Figure 3.9-13).

  Views of the project site from more distant recreational areas are more limited. From the Bowerman Basin Sandpiper Trail at the Grays Harbor National Wildlife Refuge (Figure 3.9-14) and from the Totem Pole Park Trail (Figure 3.9-15), located across the harbor, it is possible to see the AGP silos in the background, but it is not possible to discern the applicant's specific facility at the project site from the broader industrial development. The storage tanks can be seen from the Chehalis River Walkway, along the south bank of the Chehalis River approximately 1 mile southeast of the project site, but views are often screened by fencing, the aboveground pipeline, and vegetation along the trail and harbor shoreline (Figure 3.9-16).
- **Scenic byway views.** The project site can be seen by motorists traveling on State Route 105 (SR 105) (in Oregon) where gaps in vegetation are present along the roadway; however, as seen in Figure 3.9-17, it is difficult to distinguish the project site features from the surrounding industrial development. Views of the project site from vantages across the harbor are limited by topography and vegetation. For example, the project site is not visible from residential areas of Aberdeen that are south of the harbor, the Bishop Athletic Complex, or from most vantages along SR 105. Although the nearby AGP silos may be visible, views of the project site from US Route 101 (US 101) and State Route 109 (SR 109) are not available due to intervening development, infrastructure, and vegetation.
- **Water-based views.** The project site is visible from recreational, commercial, and industrial vessels in the harbor and close to the Terminal 1 berth. Visibility is limited by elevation moving farther from the shoreline.

The visual character of the project area consists of a mix of industrial, commercial, residential, and recreational uses. Views of the harbor and vegetated hillsides serve as a scenic backdrop, helping to increase the overall vividness of the project vicinity. However, somewhat disjointed land uses and the presence of human-made structures affect the overall intactness and unity of the project vicinity, as a whole. Therefore, depending on the specific location, visual quality can range from moderately low in highly industrialized portions of the vicinity to moderately high in areas with fewer encroaching features (industrial facilities) where views of primarily homes and natural landscapes (hillsides and harbor) are more intact.

Figure 3.9-2. Photo Location 1
View From 1st Street at the Intersection with Port Industrial Road
Looking Southwest Toward the Project Site

Figure 3.9-3. Photo Location 2
View From Port Industrial Road, Near 29th Street
Looking Southwest Toward the Project Site

Figure 3.9-4. Photo Location 3
View From the Home Depot Parking Lot Looking West Toward the Project Site

Figure 3.9-5. Photo Location 4
View From the Intersection of Pacific Avenue and 30th Street
Looking Southeast Toward the Project Site

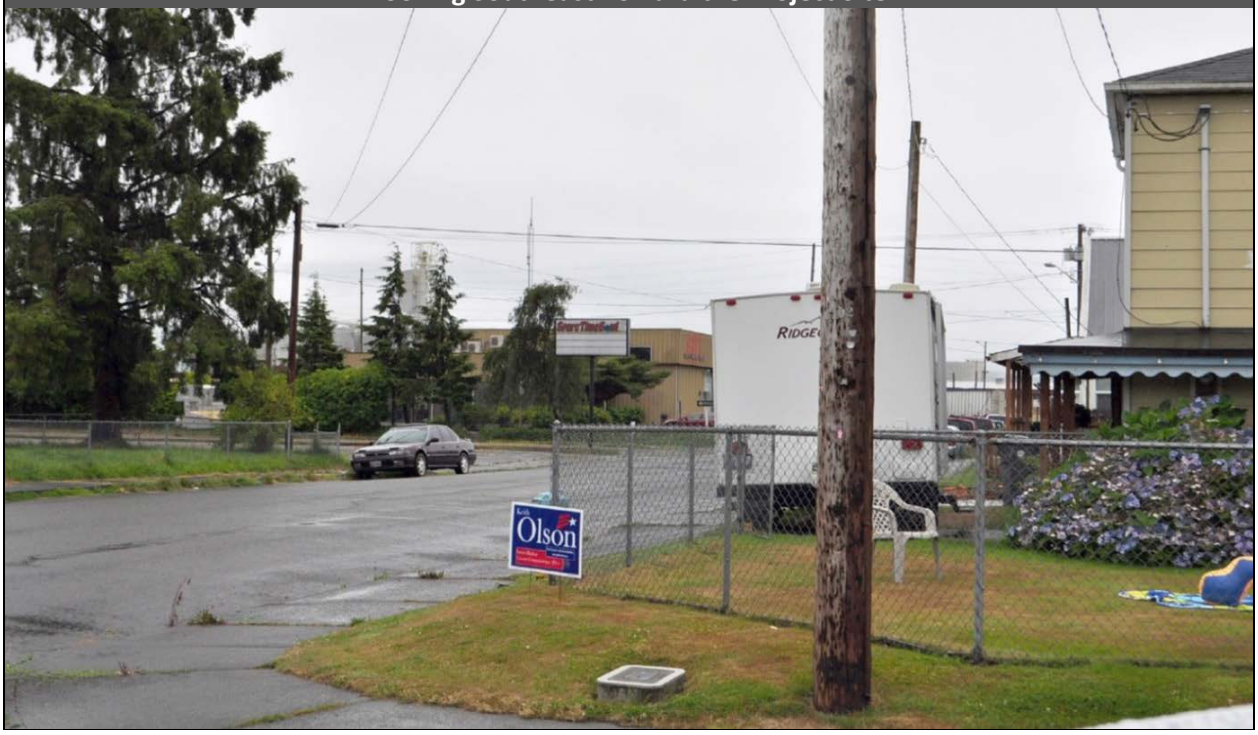


Figure 3.9-6. Photo Location 5
View From the Intersection of Pacific Avenue and Myrtle Street
Looking South Toward the Project Site

Figure 3.9-7. Photo Location 6
View From the West End Playfield on Bay Avenue Looking Southwest Toward the Project Site

Figure 3.9-8. Photo Location 7
View From Beacon Hill Drive Looking Southeast Toward the Project Site

Figure 3.9-9. Photo Location 8
View From Oak Street, Near Hemlock Street Looking South Toward the Project Site

Figure 3.9-10. Photo Location 9
View From Council Crest Drive Looking Southwest Toward the Project Site

Figure 3.9-11. Photo Location 10
View From the Grays Harbor Community Hospital
Looking Southwest Toward the Project Site

Figure 3.9-12. Photo Location 11
View From the 28th Street View Tower Looking Northeast Toward the Project Site

Figure 3.9-13. Photo Location 12
View From the 28th Street Boat Ramp Dock Looking East Toward the Project Site

Figure 3.9-14. Photo Location 13
View From Airport Way, Near Grays Harbor National Wildlife Refuge
Looking East Toward the Project Site

Figure 3.9-15. Photo Location 14
View From Totem Pole Park Trail, Near U.S. 101 Bridge Over the Chehalis River, Looking West Toward the Project Site

Figure 3.9-16. Photo Location 15
View From the Chehalis River Walkway Looking Northwest Toward the Project Site

Figure 3.9-17. Photo Location 16
View From SR 105 Looking Northwest Toward the Project Site

Light

The project site and the Port are well lit at night. Existing sources of light include interior office lighting, exterior safety lighting on buildings, overhead lighting to illuminate outdoor work areas, lighting at the dock and rail offloading areas, weigh station lighting, and lighting at the tops of stair cases that lead to the tops of the storage tanks and silos.

Sources of light seen from the area surrounding the project site include interior and exterior lighting associated with residential, commercial, and industrial development; overhead streetlights; vehicle headlights; train headlights; lighting on vessels; and nighttime stadium lighting associated with local sports fields. The concentration of nighttime lighting from Hoquiam, Aberdeen, and Cosmopolis produces ambient light glow that radiates into the night sky.

Glare

Existing sources of glare include reflective surfaces such as the existing white storage tanks, light-colored building exteriors, building windows, vehicle windows, and lighter paved surfaces lacking vegetative cover. A major source of glare near the project site is the water surface of Grays Harbor and Chehalis River, which are large, reflective bodies of water that can reflect sunlight, moonlight, and artificial nighttime lighting.

3.9.4.2 PS&P Rail Line

The PS&P rail line travels through the region, roughly parallel to US Route (US 12), and rail traffic is common to the existing visual landscape. In general, the PS&P rail line is most visible to those traveling along US 12 and to residents in communities most heavily populated at the western end of the rail line in Hoquiam and Aberdeen, and at the southern end of the rail line in Fords Prairie and Centralia. Smaller communities along the PS&P rail line include Cosmopolis, Junction City, Central Park, Alder Grove, Montesano, Brady, Satsop, Elma, Saginaw, Malone, Porter, Oakville, and Rochester. In some locations, rail traffic is visible from residences and businesses close to the rail line. Although this is primarily the case in the larger communities, some rural residences are located close to the PS&P rail line.

The forested terrain on either side of the numerous river valleys and harbor create an enclosed landscape. Development is concentrated close to the rivers and harbor on flatter lands and along transportation routes. However, some development extends onto the hillsides and isolated development does occur in forested areas. Flat, fertile areas along rivers also support a patchwork of agricultural uses and the forested hillsides support timber harvest.

Near the project site, US 101 is designated as the Pacific Coast Scenic Byway from Olympia to the Columbia River (Washington State Department of Transportation 2014a). SR 109 is designated as the Hidden Coast Scenic Byway from Hoquiam to Taholah (Washington State Department of Transportation 2014b). SR 105 is designated as the Cranberry Coast Scenic Byway from Aberdeen to Raymond (Washington State Department of Transportation 2014c, 2014d). US 101 passes closest to the project site, approximately 0.5 mile to the north, and is separated from the project site by development in Aberdeen.

3.9.4.3 Grays Harbor

Forested hillsides surround Grays Harbor, which has two bars that separate the harbor from the Pacific Ocean, creating a largely enclosed bay. The shoreline communities of Ocean Shores, Westport, and Cohassett Beach support year-round residential and commercial development, tourism, commercial and sport fishing, and aquaculture. Most development around the harbor is centrally located in Hoquiam, Aberdeen, and Cosmopolis. Smaller areas of development are located around the harbor's edge, such as Grays Harbor City, Gray Gables, Ocosta, and individual properties.

Views of Grays Harbor are relatively intact and are available from land- and water-based vantages. The many recreational and wildlife areas around the bay with views of the water include Grays Harbor National Wildlife Refuge, Bowerman Basin Sandpiper Trail, Ocean Shores Bay Wildlife Area, John Gable Community Park, Damon Point State Park, Harms Field, Oyhut Wildlife Recreation Area, Bottle Beach State Park, the Chehalis River Surge Plain Natural Area Preserve, the Johns River Wildlife Area, and the Chehalis River Trailway. Views are also available through gaps in the vegetation and development along local roadways, including SR 109 and SR 105, and from residences that are near the harbor. Water-based views are available from recreational, commercial, and industrial vessels.

Views in the region vary based on viewers' location in the landscape. Many views are of high visual quality due to the available views of the harbor and rivers, tidal areas, forested hillsides, and relatively low levels of development. However, other views are somewhat degraded and include mostly industrial operations and infrastructure juxtaposed against the forested hillsides and waterfront.

3.9.5 What are the potential impacts on aesthetics, light, and glare?

This section describes the impacts on aesthetics, light, and glare that could occur in the study area. Potential impacts of the no-action alternative are described first, follow by potential impacts of the proposed action.

3.9.5.1 No-Action Alternative

Under the no-action alternative, impacts on aesthetic, light, and glare from the construction of the proposed action would not occur. The applicant would continue to operate its existing facility as described in Chapter 2, Section 2.1.3.2, *Existing Operations*. Although the proposed action would not occur, it is assumed that growth in the region would continue under the no-action alternative. This growth could lead to development of another industrial use at the project site, which could result in impacts similar to those described for construction and routine operation of the proposed action. However, for the purposes of this analysis, it is assumed that no future development would occur at the project site.

3.9.5.2 Proposed Action

This section describes the impacts that could occur in the study area as a result of construction and routine operation of the proposed action. First, this section describes impacts from construction of the proposed action. It then describes impacts of routine operation at the project site and of routine rail and vessel transport to and from the project site.

Construction

Aesthetics

The presence of construction equipment (e.g., backhoes, tractors, cranes, and trucks) and the related increase in activities would create short-term visual changes at the project site. However, as described in Section 3.9.4.1, *Project Site*, the project site is an existing industrial area and cranes and industrial operations are a common part of the visual environment. Although construction activity would increase, the use of heavy machinery is consistent with the existing visual environment at and nearby the project site.

Close views (within 1.5 miles) of the project site by the public would be limited for motorists traveling along Port Industrial Road and SR 105, and even more limited for residents to the north. Much of the construction activity would not be visible from these locations. From the 28th Street viewing tower and boat ramp, from within and across the harbor, or from any other slightly elevated vantages, it may be possible to see construction of the proposed tanks and the hose tower at the dock. However, as noted previously, these activities are similar to existing operations and would likely be difficult to discern from existing industrial activities. Scenic views from US 101 and SR 109 would not be affected by the proposed action because of the limited views of the project site from these locations.

Because views of the project site would be either limited or similar to existing operations and because construction would be short term, construction of the proposed action would not result in substantial visual impacts, especially when seen from a distance of 1.5 miles or more.

Light and Glare

Because construction would take place during daylight hours (between 7:30 a.m. and 4:30 p.m.), it would not require the use of high-intensity nighttime lighting and would not negatively affect day or nighttime public views. Glare would not be increased at the project site during construction.

Operations

This section describes impacts that would occur as a result of routine operations at the project site, rail transport along the PS&P rail line, and vessel transport through Grays Harbor.

Project Site

Aesthetics

The two new rail spurs would be built next to the existing rail spurs and would be similar to existing conditions. Lengthening of the existing rail spurs would only be visible to Port workers. The new pipelines would be visually similar to the existing bridge structures and pipelines and would not constitute a substantial visual change. Vessels would be at the Terminal 1 docks more often under the proposed action (up to an additional 119 days per year) compared to the no-action alternative (34 days per year), but the view would be similar to existing conditions.

Removal of the existing warehouse would not greatly alter visual conditions at the Port because, as seen in Photo 3.9-1, the existing offloading pipe bridge and common presence of rail cars limits views of the structure. The hose tower and marine vapor control system at the dock would be visible from the harbor and the 28th Street viewing tower and boat ramp but, as seen in Photo 3.9-12, offloading structures on the dock are already prominent. The hose tower and marine vapor control system would blend in with existing infrastructure on the dock and would not detract from views of the coastline from the harbor or the 28th Street viewing tower and boat ramp. Similarly, because the hose tower and marine vapor control system would blend with existing infrastructure on the dock, they would not be very noticeable or detract from views of the coastline from slightly elevated vantages, distant views, views across the harbor, or panoramic scenic vista views. Therefore, visual changes resulting from the new and lengthened rail spurs, new pipelines, removal of the existing warehouse, the new hose tower, and new marine vapor control system are not anticipated to result in substantial visual impacts on views of the Port or harbor that would negatively affect any viewer groups.

The most prominent features to be built at the project site would be the storage tanks. As described in Section 3.9.4.1, *Project Site*, the four existing storage tanks are white and 120 feet wide and 40 feet tall. The five proposed tanks, to be located south of the existing tanks, would be 150 feet wide and 64 feet tall. While 24 feet taller than the existing tanks at the project site, the proposed tanks would be only 4 feet taller than the existing Imperium Terminal Services tanks and 63 to 71 feet shorter than the existing AGP silos. The new taller tanks, therefore, would not be noticeably taller than existing tanks and silos at the Port when seen from surrounding vantages by all viewers. As noted in Section 3.8, *Land and Shoreline Use,* the proposed action would be required to obtain a conditional use permit from the City of Hoquiam because the proposed tanks would otherwise exceed the City's height restriction.

As described in Section 3.9.4.1, *Project Site*, foreground views of the project site would primarily include motorists traveling along Port Industrial Road, US 101, and SR 105, with even more limited views visible to residents to the north. Foreground views would also be visible to recreationalists at

the 28th Street viewing tower and boat ramp. Although residents and recreationalists in general are thought to have a higher sensitivity to changes in the visual environment, these viewer groups are expected to have relatively low to moderate sensitivity to changes related to the proposed action. This is because the proposed facility would be largely consistent with the existing industrial character of the Port and immediately surrounding area. As mentioned previously, motorists are also anticipated to have relatively low sensitivity to the proposed changes because they would be passing through the area.

Within and across the harbor, or from any other slightly elevated vantages (such as the residential area farther to the north), it may be possible to see the proposed tanks, particularly the taller tanks, in the middleground or background; however, it would likely be difficult to discern the proposed facility from the existing industrial area. Scenic views from US 101 and SR 109 would not be affected by the proposed action because of these locations provide limited views of the project site. Additionally, the proposed facility would be consistent with the existing industrial character of the immediately surrounding area and would not materially change the visual character or quality of the views from these locations. Implementation of the mitigation measures described in Section 3.9.7.1, *Applicant Mitigation*, would further reduce the impact of visual changes.

Light and Glare

As described in Section 3.9.4.1, *Project Site*, the project site and the Port are well lit at night. The proposed rail unloading and vessel-loading facility would require some additional lighting for nighttime operations. Similar to existing conditions, lighting would not be needed to illuminate the new pipelines. The hose tower and dock safety unit (a component of the marine vapor combustion unit) at the dock may need some additional lighting, similar to what currently exists at the dock. The storage tanks would also have lighting at the top of the tank staircases, similar to the existing tanks. Some additional security lighting is also likely. This new lighting would result in minor increases in light and glare compared to existing conditions and would be installed to minimize impacts on offsite receptors (e.g., water, residential uses).

The changes in lighting toward the interior of the Port and away from residential areas are not anticipated to affect views from scenic routes. Operating hours are not limited to daylight hours; increased light at the dock for night loading is anticipated to occur up to an estimated 119 nights per year and could affect views from within and across the harbor. Although nighttime lighting would increase compared to the no-action alternative, new sources of nighttime lighting are not expected to affect any viewer groups negatively. Additionally, implementation of the mitigation described in Section 3.9.7.1, *Applicant Mitigation*, would further reduce potential impacts related to increased lighting.

While the proposed tanks would mostly blend in with the existing tanks (both at the project site and in the immediately surrounding area), silos, and offloading infrastructure and would be in keeping with the existing visual character at the Port, they could stand out slightly if they were to be painted in a highly reflective color. This could draw viewers' attention toward the tanks and result in increased glare on sunnier days. As described in Section 3.9.7.1, *Applicant Mitigation*, painting the tanks in a more subdued tone may help them to blend better with the majority of tanks at the Port. This would also ensure that a larger clustering of brightly colored tanks does not become a focal point associated with the Port in scenic views. The hose tower and marine vapor control system would be colored similar to existing structures on the dock and would not increase glare in any views. This would reduce the potential for glare seen by onsite workers, within scenic views, or

where the tops of tanks are visible from nearby vantages by avoiding a clustering of large, white surfaces that are more reflective than gray. Changes in glare would not affect views from scenic routes because they would not be readily visible due to distance and intervening development and vegetation. Furthermore, the proposed action would not conflict with laws and regulations related to light and glare, which are described in Section 3.9.2.

Rail and Vessel

As described in Section 3.15, *Rail Traffic*, and Section 3.17, *Vessel Traffic*, the proposed action would result in increased rail and vessel traffic in the study area compared to the no-action alternative. These increases would occur in existing transportation corridors. Rail and vessel transport in these areas is ongoing and a predominant part of the visual landscape in these areas. Currently, rail and vessel operators use lighting for safety when operating at night. In general, nighttime train lighting is directed downward and ahead of the train to illuminate the path forward or to make the train more visible to others. Vessels are required by law to display lights for navigation and these lights would be visible in a 360-degree arc around the vessel. These lights are designed to identify the vessel and its location but do not act as floodlights to illuminate the surrounding area.

Although most lighting would not disturb surrounding land uses, the proposed action would result in the potential for increased nighttime lighting compared with the no-action alternative. While it is not possible to determine what proportion of the additional traffic would occur at night, it is possible that some small increase in nighttime traffic would occur.

3.9.6 What required permits and plans apply to aesthetics, light, and glare?

The following permit conditions and required plans are expected to reduce impacts on aesthetics, light, and glare.

- City of Hoquiam Conditional Land Use Permit
  - Grants exception to maximum height of 55 feet specified in the Density and Dimensional Requirements (HMC 10.03.100)

3.9.7 What mitigation measures would reduce impacts on aesthetics, light, and glare?

This section describes the applicant mitigation that would reduce impacts on aesthetics, light, and glare from construction and routine operation of the proposed action. Mitigation measures to reduce potential impacts on environmental health and safety from increased risk of incidents and related consequences are presented in Chapter 4, *Environmental Health and Safety*.

3.9.7.1 Applicant Mitigation

The applicant will implement the following mitigation measures.

- To reduce potential glare, the applicant will ensure the proposed storage tanks are of a tone that blends into the surrounding landscape and/or match the existing facility tank paint or insulation, appropriate to the existing design and without affecting air emissions for the surrounding facilities.

- To ensure that lighting at the project site does not conflict with other land uses, the applicant will coordinate with the Port of Grays Harbor to develop the proposal for project lighting.

3.9.8 Would the proposed action have unavoidable and significant adverse impacts on aesthetics, light, and glare?

Compliance with the applicable regulations and permits along with implementation of the mitigation measures described above would reduce impacts on aesthetics, light, and glare. Although the proposed action would result in unavoidable visual changes, there would be no unavoidable and significant adverse impacts. Potential impacts related to increased risk of incidents and related consequences are addressed in Chapter 4, *Environmental Health and Safety*.

3.10 Recreation

Recreation provides humans with the opportunities for relaxation, enjoyment, and engagement with the natural and human-made environment. In Grays Harbor, recreational uses and areas are important for local lifestyles and the economy. Recreation activities include water-based activities (boating, fishing, beachcombing, diving) and land-based activities (wildlife viewing, walking, and active sports).

This section describes recreational uses and areas in the study area, including parks and natural areas, fishing, bird watching, and whale watching. It then describes impacts on recreation that could result under the no-action alternative or as a result of the construction and routine operation[1] of the proposed action. Finally, this section presents any measures identified to mitigate impacts of the proposed action and any remaining unavoidable and significant adverse impacts.

3.10.1 What is the study area for recreation?

The study area for recreation consists of recreational uses and areas near the project site that could be affected by construction and routine operation at the project site. The study area also includes recreational uses and areas that could be affected during routine rail transport along the Puget Sound & Pacific Railroad (PS&P)[2] rail line and vessel transport through Grays Harbor out to 3 nautical miles from the mouth of the harbor.

3.10.2 What laws and regulations apply to recreation?

Laws and regulations for determining potential impacts on recreation are summarized in Table 3.10-1. More information about these laws and regulations is provided in Appendix B, *Laws and Regulations*.

Table 3.10-1. Laws and Regulations for Recreation

Regulation, Statute, Guideline	Description
Federal	
No federal laws or regulations apply.	
State	
Department of Fish and Wildlife (Fisheries) (220 WAC)	Describes regulations related to fisheries; establishes fishing seasons and limits.
Department of Fish and Wildlife (Wildlife) (232 WAC)	Describes regulations related to use of wildlife areas and game reserves; establishes hunting seasons.
Local	
Shoreline Management Master Program Regulations (HMC 11.04 and AMC 16.20)	Carries out responsibilities imposed on the respective cities by the Shoreline Management Act of 1971.

WAC = Washington Administrative Code; HMC = Hoquiam Municipal Code; AMC = Aberdeen Municipal Code

[1] Chapter 4, *Environmental Health and Safety*, addresses the potential impacts from increased risk of incidents (e.g., storage tank failure, train derailments, vessel collisions) and related consequences (e.g., release of crude oil).

[2] The PS&P rail line refers to the rail line between Centralia and the project site.

3.10.3 How were impacts on recreation evaluated?

3.10.3.1 Information Sources

Information about recreational uses and areas in the study area was obtained from the Washington Department of Fish and Wildlife (WDFW), local planning documents, scoping comments, personal communications with local planners, and a review of aerial photography. Additionally, a site visit was conducted to observe and verify recreational uses in the study area on August 13, 2014.

3.10.3.2 Impact Analysis

Impacts on recreation within 0.25 mile of the project site, along the PS&P rail line, and within and along the shoreline of Grays Harbor were qualitatively assessed based on an evaluation of how construction and routine operation of the proposed action could disturb recreational uses.

3.10.4 What recreational resources are in the study area?

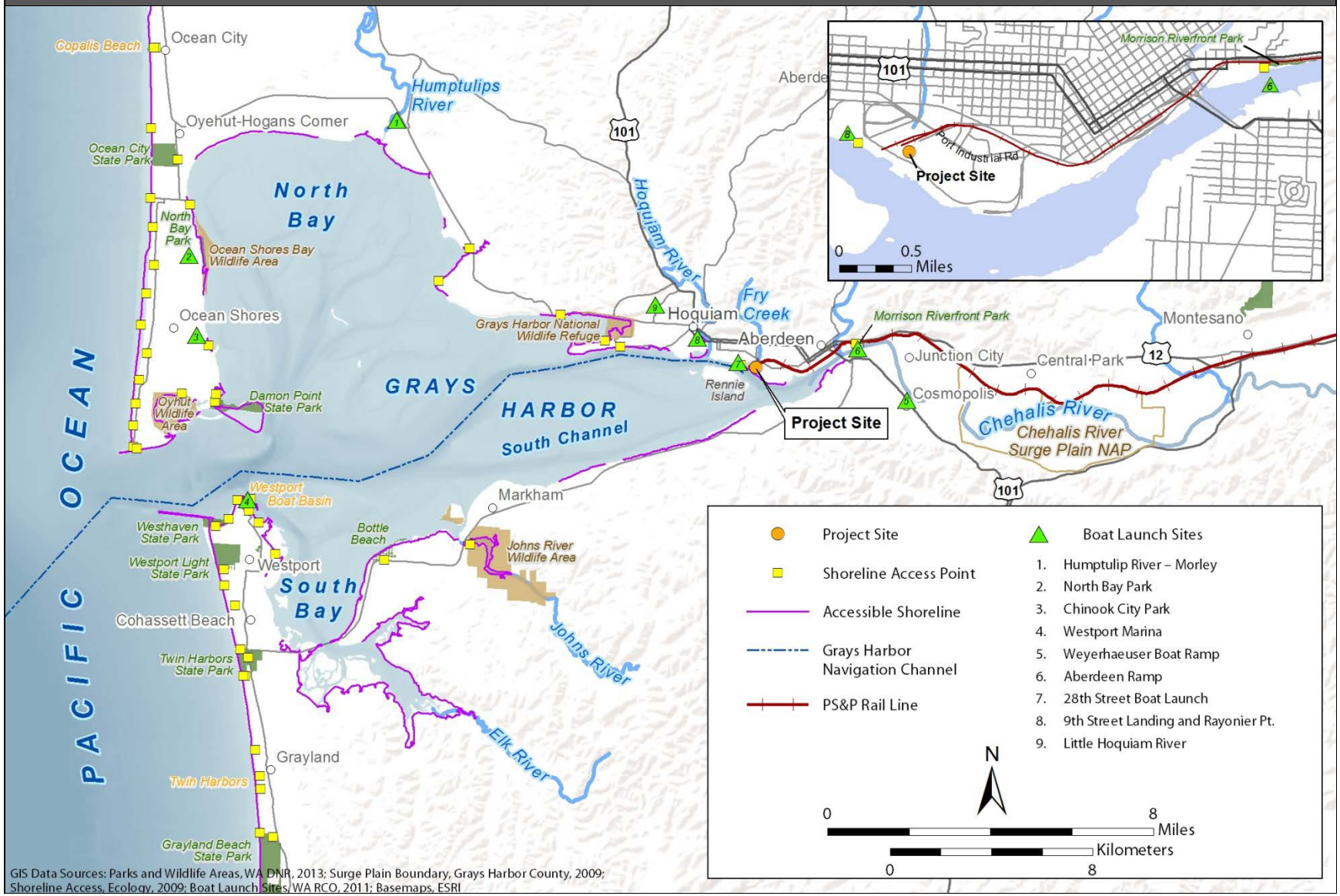
This section describes recreational uses and areas in the study area that could be affected by construction and operation of the proposed action. This section describes recreation on the project site, along the PS&P rail line, and in and along the shoreline of Grays Harbor.

3.10.4.1 Project Site

The nearest recreational amenities to the project site are the 28th Street boat launch and observation tower, located on an 0.5-acre site less than 0.25 mile northwest of the Terminal 1 dock (Figure 3.10-1). These facilities are owned by the Port of Grays Harbor (Port) and were developed as part of the approval process for the Imperium Terminal Services facility. Access to these facilities is provided by 28th Street and John Stevens Way. The boat launch includes a fishing pier and provides boaters and anglers free public access to Grays Harbor and the Chehalis River. In the fall, the boat launch is in full use and as many as 60 boats are launched daily during the height of the salmon fishing season (Port of Grays Harbor 2011). Adjacent to the boat launch is an observation tower affording visitors views of Grays Harbor, Port operations, and Rennie Island. Picnic areas are also available here. The portion of the navigation channel adjacent to the project site and continuing east is a popular area for recreational fishing, as discussed in Section 3.10.4.3, *Grays Harbor*.

Less than 0.25 mile north of the project site is a, 3.5-acre neighborhood park called West End Park. This park is located within the city limits of Aberdeen and includes an open playfield with basketball courts and a softball diamond. Support facilities such as parking and bathrooms are also available (City of Aberdeen 2011).

Figure 3.10-1. Public Recreation Areas



3.10.4.2 PS&P Rail Line

Along the PS&P rail line, recreational facilities are concentrated in the more developed areas such as Hoquiam, Aberdeen, and Centralia. Facilities include community and neighborhood parks, designated waterfront recreational areas, playfields and sport facilities, and urban pathways. Along the PS&P rail line are some privately owned amenities, including golf clubs and exhibition centers. A large area along the rail corridor consists of forested open spaces that offer outdoor recreational activities. Within this area, state forests and parks, protected natural areas, and designated recreational areas provide activities such as hiking, camping, fishing, kayaking, canoeing, and wildlife viewing.

State and City Parks

Numerous state and city parks provide opportunities for outdoor recreation and day use near the PS&P rail line. The larger state and local parks are listed in Table 3.10-2 along with a general description of their facilities and recreational opportunities. Several smaller city or neighborhood parks (1 to 3 acres) are also located in the larger cities along the rail line, and these include landscaped or manicured areas, athletic fields and courts, and picnic facilities.

Table 3.10-2. State and City Parks along the PS&P Rail Line

Park	Description
West End Playfield (Aberdeen)	3.5-acre neighborhood park with playground equipment, combination ball field, parking area, and paved multipurpose park.
Morrison Riverfront Park (Aberdeen)	11-acre complex on the Chehalis River with Rotary Log Pavilion, picnic tables, fishing and viewing dock, and a 1.35-mile landscaped trail.
John W. Vessey Memorial Ball Park (Montesano)	Less than 1-acre athletic facility used for girls' softball.
Lake Sylvia State Park (Montesano)	233-acre camping park with 15,000 feet of freshwater shoreline. Facilities offer campsites, a fishing dock and boat ramp, 5 miles of hiking and biking trails, and playground equipment.
Gladys Smith Park/Lloyd Murray Park (Elma)	10-acre park with playfields for baseball, softball, and soccer. Includes picnic tables and playground facility.
Cedar Park (Centralia)	Less than 1-acre park with playground equipment, picnic tables, tennis court, basketball court, and site furnishings.

Natural Areas

Natural areas along the PS&P rail line range from approximately 100 acres to 100,000 acres, and offer opportunities for wildlife viewing, bird watching, hiking, fishing, and hunting. Table 3.10-3 provides a general description of the facilities and recreational opportunities at natural areas along the PS&P rail line.

Table 3.10-3. Natural Areas along the PS&P Rail Line

Natural Area	Description
Chehalis River Surge Plain	3,018-acre natural area maintained by WDNR, located just upstream from where the Chehalis River empties into Grays Harbor. Comprises protected high-quality tidal surge plain wetland, the largest in Washington. Includes sloughs that shelter salmon and other fish and supports birds such as osprey, bald eagles, and Olympic mudminnows. Public access is provided. Offers 3.5-mile interpretive trail for hiking, bird watching, and educational use along the southern margin. Other activities include bank fishing, kayaking, and canoeing. Hunting is limited.
Capitol State Forest	91,650-acre working forest and recreation area east of the rail corridor from Elma to Oakville. Managed by WDNR. Includes camping facilities, hiking, hunting, horseback riding, and areas for vehicle off-roading.
Black River Habitat Management Area	109-acre WDFW management area in Rochester. Provides habitat for upland birds and waterfowl and offers fishing.
Black River Preserve	320-acre preserve owned by The Nature Conservancy near Rochester offering wildlife viewing accessible by canoe or kayak only.

WDNR = Washington State Department of Natural Resources; WDFW = Washington Department of Fish and Wildlife

Recreational Fishing

As discussed in Section 3.3, *Water*, the PS&P rail line largely parallels the Chehalis River (within 0.1 mile). This waterway and its primary tributaries support recreational fishing from Grays Harbor to Centralia; however, fishing upriver from Porter is limited (Hiss and Knudsen 1993). Recreational fishing (both bank and boat fishing) typically runs from early May through January. Recreational fish species in the Chehalis River system include salmon, steelhead, trout, and some warmwater species. Several boat launches provide access the river: including the 28th Street boat launch (east Hoquiam), 9th Street Landing and Rayonier Point (Hoquiam), Pakonen Ramp (south Aberdeen), Weyerhaeuser Boat Ramp (Cosmopolis), Friends Landing Boat Ramp (Montesano), and Montesano Boat Launch (south Montesano).

3.10.4.3 Grays Harbor

The shoreline of Grays Harbor provides an abundance of opportunities for hiking, biking, picnicking, wildlife viewing, bird watching, and hunting at the numerous state and city parks and designated wildlife areas that surround the harbor. Miles of public shoreline with abundant public access provide opportunities for beachcombing and shellfishing; public boat launches provide access for recreational fishing and boating. Wave riding and surfing are other popular activities near the south jetty. The parks, wildlife areas, public shorelines, and public boat launches are shown on Figure 3.10-1 and described further in the sections below.

State and City Parks

Numerous state and city parks provide opportunities for outdoor recreation and day use near Grays Harbor. The larger state and local parks are listed in Table 3.10-4 along with a general description of their facilities and recreational opportunities. Several smaller city or neighborhood parks (1 to 3

acres) are also spread widely across the areas surrounding the harbor, and these include landscaped or manicured areas, athletic fields and courts, and picnic facilities.

Table 3.10-4. State and City Parks around Grays Harbor

Park	Description
Damon Point State Park (southeast Ocean Shores Peninsula)	61-acre day-use park at the southeastern tip of the Ocean Shores Peninsula with a walk along a 1-mile-long, 0.5-mile-wide stretch of land jutting out to the ocean. Activities include bird watching, wildlife viewing, hiking, picnicking, fishing, clamming, crabbing, rock collecting, and beachcombing.
Westhaven State Park (Westport)	79-acre day-use park near the City of Westport on the Pacific Ocean and Half Moon Bay. Activities include picnicking, fishing, clamming, horseback riding, kite flying, crabbing, surfing, scuba diving, and beachcombing.
Westport Light State Park	212-acre park on the Pacific Ocean adjacent to the historic Westport Lighthouse. Activities include hiking, fishing, beachcombing, and bird watching.
Westport City Park	7-acre park east of Westport Light State Park. Facilities include a covered picnic shelter, children's play area, tennis court, softball field, hiking trails, BMX track, and community house.
Bottle Beach State Park	75-acre day-use park in Ocosta with 6,000 feet of shoreline on Grays Harbor. Activities include bird and wildlife viewing, and a walking trail is provided.
North Bay Park	7-acre city park in Ocean Shores between the Ocean Shores Wildlife Area and Duck Lake. Facilities include a boat launch, fishing dock, athletic fields and courts, playground, and picnic shelter.
Ocean City State Park	170-acre camping park in Ocean City. Activities include camping, hiking, beachcombing, and bird watching.
Twin Harbors Beach State Park	172-acre camping park along the Pacific Coast approximately 4 miles south of Westhaven. Activities include camping, hiking, beachcombing, and wildlife viewing.

Natural Areas

Natural areas along Grays Harbor range from 185 acres to more than 3,000 acres, and offer opportunities for wildlife viewing, bird watching, hiking, fishing, and hunting. Table 3.10-5 provides a general description of the facilities and recreational opportunities offered at designated wildlife areas along Grays Harbor.

Table 3.10-5. Natural Areas around Grays Harbor

Natural Areas	Description
Oyhut Wildlife Recreation Area	682-acre wildlife area managed by WFDW at the southern end of the Ocean Shores peninsula. Features wetlands and tidal flats that shelter coastal birds, including blue herons, brown pelicans, pheasants, and federally listed (threatened) snowy plovers. Serves as a popular migrant stop for these birds and is a site for bird watching.
Ocean Shores Airport Unit	185-acre wildlife area managed by WFDW in Ocean Shores and adjacent to the harbor. Offers year-round birding opportunities and is popular for waterfowl hunting.
Grays Harbor National Wildlife Refuge	1,500-acre wildlife refuge managed by USFWS in the Grays Harbor estuary along the northeastern shore. Encompasses intertidal mudflats, salt marsh, and uplands, including the Bowerman Basin, an arm of Grays Harbor that is a world-renowned bird-watching area particularly during the spring and fall shorebird migration. Although limited, recreational activities allowed include wildlife viewing, photography, and nature study. No fishing or hunting is allowed on the refuge. Visited by over a million travelers each year (U.S. Fish and Wildlife Service 2012).
Johns River Unit, State Wildlife Area	1,500-acre area managed by WFDW in the Johns River State Wildlife Area approximately 6 miles southwest of Hoquiam. Comprises extensive mudflats and swamps that have formed behind old dikes that create prime habitat for numerous types of wildlife and waterfowl. Includes a boat launch and trails for easy public access. Hiking, wildlife viewing, fishing, and hunting are popular activities in the wildlife area.

WDFW = Washington Department of Fish and Wildlife; USFWS = U.S. Fish and Wildlife Service

Recreational Activities

Recreational activities and facilities in and along the harbor are focused on fishing, shellfishing, bird watching, and whale watching.

Fishing

Grays Harbor and several large rivers that empty into the harbor (Chehalis, Wishkah, Hoquiam, Humptulips, and Johns Rivers) provide excellent opportunities for recreational saltwater and freshwater fishing for salmon, steelhead, sturgeon, and other game fish.

Grays Harbor is a very popular small-boat fishing area, especially for large Chinook and coho salmon. Major access points include the 28th Street boat launch, Westport, Ocean Shores, and Johns River; several smaller public boat launches provide access to the water (Table 3.10-6; Figure 3.10-1). The protected nature of Grays Harbor allows small boats access to exceptional salmon fishing. Recreational fishing is open throughout the harbor but tends to concentrate in the navigation channel east of the Hoquiam River (near the project site and continuing east) and in the south channel (Figure 3.10-1), east of Johns River (Scarp pers. comm.). Most recreational salmon fishing occurs in September and early October before the commercial fishery commences (Washington Department of Fish and Wildlife 2015a). Typically, recreational fishing is limited to daylight hours. WDFW fishing regulations identify closures at night by species, location, and season.

Chartered ocean fishing for albacore tuna, Pacific halibut, rockfish, lingcod, and salmon is available from the Westport Marina, Washington's largest fish-landing port. Bank fishing is available from the

boardwalks, jetty, and piers near the Westport Marina and on the east end of the harbor near the Morrison Riverfront Park.

Grays Harbor facilities providing moorage and access for recreational fishing boats are described below. Refer to Section *3.5, Animals,* for more information on the fisheries in Grays Harbor.

Westport Marina

The Westport Marina, located on a peninsula on the south side of the entrance to Grays Harbor, is home to over 200 commercial fishing vessels and many recreational boats in Grays Harbor. It has designated moorage slips for guest boats and a public boat launch ramp. Westport Marina has 21 floats with 650 boat slips. It is Washington's largest fish landing port, providing loading and fuel docks and on-shore processing and service facilities (WorleyParsons 2014).

Public Boat Launches

Public boat launches providing public access for recreational boating and fishing at Grays Harbor are listed in Table 3.10-6 along with a description of each facility's amenities and capacity for car and trailer parking. Smaller facilities typically have a single concrete or gravel boat ramp with parking capacity for up to 10 cars and between 5 and 25 trailers. Larger facilities have more than one boat ramp and substantially greater capacity for parking cars and trailers. For example, the Weyerhaeuser boat launch has two boat ramps and parking for 50 cars and 50 trailers, while the Westport Marina has three boat ramps and parking for 100 cars and 135 trailers.

Recreational boating activity fluctuates significantly depending on season, day of the week, and weather conditions. Peak boat activity in Grays Harbor is usually concentrated on weekend days during open salmon fishing season, typically from June to October, and particularly when the weather is warm and sunny. Much of the in-harbor sports-fishing activity is further concentrated in the second half of September and the first half of October. However, even in high season, the density of recreational boats and fishing vessels in Grays Harbor is considered to be low (WorleyParsons 2014).

Table 3.10-6. Public Boat Launches

Boat Launch	Description of Amenities
Humptulips River – Morley Site Manager: WDFW	• 1 concrete plank ramp • 5 gravel car parking spaces • 7 gravel trailer parking spaces
North Bay Park Site Manager: City of Ocean Shores	• 1 loading float • 1 concrete plank ramp • 7 paved car parking spaces • 10 paved trailer parking spaces
Chinook City Park Site Manager: City of Ocean Shores	• 1 loading float • 1 concrete plank ramp • 10 gravel car parking spaces • 5 gravel trailer parking spaces
Ocean Shores Marina Site Manager: Quinault Indian Nation	• 1 concrete ramp • 20 paved car parking spaces • 50 paved trailer parking spaces • Boat moorage is available at the marina

Boat Launch	Description of Amenities
Little Hoquiam River Site Manager: Hoquiam Parks & Recreation Department	• 1 concrete plank ramp • 10 gravel car parking spaces • 25 gravel trailer parking spaces
9th Street Landing and Rayonier Point Site Manager: Hoquiam Parks & Recreation Department	• 1 gravel ramp • 7 gravel car parking spaces • No trailer parking
28th Street Boat Launch Site Manager: Port of Grays Harbor	• 1 loading float • 1 concrete plank ramp • 10 gravel car parking spaces • 8 gravel trailer parking spaces
Aberdeen Ramp Site Manager: City of Aberdeen	• 1 concrete plank ramp • 5 gravel car parking spaces • 5 gravel trailer parking spaces
Weyerhaeuser Boat Ramp Site Manager: Weyerhaeuser Company	• 1 asphalt ramp • 1 gravel ramp • 50 gravel car parking spaces • 50 gravel trailer parking spaces
Westport Marina Site Manager: Port of Grays Harbor	• 3 asphalt ramps • 2 loading floats • 100 paved car parking spaces • 135 gravel trailer parking spaces • Boat moorage is available at the marina

Source: Grays Harbor Chamber of Commerce 2000
WDFW = Washington Department of Fish and Wildlife

Shellfishing

Razor clams are found primarily on the intertidal coastal beaches (those that are exposed at low tide) from a +3 foot tide level to a -2 foot tide level. The Washington Department of Fish and Wildlife manages two razor clam harvest areas near Grays Harbor.

- **Copalis Beach**. Harvests are managed from the north jetty at the mouth of Grays Harbor to the Copalis River.
- **Twin Harbors**. Harvests are managed from the Willapa Bay north to the south jetty at the mouth of Grays Harbor.

Razor clam seasons are variable and occur only after clam samples have been tested by Washington Department of Health and are found to be safe for human consumption. Seasons are set to allow digging during daylight spring tides when there is better weather and again during the fall and winter (Washington Department of Fish and Wildlife 2015b).

Crabbers in the harbor use crab pots to catch Dungeness and red rock crabs; however, crabs are also caught using ring nets and dip nets and by wading in shallow water during spring and early summer. The season for crabbing by use of crab pots is limited (December 1 through September 15), whereas fishing with other crab gear is open all year. Public access for crabbing is available at the Westport Boat Basin. Crabbing is allowed off any of the floats in this area as well as off the walkway along the top of the breakwater (Washington Department of Fish and Wildlife 2015c).

Bird Watching

Bird watching is a very popular recreational activity at the harbor, particularly in springtime with the peak bird migration typically in late April and early May. The Grays Harbor estuary offers many opportunities for excellent bird watching, notably at the Grays Harbor National Wildlife Refuge during the Grays Harbor Shorebird Festival. This event (hosted by the Grays Harbor Audubon Society, Grays Harbor National Wildlife Refuge, the City of Hoquiam, and local sponsors) is scheduled during the annual migration of hundreds of thousands of Arctic-bound shorebirds as they rest and feed at the estuary (Shorebird Festival 2015). Thousands of visitors attend the festival's activities, which include shorebird viewing, field trips, lectures, and a birding market place and nature fair.

Whale Watching

Whale watching off the coast of Washington peaks between March and May as gray whales migrate between feeding grounds in the North Pacific and breeding lagoons in Baja California. Humpback whale sightings are often reported as the whales travel along the coast near the mouth of Grays harbor, but humpbacks are rarely reported entering the bay itself (Orca Network 2013 in U.S. Army Corps of Engineers 2014: 88). Gray whale use of Grays Harbor is well documented, especially during migrations along the coast (Washington Department of Fish and Wildlife 1997). During this time, Pacific gray whales can be spotted from shore, within and beyond the entrance to Grays Harbor, or from one of many chartered whale-watching boats departing from Westport.

3.10.5 What are the potential impacts on recreation?

This section describes impacts on recreational uses and areas that could occur in the study area. Potential impacts of the no-action alternative are described first, followed by potential impacts of the proposed action.

3.10.5.1 No-Action Alternative

Under the no-action alternative, impacts related on recreation from the construction of the proposed action would not occur. The applicant would continue to operate its existing facility as described in Chapter 2, Section 2.1.3.2, *Existing Operations*. Although the proposed action would not occur, it is assumed that growth in the region would continue under the no-action alternative. This growth could lead to development of another industrial use at the project site, which could result in impacts similar to those described for construction and routine operation of the proposed action. However, for the purposes of this analysis, it is assumed that no future development would occur at the project site.

As discussed in Section 3.15, *Rail Traffic*, it is assumed that rail traffic would not increase between 2017 and 2037. Therefore, there would be no impacts on recreation from increase rail traffic under the no-action alternative.

As discussed in Section 3.17, *Vessel Traffic*, large commercial vessel trips are projected to increase from 338 in 2017 to 436 in 2037 and Terminal 1 berth occupancy is expected to increase slightly. This additional activity would proportionally increase the potential for impacts on recreational vessels compared to existing conditions. However, because recreational fishing and boating is highly seasonal and even at the height of the season the boat density is considered low by both the pilots

and the U.S. Coast Guard (WorleyParsons 2014), potential conflicts are not anticipated to be frequent or to last for a substantial amount of time.

3.10.5.2 Proposed Action

This section describes the impacts that could occur in the study area as a result of construction and routine operation of the proposed action. First, this section describes impacts from construction of the proposed action. It then describes impacts of routine operation at the project site and of routine rail and vessel transport to and from the project site.

Construction

Construction activities could have impacts on recreation if they were to limit access to recreational facilities or conflict with recreational uses (e.g., increased noise levels or visual changes that affect the recreational experience). Construction-related impacts could occur as a result of construction vehicles entering and leaving the project site and generating noise or obstructing views.

Construction vehicles would access the site from Port Industrial Road and are not likely to block or reduce vehicle access to the 28th Street boat launch, fishing pier, viewing tower, or nearby parks. No in-water construction or access to the project site by water is proposed; therefore, the activities would not conflict with in-water recreation near the project site.

As discussed in Section 3.7, *Noise and Vibration*, construction activities, primarily pile driving, would result in increased noise levels that could disturb surrounding recreational uses. Although noise would increase above ambient conditions, construction noise would be short term (up to approximately 22 months) and would not represent permanent changes to the environment.

Operations

This section describes impacts that would occur as a result of routine operations at the project site, rail transport along the PS&P rail line, and vessel transport through Grays Harbor.

Onsite

The proposed action could affect recreation if onsite operations block access to recreational facilities or conflict with adjacent recreational uses (e.g., increased noise levels or visual changes that affect the recreational experience). Because onsite operations would occur entirely within the boundaries of the project site, these activities would not block access to offsite recreational facilities. Tank vessels at berth during vessel loading would restrict recreational boating and fishing access to the area adjacent to the Terminal 1 dock. A vessel would occupy this area for up to 119 days per year[3] compared to 58 days per year under the no-action alternative. Impacts on recreational boaters would be low because boaters could access other boating and fishing areas throughout the harbor, including popular areas in the south channel east of Johns River and the navigation channel east of the project site.

As noted in Section 3.7, *Noise and Vibration*, operational noise levels would be similar to existing noise levels at the project site and would be consistent with current uses surrounding the project site. Although new facilities (e.g., new storage tanks, hose tower or loading arm, and new marine

[3] Assumes all vessels are tank barges with maximum 24-hour berth occupancy.

vapor control system) would be visible from the 28th Street viewing tower and boat launch, as discussed in Section 3.9, *Aesthetics, Light, and Glare*, these facilities would visually blend in with the existing infrastructure. These new features, once implemented, would not be very noticeable to viewers from nearby recreational uses. See Section 3.10.7.1, *Voluntary Measures and Design Features*, for the commitment by the applicant to halt crude oil vessel-loading operations for a period of 2 weeks each year overlapping with the Shorebird Festival.

Rail

Operation of the proposed action at maximum throughput would add 458 unit train trips[4] per year (1.25 trips per day on average) along the PS&P rail line to the approximately 1,100 train trips per year (three trips per day on average) under the no-action alternative (Section 3.15, *Rail Traffic*). This increased traffic could affect recreational uses along the PS&P rail line because of increased noise and limitations to access, which are discussed in Section 3.7, *Noise and Vibration*, and Section 3.16*, Vehicle Traffic and Safety,* respectively.

As noted in Section 3.7, *Noise and Vibration*, the passing of a train (including sounding horns for safety at PS&P rail line grade crossings) would generally increase the average noise levels along the PS&P rail line; however, the maximum level of noise associated with a single passby likely to be experienced by recreational areas would not change. This is because all trains would continue to travel at the same speeds and would continue to sound horns consistent with existing operational practices. As noted above, the number of events per day would increase by approximately one trip per day on average. This increased train noise could cause temporary disturbance to surrounding recreational uses, during the passage of a train. Given that the recreational uses present along the PS&P rail line already experience noise levels associated with rail operations and the temporary nature of the noise, noise impacts from the additional rail traffic under the proposed action are considered low.

Increased rail traffic along the PS&P rail line could also affect recreation if the trains block access to a recreational area for an extended period. This would occur in situations where the only public access is from roadways that cross the PS&P rail line. With the exception of the Morrison Riverfront Park, all the other recreational areas listed in Section 3.10.4.2, *PS&P Rail Line*, can be accessed by multiple roadways. Additionally, as discussed in Section 3.16, *Vehicle Traffic and Safety*, for the majority of the rail line, the increase in blockages would not result in a substantial decline in the level of service. Although the potential for an individual to encounter a train at any PS&P rail line grade crossing would increase to four times per day on average, compared to three times per day under the no-action alternative, the likelihood and duration of an individual experiencing a delay would be similar to the no-action alternative.

Morrison Riverfront Park, which can only be accessed through entrances to the Olympic Gateway Plaza, would be blocked more frequently. As described in Section 3.15, *Rail Traffic*, operation of the proposed action at maximum throughput would block all access points to the Olympic Gateway Plaza area more frequently, an average of four more times per week compared with four times per week under the no-action alternative. Per event, the length of additional time that all access to the plaza would be blocked would increase from approximately 35 minutes to 45 minutes under the

[4] A trip represents one-way travel; in other words, an inbound trip and an outbound trip are counted as two trips.

proposed action. The potential impacts on vehicle delay and mitigation measures to address delay are discussed in Section 3.16, *Vehicle Traffic and Safety*.

An analysis of potential impacts from increased risk of incidents (e.g., train derailments) and related consequences (e.g., release of crude oil) is provided in Chapter 4, *Environmental Health and Safety.*

Vessel

As described in Section 3.17, *Vessel Traffic*, operation of the proposed action at maximum throughput would add 238 tank vessel trips per year (0.7 trip per day on average) along the navigation channel to projected large commercial vessel trips under the no-action alternative—between 338 and 436 large commercial vessel[5] trips per year in 2017 and 2037, respectively, or approximately one trip per day on average. This increased traffic could affect recreational activities in the harbor, including boating and fishing, by restricting access to certain areas in the harbor. Because vessel traffic under the proposed action would be limited to the navigation channel, impacts on recreational uses in the harbor but outside the channel are not expected. As noted in Section 3.10.4.3, *Grays Harbor*, and shown in Figure 3.10-1, with the exception of the 28th Street boat launch, all other major access points for recreational boaters would be distant and not affected by vessel traffic under the proposed action. Because recreational boats are smaller and are not limited to using the navigation channel, it is expected that recreational boaters would have sufficient room to navigate safely away from the launch into the harbor and would not be substantially affected by vessels passing through the navigation channel.

As noted in Section 3.10.4.3, *Grays Harbor*, recreational fishing does occur within the navigation channel, primarily in the fall (September and early October). As explained in Section 3.17, *Vessel Traffic*, this area would not be accessible while a vessel was making the trip to and from the project site. Although vessels would occupy the berth more frequently (as addressed for onsite impacts), the potential impacts related to vessel transport would be limited to the time required for a vessel to move through the navigation channel (approximately 2 hours one-way). Recreational fishing and boating is highly seasonal, and even at the height of the season, the boat density is considered low by both the pilots and the U.S. Coast Guard (WorleyParsons 2014), meaning potential conflicts are not anticipated to be frequent or to last for a substantial amount of time. Additionally, as noted in Section 3.17, alternative fishing areas include the south channel, east of Johns River, which would not be affected by vessel traffic under the proposed action. For these reasons, impacts on recreation associated with vessel transport would be low. The measure identified in Section 3.10.7.2, *Applicant Mitigation*, to announce project-related vessel traffic arrivals and departures would further reduce impacts.

An analysis of impacts from increased risk of incidents (e.g., vessel collisions) and related consequences (e.g., release of crude oil) is provided in Chapter 4, *Environmental Health and Safety.*

3.10.6 What required permits and plans apply to recreation?

No required permits or plans apply to recreation.

[5] The term *large commercial vessels* refers collectively to tank and cargo vessels.

3.10.7 What mitigation measures would reduce impacts on recreation?

This section describes the voluntary measure and applicant mitigation that would reduce impacts on recreation from construction and routine operation of the proposed action. Mitigation measures to reduce potential impacts on environmental health and safety from increased risk of incidents and related consequences are presented in Chapter 4, *Environmental Health and Safety*.

3.10.7.1 Voluntary Measures and Design Features

The applicant has committed to the following measure.

- To acknowledge the importance of the annual Grays Harbor Shorebird Festival to the community and its visitors and to eliminate the potential for a spill from vessel-loading operations occurring during the festival, the applicant will coordinate with the City of Hoquiam to receive advance notice of the date for and will halt crude oil vessel-loading operations for a period of 2 weeks each year overlapping with the event.

3.10.7.2 Applicant Mitigation

The applicant will implement the following mitigation measure.

- While fishing boats are required to follow the U.S. Coast Guard navigation rules, to improve awareness of vessel traffic in the navigation channel, the applicant will work with the Grays Harbor Safety Committee, including the U.S. Coast Guard and Port of Grays Harbor, to establish procedures to announce project-related vessel traffic arrivals and departures over a designated VHF marine radio channel at least 1 hour before arriving and departing.

3.10.8 Would the proposed action have unavoidable and significant adverse impacts on recreation?

Increased activity at the project site and rail and vessel traffic could interfere with or disrupt recreational activities but the impact is not considered significant. Implementation of the voluntary and applicant mitigation measures listed above would further reduce these impacts. There would be no unavoidable and significant adverse impacts. Potential impacts related to increased risk of incidents and related consequences are addressed in Chapter 4, *Environmental Health and Safety*.

3.11 Historic and Cultural Preservation

Historic and cultural preservation refers to the idea that a place's value is in part derived from its heritage and that this heritage is worth preserving. In this section, the term *cultural resources* is used to refer to the broad range of resources that represent or convey this heritage, or help tell the story of a region's past. A cultural resource can be considered any building, structure, object, site, landscape, or district associated with human manipulation of the environment. These resources are often valued by a particular group of people (monetarily, aesthetically, or religiously), and can be historic in character or date to the prehistoric past (i.e., prior to written records).

Three categories of cultural resources are discussed in this section: archaeological resources, historic resources, and culturally significant properties. Archaeological resources encompass features and deposits located on or below the ground surface that are evidence of prior human occupation or use in a particular area. Historic resources include elements of the built environment, such as buildings or structures, or human-made objects or landscapes. Finally, culturally significant properties are sites or locations considered culturally important to the history of a group or people, or sites where culturally important events or practices are known to have occurred.

In contrast, *tribal resources* refers to the collective rights and resources associated with a tribe's sovereignty or formal treaty rights, or their interest in and use of resources within a particular sphere of influence. Such resources may include cultural resources but may equally encompass elements of the natural environment, such as fisheries or the use and availability of plants and wildlife. Because tribal resources span many of the resource areas addressed in this environmental impact statement, the analysis of potential impacts on tribal resources is addressed separately, in Section 3.12, *Tribal Resources*.

This section describes cultural resources in the study area. It then describes impacts on cultural resources that could result under the no-action alternative or as a result of the construction and routine operation[1] of the proposed action. Finally, this section presents any measures identified to mitigate impacts of the proposed action and any remaining unavoidable and significant adverse impacts.

3.11.1 What is the study area?

The study area for cultural resources consists of the cultural resources on and near the project site that could be affected by construction and routine operation at the project site. The study area also includes cultural resources that could be affected during routine rail transport along the Puget Sound & Pacific Railroad (PS&P)[2] rail line and vessel transport through Grays Harbor.

[1] Chapter 4, *Environmental Health and Safety*, addresses the potential impacts from increased risk of incidents (e.g., storage tank failure, train derailments, vessel collisions) and related consequences (e.g., release of crude oil).
[2] The PS&P rail line refers to the rail line between Centralia and the project site.

3.11.2 What laws and regulations apply to cultural resources?

Laws and regulations for determining potential impacts on cultural resources are summarized in Table 3.11-1. More information about these laws and regulations is provided in Appendix B, *Laws and Regulations*.

Table 3.11-1. Laws and Regulations for Cultural Resources

Laws and Regulations	Description
Federal	
National Historic Preservation (16 U.S.C. 470a)	The NRHP is the official list of the nation's historic places worthy of preservation and is administered by the National Park Service as part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect America's historical and archeological resources.
State	
Indian Graves and Records (RCW 27.44)	Protects Native American graves and burial grounds, encourages voluntary reporting of said sites when they are discovered, and mandates a penalty for disturbance or desecration of such sites.
Archaeological Sites and Resources (RCW 27.53)	Governs the protection and preservation of archaeological sites and resources and establishes DAHP as the administering agency for these regulations.
Abandoned and Historic Cemeteries and Historic Graves (RCW 68.60)	Protects and preserves abandoned and historic cemeteries and historic graves.
Local	
Municipal Historic Preservation Ordinances (HMC 10.06 and AMC 17.50)	Safeguards the heritage of Aberdeen and Hoquiam by the identification, evaluation, designation, and protection of historic properties. Maintains a local register of historic places in each community.

U.S.C. = United States Code; NRHP = National Register of Historic Places; RCW = Revised Code of Washington; DAHP = Washington State Department of Archaeology & Historic Preservation; HMC = Hoquiam Municipal Code; AMC = Aberdeen Municipal Code

3.11.3 How were impacts on cultural resources evaluated?

This section describes the sources of information and methods used to evaluate impacts.

3.11.3.1 Information Sources

A literature review and records search was conducted to establish the historic context for the study area using the following sources of information.

- Washington State Department of Archaeology & Historic Preservation's (DAHP) Washington Information System for Architectural and Archaeological Records Database (WISAARD) for previously completed cultural resources studies and previously documented archaeological, ethnographic, and historic resources within a 1-mile radius of the project site.
- Additional primary and secondary resources from local repositories.

- Cultural resources studies recently performed for the proposed action, supplemented by additional historical and geological documentary research. No subsurface investigations within or near the project site were conducted by these studies.
- Geological and historical documents that characterize the local geology and landform development history.
- Property-specific archival information about the project site and immediate vicinity.
- A reconnaissance-level survey of all buildings and structures determined to be 45 years of age or older at or within 300 feet of the project site.
- Excavation of 11 subsurface geoarchaeological borings in the project site. The locations and methods of these units were determined based on the consideration of previous cultural resource studies performed in the study area, a review of supplemental historical and geological research documents, and consultation with DAHP. The subsurface investigations were performed in accordance with the cultural resources workplan, which was developed based on comments and feedback from DAHP.
- Review of the sedimentary and stratigraphic data obtained during the subsurface archaeological investigations.

3.11.3.2 Impact Analysis

Data used in the identification and evaluation of cultural resources in the study area were collected from the sources described above. Appendix J, *Cultural Resources Technical Report*, describes these efforts and their results in detail.

For historic resources, identified buildings and structures 45 years of age or older on or adjacent to the project site were evaluated to determine their eligibility for listing in the National Register of Historic Places and the Washington Heritage Register. For archaeological resources, subsurface investigations at and near the project site included mechanical trenching and geoarchaeological borings. The mechanical trenches were excavated in unpaved areas to a maximum vertical reach of 24 feet, where possible. Geoarchaeological borings were used to sample soils in paved areas and to supplement the mechanical trenching. They were excavated to a minimum depth of 40 feet below the ground surface in all instances. Sediment samples from the geoarchaeological borings were screened through 0.25-inch hardware cloth to identify any artifacts.

An assessment of collected information identified the potential for impacts on cultural resources in or near the project site. A review of field notes combined with previous geotechnical and geoarchaeological findings, for example, were conducted to identify the stratigraphy and age of sediments within the project site and its vicinity. In addition, 68 radiocarbon samples from four studies, including one sample collected during the current archaeological investigations, were compiled to establish past changes of sea level in the Grays Harbor Basin. These efforts helped determine the chronology of the landform creation in the project site and its potential to contain archaeological resources.

Impacts on cultural resources along the PS&P rail line and within Grays Harbor were assessed qualitatively based on an expectation of the types of resources likely to be present and an assessment of how they could be affected by routine operations. WISAARD was used to review previously recorded cultural resources in these areas and, along with the aforementioned information sources, used to establish possible resource types in the vicinity that could be affected.

Impacts were determined by evaluating if construction and operations would alter any characteristic of a cultural resource (archaeological, historical, or culturally significant) that qualifies the resource for inclusion in the National Register of Historic Places or Washington Historic Register, or affect a recorded archaeological site.

3.11.4 What cultural resources are in the study area?

This section describes cultural resources in the study area that could be affected by construction and operation of the proposed action. This section provides the general context for cultural resources in the study area and describes archaeological resources, culturally significant properties, and historic resources at the project site, along the PS&P rail line, and in and along the shoreline of Grays Harbor.

3.11.4.1 General Cultural Setting

This section provides the context for cultural resources in the study area.

Precontact Context

Studies of the archaeology and prehistory of the Pacific Northwest divide the prehistory of the region into multiple phases or periods from about 12,500 to 225 years before present. These periods are delineated by changes in regional patterns of land use, subsistence, and tool types over time. These phases are academic constructs and do not necessarily reflect Native American viewpoints.

Although the earliest evidence of human occupation in the Pacific Northwest dates to nearly 12,500 years ago (Carlson 1990; Matson and Coupland 1995), the precontact[3] archaeological record for the Washington coast almost exclusively consists of sites with contents that are consistent with assemblages from, or have been dated to, the Middle (3800 to 1500 before present) and Late Pacific (1800 to 1500 to about 225 before present) periods. Older, unidentified sites likely exist locally as well, because they are found elsewhere on the Pacific Northwest coast and especially on the eastern Olympic Peninsula (Wessen 1984, 1990). Few excavated archaeological sites exist in the Grays Harbor region, and nearly all of those date to within the past 1,000 years.

Ethnographic Context

The vicinity of the project site was traditionally inhabited by the Hoquiam and Wishkah people. The waters near the project site—including the mouth of the Hoquiam River—were also seasonally used for fishing by the Quinault people (Gibbs 1877; Curtis 1913; Hajda 1990). Grays Harbor was an important hub for habitation, resource collection, and travel for coastal Native American groups. It served as a passage for coastal tribes to the Puget Sound by way of the Chehalis River and to the Columbia River by way of the Chehalis River and the Cowlitz River. As a productive fishing area, Grays Harbor was used by numerous Lower Chehalis–speaking groups, as well as the Quinault (Miller 2009).

The precontact peoples of Grays Harbor area relied on fish for a large portion of their diet (Welsh 1942:10; Van Syckle 1982:74). Salmon fishing occurred throughout Grays Harbor and its associated rivers and creeks and particularly at the mouth of the Hoquiam River. Precontact peoples also

[3] Precontact refers to the period before European explorers and settlers established contact with the indigenous Native American people who inhabited the region.

caught eulachon, flounder, herring, lamprey, smelt, sole, and sturgeon (Miller 2009). The Grays Harbor shoreline provided habitat for terrestrial mammals, avians, and plant resources. Game included bear, beaver, deer, elk, and otter. Edible plants, such as berries, roots, and bulbs, were collected along the rivers and tide prairie. Sweetgrass (a particularly important traditionally used plant), cattail, swampgrass, and stinging nettle were collected for weaving and textiles. Nettle was also used to make nets and line for fishing (Miller 2009).

Historic Context

The Washington Territory was established in 1853, and Chehalis County (whose name was changed to Grays Harbor County in 1915) was formed the following year. The area's earliest settlers were typically cattle and dairy farmers who cleared the land. Several communities emerged to support this early settlement. Cosmopolis, a lumber-company town, was founded in the early 1850s on the Chehalis River's south shore, approximately 3.5 miles east of present-day Aberdeen, followed by the towns of Hoquiam and Aberdeen in the late 1850s.

By the mid-1860s, the land along the lower Hoquiam River was largely settled. However, Hoquiam and other Grays Harbor communities remained largely isolated, with only a few farms and established transportation routes until the 1880s. Shipping routes between Grays Harbor communities and other cities nationwide soon enabled the development of the region's logging and timber industries (Van Syckle 1982). During this period, Hoquiam and Aberdeen transformed from small agricultural communities into modern industrial cities. By 1881, local lumber mills began to export lumber to distant markets. By 1890, the local lumber industry had evolved into a large-scale commercial business and one of the most important lumber-shipping ports on the west coast.

Because Grays Harbor was not the primary consumer of most of its wood products, transportation of the milled and raw lumber played a key role in the development of the region's industry and local economy. The two primary modes of transportation were by ship or by rail.

Initially, most finished lumber was shipped by water to distant customers, despite the difficulties of navigating Grays Harbor. The first dredging of the Grays Harbor Navigation Channel began in 1889. Regular dredging to provide safe passage for ships continued well into the 20th century and remains a significant issue today.

The Northern Pacific Railroad was the first major rail line to serve the Grays Harbor region, spurring the early growth of Aberdeen, Hoquiam, and other communities that competed to become the railroad's west coast terminus. The first portions of the Northern Pacific Railroad's Grays Harbor Branch were completed in 1892. In 1898, the Northern Pacific Railroad extended the Grays Harbor Branch rail line an additional 4.6 miles over the Wishkah and Hoquiam Rivers, through central Aberdeen to Hoquiam. The railroad was later connected to three transcontinental routes. Today, the route is operated by PS&P and services the Port of Grays Harbor (Port) and other area industries.

The Port was first established in 1911. Initial improvements included dredging navigation channels, adding piers and slips, filling tidelands, adding a railroad avenue in Hoquiam, and removing two bends in the Wishkah River. Terminal 1, the Port's first public terminal facility, was constructed at Cow Point in 1921 and 1922. It was purposely located between Hoquiam and Aberdeen to prevent disputes over which town would benefit more from future improvements. The dock at Cow Point, known as Pier 1, opened on September 22, 1922. It featured a 2000-foot by 300-foot dock with a slip along its west side (Slip 1). A second slip (Slip 2) was constructed east of the new pier shortly thereafter.

New development at the Port continued through the 1920s. The Great Depression abruptly ended the region's lumber boom, but the industry recovered in the postwar period. The Port established an industrial development district in the 1960s to attract new commercial and industrial industries to the area. This effort included the construction of new warehouses, manufacturing plants, and other facilities in the previously undeveloped lands around Terminal 1. The Port pursued further development in the late 1970s and 1980s, significantly altering waterfront facilities. The Port began the construction of Terminal 2 in 1979 and coordinated with the U.S. Army Corp of Engineers (USACE) to dike and fill Slips 1 and 2. Slips 1 and 2 were diked and filled by the Port beginning in 1983 to create new areas for development.

3.11.4.2 Archaeological Resources

This section describes the findings of archaeological investigations at and near the project site, considers the area's landform development, and identifies the types of archaeological resources that may occur along the PS&P rail line and in and along the shoreline of Grays Harbor.

Project Site

The project site is located in what were tidelands[4] prior to development of the Port's Terminal 1 in the early 1920s (Boersema 2013: 6-7). The tidelands were initially formed by the inundation of the Grays Harbor basin due to sea level rise over several thousand years and subsequent sedimentation caused by the Chehalis River and tidal effects. Beginning in the early 20th century, widespread and deep dredge and fill activities within and along the shoreline of Grays Harbor physically altered its elevation and disturbed its naturally deposited soils. Figure 3.11-1 shows the historical shoreline near the project site.

These changes are evident in comparisons of the U. S. General Land Office's 1860 cadastral survey map of the region and later environmental studies conducted by USACE in 1978 for the construction of Terminal 2, the expansion and modification of Terminal 1, and, in 1989, for proposed dredging and navigation channel improvements. Each of these studies provides information on changes to landforms within the project site (U. S. General Land Office 1860a, 1860b; U. S. Army Corps of Engineers 1978a, 1978b, 1989).

[4] Tidelands are submerged lands with beaches that are exposed and submerged with the movement of the tides.

Figure 3.11-1. Historical Shoreline Near the Project Site

Beginning in the early 1920s, the Port constructed Terminal 1over the tidelands at Cow Point, which involved both dredging and the placement of fill. As shown in Figure 3.11-2, Terminal 1 originally included a long dock with an excavated slip along its west side (Slip 1) and a second slip (Slip 2, location of the project site) along its east side (Ott 2010; Boersema 2013: 11–12). Both slips were diked and filled with dredge spoils from 1983 to 1992 (Boersema 2013: 11–12); Figure 3.11-3 shows conditions in 1984. Environmental impact statements prepared in response to the Port's application for these fill activities and to the construction of Terminal 2 identified the fill depths of Slip 2, where the project site is located. The fill depths of Slip 2 ranged from just below mean lower low water to 37 feet below mean lower low water (-37 feet) or between 18 and 55 feet below the current ground surface (U.S. Army Corps of Engineers 1978a, 1978b).

Geotechnical investigations performed from 1995 to 1996 and in 2006 at the adjacent Imperium Terminal Services industrial site and the subsurface archaeological investigations conducted within the project site confirmed the depths of prior dredge and fill activities in the area of Slip 2. The geotechnical investigations revealed the presence of dredge fill to a depth of around 23 meters (75 feet) below the ground surface, although this appears to be significantly deeper than the depth of the dredged slip reported by USACE in 1989. Native soils were documented below the dredge fill to a terminal excavated depth of 39.5 meters (130 feet). Other prior geotechnical investigations performed in the project site vicinity indicate that native soils transition into dense alluvial gravels and sands—inferred to be glacial outwash—at depths ranging from 39.5 meters (130 feet) to 43 meters (140 feet) (Heller and Phelps 2014).

The subsurface archaeological investigations revealed no buried surfaces or archaeological resources in the project site. Review of the sedimentary and stratigraphic data obtained during the field survey revealed two types of soil deposits. These deposits included undifferentiated fill material over underlying native soils. The undifferentiated fill ranged from around 17 feet thick along the project site's eastern margin to between 36 and 37 feet thick along its central portion. The terminal depth of the native soils beneath the undifferentiated fill was not established within the project site. It is inferred that the terminal depth of the native soils ranges from 120 to 130 feet below the ground surface (Heller and Phelps 2014; Phipps 2010).

No documented archaeological resources are known to exist in the project site and the potential to encounter yet undocumented archaeological sites is considered low. This conclusion is based on archaeological investigations conducted at and near the project site and consideration of the area's landform development.

Figure 3.11-2. Aerial View of Port of Grays Harbor circa 1920

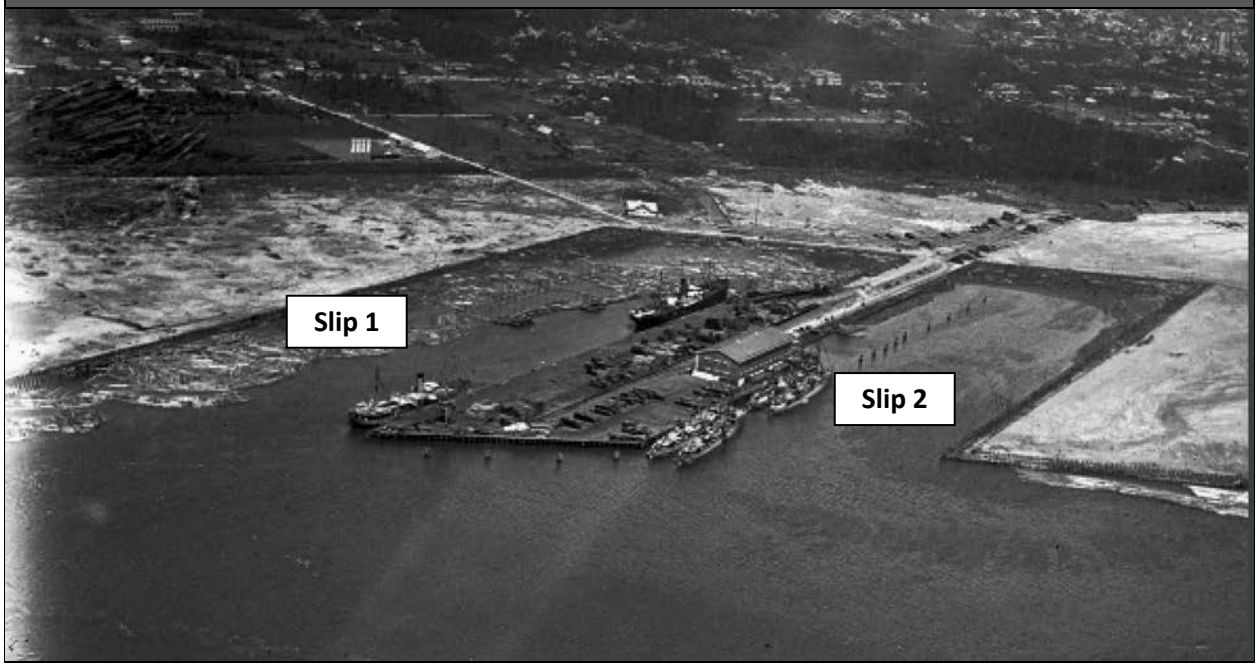


Figure 3.11-3. Aerial View of Port of Grays Harbor circa 1984

PS&P Rail Line

The precontact and ethnographic contexts of the Grays Harbor area indicate that the region was important for habitation and resource gathering, and as an inland travel corridor. Several types of archaeological resources may occur along the PS&P rail line, including historical agriculture, homestead, logging, and railroad-related properties, and precontact village sites, rock shelters, pictographs or petroglyphs, shell middens or mounds, cemeteries or burials, lithic scatters, rock alignments or stacked rock features, and fish weirs or traps.

Grays Harbor

Precontact peoples used the upland shorelines of Grays Harbor for habitation, plant gathering, and hunting; and the waters of Grays Harbor for fishing and shellfish harvesting. Of these activities, habitation and facility-based fishing tend to leave the most robust archaeological traces. Archaeological resources within and along the shoreline of Grays Harbor may consist of archaeological sites or culturally significant properties, such as historic water structures, precontact village sites, shell middens or mounds, cemeteries or burials, lithic scatters, and fish weirs or traps.

3.11.4.3 Culturally Significant Properties

No culturally significant properties are known to exist in the project site or its immediate vicinity. At least two ethnographically named places are located within a few miles, but outside, of the project site. These places are the xwəʼqwyamc (the Hoquiam River) and Ho-kwa-im-its (a village located at the mouth of the Hoquiam River). A third ethnographically named place, Cow Point, is a portion of the project site, but the primary fishing area or camp is located east of the project site. (James and Martino 1986; Miller 2009). Although other areas of ethnographic significance are undoubtedly located near the study area, they do not appear to be documented in the available literature.

Additional information on tribal resources is presented in Section 3.12, *Tribal Resources.*

3.11.4.4 Historic Resources

This section describes the results of the historic resources survey of the project site and immediate vicinity and the types of historic resources that may be present along the PS&P rail line and in and along the shoreline of Grays Harbor.

Project Site

The project site has been subject to dredge and fill activities since the early 20th century and, since the 1970s, to industrial development.

The historic resources survey identified 12 buildings and structures on and immediately surrounding the project site. Two properties were identified as being 45 years of age or older. Of these, one property is located at the project site and consists of a warehouse building, known as Warehouse E, at 3128 Port Industrial Road. It was first built as a warehouse for Terminal 1 in 1962 and was originally twice its current length. The second property is located in the study area but outside the project site. It is the California Petroleum Corporation Warehouse at 2519 West 1st Street (also known as 2421 West 1st Street). This property was previously identified and evaluated as not eligible for the National Register of Historic Places by a prior cultural resources study (Schneyder et al. 2010). None of these buildings or structures was determined to be eligible for the National Register of Historic Places or Washington Historic Register.

PS&P Rail Line

The railroad was important to the development of the region. Several types of historic resources occur along the PS&P rail line, including railroad-related structures, single-family and multifamily residences, and commercial and industrial properties.

Grays Harbor

Although a detailed evaluation of historic resources was not completed for the Grays Harbor shoreline, affected resources might consist of single-family and multifamily residences, commercial and industrial properties, and maritime-related resources.

3.11.5 What are the potential impacts on cultural resources?

This section describes impacts on cultural resources that could occur in the study area. Potential impacts of the no-action alternative are described first, followed by potential impacts of the proposed action.

3.11.5.1 No-Action Alternative

Under the no-action alternative, potential impacts on cultural resources from the construction of the proposed action would not occur. The applicant would continue to operate its existing facility as described in Chapter 2, Section 2.1.3.2, *Existing Operations*. Although the proposed action would not occur, it is assumed that growth in the region would continue under the no-action alternative. This growth could lead to development of another industrial use at the project site, which could result in impacts similar to those described for construction and routine operation of the proposed action. However, for the purposes of this analysis, it is assumed that no future development would occur at the project site.

3.11.5.2 Proposed Action

This section describes the impacts that could occur in the study area as a result of construction and routine operation of the proposed action. First, this section describes impacts from construction of the proposed action. It then describes impacts of routine operation at the project site and of routine rail and vessel transport to and from the project site.

Construction

Construction at the project site would occur on the upland flats adjacent to the current shoreline. No in-water construction is proposed. No significant or protected cultural resources—archaeological resources, historic resources, or culturally significant properties—are known to exist on or in the project site. Therefore, construction of the proposed action would not be expected to affect any cultural resources.

Because the project site is known to have been subject to previous widespread and deep dredging, there is limited potential to encounter undocumented archaeological sites. However, as described in Chapter 2, *Proposed Action and Alternatives*, construction of the proposed action would require pile driving to a depth of approximately 150 feet. Although the likelihood of encountering cultural resources is anticipated to be low, based on the results of the subsurface archaeological investigations conducted in and near the project site, undocumented resources could exist in native soil below 15 feet. The preparation of an unanticipated discovery plan, as described in Section 3.11.7.1, *Applicant Mitigation,* would address the discovery of previously unidentified archaeological resources during construction.

Operations

This section describes impacts that would occur as a result of routine operations at the project site, rail transport along the PS&P rail line, and vessel transport through Grays Harbor.

Onsite

Routine onsite operations would occur within the boundaries of the project site and would be similar in nature to existing operations at the project site. Because there are no known significant or protected cultural resources at the project site and because proposed operations would not involve ground-disturbing activities, routine onsite operations would have no impacts on cultural resources.

The operations would be similar to existing conditions. Increased traffic could affect resources located nearby as a result of visual and audible intrusions or vibrations. However, as discussed in in Section 3.7, *Noise and Vibration*, the proposed action would not increase noise or vibration on site that would adversely affect historic resources. As noted above, potential impacts related to increased risks associated with rail and vessel transport along the PS&P and in Grays Harbor are addressed in Chapter 4, *Environmental Health and Safety.*

Rail

Rail transport of crude oil under the proposed action would occur along the existing PS&P rail line. Increased rail traffic along the PS&P line under the proposed action could affect resources located nearby as a result of visual and audible intrusions or vibrations. However, as discussed in Section 3.7, *Noise and Vibration*, the proposed action would not increase vibration along the PS&P rail line that would adversely affect cultural resources. Moreover, if resources along the line contain prominent and distinctive character-defining visual features, the alteration of the views from increased traffic would not affect these resources to the extent that they would no longer be considered historically significant (Section 3.9, *Aesthetics, Light, and Glare*). Therefore, impacts on historic and cultural resources as a result of routine rail transport under the proposed action are considered low.

Vessel

Vessel transport of crude oil under the proposed action would occur within the existing navigation channel. As noted in Section 3.3, *Water*, increased vessel traffic under the proposed action could result in an incremental increase in shoreline erosion. Onshore resources could be affected if shoreline erosion altered or destroyed the landforms on or in which resources are located.

3.11.6 What required permits and plans apply to cultural resources?

No required permits or plans apply to cultural resources.

3.11.7 What mitigation measures would reduce impacts on cultural resources?

This section describes the applicant mitigation that would reduce impacts on cultural resources from construction and routine operation of the proposed action. Mitigation measures to reduce impacts on environmental health and safety from increased risk of incidents and related consequences are presented in Chapter 4, *Environmental Health and Safety*.

3.11.7.1 Applicant Mitigation

The applicant will implement the following mitigation.

- To address the risk of disturbing undocumented cultural resources, the applicant will prepare an unanticipated discovery plan to address previously unidentified archaeological resources should any be discovered during the construction of the proposed action. The applicant will submit the plan to DAHP before construction. The plan will contain provisions requiring that if archaeological resources are uncovered during excavations, construction activities will cease immediately and the applicant will notify the City of Hoquiam, DAHP, the Quinault Indian Nation, and the Confederated Tribes of the Chehalis Reservation. In such cases, the applicant will provide for a site inspection and evaluation by a professional archaeologist to ensure that all possible valuable archaeological data are properly salvaged or mapped.
- To protect archaeological resources that may occur in subsurface deposits, the applicant will have a qualified professional archaeologist monitor the ground-disturbing activities that would result in the excavation and exposure of subsurface deposits at depths greater than 15 feet below the current ground surface. If archaeological monitoring reveals fill deposits at greater depths, these results will be used to establish a 100-foot buffer around the location of the discovery in which no additional archaeological monitoring would be needed to the maximum depth at which fill deposits have been documented.

3.11.8 Would the proposed action have unavoidable and significant adverse impacts on cultural resources?

Compliance with the applicable regulations along with implementation of the mitigation measures described above would reduce impacts on cultural resources. There would be no unavoidable and significant adverse impacts. Potential impacts related to increased risk of incidents and related consequences are addressed in Chapter 4, *Environmental Health and Safety*.

3.12 Tribal Resources

In this document, tribal resources refer to the collective rights and access to traditional areas and times for gathering resources associated with a tribe's sovereignty or formal treaty rights. These resources may include plants or fish used for commercial, subsistence, and ceremonial purposes. Tribal fishing resources include catch in freshwater, Grays Harbor, and ocean fisheries.

This section describes tribal resources in the study area, including resources important to the Quinault Indian Nation (Quinault) and the Confederated Tribes of the Chehalis Reservation (Chehalis) as identified by the tribes and agencies. It then describes impacts on tribal resources that could result under the no-action alternative or as a result of the construction and routine operation[1] of the proposed action. Finally, this section presents any measures identified to mitigate impacts of the proposed action and any remaining unavoidable and significant adverse impacts.

3.12.1 What is the study area?

The study area for tribal resources consists of tribal resources on and near the project site that could be affected by construction and routine operation at the project site. The study area also includes tribal resources that could be affected during routine rail transport along the Puget Sound & Pacific Railroad (PS&P) [2] rail line and vessel transport through Grays Harbor out to 3 nautical miles from the mouth of the harbor.

3.12.2 What laws, regulations, and treaty rights apply to tribal resources?

Laws and regulations for determining potential impacts on tribal resources are summarized in Table 3.12-1. More information about these laws and regulations is provided in Appendix B, *Laws and Regulations*.

[1] Chapter 4, *Environmental Health and Safety*, addresses the potential impacts from increased risk of incidents (e.g., storage tank failure, train derailments, vessel collisions) and related consequences (e.g., release of crude oil).
[2] The PS&P rail line refers to the rail line between Centralia and the project site.

Table 3.12-1. Laws, Regulations, and Treaty Rights for Tribal Resources

Laws, Regulations, Court Cases, and Treaties	Description
Federal	
Treaty of Olympia of 1856	Set aside reservation land and reserve fishing, gathering and hunting rights for the Quinault Indian Nation throughout their usual and accustomed grounds.
Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006 (16 U.S.C. 1801 *et seq*.)	Granted the States of California, Oregon, and Washington the interim authority to manage Dungeness crab in federal coastal waters (3 to 200 nautical miles offshore). Includes provisions for treaty-reserved rights in Washington State and comanagement of crab.
Pacific Coast Treaty Indian Fisheries, Wildlife and Fisheries (50 CFR 660.50)	Describes the regulatory process to accommodate treaty-reserved rights for the harvest of groundfish.
United States v. Winans, 198 U.S. 371 (1905)	U.S. Supreme Court held that the Treaty with the Yakima of 1855, and similar treaties, protects tribal access rights to fishing, hunting, and other privileges on off-reservation lands.
United States v. Washington, 384 F. Supp. 312 (W.D. Wash. 1974) "Boldt Decision"	Federal district court interpreted the rights of treaty tribes to take fish in their "usual and accustomed places in common with all citizens" to mean that treaty tribes have a treaty-reserved right to harvest 50% of the harvestable portion of fish.
Washington v. Washington State Commercial Passenger Fishing Vessel Association, 443 U.S. 658 (1979)	U.S. Supreme Court upheld the 1974 Boldt Decision.
United States v. Washington, 873 F. Supp. 1442 (1994) "Rafeedie Decision"	Federal district court concluded that treaty rights include shellfish and that tribes are entitled to 50% of the harvestable shellfish on most Washington State beaches.
State	
Washington Department of Fish and Wildlife Grays Harbor Basin Salmon Management (Policy C-3621)	Advances the conservation and restoration of Grays Harbor wild salmon and maintains or enhances economic well-being and stability of fishing industry. Quinault Indian Nation fisheries are not subject to this policy, but this policy influences negotiations between the Quinault Indian Nation and State on number of fish available for harvest.
Washington Department of Fish and Wildlife Hatchery and Fishery Reform (Policy C-3619)	Advances the conservation and recovery of wild salmon and steelhead by promoting and guiding the implementation of hatchery reform. Quinault Indian Nation fisheries are not subject to this policy, but this policy influences negotiations between the Quinault Indian Nation and State on number of fish produced from hatcheries in Grays Harbor, number of fish available for harvest, and fishing gear types.
Washington Department of Fish and Wildlife North of Falcon Policy (Policy C-3608)	Guides conservation, allocation, in-season management, and monitoring associated with the annual salmon fishery planning process.
Local	
No local laws, regulations, or treaties apply to tribal resources.	

3.12.3 How were impacts on tribal resources evaluated?

This section describes the sources of information and methods used to evaluate impacts on tribal resources.

3.12.3.1 Information Sources

Information used to evaluate existing tribal resources was obtained from the following sources.

- Communication between the Chehalis Tribe and Washington State Department of Ecology (Connelly pers. comm.)
- Quinault Indian Nation response to treaty fisheries in the Grays Harbor (Quinault Indian Nation 2015)
- Information about Chehalis Tribe and fisheries (Chehalis Tribe 2015)
- Information about Quinault Indian Nation and fisheries (Quinault Indian Nation 2014a)
- Treaty of Olympia (Northwest Indian Fisheries Commission 2015)
- Testimony of James E. Jorgenson to the Shorelines Hearing Board (Jorgenson pers. comm.)
- Communication from Quinault Ocean Fishers Committee responses to the 2014–15 seasonal regulation about the Grays Harbor commercial crabbing season (Quinault Indian Nation 2014b)
- Communication from Quinault Ocean Fishers Committee regarding the 2014–15 Seasonal Regulation about the Grays Harbor ceremonial and subsistence crabbing season (Quinault Indian Nation 2014c)
- Imperium Renewables, Inc. and Westway Terminals LLC Vessel Traffic Impact Analysis for Imperium and Westway (WorleyParsons 2014)
- Letter from EarthJustice on the Westway Expansion (EarthJustice 2013)
- Information about treaty rights in the Pacific Northwest (Columbia Inter-Tribal Fish Commission et al. 2013)
- *Grays Harbor and Native Americans* (James and Martino 1986)
- Summary of tribal (treaty and nontreaty) and nontribal commercial and recreational fisheries in Grays Harbor and the Chehalis River (Scharpf pers. comm. March 24, 2015)
- Economic Impacts of Crude Oil Transport on the Quinault Indian Nation and Local Economy (Resource Dimensions 2015)

3.12.3.2 Impact Analysis

Impacts on tribal resources were assessed by evaluating how the proposed action could disrupt access to tribal resources in the study area. The impact analysis considered fishing and gathering information provided by the tribes and agencies, including practices and areas used by Quinault and Chehalis tribal members, typical methods to access these areas, gear used in these fisheries, timing of fisheries, and catch by fisheries. The impact analysis evaluated how construction and routine operation of the proposed action could reduce the amount of time available to fish, change the time when fishers could deploy gear, or exclude members from fishing areas typically fished by Quinault or Chehalis tribal members.

3.12.4 What tribal resources are in the study area?

This section describes the tribes and tribal resources in the study area that could be affected by construction and operation of the proposed action. This section provides the general context for tribal resources in the study area and describes tribal resources on the project site, along the PS&P rail line, and in and along the shoreline of Grays Harbor.

3.12.4.1 Tribes

The vicinity of the study area was traditionally inhabited by the Hoquiam and Wishkah people and their ancestors, who spoke the Lower Chehalis dialects of the Salish language. Both groups lived along the banks of the Hoquiam and Wishkah Rivers. The waters near the study area—including the mouth of the Hoquiam River—were also used seasonally by the Quinault people, who spoke the Quinault dialect of the Salish language (Gibbs 1877; Curtis 1913; Hajda 1990). The waters of Grays Harbor, the Chehalis River, and other streams entering Grays Harbor were traditionally, and continue to be, important fishing areas for Native American tribes in the region, while the Grays Harbor shores continue to be productive hunting and plant-gathering areas.

Pacific Coast treaty tribes with a marine fish allocation are the Makah, Quileute, Hoh, and Quinault. Of these, the Quinault is the only treaty tribe with usual and accustomed areas within and adjacent to Grays Harbor. Other treaty tribes may use Grays Harbor as a moorage from which they access usual and accustomed areas but because those areas are not within Grays Harbor, they are not discussed further.

Quinault Indian Nation

The Quinault Indian Nation is a federally recognized Indian tribe that consists of the Quinault and Queets Tribes and descendants of five other coastal tribes: Quileute, Hoh, Chehalis, Chinook, and Cowlitz (Quinault Indian Nation 2014a). The Quinault Indian Reservation is located on the southwestern corner of the Olympic Peninsula. The reservation is more than 208,150 acres of land and includes 23 miles of ocean beach. The reservation was established in 1855, when the tribes and bands that now make up the Quinault Indian Nation ceded land to the United States in the Treaty of Olympia (Quinault Indian Nation 2014a).

The Quinault Indian Nation has treaty-reserved rights to fishing, hunting, and gathering. The Quinault Indian Nation is a signatory to the Treaty of Olympia (1856). The treaty reserved a right to take fish at its "usual and accustomed fishing grounds and stations" and the privilege of gathering, among other rights, in exchange for ceding lands the tribe historically roamed freely (Northwest Indian Fisheries Commission 2015). The study area includes Quinault usual and accustomed fishing, hunting, and gathering areas.

The Quinault have lived near and depended on Grays Harbor for generations. They were called the canoe people because of the importance of canoes to every aspect of tribal life (Storm and Capoeman 1990: 45). Canoes were used for travel in the ocean, bays, estuaries, and rivers. The Quinault constructed ocean-going canoes to travel between villages along the coast and to hunt and fish. They constructed shovel-nosed, slack-water canoes to navigate rivers entering Grays Harbor and the Quinault River.

Primary villages on the Quinault Indian Reservation are Taholah at the mouth of the Quinault River and Queets at the mouth of the Queets River. These villages are on traditional village sites.

Quinault fishers are dependent on Grays Harbor to access ocean fisheries because both villages lack a harbor. The Quinault have treaty-reserved commercial, subsistence, and ceremonial fisheries (Resource Dimensions 2015: 55-59). Quinault ocean fisheries include salmon (Chinook and coho), halibut, Dungeness crab, lingcod, rockfish sablefish, and sardines. Grays Harbor gillnet fisheries include salmon (Chinook, coho, and chum), steelhead, and white sturgeon. Quinault treaty commercial and subsistence diggers harvest razor clams from beaches from Grays Harbor north. The Chehalis, Humptulips, and several other smaller rivers entering the Grays Harbor estuary provide the freshwater and estuarine habitat that supports Chinook, chum, and coho salmon and steelhead of critical importance to the Quinault. Grays Harbor nourishes other species of fish important to the Quinault fisheries such as white sturgeon and Dungeness crab.

Quinault weavers have gathered materials from the Grays Harbor area for many generations. Sweetgrass, cattail, and other grasses and willow gathered from Bowerman Basin in Grays Harbor are used to weave baskets and mats and for ceremonial purposes. Weaving is as integral to contemporary Quinault culture as it was in the past (Resource Dimensions 2015:57).

As a treaty tribe, the Quinault manage their fisheries and are responsible for regulating its fishers both on and off reservation. The Quinault Indian Nation is a comanager with the Washington Department of Fish and Wildlife for salmon, steelhead, and Dungeness crab. Each year the tribe and state meet to determine how many fish and crab can be caught in fisheries. The tribe and state then negotiate fishery schedules to ensure an equitable share of the catch. The process for comanagement of the ocean and freshwater salmon fisheries has evolved over the years and now incorporates preseason meetings and use of model based predictions of abundance, number of fish available for harvest, and catch. Grays Harbor salmon and steelhead fishery openings and predicted catch by week and season are based on models that consider fish timing, level of effort (number fishers participating in the fishery), expected catch, and previous years' fishery data. Once the tribe and state reach agreement on fisheries, in the spring they release a preseason summary of planned fisheries and predicted catch (the planned fisheries includes weekly schedules of weeks and days open).

The Quinault post tribal fishery regulations on their website reporting days and areas opened by statistical week (Sunday through Saturday) for their fishers. The Washington Department of Fish and Wildlife also posts planned openings of tribal fisheries on their website to inform recreational fishers when nets may be deployed. The tribe is responsible for enforcing Quinault fishing regulations. The tribe actively monitors in-season catch during each opening. Summaries of weekly and annual catch are shared with the Washington Department of Fish and Wildlife as the fishery progresses and annual catch data are shared at the end of the season. An important aspect of fisheries management is the in-season review of catch and updated estimates of number of harvestable fish. The tribe and state can adjust fishery schedules in season if the actual number of fish and harvestable abundance are not as forecast or if bad weather has disrupted fishing schedules (Scharpf pers. comm. May 26, 2015). These updates may result in adjustments to fishery schedules or closures to protect certain species, or they may add a fishing day in the same week (if bad weather affected a fishery), a run, or additional fishery openings if harvestable abundance is more than planned.

The Quinault began to exert their treaty-reserved right for Dungeness crab when treaty-reserved rights were extended to shellfish in a ruling by Judge Rafeedie in 1994 (*United States v. Washington, 873 F. Supp. 1422*). The States of Washington, Oregon, and California, and treaty tribes comanage the coastal Dungeness crab fishery. The four coastal treaty tribes (Makah, Quileute, Hoh, and Quinault)

have designated usual and accustomed ocean fishing areas for crab. The treaty tribes and state determine the amount of harvestable crab for each area, of which the treaty tribes are entitled to 50%. The tribes manage their fisheries specific to their usual and accustomed area, setting seasons, issuing permits, regulating number of pots that can be deployed, and recording catch.

Management of treaty-reserved marine fish harvest is at the international or federal level. Halibut are managed at the international level with the International Pacific Halibut Commission regulating harvest. Other marine fish such as sablefish, groundfish (rockfish, pacific cod, lingcod, and whiting) are managed through the Pacific Fisheries Management Council. The council and coastal treaty tribes (Makah, Quileute, Hoh, and Quinault) have formal harvest allocations for sablefish and whiting (Pacific Fishery Management Council 2014). Treaty allocation of other groundfish species is made through annual determination by the council (50 Code of Federal Regulations [CFR] 660.50).

Confederated Tribes of the Chehalis Reservation

The Chehalis are a federally recognized Indian tribe in rural southwest Washington State. The Chehalis Reservation is located on the Chehalis River at the mouth of the Black River near Oakville, Washington, southeast of Hoquiam. The 4,849-acre reservation was established in 1864 by secretarial order. The reservation is rural agricultural with low-density residential, farms, open prairies, forest, and wetlands. In the late 1800s, the reservation had a boarding school for tribal children, numerous home sites, and a small tribal center for community meetings and events. The 2014 enrolled population of the Chehalis Tribe was 894. The Bureau of Indian Affairs Labor Force Report for 2010 shows a service population (enrolled and nonenrolled Indians living on and near the reservation) of 3,625 individuals. Tribal government has grown considerably in the last 20 years to provide services to the many Native Americans living on or adjacent to the reservation (Connelly pers. comm.).

Preservation of tribal land and culture is essential for the perpetuation of the Chehalis people. The importance of the land to the tribe cannot be overstated. It provides the living space, the sacred and cultural sites, and the natural resources that sustain the Chehalis people and culture. It provides spiritual and physical sustenance, and the means for economic self-sufficiency. Many tribal members hunt and fish to supplement their incomes (commercial harvest), to provide sustenance for their families, and for cultural reasons (subsistence and ceremonial harvest). Historically, tribal members were expert fishers and paddlers of shallow shovelnose canoes. Women wove fine baskets, clothing, canoe mats, and even diapers using grasses, bark, and reeds collected from the area. Men carved dugout canoes, beautiful masks, and ceremonial items from red cedar and other trees (Connelly pers. comm.).

The location of the reservation at the confluence of the Chehalis and Black Rivers provides a prime fishing area for the salmon and steelhead returning to the Chehalis River. Salmon and steelhead have been important to their diet for centuries. The present-day Chehalis commercial, subsistence, and ceremonial fishery is limited to the portions of the Chehalis and Black Rivers on the Chehalis Reservation.

3.12.4.2 Project Site

The project site is located on property owned by the Port of Grays Harbor but has been under lease agreement and managed by the applicant for several years. Near the dock, there are tribal fishing areas, discussed below in Section 3.12.4.4, *Grays Harbor*. There are no known tribal resources on the upland portion of the project site.

3.12.4.3 PS&P Rail Line

Quinault Indian Nation

The Quinault Indian Nation has treaty-reserved rights to off-reservation hunting, including lands adjacent to the PS&P rail line. Off-reservation hunting by the Quinault is largely for deer and elk.

Along the PS&P rail line, the primary area for tribal fishing is the lower Chehalis River. The Quinault fishers harvest salmon, steelhead, and white sturgeon in the lower Chehalis River from the mouth to approximately the confluence with the Wynoochee River (Figure 3.12-1). Species and runs harvested in-river are the same as harvested in Grays Harbor (fall Chinook, spring Chinook, coho, and chum salmon, winter steelhead, and white sturgeon). Fisheries in the Chehalis River are open on the same weeks and days as in Grays Harbor.

Quinault fishers can elect to deploy gillnet fishing gear in the Chehalis River or Grays Harbor. The in-river fishery includes a combination of drifting nets from smaller boats and setting nets secured to the shore (Quinault Indian Nation 2015:11). Drift gillnet fishing entails the fisher deploying the net from the bow or stern of the fishing vessel perpendicular to the channel. Fishers attempt to deploy gillnets to cover as much of the channel as possible to maximize catch. The net is allowed to drift with the currents, sweeping the channel for fish. Fishers need to actively monitor the net and adjust the net position in the channel to avoid known hazards (logs, shallow areas, docks, and other vessels). Set-net gillnet fishing entails the fisher securing one end of the net to the shore and anchoring the other end in the channel to keep the net perpendicular to the channel. A set net may be deployed for several hours at a time during an opening. The fisher may monitor the net and remove fish periodically. Set-net fishing locations are well established and fishing grounds are allocated to specific fishers. Set-net sites are primarily in the Chehalis River and other rivers entering Grays Harbor. Set nets that may be deployed in Grays Harbor are on the edges of the Grays Harbor Navigation Channel and do not obstruct vessel traffic.

Set-net fishers access their fishing sites from shore when direct vehicle access to their site is available. If shore access is not available, fishers access their sites by small boat from a nearby boat launch or the Quinault Pride dock in Aberdeen. Annual harvest from the Chehalis in-river fishery is included in Grays Harbor catch summarized in Section 3.12.4.4, *Grays Harbor.*

Confederated Tribes of the Chehalis Reservation

Because the Confederated Tribes of the Chehalis Reservation (Chehalis) are a nontreaty tribe, hunting with a tribal-issued permit is limited to the reservation. However, the reservation size and setting do not provide meaningful hunting opportunities for deer and elk. Chehalis hunters that hunt deer or elk off-reservation must obtain a state hunting permit and follow state regulations for seasons and bag limits.

The Chehalis in-river fishery is entirely on the reservation and managed by the Chehalis (Figure 3.12-1). Because the Chehalis are a nontreaty tribe, their commercial fishery is limited to the portion of the rivers on the reservation. Primary commercial and subsistence fisheries are in the fall and winter. The fall fishery harvests coho and Chinook salmon. The winter fishery harvests steelhead. Depending on abundance of spring Chinook returning to the river, there may be a spring Chinook fishery. The number of harvestable spring Chinook is low and most fish are for subsistence or ceremonial consumption (Connelly pers. comm.).

A recreational fishery also occurs on the reservation with a tribal fishing license. Chehalis tribal members must have a valid Washington State fishing license to fish off-reservation and must follow state regulations.

The nontreaty tribal harvest of salmon and steelhead is based on a sharing formula between the state and the tribe. The allowable catch of salmon and steelhead by Chehalis tribal members is calculated from the nontreaty harvestable share returning to Grays Harbor. The state and tribe have an agreement to share equally the nontreaty harvestable portion of fish returning to spawning areas upstream of the Chehalis Reservation boundary (Hughes pers. comm.). The sharing formula applies to fall Chinook, spring Chinook, coho, and steelhead. All chum salmon returning to the Chehalis River spawn downstream of the Chehalis Reservation and are not included in the sharing formula.

Access to fishing sites by Chehalis tribal members is by small boats and bank access to set-net fishing locations. The number of fish available for harvest is developed from the preseason run forecast. Annual records of number of fish harvested are not available for the Chehalis fisheries.

3.12.4.4 Grays Harbor

Quinault Indian Nation

As described in Chapter 3.5, *Animals*, Grays Harbor and its tributaries provide habitat for various fish species, including salmonids, sturgeon, lamprey, groundfish, and forage fish. The Chehalis River is the largest tributary that drains directly into Grays Harbor. Six species of salmonids are known to migrate and rear in portions of Grays Harbor and its tributaries. This waterway and its primary tributaries support tribal, commercial, and recreational fishing. Grays Harbor has a history of vessel operations involving large commercial vessels transporting a variety of goods and materials in the area.

The Quinault Indian Nation traditionally used the Grays Harbor area for collecting weaving materials, fishing, hunting, and as a gathering place. Quinault fishers fish in Grays Harbor for salmon, steelhead, and sturgeon using drift and set gillnets and for Dungeness crab using pots. Ocean fisheries adjacent to Grays Harbor are for Dungeness crab (pots), halibut (longline), sablefish (longline, pots, and trawl gear), groundfish such as rockfish, pacific cod, whiting (longline and trawl gear) and ocean Chinook and coho salmon (troll gear). Grays Harbor is home port for fishing vessels in ocean fisheries and is where fishers offload catch for these fisheries. The Quinault also manage razor clams for commercial and subsistence harvest on beaches on and off the reservation adjacent to Grays Harbor.

Sweetgrass, cattail, and other grasses that grow in either freshwater or brackish marshes on the flats of the intertidal zone, such as those areas along the shoreline of Bowerman Basin and adjacent saltmarshes in the Grays Harbor National Wildlife Refuge, have been gathered by Quinault weavers for many generations (James and Martino 1986:71–76). These grasses are collected in July and August (James and Martino 1986:71–76). According to Jones (2012 in Resource Dimensions 2015: 59), the gathering of plant materials for basket weaving was an important element of traditional Quinault culture. This tradition remains an important component of tribal culture with extended families and friends gathering material for weaving (Resource Dimensions 2015:59).

Quinault fishers currently harvest salmon, steelhead, white sturgeon, and Dungeness crab in Grays Harbor. In addition, Quinault fishers use Gray Harbor to access ocean fisheries and offload catch from these fisheries.

Quinault Pride Seafood processes and markets Quinault-caught seafood products. It is owned by the Quinault Indian Nation, which requires fishers to sell most of their catch to Quinault Pride Seafood (Quinault Indian Nation 2014a) and authorized buyers; depending on the fishery, regulations may allow a small portion to be sold directly to the consumer. Quinault Pride Seafood operates a processing plant at Taholah and Westport and maintains a dock to moor boats and offload catch in Aberdeen (Figure 3.12-1). Quinault Pride Seafood may operate a fish tender anchored in the Chehalis River and buyers at various boat launches to offload catch during periods of peak salmon abundance. The Westport plant was purchased by the Quinault Indian Nation in 2014 (Resource Dimensions 2015:5). Westport is the primary moorage for fishing vessels participating in ocean fisheries (Quinault Indian Nation 2015:12).

All commercial catch must be reported to the tribal fish management organization. The Quinault do not maintain records of subsistence or ceremonial catch of salmon, steelhead, and white sturgeon (Resource Dimensions 2015: 78). The Quinault maintain records of subsistence catch for crab, razor clams, and marine fish. Subsistence harvest ranges from 5 to 20% of reported commercial catch of salmon, steelhead, and sturgeon, based on interviews with fishers (Resource Dimensions 2015:78).

The following discussion focuses on the areas, species, and practices for commercial and subsistence harvest of salmon, steelhead, sturgeon, and crab in Grays Harbor. This is followed by a discussion of use of Grays Harbor to access marine fisheries and fish caught in these fisheries.

Salmon, Steelhead, and White Sturgeon—Grays Harbor Gillnet Fisheries

Quinault treaty gillnet fisheries for salmon, steelhead, and sturgeon can occur nearly year-round in Grays Harbor. Grays Harbor fisheries target salmon and steelhead adults returning to the Chehalis River and other streams entering Grays Harbor. White sturgeon caught in Grays Harbor are from river systems outside of Grays Harbor. White sturgeon and green sturgeon use the Grays Harbor estuary for foraging.

The Grays Harbor annual management cycle is divided into three seasons. The most intense fishery (maximum number of participants) and largest catches occur during the fall fishery from September to mid-November (Quinault Indian Nation 2015:2). Species harvested during the fall fishery are coho, chum, and fall Chinook salmon.

The winter fishery begins in late November and extends to mid-April. This fishery is directed at winter steelhead and more fishers participate early in the season to target the more abundant hatchery steelhead. Later in the season (February to May) the majority of fish entering the river are wild steelhead. Depending on abundance, the fishery may be modified to fewer days open per week and include gear restrictions to direct harvest at sturgeon (Quinault Indian Nation 2015:7).

The spring and summer management period is from April to July and directed at sturgeon foraging in Grays Harbor (Quinault Indian Nation 2015:3). This fishery is also less intense than the fall fishery. The spring and summer fishery may include catch of spring or summer Chinook salmon returning to the Chehalis River. However, the abundance of this run of Chinook has been low. Generally, not enough fish are returning to the river to provide for a directed fishery. The spring and summer sturgeon fishery is typically open 5 days per week with gear restrictions on size of gillnet mesh to reduce the incidental catch of Chinook. Quinault fisheries are generally closed August to mid-September to protect federal Endangered Species Act-listed green sturgeon.

Gillnet fishing schedules vary from year to year depending on abundance of different salmon species entering Grays Harbor, their run timing, and number of fish available for harvest (Quinault Indian

Nation 2015:4). The Quinault Indian Nation (2015:4-5) provided the planned fall fishery schedule and predicted weekly catch in 2014 and 2015. The gillnet fishery starts mid-September in 2014 and late September in 2015. In both years, the scheduled days open per week varied from 0 to 4 days from mid-September to early November. The 2015 planned schedule includes 3 weeks with no fishing (October 18 to November 7) in areas 2A and 2D (Figure 3.12-1; Chehalis River side of Gray Harbor) to reduce harvest on low-abundance wild chum salmon. The 2014 and 2015 fishery schedules are open 5 days per week from mid-November to the end of the year.

To provide a picture of timing of Chinook, coho, and chum catch in the fishery, the Quinault Nation have provided estimates of weekly catch based on a hypothetical 1-day per week fishery.

- **Fall fishery.** The largest predicted catch of Chinook salmon is from mid-September to the end of September. Chinook catch by week in early September and in October is predicted to be about half the late September weekly catch. Peak weekly catch of coho is from late September to late October. Coho catch in early to mid-September is predicted be much less. Coho catch declines rapidly from early November to the end of the fall management period. Peak weekly catch of chum salmon is over a shorter period and later than Chinook and coho. Predicted chum catch by week is highest from late October to mid-November.

  Scheduled openings in 2014 and 2015 during the peak Chinook catch period (mid- to late September) were 2 to 4 days per week (Quinault Indian Nation 2015:6-7). Scheduled openings in 2014 and 2015 during the peak coho catch period (late September to late of October) were 3 to 4 days per week early in the period. The 2015 fishery is scheduled to be closed the last 2 weeks of October. Scheduled openings in 2014 during the peak chum catch period (late October to mid-November) were 1 to 2 days per week. The fishery is scheduled to be closed through most of the peak chum period in 2015.
- **Winter fishery.** The 2013–2014 winter fishery scheduled was 5 days per week from mid-November to mid-April (Quinault Indian Nation 2015:8). Predicted catch in most weeks was less than 100 fish. Predicted weekly catch from early January to early February varied from 200 fish to more than 450 fish.
- **Summer fishery.** The 2015 scheduled spring and summer fishery is 5 days per week from mid-April to the end of July (Quinault Indian Nation 2015:9). The Quinault did not provide predicted weekly catch for this fishery.

Resource Dimensions (2015:68) summarized the number of fishers reported by the Quinault that participate in the various treaty-right fisheries. The Quinault provided additional information on the number of active fishers in the Grays Harbor gillnet fisheries and number of fishers by area. Resource Dimensions (2015:68) reported 123 fishers in the Grays Harbor gillnet fishery. The Quinault (2015:4) reported 70 authorized Quinault gillnet fishers in Grays Harbor. The Quinault limit the number of fishers in the Chehalis River portion of Grays Harbor, fishing areas 2D, 2A, 2A1, and the lower Chehalis River up to Wynoochee River, to 50 fishers (Figure 3.12-1). Another 10 fishers are authorized to fish in the Humptulips River and another 10 authorized to fish in the North Bay area (fishing area 2C).

Drift gillnet fishing effort in Grays Harbor during the fall management period is concentrated in certain locations based on relative abundance of fish (Goodell 2015a and Quinault Indian Nation 2015:10). Of the 50 fishers authorized for the Chehalis River portion of Grays Harbor, up to 25 fishers may operate drift gillnets in preferred areas of the Chehalis River and Grays Harbor from Cosmopolis to the Crossover Channel Reach of the navigation channel (Figure 3.12-1). Another

group of fishers may deploy nets in the south channel near Markham. Fishers authorized to fish area 2C may deploy nets in North Bay off the mouth of the Humptulips River. Fishers authorized to fish the Humptulips River fish in the river and immediately off the mouth of the river. Gillnets used by Quinault fishers can be designed for specific areas in Grays Harbor. Gillnets used by fishers can range in length from 10 to 1,200 feet and in depth from 2 to 75 feet. These differences can be specific to the depth and condition of the fishing area for which the net is intended.

Drift gillnet fishing is done during incoming and outgoing tides and during slack tide (Quinault Indian Nation 2015:11); Quinault fishers prefer the approximately 1-hour slack tide. The time that nets are in the water varies depending on fish abundance, and tidal and river currents. As a frame of reference, nontreaty commercial regulations for Grays Harbor limit soak times (the time that the net first enters water to the time when the net is completely removed) to less than 45 minutes (Washington Department of Fish and Wildlife 2014). Quinault (2015:11) reports that nets may be deployed for up to 2 hours during slack tide. Quinault fishers take turns fishing desired areas. Fishers deploy gear one boat at a time, releasing their net beginning from the bank and extending across and in some cases into the navigation channel (Quinault Indian Nation 2015:10). The boat and net then drift with the current. During peak periods of the fall fishery, up to nine boats may be actively fishing the navigation channel near and in front of the terminals. At times of high abundance, there may be two to four fishers with their nets deployed drifting the channel at any one time. Each boat is spaced evenly in the navigation channel to share opportunities and maximize harvest. At the end of a drift, the fisher retrieves the net, removing fish at the same time. The Quinault (2015:11) report that the time required to retrieve a net is from 5 minutes at the quickest to 2 hours if the net is loaded with fish. Retrieval may take twice as long if the fisher is retrieving the net by hand. Boats that recently completed a drift may return to the start where they wait for their next turn at fishing or they may offload catch. There may be several boats returning to the start or waiting their turn to fish at any one time. Fishers may make two to six trips to offload catch in a 24-hour period at the peak of the run (Quinault Indian Nation 2015:12). Fishing nets are marked at each end by orange or red marker buoys during daylight hours. When fishing occurs at night, nets are marked at each end with a steady white or flashing white or red light.

Fishers may choose to fish for salmon, steelhead, and white sturgeon using set nets attached to the bank. The relative number of drift and set nets deployed for salmon, steelhead, and sturgeon in Grays Harbor is not reported. Quinault fishing regulations restrict the use of set nets for white sturgeon downstream of the US Route 101 (US 101) bridge (Scharpf pers. comm. May 26, 2015).

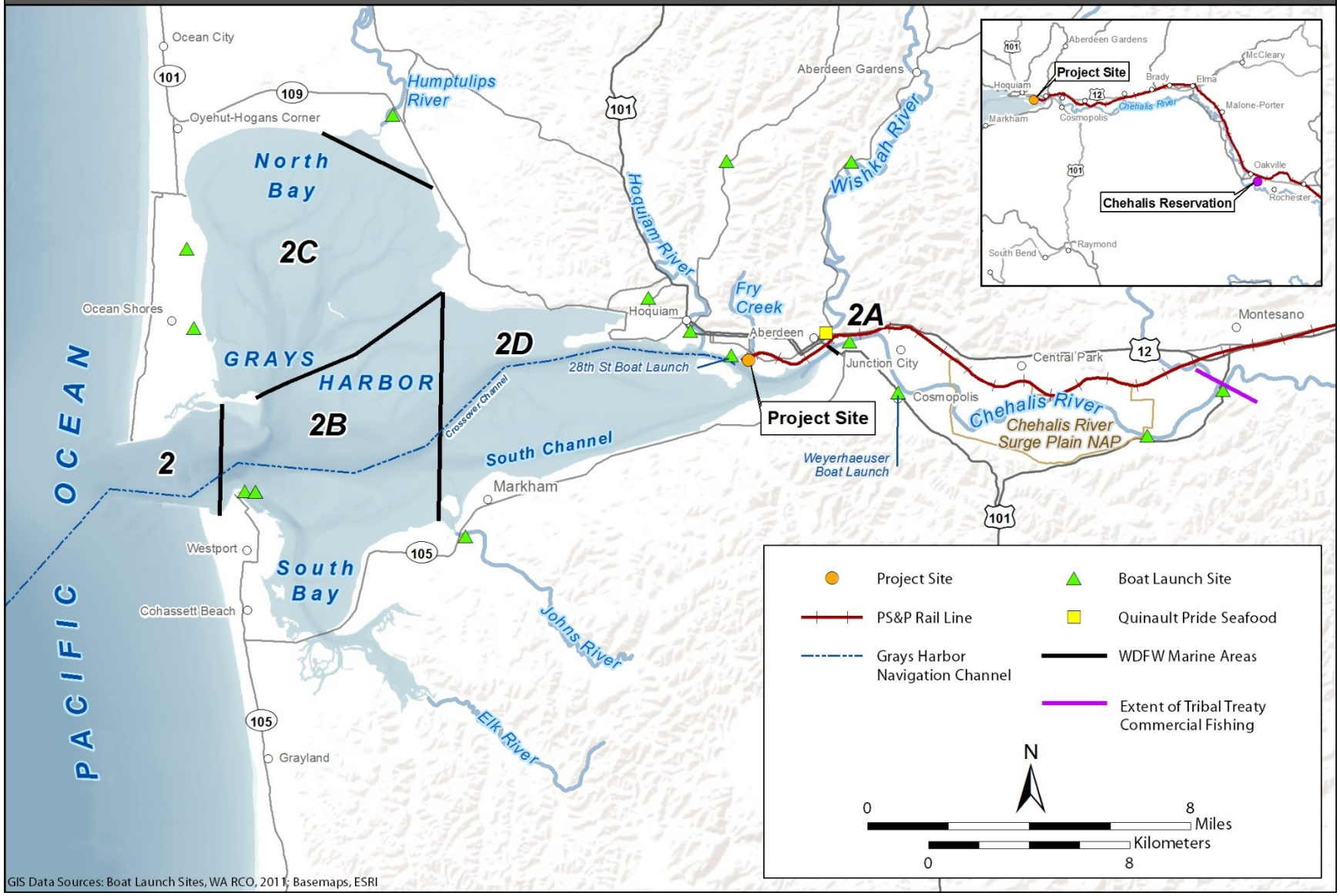
Annual landed catch for 2004 to 2013 for Grays Harbor treaty gillnet fisheries (all areas and gear types combined) is summarized in Table 3.12-2. Fall fisheries for coho, chum, and Chinook harvested an average of 31,340 fish. Chinook catch are not reported separately for fall and spring Chinook. Thus, fall catch is an overestimate as some spring Chinook are included in the total. However, the spring and summer Chinook catch is relatively small compared to the fall Chinook catch (Quinault Indian Nation 2015:8). Coho made up the largest portion of the fall harvest (averaging 20,387 fish). The winter fishery catch of steelhead is much smaller, averaging 3,129 fish. Quinault fishers harvested an average of 1,758 sturgeon.

Table 3.12-2. Quinault Grays Harbor Salmon, Steelhead, and White Sturgeon Fisheries, Annual Catch

Year	Chinook Catch (# fish)	Coho Catch (# fish)	Chum Catch (# fish)	Winter Steelhead Catch (# fish)	White Sturgeon Catch (# fish)
2004	3,546	18,093	9,600	6,742	1,544
2005	2,297	23,428	5,804	4,992	3,374
2006	3,758	8,746	4,070	3,404	2,918
2007	2,483	8,927	598	3,975	1,766
2008	1,880	10,208	2,070	1,467	3,206
2009	2,512	28,487	4,397	697	1,373
2010	3,403	25,347	8,938	1,837	1,125
2011	6,417	27,982	17,207	3,341	947
2012	3,994	30,693	11,670	2,880	598
2013	2,909	21,692	11,976	1,955	726
Average	**3,320**	**20,387**	**7,633**	**3,129**	**1,758**

Source: Resource Dimensions 2015:61–62

Figure 3.12-1. Tribal Fishing Resources



Chinook and Coho Salmon—Ocean Troll Fishery

The treaty ocean-troll fishery typically begins May 1 and extends to September 15 (Quinault Indian Nation 2015:14). Troll vessels drag baited hooks or lures at the depth of the target species. Chinook salmon are harvested from May 1 to June 30 or when allowable catch has been attained. The fishery remains open from July 1 to mid-September for coho salmon and Chinook if allowable catch has not been attained. The Chinook and coho ocean fisheries may close early if allowable catch has been attained early.

Areas fished by Quinault fishers are coastal waters from Destruction Island just north of the Quinault Reservation boundary to Grays Harbor (50 CFR 660.50). Quinault fishers access the fishery from Grays Harbor.

Table 3.12-3 summarizes the annual Quinault fisher participation and catch for Chinook and coho in the ocean troll fishery. Across the decade, catch was generally evenly split between Chinook and coho, but varied significantly for each year. Chinook are the more valuable fish because of the higher price per pound for Chinook and their larger size (Resource Dimensions 2015: 63–64).

Table 3.12-3. Quinault Treaty Ocean Troll Fishery, Annual Catch

Year	Quinault Fishers (number of fishers)	Chinook Catch (number of fish)	Coho Catch (number of fish)
2004	1	237	170
2005	0	3,113	578
2006	6	200	165
2007	4	367	1,039
2008	5	437	591
2009	3	432	4,039
2010	16	2,519	1,988
2011	6	1,944	719
2012	5	1,456	1,080
2013	4	616	997
Average	**5**	**1,132**	**1,137**

Source: Resource Dimensions 2015:64–69

The Quinault do not maintain records of subsistence or ceremonial catch from the troll fishery, which is estimated to range from 5 to 20% of reported commercial catch based on interviews with fishers (Resource Dimensions 2015:78).

Dungeness Crab

Quinault fishers operate crab-fishing vessels in Grays Harbor and coastal waters outside of Grays Harbor (Goodell 2015a, 2015b). Although regulations for the Quinault Dungeness crab fishery allow subsistence and commercial harvest from November through September (Quinault Indian Nation 2014a), the majority of the catch occurs between November and February (Quinault Indian Nation 2015:13)—months that are prone to extreme weather events. The ocean vessels use the navigation channel to transport the catch into the harbor; to lessen the danger of hazardous conditions during incoming or outgoing tides, bar crossings are often timed during slack high or low tides. The treaty commercial crab season generally opens 45 days prior to the nontreaty commercial fishery to help

ensure equal catch allocation with nontreaty fishers. Early in the season, prior to the nontreaty fishery opening, Quinault fishers deploy pots along the coast close to Grays Harbor. Quinault fishers have an exclusive fishing area north of Grays Harbor (mouth of Copalis River to mouth of Raft River) within the Quinault usual and accustomed area when the nontreaty fishery is open. This exclusive Quinault area also ensures an equal sharing of the catch with nontreaty fishers. The Quinault have had to implement gear restrictions later in the season to limit treaty harvest for equal sharing with nontreaty fishers.

Table 3.12-4 summarizes the annual Quinault participation and catch in the Dungeness crab fishery (2004 to 2013). Quinault fishers harvest an average of 2.6 million pounds of crab annually, of which an estimated 23,529 pounds are harvested for subsistence (Resource Dimensions 2015:80).

Table 3.12-4. Quinault Dungeness Crab Fishery, Annual Commercial Catch

Year	Quinault Fishers (number of vessels)	Catch (pounds)
2004	15	1,486,853
2005	26	3,188,806
2006	21	1,371,961
2007	22	2,956,441
2008	25	2,061,477
2009	24	3,004,009
2010	21	2,771,881
2011	21	3,254,288
2012	21	2,019,549
2013	21	3,694,925
Average	**21.7**	**2,581,019**

Source: Resource Dimensions 2015:64–69

Marine Fisheries—Halibut, Sablefish, Lingcod, Rockfish, and Sardine

Quinault fishers operate long-line ocean fishing vessels in coastal waters outside of Grays Harbor for halibut, sablefish, and other marine species (Goodell 2015b).

Quinault fishers harvest a portion of the treaty allocation for halibut shared among the Quinault, Hoh, Makah, and Northern Puget Sound treaty tribes. The fishery opens in March with a 48-hour opening followed by additional openings with restrictions on number of pounds harvested by vessel per day. The fishery remains open until the treaty allocation has been harvested, usually by May (Quinault Indian Nation 2015:14).

Quinault fishers harvest a portion of the treaty allocation for sablefish shared among the Quinault, Hoh, and Makah Tribes (Quinault Indian Nation 2015:14). The fishery opens in March with a concurrent opening for the four tribes. Additional openings occur through the summer and fall on individual tribal quotas of the treaty allocation. Effort and catch decline as the season progresses and the quota for the Quinault Indian Nation is attained.

Table 3.12-5 summarizes the annual Quinault participation and catch in the marine fisheries (2004 to 2013). Quinault fishers harvest an average of 737,800 pounds marine fish annually.

Table 3.12-5. Quinault Marine Fisheries, Annual Commercial Catch

Year	Quinault Fishers (number of vessels)	Catch, All Species (pounds)
2004	13	437,512
2005	12	351,014
2006	12	406,641
2007	10	264,308
2008	15	346,625
2009	16	424,084
2010	13	300,456
2011	13	260,040
2012	12	3,127,701
2013	9	1,459,616
Average	**12.5**	**737,800**

Source: Resource Dimensions 2015:64–69

Confederated Tribes of the Chehalis Reservation

The Chehalis own tidal land in Grays Harbor (County parcel 181226849800) and use it for recreational shellfish harvesting. The tribe plans to make it a commercial operation in the future (Connelly pers. comm.). Chehalis tribal members do not have fishing rights in Grays Harbor or marine waters.

3.12.5 What are the potential impacts on tribal resources?

This section describes impacts on tribal resources that could occur in the study area. Potential impacts of the no-action alternative are described first, followed by potential impacts of the proposed action.

3.12.5.1 No-Action Alternative

Under the no-action alternative, the applicant would continue to operate its existing facility as described in Chapter 2, Section 2.1.3.2, *Existing Operations*. Although the proposed action and related vessel traffic would not occur, it is assumed that growth in the region would continue under the no-action alternative. This growth could lead to development of another industrial use at the project site, which could result in impacts similar to those described for routine onsite operations. However, for the purposes of this analysis, it is assumed that no future development would occur at the project site.

Large commercial vessel[3] traffic in Grays Harbor is expected to increase in response to increased trade of commodities from 338 trips in 2017 to 436 trips in 2037 (Section 3.17, *Vessel Traffic*). Terminal 1 berth occupancy is expected to increase slightly between 2017 and 2037. Impacts related to restricted and interrupted access to the tribal fishery in Grays Harbor under the no-action alternative would be similar to those described for existing conditions but proportionally greater.

As noted in Section 3.15, *Rail Traffic*, rail traffic is expected to continue at existing levels (an average of three trips per day) under the no-action alternative.

[3] The term *large commercial vessel* refers collectively to tank and cargo vessels.

3.12.5.2 Proposed Action

This section describes impacts that could occur in the study area as a result of construction and routine operation of the proposed action. First, this section describes impacts from construction of the proposed action. It then describes impacts of routine operation at the project site and of routine rail and vessel transport to and from the project site.

Construction

Construction of the proposed action could have an impact on tribal resources if construction activities were to limit access to or degrade the resources used by the tribes, including the plants and fisheries described in Section 3.12.4.3, *PS&P Rail Line,* and Section 3.12.4.4, *Grays Harbor*. Because all work would be limited to the project site and no in-water work would occur, construction would not restrict access to tribal resources in the study area.

Construction of the proposed action at the project site could degrade the fishery if construction activities were to impair water quality as a result of increased erosion of soils into Grays Harbor or produce vibration levels from pile driving that would be harmful to fish in Grays Harbor. As described in Section 3.1, *Earth*, the potential for increased erosion on the project site is low, because the site is relatively flat and contains soils that have low erosion potential. As described in Section 3.3, *Water*, Section 3.4, *Plants*, and Section 3.5, *Animals*, the construction activities would be subject to water pollution control laws and are not expected to result in any permanent impacts on water resources, or related impacts on plants, animals, or fish. As described in Section 3.5, *Animals*, noise levels in the waters adjacent to the project site from pile driving at the project site do not have the potential to exceed levels deemed potentially harmful to fish. Therefore, construction of the proposed action would have no impact on tribal resources.

Operations

This section describes impacts that would occur as a result of routine operations at the project site, rail transport along the PS&P rail line, and vessel transport through Grays Harbor.

Onsite

Onsite operations of the proposed action could have an impact on tribal resources if operations were to limit access to or degrade the resources used by the tribes, including the plants, wildlife, and fisheries described in Section 3.12.4.3, *PS&P Rail Line*, and Section 3.12.4.4, *Grays Harbor*.

Onsite operations could degrade plants and fisheries because of ongoing impacts on water quality resulting from increased stormwater runoff. However, as described in Section 3.3, *Water*, facility operations would be subject to water pollution control laws and the potential for impacts on water quality during routine operations would be slightly greater than under the no-action alternative. The impacts would not be at a level to affect the health of the Grays Harbor's plants or animals, as discussed further in Section 3.4, *Plants* and Section 3.5, *Animals*. The potential impacts associated with oil spills are addressed in Chapter 4, *Environmental Health and Safety*.

Onsite operations could reduce access to tribal fishing areas as result of the increased frequency of vessels docked at the Terminal 1 berth. Tribal fishers deploy gillnets and drift with the tide, taking turns sweeping through segments of the harbor that typically extend as far as Cosmopolis to the Crossover Channel Reach of the navigation channel. This area includes the portion of the navigation channel in front of the Terminal 1 berth. Depending on its size, a docked vessel would occupy

approximately 20 to 25% of the width of the channel.[4] While a vessel is at berth, fishing nets cannot be extended as far and cannot access the areas nearest to the dock structure where fish are reported to be concentrated by tribal fishers (Quinault Indian Nation 2015: Exhibit E) (Figure 3.12-1). Lighting impacts from nighttime transfer operations may also affect fishing operations by affecting fish behavior.

Vessel calls under the proposed action would occupy the Terminal 1 berth up to 119 days per year.[5] When combined with occupancy by baseline vessels, the Terminal 1 berth would be occupied approximately 177 days per year (Section 3.17, *Vessel Traffic*). Under the no-action alternative, the berth would be occupied approximately 58 days per year.

The most intensive fishing at the dock area is during the fall salmon management period from September to mid-November, when several fishing vessels may deploy drift gillnets near the Terminal 1 berth. Quinault fishers may also fish the area during other times of the year, deploying gillnets for winter steelhead, spring Chinook, and white sturgeon in spring and summer.

On average, vessels related to the proposed action would occupy the berth approximately 2 days per week compared to an average of 1 day per week under the no-action alternative. During periods of maximum catch for Chinook, coho, or chum salmon, the fall fishery is typically open 2 to 4 days per week and sometimes up to 5 days per week. Assuming a 24-hour maximum berth occupancy and vessel calls evenly dispersed over the week, it is likely a vessel would be at the dock during a portion of the open treaty fishery. However, the potential of these vessels to affect treaty catch is dependent on how fish are distributed across the navigation channel relative to the remaining channel area available to treaty fishers.

Salmon concentrate next to the dock at Terminal 4 (Quinault Indian Nation 2015: Exhibit E); however, the navigation channel is narrower at Terminal 1 and salmon may be distributed differently at this location compared to the wider channel and adjacent shallow areas leading to the south channel at Terminal 4. Migration patterns in estuaries and rivers are complex. Hinch and Rand (2000) found evidence to suggest sockeye salmon were efficient at finding small reverse flow vortices to increase swimming efficiencies during upstream migration. Generally upstream migrating salmon avoid fast water by swimming near the shore and near the bottom (Quinn 2005:80). Large Chinook salmon tend to migrate upstream further from the bank than smaller salmon (i.e., sockeye). Hughes (2004) hypothesized that Chinook salmon migrate further from the bank to avoid wave drag caused by swimming close to the surface in shallow water. However, all species may distribute similarly in the dredged and tidally influenced navigation channel.

Because the circumstances of each interaction vary (e.g., chance of a vessel calling during an open fishing window, time the vessel is at the dock, distribution of the fish, number of fishers on any given day), it is difficult to predict how increased occupancy at Terminal 1 would affect the tribe's ability to meet the treaty allocation under their current practices. During the fall fishery, openings are sometimes managed to harvest specific species within short windows of opportunity. Opportunities to relocate during intense fishing periods may be limited if the other areas are occupied by fishers and because gillnets used by fishers may be designed for one location and not appropriate for another location. Implementation of the mitigation described in Section 3.12.7.1, *Applicant*

[4] The typical 550-class tank barge is approximately 600 feet in length and a maximum of 78 feet wide and is assisted by a tug that is approximately 127 feet long and a maximum of 42 feet wide. A Panamax class tanker has a maximum overall length of 950 feet and a maximum width of approximately 106 feet.
[5] Assumes all vessels are tank barges with a maximum 24-hour berth occupancy.

Mitigation, to coordinate docking schedules and limit vessel time at the dock to avoid peak fishing openings, could reduce the potential for impacts on treaty tribal fishing.

Docked vessels at other times of the year (i.e., winter, spring, and summer fishery openings) likely would have less of an impact because fewer fishers are out and would have more options to move to other preferred areas in Grays Harbor and the Chehalis River.

Rail

Operation of the proposed action at maximum throughput would add 458 unit train trips[6] per year (1.25 trips per day on average) along the PS&P rail line to the approximately 1,100 train trips per year (three trips per day on average) under the no-action alternative (Section 3.15, *Rail Traffic*).

This increase in rail traffic and the associated routine operations activities could affect animals along the PS&P rail line as the result of increased noise, increased potential for animal mortality (collisions with moving trains), and increased exposure to pollutants (spills). These impacts could in turn affect the number of animals available for take by Quinault and Chehalis hunters. These potential impacts on wildlife from increased rail traffic under the proposed action are addressed in detail in Section 3.5, *Animals*, and summarized below.

Noise from additional trains would likely be imperceptible and would not likely affect species populations or fitness. Animals that feed on carrion, use the rail line as a movement corridor, or use habitats adjacent to the rail line could have an increased incidence of collision mortality. A potential secondary effect of animal collision mortality is the loss of any dependent offspring. While these animals may be habituated to the movement of existing trains, increased rail traffic under the proposed action is expected to proportionally increase animal mortality compared to the no-action alternative. This proportional increase in mortality is not likely to measurably alter species populations or fitness.

Potential impacts on wildlife from increased risk of incidents (e.g., storage tank failure, train derailments, vessel collisions) and related incidents (e.g., release of crude oil) are addressed in Chapter 4, Section 4.7, *Impacts on Resources*.

This increase in rail traffic could have an impact on tribal resources if it were to reduce access to tribal fishing fleets, boat launches, and gillnet set net sites as a result of vehicle delay at PS&P rail line crossings or if it were to degrade the fishery through water quality impacts.

The only rail crossing between the Quinault Indian Reservation and its fleet in the Westport Marina is at the US 101 bridge over the lower Chehalis River, which is not an at-grade crossing. There is no rail crossing between the Quinault Indian Reservation and the Quinault Pride Seafood dock in Aberdeen.

As described in Section 3.16, *Vehicle Traffic*, increased rail trips along the PS&P rail line related to the proposed action would increase average vehicle delay compared to the no-action alternative, because the average number of train trips would increase from approximately three trips per day to 4.25 trips per day. However, for the majority of the PS&P grade crossings, the increase in crossing blockage time would not result in a substantial decline in vehicle delay compared to the no-action alternative because the potential to encounter a train at any crossing for the average vehicle would be low.

[6] A trip represents one-way travel; in other words, an inbound trip and an outbound trip are counted as two trips.

Access to Quinault fishing sites on the north side of the Chehalis River around Cosmopolis and at the Friends Landing near Montesano would be affected by increased rail traffic at the Junction City Road grade crossing and other smaller grade crossings between Cosmopolis and the Wynoochee River. However, as noted in Section 3.16, *Vehicle Traffic and Safety*, increased rail traffic on the PS&P rail line between Centralia and Aberdeen is not anticipated to result in substantial increases in delay at grade crossings. Quinault fishers accessing fishing sites from the south side of the Chehalis River (Cosmopolis and US 101) would not be affected by increased rail traffic. As discussed in Section 3.17, *Vessel Traffic*, access to boat ramps in Grays Harbor would not be affected by the proposed action. The 28th Street Boat Ramp in Hoquiam used by Quinault fishers to launch boats and offload catch would not be affected by increased rail traffic as the access road crosses the PS&P rail line west of the project site and the proposed action would not increase rail traffic at crossings used to access the ramp.

Access to fishing sites by the Chehalis Tribe would not be affected by the increase in rail traffic because access roads to fishing sites do not cross the PS&P rail line.

As described in Sections 3.3, *Water*, 3.4, *Plants*, and 3.5, *Animals*, leaks and spills of petrochemicals from routine rail operations and associated maintenance could increase under the proposed action because of increased rail trips. The increase would be slightly greater than under the no-action alternative and is not expected to have any measurable impact on water quality, aquatic habitat, or animals.

Vessel

Operation of the proposed action at maximum throughput would add 238 tank vessel trips per year (0.7 trip per day on average) along the navigation channel to projected large commercial vessel trips under the no-action alternative—between 338 and 436 large commercial vessel[7] trips per year in 2017 and 2037, respectively, or approximately one trip per day on average. This increase in vessel trips related to the proposed action could have an impact on tribal resources if it were to degrade water quality or reduce access to tribal resources, including the plants and fisheries described in Section 3.12.4.3, *PS&P Rail Line* and Section 3.12.4.4, *Grays Harbor*.

As described in Sections 3.3, *Water*, 3.4, *Plants*, and 3.5, *Animals*, small spills or leaks of petrochemicals from routine vessel operations and associated maintenance could increase under the proposed action because of increased vessel trips. Spill prevention and contingency planning is discussed in Chapter 4, *Environmental Health and Safety*. However, the potential for these incidents to occur would be reduced by appropriate training and the implementation of prevention and control measures as described in the facility spill prevention, control, and countermeasures plan, vessel spill response plan and facility oil spill prevention plan. For these reasons, impacts related to spills and leaks from routine operations present a low risk to aquatic habitat and animals likely to be present along the shoreline near the project site.

Because vessel traffic under the proposed action would be limited to the navigation channel (Section 3.17, *Vessel Traffic*), impacts on tribal resources in the harbor but outside the channel are not expected. Drift and set-net gillnet fishers operating east of Terminal 1 and the turning basin, in the south channel near Markham, and in Area 2C would not be affected by the increase in vessel traffic under the proposed action. Crab fishing grounds in Grays Harbor are outside of the navigation channel and access to those areas would not be affected by the increase in vessel traffic. This

[7] The term *large commercial vessels* refers collectively to tank and cargo vessels.

increased vessel traffic would have no impact on the Chehalis, because their protected tribal fishing is within the Chehalis Reservation.

Vessels related to the proposed action would be most likely to affect tribal fishing during the fall salmon management period, when more fishers typically deploy drift gillnets in the navigation channel (from the Crossover Channel Reach of the navigation channel to the turning basin). This is the area with the greatest potential for conflict between tribal fishers and vessels related to the proposed action. During peak periods of the fall fishery, up to nine boats may be actively fishing this area and two to four fishers with nets deployed at one time (Quinault Indian Nation 2015:10). Increased vessel traffic related to the proposed action means that there would be a greater chance that a vessel could travel through this area and affect tribal fishing. This could affect fishers deploying or retrieving nets. Vessels related to the proposed action would transit this portion of the navigation channel 4.5 times per week on average; for comparison, large commercial vessels would transit this portion of the channel approximately 8 times per week on average under the no-action alternative.

As described in Section 3.17, *Vessel Traffic*, it takes approximately 2 hours for vessels to transit the navigation channel between the entrance buoy and Terminal 1. Favorable transit times for vessels related to the proposed action are close to high tide. Quinault fishers currently choose the high slack tide period for salmon drift gillnetting. Assuming the vessel is between the Crossover Channel Reach of the navigation channel and Terminal 1 for approximately half of the 2-hour transit time, including docking and undocking maneuvers, a vessel trip could disrupt fishing for a 1-hour period. The time Quinault fishers are not fishing to avoid a vessel would likely be longer to ensure adequate time to retrieve their net, particularly if the net is full of fish during peak fishing times.

Transiting vessels related to the proposed action would affect (limit) the timing, duration, and physical area that could be fished. Depending on the specific circumstances of the interaction, this could affect the volume of a day's catch. Fishers may be able to compensate for lost fishing time by retrieving their net and motoring back to the start of the drift area; however, depending on factors such as the time of day and number of other fishers, it may not be practical to do so and the disruption could equate to lost fishing opportunities.

Although it is difficult to predict whether the increased vessel traffic would result in an overall inability to meet the tribe's seasonal quota, increased traffic would limit access to some usual and accustomed fishing areas. Implementation of the mitigation described in Section 3.12.7.1, *Applicant Mitigation*, to coordinate docking schedules and limit vessel transits during peak fishing seasons, could reduce these potential impacts.

Increased vessel transit under the proposed action could also reduce access to the Quinault's ocean crab and marine fisheries by limiting access by tribal fishers to cross the bar leaving the mouth of Grays Harbor. As stated, although loaded tank vessels would be restricted to transit during high tide, inbound vessels in ballast could transit the navigation channel at any time. Inbound and outbound vessels could disrupt access to the Quinault's ocean crab and marine fisheries because ocean fishing vessels prefer to use the navigation channel to transport the catch into the harbor. To lessen the danger of hazardous conditions during incoming or outgoing tides, bar crossings are often timed during slack high or low tides. It is likely this disruption would be minor because smaller Quinault fishing vessels would have the ability to adjust their time to avoid the transiting tank vessels.

Quinault fishers participating in the Dungeness crab fishery inside Grays Harbor would not be affected by tank vessels related to the proposed action because they operate outside the navigation

channel and monitor marine communications to avoid larger vessels when transiting to fishing grounds.

3.12.6 What required permits and plans apply to tribal resources?

No required permits or plans apply to tribal resources.

3.12.7 What mitigation measures would reduce impacts on tribal resources?

This section describes the applicant mitigation that would reduce impacts on tribal resources from construction and routine operation of the proposed action. Mitigation measures to reduce impacts on environmental health and safety from increased risk of incidents and related consequences are presented in Chapter 4, *Environmental Health and Safety*.

3.12.7.1 Applicant Mitigation

The applicant will implement the following mitigation.

- To mitigate potential impacts on tribal fishing, the applicant will coordinate with the Quinault Indian Nation and Washington Department of Fish and Wildlife, annually, as requested, to support review and possible adjustments of docking schedules to minimize conflict with fishing schedules negotiated preseason by the state and tribe. Consultation will account for operations, including anticipated vessel movements related to the proposed action.
- While tribal fishing boats are required to follow the U.S. Coast Guard navigation rules, to improve awareness of vessel traffic in the navigation channel, the applicant will work with the Grays Harbor Safety Committee, including the U.S. Coast Guard and Port of Grays Harbor, to establish procedures to announce project-related vessel traffic arrivals and departures over a designated VHF marine radio channel at least 1 hour before arriving or departing.
- To mitigate impacts on access to tribal treaty fishing areas, the applicant will initiate a process between stakeholders and Quinault Indian Nation tribal officials to discuss and identify additional mitigation measures. Initiation of the process between the parties will occur before vessel operations begin.

3.12.8 Would the proposed action have unavoidable and significant adverse impacts on tribal resources?

Implementation of the mitigation measures described above would reduce but may not completely eliminate impacts on tribal resources. More specifically, vessels related to the proposed action would travel through and dock in usual and accustomed fishing areas in Grays Harbor. Under current and future conditions, increased vessel activity could restrict access to tribal fishing areas in the navigation channel and adjacent to Terminal 1. This conflict is most likely to occur for fishing related to harvest of salmon, steelhead, and sturgeon. Because other factors besides vessel operations affect fishing opportunities, such as the number of fishers, fish distribution, timing, and duration of fish windows, the extent to which vessel operations related to the proposed action would affect tribal fishing is difficult to quantify. Potential impacts related to increased risk of incidents and related consequences are addressed in Chapter 4, *Environmental Health and Safety*.

3.13 Public Services and Utilities

Public services and utilities refer to water, wastewater treatment, and solid waste disposal services that are provided to communities. These services contribute to the health and well-being of citizens and communities. The construction and operation of the proposed action could place additional demands on or otherwise affect public services and utilities. Utilities also include electricity and natural gas services; these utilities are addressed in Section 3.6, *Energy and Natural Resources*. Public services also include emergency response and medical services; these services are addressed in Chapter 4, *Environmental Health and Safety.*

This section describes water supplies, wastewater collection and disposal, and solid waste disposal services in the study area. It then describes impacts on these services that could result under the no-action alternative or because of the construction and routine operation[1] of the proposed action. Finally, this section presents any measures identified to mitigate impacts of the proposed action and any remaining unavoidable and significant adverse impacts.

3.13.1 What is the study area for public services and utilities?

The study area for public services and utilities consists of the service areas that encompass the project site that could be affected by construction and routine operation at the project site. Because transport along the Puget Sound & Pacific Railroad (PS&P)[2] and in Grays Harbor would occur within existing transportation corridors, the proposed action would not require the provision of additional public services or utilities (e.g., provision of water, wastewater treatment, and solid waste disposal services) to accommodate the increased traffic associated with routine operations. Therefore, these areas are not addressed in this section.

3.13.2 What laws and regulations apply to public services and utilities?

Laws and regulations for determining potential impacts on public services and utilities are summarized in Table 3.13-1. More information about the applicable laws and regulations is provided in Appendix B, *Laws and Regulations.*

[1] Chapter 4, *Environmental Health and Safety*, addresses the potential impacts from increased risk of incidents (e.g., storage tank failure, train derailments, vessel collisions) and related consequences (e.g., release of crude oil).
[2] The PS&P rail line refers to the rail line between Centralia and the project site.

Table 3.13-1. Laws and Regulations for Public Services and Utilities

Laws and Regulations	Description
Federal	
No federal laws or regulations apply to public services and utilities.	
State	
Building Permit Application – Evidence of Adequate Water Supply (RCW 19.27.097)	Requires applicant to provide evidence of adequate water supply for the intended use of the building.
Prohibited Methods of Sewage Disposal (RCW 43.20.050)	Prohibits disposal of sewage and industrial waste in a manner that would negatively affect domestic water supply or endanger the health and well-being of the people of the state.
Local	
Adoption of International Fire Code (HMC 2.38 and AMC 15.12)	Recognizes that the respective city has adopted the International Fire Code, 2012 Edition, as the official fire code of the city.
Solid Waste and Recyclable Materials (HMC 3.16.030 and AMC 13.08)	Regulates safe, reliable, and responsible use of public services by establishing a system for collection, removal, and disposal of solid waste and recyclables and indicating other forms of disposal is unlawful.
Water System Regulations (AMC 13.56)	Sets requirements and specifications for use of City of Aberdeen water supply regarding connections and maintenance of pipelines, provisions to avoid insufficient supply for fire flow, permitting, emergency water use restrictions, and fire protection services.

RCW = Revised Code of Washington; HMC = Hoquiam Municipal Code; AMC = Aberdeen Municipal Code

3.13.3 How were impacts on public services and utilities evaluated?

This section describes the sources of information and methods used to evaluate impacts.

3.13.3.1 Information Sources

Information about public services and utilities in the study area was obtained by interviewing local service providers and reviewing public scoping comments, previous environmental documents related to the proposed action, project construction and operation plans, and local plans.

3.13.3.2 Impact Analysis

The impact analysis considers the proposed action's potential to affect utilities that provide potable (drinkable) and industrial water, collect and treat wastewater, and dispose of solid waste during construction, as well as subsequent routine operations. Impacts were evaluated in the context of applicable regulatory requirements (Section 3.13.2) and the current capacity of these public services and utilities.

3.13.4 What public services and utilities are in the study area?

This section describes public services and utilities in the study area that could be affected by construction of the proposed action and routine operations at the project site.

3.13.4.1 Water Supplies

The City of Aberdeen Public Works Department is responsible for providing municipal services related to water supply distribution to the project site. Under existing conditions, the department provides potable water to the project site. The project site currently has no industrial water demand; however, it is likely that the department would supply industrial water if needed. The department's potable water capacity is 6.5 million gallons per day and current demand averages 2.6 million gallons per day (Randich pers. comm. [A]). The industrial water supply capacity is 100 million gallons per day, of which current demand only accounts for a small fraction (Randich pers. comm. [B]).

3.13.4.2 Wastewater Collection and Treatment

The City of Aberdeen Public Works Department provides treatment of wastewater at the project site. The department's current collection system consists of 16 lift stations that are fed by 82 miles of sanitary sewer. The treatment facility is located in Aberdeen and discharges treated wastewater into the Chehalis River.

More than $1.1 million in capital improvements were made to the City of Aberdeen's wastewater treatment facility in 1999 and 2000, and $7.6 million of capital projects are currently under construction (City of Aberdeen 2014). The current use and available capacity of the facility are shown in Table 3.13-2.

Table 3.13-2. Current Use and Available Capacity for the City of Aberdeen Wastewater Treatment Facility

Permit Defined Design Criteria	2013 Peak or Maximum	Annual Average	Maximum Available Capacity	Maximum Available Capacity (%)
Average flow for the maximum month: 9.90 mgd	January: 4.30 mgd	3.25 mgd	5.6 mgd	43
Peak hourly flow: 18.0 mgd	15.5 mgd	N/A	2.5 mgd	14
BOD_5 loading for maximum month: 7,400 lbs/day	April: 4,910 lbs/day	4,342 lbs/day	2,490 lbs/day	34
TSS loading for maximum month: 8,900 lbs/day	September: 8,629 lbs/day	8,629	271 lbs/day	3

Source: Scott pers. comm.
mgd = million gallons per day; N/A = not applicable; BOD_5 = 5-day biological oxygen demand; lbs/day = pounds per day; TSS = total suspended solids

3.13.4.3 Solid Waste Disposal

Solid waste collection and disposal services in the study area are provided by Hometown Sanitation LLC and LeMay, Inc. Both companies provide garbage and recycling collection for residential and commercial customers. Under existing conditions, Hometown Sanitation provides collection service

to the project site. Solid waste collected by Hometown Sanitation is transported to LeMay's Central Transfer Station, in Aberdeen, for temporary storage prior to transport for permanent disposal. The transfer station is currently at about 60% capacity, but has a flexible system to respond to shifts in demand (Dionne pers. comm.). Waste from the transfer station is trucked to the Wasco County Landfill in The Dalles, Oregon, for permanent disposal (Stalander pers. comm.).

Hazardous waste collection and disposal is provided to the study area by several companies. Currently, the applicant contracts with Cowlitz Clean Sweep to transport materials to the Stericycle Environmental Solutions disposal facility in Kent, Washington, as needed.

3.13.5 What are the potential impacts on public services and utilities?

This section describes impacts on public services and utilities that could occur in the study area. Potential impacts of the no-action alternative are described first, followed by potential impacts of the proposed action.

3.13.5.1 No-Action Alternative

Under the no-action alternative, impacts related to public services from the construction of the proposed action would not occur. The applicant would continue to operate its existing facility as described in Chapter 2, Section 2.1.3.2, *Existing Operations*. Although the proposed action would not occur, it is assumed that growth in the region would continue under the no-action alternative. This growth could lead to development of another industrial use at the project site, which could result in impacts similar to those described for the proposed action. However, for the purposes of this analysis, it is assumed that no future development would occur at the project site.

3.13.5.2 Proposed Action

This section describes impacts that could occur in the study area as a result of construction and routine operation of the proposed action. First, this section describes impacts from construction of the proposed action. It then describes impacts of routine operation at the project site.

Construction

Construction of the proposed action would temporarily increase the demand for water at the project site. Industrial water would be used for construction and for hydrostatic testing. Approximately 8.4 million gallons of water would be used to conduct serial hydrostatic testing of one storage tank at a time. Special treatment of the hydrotest water prior to discharge is not expected but if the water exceeds discharge requirements, the water would be treated appropriately (e.g., filtering, pH adjustment) on site prior to discharge or shipped for offsite disposal if it cannot be handled on site. If no contamination issues are found, a hose would be attached to a valve on the last tank and routed into the stormwater sump of the new tank farm containment for release into Grays Harbor through the Port of Grays Harbor stormwater system. Information about stormwater runoff and water quality is provided in Section 3.3, *Water*.

Potable and industrial water supply for construction would be provided by the City of Aberdeen and considered an additional demand to the applicant's existing facility account.

Construction activities would also result in a temporary increase in solid waste and hazardous waste, including debris from demolition activities (e.g., concrete and asphalt) and construction of the new facility. It is anticipated that solid waste generated during construction would be taken to LeMay's Central Transfer Station prior to transport for permanent disposal. The transfer station and destination landfill have adequate capacity to handle this temporary increase in waste. It is anticipated that the applicant would use one or more of the providers listed in Section 3.13.4.3, *Solid Waste Disposal*, for collection and disposal of these wastes. The handling of hazardous materials is addressed in Section 3.14, *Hazardous Materials.*

Operations

The proposed action would result in new buildings[3] and 18 additional employees, which would modestly increase the demand for potable water on site. This demand would be added on to the applicant's existing contract with the City of Aberdeen Public Works Department. As noted, the applicant would be required to comply with the code that protects the city's water supply.

Routine operation of the proposed action would also increase the amount of solid waste generated at the project site. Hometown Sanitation LLC would provide services for regular pickup; LeMay's Central Transfer Station would be available to handle excess solid waste. The incremental increase in solid waste would be within the capacity of both service providers and that of the destination landfill.

Operation of the proposed action could also generate hazardous waste as a result of minor releases, as described in Section 3.14, *Hazardous Materials.* These hazardous materials would require safe disposal and would be hauled separately from regular solid waste. It is anticipated that the applicant would continue to contract with the providers listed in Section 3.13.4.3, *Solid Waste Disposal*, to collect and dispose of these wastes. Information specific to the safe handling of hazardous materials in compliance with applicable regulations is discussed in Section 3.14, *Hazardous Materials*.

3.13.6 What required permits and plans apply to public services and utilities?

The following permit conditions and required plans are expected to reduce impacts on public services and utilities.

- City of Hoquiam and City of Aberdeen Fire Department Permits.
  - Permits the proposed action as meeting fire prevention and suppression requirements.
  - Adherence to the International Fire Code, 2012 Edition.
- City of Aberdeen Utility Services Agreement.
  - Communication and coordination.

[3] The new buildings would provide offices, a laboratory, and maintenance and warehouse facilities.

3.13.7 What mitigation measures would reduce impacts on public services and utilities?

With implementation of the permit conditions described above, impacts resulting from the proposed action would not be considered significant and would not necessitate mitigation.

Mitigation measures to reduce impacts on emergency response and medical services are addressed in Chapter 4, *Environmental Health and Safety.*

3.13.8 Would the proposed action have unavoidable and significant adverse impacts on public services and utilities?

Compliance with the applicable regulations and permits described above would reduce impacts on public services and utilities. There would be no unavoidable and significant adverse impacts. Impacts on emergency response and medical services are addressed in Chapter 4, *Environmental Health and Safety.*

3.14 Hazardous Materials

Hazardous materials are substances that could affect the safety of the human or natural environment. There are risks in using, storing, and transporting hazardous materials. If a hazardous material is released to the environment, it may contaminate the surrounding area and could expose people and the environment to harm.

This section describes hazardous materials in the study area, including past land uses and the associated risks of site contamination. In addition, this section describes the existing and proposed onsite operations with the potential to result in exposure to hazardous materials. It then describes impacts related to hazardous materials that could occur under the no-action alternative or as a result of the construction and routine operation of the proposed action. The analysis of impacts of the proposed action addresses the risks associated with smaller-scale releases of crude oil at the project site in general terms.[1] A detailed analysis of potential impacts from spills and incidents is included in Chapter 4, *Environmental Health and Safety*. Finally, this section presents any measures identified to mitigate impacts of the proposed action and any remaining unavoidable and significant adverse impacts.

3.14.1 What is the study area for hazardous materials?

The study area for hazardous materials includes all hazardous materials on and near the project site that could be affected by construction and routine operation at the project site. Potential hazardous materials impacts along the Puget Sound & Pacific Railroad (PS&P)[2] and in Grays Harbor and adjacent state waters off the coast are addressed in Chapter 4, *Environmental Health and Safety*.

3.14.2 What laws and regulations apply to hazardous materials?

Laws and regulations for determining potential impacts related to hazardous materials are summarized in Table 3.14-1. More information about these laws and regulations is provided in Appendix B, *Laws and Regulations*.

Table 3.14-1. Laws and Regulations for Hazardous Materials

Laws and Regulations	Description
Federal	
Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (42 U.S.C. 103)	Regulates proper site characterization of and site remediation for hazardous materials.
Resource Conservation and Recovery Act (42 U.S.C. 6901 et seq.)	Regulates hazardous waste through a regulatory framework that includes requirements for entities that generate, store, transport, treat, and dispose of hazardous waste (40 CFR 260 through 299).

[1] Chapter 4, *Environmental Health and Safety*, addresses the potential impacts from increased risk of incidents (e.g., storage tank failures, train derailments, vessel collisions) and related consequences (e.g., release of crude oil).
[2] The PS&P rail line refers to the rail line between Centralia and the project site.

Laws and Regulations	Description
Clean Water Act (33 U.S.C. 1251 et seq.)	Establishes the structure for regulating discharges of pollutants into navigable waters of the United States by regulating point pollution sources, such as stormwater discharges, and contains specific provisions related to the accidental release of oil and other hazardous substances into U.S. waters.
Oil Pollution Act of 1990 (33 U.S.C. 40)	Requires more stringent planning and spill prevention activities, improved preparedness and response capabilities, and ensures that responsible parties pay for oil spill cleanups.
Occupational Safety and Health Act of 1970 as Amended 2004 (29 U.S.C. 651 et seq.)	Establishes the framework for safe and healthful working conditions by authorizing enforcement of the standards.
National Oil and Hazardous Substances Pollution Contingency Plan 40 CFR 300	Establishes federal on-scene coordinators for oil spills and hazardous material releases within the inland zone and coastal environments. Lays out a system for federal, state, local agencies, tribal nations, private interests, environmental groups, and other stakeholders to jointly respond to spills and releases.
Natural Resource Damage Assessments 43 CFR 11	Supplements the procedures established under the National Contingency Plan and provides a mechanism for natural resource trustees to determine compensation for injuries to natural resources that have not been nor are expected to be addressed by response actions conducted pursuant to the National Contingency Plan.
State	
Hazardous Substances Account Act (RCW 70.105 et seq.)	Regulates proper site characterization and site remediation of hazardous materials (Health and Safety Code Section 25300 et seq.).
Sediment Management Standards (WAC 173-204)	Establishes rules used to manage sediment in Washington through standards that apply to sediment quality and reduced pollutant discharges.
Model Toxics Control Act (RCW 70.105D and WAC 173-340)	Establishes a toxic waste cleanup law.
Dangerous Waste Regulations (WAC 173-303)	Provides authorities and standards for designating, tracking, generator management, and safely disposing of dangerous solid wastes.
Facility Oil Handling Standards (WAC 173-180)	Establishes facility oil handling standards.
Hazardous Waste Operations (WAC 296–843)	Provides regulations for employees working in operations, investigations, or clean-up operations at sites with hazardous waste.
Water Rights—Oil and Hazardous Substance Spill Prevention and Response "Oil Spill Act" (RCW 90.56)	Establishes programs to reduce the risk and develop an approach to respond to oil and hazardous substance spills; provides a simplified process to calculate damages from an oil spill; holds responsible parties liable for damages resulting from injuries to public resources.
Oil Spill Natural Resources Damage Assessment (WAC 173-183)	Establishes procedures for convening a resource damage assessment committee, preassessment screening of damages, and selecting the damage assessment method.
Local	
No local laws or regulations apply to hazardous materials.	

U.S.C. = United States Code; CFR = Code of Federal Regulations; RCW = Revised Code of Washington; WAC = Washington Administrative Code

3.14.3 How were hazardous materials impacts evaluated?

This section describes the sources of information and methods used to evaluate impacts.

3.14.3.1 Information Sources

The following regulatory databases provided information to identify potential hazardous materials issues associated with past and present operations at the project site and adjacent properties within 0.25 mile of the project site.

- Federal National Priorities List
- Delisted National Priorities List Database
- Resource Conservation and Recovery Act Information (RCRA)
- RCRA Large-Quantity Generator
- Federal Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS)
- Federal CERCLIS No Further Remedial Action Planned
- Federal Corrective Action Sites
- Federal Emergency Response and Notification System
- Toxic Chemical Release Inventory System
- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 U.S.C. 103) or Superfund Consent Decrees
- Hazardous Sites List
- Leaking Underground Storage Tank (LUST)
- Spills
- Independent Cleanup Reports
- Facility/Site Identification System Listing (ALLSITES)
- Confirmed and Suspected Contaminated Sites—No Further Action (CSCSL NFA)
- Hazardous Waste Manifest Information (MANIFEST)
- Facility Index System/Facility Registry System (FINDS)
- Voluntary Cleanup Program (VCP)

Information about the physical properties and risks of crude oil that could be used under the proposed action was obtained from the applicant and environmental site assessments recently completed in the study area. Regulatory agency databases reviewed included the U.S. Environmental Protection Agency (EPA) and Washington State Department of Ecology (Ecology) databases and an Environmental Data Resources Radius Map Report for applicable environmental records.

3.14.3.2 Impact Analysis

Impacts related to hazardous materials were determined by reviewing the information sources above for sites within 0.25 mile of the project site, reviewing information about the physical properties and risks of materials that could be handled and used under the proposed action, and considering proposed construction and operation activities under the proposed action.

3.14.4 What hazardous materials are in the study area?

This section describes hazardous materials in the study area that could be affected by construction and routine operation of the proposed action.

3.14.4.1 Past Uses and Risk of Potential Contamination

Prior to the late 1970s, the project site served as a boat slip. By the early 1990s, it was filled with sediment dredged from Grays Harbor (Boersema 2013: 11–12). Based on information obtained from past environmental site assessments relevant to the study area as noted above, no Recognized Environmental Conditions were identified in the project site; however, six Recognized Environmental Conditions were identified in the study area, all outside of the project site (Table 3.14-2).

Table 3.14-2. Recognized Environmental Concerns in the Study Area

Site Name	Address and Distance from Project	Environmental Databases	Status
Grays Harbor Transportation Authority	705 30th Street, Hoquiam. Located approximately 0.25 mile northwest of the project site.	ALLSITES, LUST	Affected soil only. Case opened in 1991 and received NFA status in August of 2012.
Hoquiam School District Transportation Center	3030 Bay Avenue, Hoquiam. Located approximately 0.23 mile northwest of the project site.	ALLSITES, LUST, MANIFEST, RCRA Info, VCP	Affected soil only. Case opened in 1998 and was later granted NFA status in 1999 under Ecology's VCP. In 2010, two violations were issued to the site under the Ecology Dangerous Waste Regulation (WAC 173-303). Compliance was achieved that same year.
Imperium Grays Harbor	3122 Port Industrial Road, Hoquiam. Located approximately 800 feet northwest of the project site.	ALLSITES, CERCLIS, MANIFEST, EPA Echo, RCRA Info	This facility is a large-quantity generator. Ecology inspection of the facility found seven violations in 2011 and six violation in 2014, respectively. Ecology received confirmation that all violations were corrected.

Site Name	Address and Distance from Project	Environmental Databases	Status
Paneltech Products, Inc.	2999 John Stevens Way, Hoquiam. Located approximately 200 feet northwest of the project site, across John Stevens Way.	ALLSITES, FINDS, MANIFEST, RCRA Info, SPILLS, VCP	Approximately 375 gallons of phenol spilled on site December 2005. Soil and groundwater were affected. Site was granted NFA under the VCP in June 2010. Two violations and one violation were found at the facility during Ecology dangerous waste inspection in 2013 and 2014, respectively. Both violations were corrected.
Pettit Oil (Tosco/Unocal Bulk Plant No. 0291)	640, 700, and 820 Myrtle Street, Hoquiam. Located approximately 0.10 mile north of the project site.	ALLSITES, CSCSL, FINDS, SPILLS	A 100- to 200-gallon gasoline spill occurred in 1993. The site was listed in the CSCSL for the contamination of soil and groundwater. An assessment conducted in 1997 revealed gasoline, diesel, and oil- range hydrocarbons above cleanup levels in soil and groundwater. The site status is listed by Ecology as 'cleanup started'.
Westport Shipyard, Inc.	2850 John Stevens Way, Hoquiam. Located approximately 200 feet northwest of the project site across John Stevens Way.	ALLSITES, FINDS, WAC 173-303, RCRA	Listed as a medium-quantity generator (Dangerous Waste Regulation, WAC 173-303), generating between 100 and 1,000 kilograms of hazardous waste per month. Ten informal violations have been issued with compliance achieved.

ALLSITES = Facility/Site Identification System Listing; LUST = Leaking Underground Storage Tank; NFA = No Further Action; MANIFEST = Hazardous Waste Manifest Information; RCRA = Resource Conservation and Recovery Act Information; VCP = Voluntary Cleanup Program; Ecology = Washington State Department of Ecology; CESQG = Conditionally Exempt Small-Quantity Generator; CERCLIS = Federal Comprehensive Environmental Response, Compensation, and Liability Information System; FINDS = Facility Index System/Facility Registry System; CSCSL = Confirmed and Suspected Contaminated Sites; WAC = Washington Administrative Code

3.14.4.2 Existing Operations

As described in Chapter 2, *Proposed Action and Alternatives*, the applicant currently operates a methanol distribution facility. Operations involve receiving, storing, and loading (for transport) methanol. The existing facility includes bulk liquid storage tanks, loading and unloading areas, and a system of pipelines connecting the loading areas with bulk liquid storage tanks. The chemical properties of methanol are described in Table 3.14-3.

Table 3.14-3. Chemical Properties of Methanol

Density	Properties and Potential Release Behavior
Specific gravity 0.79; API 47.49	Floats on water; toxic; relatively high flash point and degree of volatility; infinitely soluble in water.
Source: Cheremisinoff 2000	

Small amount of other chemicals are also handled, stored, and transported on site related to routine operations. These include hazardous materials such as fuels used in facility vehicles, solvents, cleaning agents, paints, oil filters, used oil, batteries, aerosol cans, and fire-fighting foam.

As described in Chapter 2, *Proposed Action and Alternatives*, the storage tank area and truck and rail loading and unloading areas are underlain with secondary containment to capture spills. A vapor combustion unit is used to incinerate vapors associated with rail and truck loading. Under existing conditions, the applicant requires that personnel attend training to be certified to handle hazardous materials and to respond to minor releases consistent with the Occupational Safety and Health Administration standards pertaining to hazardous materials (29 Code of Federal Regulations [CFR] 1910 Subpart H).

Per the state and federal regulations listed in Section 3.14.2, the applicant also has in place various safety and spill containment protocols to address potential releases of hazardous materials that may occur on site. Additionally, the applicant has a U.S. Coast Guard-approved operations manual to reduce the potential for incidents and to clarify emergency notification and response protocols during site operations and vessel transfers.

3.14.5 What are the potential hazardous materials impacts?

This section describes hazardous materials impacts that could occur in the study area. Potential impacts of the no-action alternative are described first, followed by potential impacts of the proposed action.

3.14.5.1 No-Action Alternative

Under the no-action alternative, impacts related to hazardous materials from the construction of the proposed action would not occur. The applicant would continue to operate its existing facility as described in Chapter 2, Section 2.1.3.2, *Existing Operations,* and summarized above. Methanol would continue to be transported to and from the project site by tanker truck, rail, and vessel and loaded, unloaded, and stored on site.

The risks of exposure would be related primarily to the handling and storage of hazardous materials such as fuels used in facility vehicles, solvents, cleaning agents, paints, oil filters, used oil, batteries, aerosol cans, and fire-fighting foam and would be similar to existing conditions. Minor releases of these chemicals and those stored in bulk, including methanol, could occur during routine operations as the result of human error (e.g., improper use, not following required handling and storage protocols) or minor equipment failure (e.g., leaking vehicles or minor hose leaks). These releases would most likely be relatively small and easily contained within the existing containment structures.

Similar to existing conditions, the applicant would continue to require that personnel attend training to be certified to handle hazardous materials and to respond to minor releases consistent with the

Occupational Safety and Health Administration standards pertaining to hazardous materials (29 CFR 1910 Subpart H). Additionally, the applicant would continue to comply with applicable regulations to implement safety and spill prevention and response protocols to reduce the release of hazardous materials.

There would also be the continued potential for larger-scale incidents to occur, primarily with respect to chemicals stored in bulk. Such events could result in more extensive release scenarios. Similar to existing conditions, the probability of larger-scale releases (such as might occur during unloading and loading or during transport) would continue to be relatively low. These risks are discussed in Chapter 4, *Environmental Health and Safety*. However, if larger bulk liquid spills of methanol were to occur, they could result in adverse impacts on humans or the environment. For example, methanol is a skin irritant and can be toxic to eyes, and at high concentrations can affect the central nervous system of humans. Methanol is also highly flammable, and while it essentially dissolves in water, release can result in fires or explosions, depending on the circumstances of the release. For additional information about the risks and environmental consequences related to the release of hazardous materials associated with the no-action alternative, see Chapter 4, *Environmental Health and Safety*.

3.14.5.2 Proposed Action

This section describes hazardous materials impacts that could occur in the study area as a result of construction and routine operation of the proposed action.

Construction

Construction activities would involve the transport, handling, storage, and disposal of hazardous materials such as fuels, solvents, paints, oils, and grease. Although there is a potential for incidents to occur that could expose people or the environment to these materials, construction activities would be conducted in a manner compliant with applicable regulations (Section 3.14.2). Specifically, transport, handling, storage, and disposal would comply with the requirements of RCRA and Washington's Dangerous Waste Regulations (WAC 173-303-145). Additionally, the construction contractor would be required to have certified personnel and a health and safety plan that comply with the Occupational Safety and Health Administration's Safety and Health Regulations for Construction (29 CFR 1926). Compliance with this standard would ensure implementation of best management practices to reduce human exposure to potential contaminants.

Construction activities could also result in the disturbance of potentially contaminated soils; however, as noted in Section 3.14.4.1, *Past Uses and Risk of Potential Contamination*, there are no Recognized Environmental Conditions at the project site. Therefore, there is a low chance of exposure from past site contamination. However, because the original source of the dredged fill material is not known, there remains a possibility that construction could encounter contaminated soils. This potential impact would be greater compared to the no-action alternative. For this reason, the measures summarized in Section 3.14.7.2, *Applicant Mitigation*, would be required to reduce this impact, consistent with state requirements pursuant to WAC 173-204.

The proposed action could also encounter contamination from Recognized Environmental Conditions outside the project site. As mentioned above, six sites located within 0.25 mile of the project site were further analyzed. Four of the sites (Paneltech Products, Inc., Westport Shipyard, Inc., Hoquiam School District Transportation Center, and Grays Harbor Transportation Authority) had previous violations but are now in compliance with Ecology standards. One site (Imperium

Grays Harbor) was listed as a large-quantity generator. Ecology inspection of the facility found seven violations in 2011 and six violations in 2014. Ecology received confirmation that all violations were corrected. The remaining site (Pettit Oil) is active under Ecology's Toxic Cleanup Program and noted as having contaminated soil and groundwater. This site is located north and approximately 0.23 mile upgradient of the project site. Because this site is located upgradient and only 0.23 mile away, it is possible that contamination migrating (via groundwater) from the Pettit Oil site could have affected the project site. Groundwater depth in the project area is approximately 10 feet below ground surface (Insight Geologic 2012). The site status is listed by Ecology as 'cleanup started'. Although impacts could occur during construction, implementation of measures summarized in Section 3.14.7.2, *Applicant Mitigation*, would further reduce impacts related to historically contaminated sites adjacent to the project site.

Operations

This section describes the impacts of the proposed action that could result from routine operations at the project site, including the potential for minor spills of various liquids related to the proposed action. Chapter 4, *Environmental Health and Safety*, addresses the potential impacts from increased chance of incidents (e.g., storage tank failure, train derailments, vessel collisions) that would result in release of crude oil and the related consequences.

Under the proposed action, the applicant would continue to handle and store methanol similar to existing conditions. Because the proposed operations related to these activities would not change, the risks of exposure of workers to hazardous materials associated with the methanol distribution activities (e.g., methanol, fuels used in facility vehicles, solvents, cleaning agents, paints, oil filters, used oil, batteries, aerosol cans, fire-fighting foam) would remain the same as the no-action alternative.

As discussed in Chapter 2, *Proposed Action and Alternatives*, the proposed action would entail the construction and operation of a new facility to support unloading, storing, and loading (for transport) crude oil. Table 3.14-4 describes the basic properties of Bakken crude oil and diluted bitumen and their potential behavior upon release. All forms of crude oil contain many different hydrocarbons and include trace levels of other chemicals. Additional information about the properties and characteristics of crude oil is presented in Chapter 4, Section 4.3, *Risk Considerations*.

Table 3.14-4. Basic Properties and Potential Release Behavior of Crude Oil

Product	Properties and Potential Release Behavior
Bakken crude oil[a, b]	A "light" crude oil with a high gas content, high vapor pressure, low flashpoint, and low boiling point. It is more volatile than most other types of crude, which correlates to increased ignitability and flammability. Floats on water.
Diluted bitumen[a, c, d]	Floats, submerges, and/or sinks depending on temperature, and specific gravity/API value of the particular oil shipment, type of diluent added, and time spent in the environment. Diluent is volatile and readily evaporates. Weathered residue exhibits high level of persistence in environment.

[a] Washington State Department of Ecology 2014.
[b] Pipeline and Hazardous Materials Safety Administration 2014.
[c] Lee et al. 2015.
[d] National Academies of Sciences, Engineering, and Medicine 2016

Crude Oil

Crude oil, the liquid form of petroleum, is typically classified as light, medium, or heavy depending on its density compared to water. Crude oil primarily consists of a mixture of paraffins (alkanes), naphthenes (cyclohexanes), and aromatic hydrocarbons that can be distilled to create a variety of products (Polaris 2013: 7). Gasoline, propane, butane, methane, kerosene, diesel, and lubricating oils are some of the products that come from crude oil distillation and processing. Distillation and processing are not part of the proposed action. Crude oil can come from a variety of sources. Under the proposed action, it is anticipated that crude oil would come in the form of Bakken crude oil from the Williston Basin in North Dakota[3] or in the form of diluted bitumen derived from oil sands from Alberta, Canada. The unique properties of these "unconventional" oils are introduced below and further discussed in Sections 4.3.1.1, *Material Characteristics* and 4.3.1.2, *Crude Oil*.[4]

Bakken Crude Oil

Bakken crude oil is a light, sweet (low sulfur) crude oil with an average API gravity between 38 and 47 degrees. Bakken crude oil typically contains higher amounts of dissolved flammable gases compared to some lighter crude oils, making it a Class 3 Flammable Liquid.[5] Bakken crude oil has a flash point that is slightly lower than the average flash point of light crudes. Characteristics such as vapor pressure, sulfur weight, and boiling point are comparable to other light crude oils. (Washington State Department of Ecology 2014: 413).

Bitumen and Diluted Bitumen

Bitumen is derived from oil sand deposits, which consist of a combination of clay, sand, water, and bitumen. Oil sands are typically mined (not pumped because they are highly viscous) and then processed to extract the oil-rich bitumen. Most heavy oils are found at the margins of geologic basins and are thought to be the residue of light oils that have lost their light-molecular-weight components through degradation by bacteria, water-washing, and evaporation (Lee et al. 2015: 20). Bitumen (prior to dilution) is a heavy, dark, black viscous oil and is considered to be a heavy crude.

Diluted bitumen refers to bitumen that has been diluted with at least one lighter petroleum product to make it easier to transport. Diluted bitumen is also referred to as dilbit. Diluted bitumen differs from conventional crudes in its high viscosity, high density (low API gravity), and high sulfur content. Typically, the ratio of bitumen to diluent is 70:30 or 30% diluent (Lee et al. 2015: 21).

Crude Oil Operations

New capacity related to the proposed facility would be dedicated to handling and storing crude oil. Primary operations would include unloading and transferring crude oil from rail cars to storage tanks; storing crude oil in above-ground storage tanks; transferring crude oil (via pipelines) from storage tanks to tank vessels; and conducting routine facility maintenance work (e.g., tank cleaning, equipment maintenance). Although the unloading, storage, and loading of crude oil would occur in a

[3] The Williston Basin rail terminals are primarily in North Dakota but extend into Montana, South Dakota, and Saskatchewan, Canada.
[4] The term *unconventional oil* is used to describe oils that are extracted using unconventional methods such as surface mining of shallow bitumen deposits, steam-assisted gravity drainage for *in situ* extraction of deep bitumen deposits, cyclic steam injection for heavy oils, or horizontal drilling with hydraulic fracturing for recovery of light shale oils (such as Bakken crude oils) (Lee et al.: 24).
[5] A Class 3 flammable liquid has a flash point of not more than 140°F (60°C) (49 CFR 173.120).

manner similar to existing operations, there is increased risk of exposure of people (primarily workers) and the environment due to the increase in throughput compared to the no-action alternative and increased consequences to human health and the environment due to the additional hazardous materials, namely crude oil.

Similar to existing conditions, exposure to hazardous materials associated with routine operations under the proposed action would be most likely to occur during unloading and loading activities. Most likely causes would continue to be human error (e.g., misuse of equipment, inadequate application of health and safety procedures, improper implementation of specific handling requirements) or minor equipment failure (e.g., small valve leak), resulting in incidental spills or exposure to other hazards (e.g., dermal absorption, inhalation exposure, small fires, slips and falls).

As noted in Chapter 2, *Proposed Action and Alternatives,* and consistent with the regulations outlined in Section 3.14.2 (Facility Oil Handling Standards, WAC 173-180; Clean Water Act [33 U.S.C 1251 et seq.] and the Oil Pollution Act [33 U.S.C. 2701 et seq.]), the proposed facility would be designed and operated to meet the appropriate safety standards as a designated oil facility. Specifically, the facility would be designed to meet primary and secondary containment standards in the event of an oil spill. Additionally, the applicant would be required to develop the required spill prevention, contingency, and response plans to reduce the potential for releases of crude oil and to clarify emergency notification and response protocols during site operations and vessel transfers. Similar to existing conditions, the applicant would also continue to ensure that personnel training and handling and storage activities would also comply with the appropriate safety standards intended to reduce the risks of incidents and to address potential spills during operation.

Because the potential consequences of an incident (e.g., a spill during vessel loading, tank rupture), depend on the specific circumstances of each event (e.g., location, size of the release, land or water based, etc.), a risk analysis was conducted to frame the analysis of impacts and to be able to characterize the potential changes in risks of exposure of people and the environment to hazardous materials associated with the proposed action. This analysis is presented in Chapter 4, *Environmental Health and Safety*, and addresses potential risks during onsite operations and offsite rail and vessel transport.

3.14.6 What required permits and plans apply to hazardous materials?

The following permit conditions and required plans are expected to reduce impacts related to hazardous materials. Additional requirements specific to the handling, storage, and transport of crude oil are discussed in Chapter 4, *Environmental Health and Safety*.

- City of Hoquiam Fire Department Approval
  - Fire prevention and suppression requirements
- City of Aberdeen Fire Department Approval
  - Fire prevention and suppression requirements
- City of Aberdeen Utility Services Agreement
  - Communication and coordination

- Washington State Department of Ecology National Pollutant Discharge Elimination System Construction Stormwater General Permit and Industrial Stormwater Permit
  - Discharge/effluent limits
  - Monitoring, sampling, and reporting requirements
  - Operations and maintenance plan
  - Stormwater pollution prevention plan
  - Onsite spill control material provision requirements
  - Stormwater pollution prevention plan preparation requirement
  - Stormwater BMP development and implementation
  - Spill prevention control and countermeasures plan preparation requirement
  - Industrial discharge best management practice development and implementation
  - Personal protective equipment plan for use, storage, and maintenance
- Spill prevention, contingency, and response plans to satisfy federal and state oil spill prevention and contingency planning and facility operations requirements
  - Evaluation of onsite safety and health hazards
  - Pre-emergency planning and coordination with outside organizations
  - Roles and responsibilities in an emergency
  - Evacuation routes and emergency alert and response protocols
  - Oil and hazardous material transfer operation protocols
  - Containment and countermeasures to prevent oil spills from entering navigable waterways
  - Notification procedures
  - Spill mitigation procedures
  - Facility response activities
  - Training and exercise procedures
  - Equipment descriptions: emergency shutdown system, containment, fire fighting

3.14.7 What mitigation measures would reduce hazardous materials impacts?

This section describes the applicant mitigation that would reduce hazardous materials impacts form the construction and routine operation of the proposed action. Mitigation measures to reduce potential impacts on environmental health and safety from increased risk of incidents and related consequences are presented in Chapter 4, *Environmental Health and Safety*.

3.14.7.1 Applicant Mitigation

The applicant will implement the following mitigation.

- To address odiferous, stained, or discolored groundwater or soil encountered during construction activities, or if groundwater encountered is suspected to be contaminated during construction activities, the following mitigation measures will be implemented.
  - The applicant will seek the professional recommendation of a consultant specializing in the handling and identification of hazardous materials and contaminated media.
  - If deemed necessary, based on the above consultation, the applicant will conduct soil and/or groundwater testing for identification of possible hazardous materials.
  - Construction personnel will isolate and cover suspect soil until analytical results are reviewed by qualified personnel.
  - The consultant will compare analytical results to the applicable EPA's regional screening levels, which address common environmental pollutants. If hazardous materials are discovered in the soils and/or groundwater at levels above the regional screening levels, the consultant will provide recommendations on the steps required for proper treatment and/or removal and disposal of the contaminated media.

3.14.8 Would the proposed action have unavoidable and significant adverse hazardous materials impacts?

Compliance with the applicable regulations and permit conditions along with implementation of the mitigation measures described above would reduce hazardous materials impacts. There would be no unavoidable and significant adverse impacts from construction and routine operations. Potential impacts related to increased risk of incidents and related consequences are addressed in Chapter 4, *Environmental Health and Safety*.

3.15 Rail Traffic

Railroads provide transportation services for passengers and commercial goods and support regional economic activity. Rail traffic in the study area consists of commercial goods, industrial products, agricultural commodities, and garbage. Similar to other forms of transportation, rail traffic is subject to various regulatory requirements governing maintenance of infrastructure standards, allowable speed limits, and methods and types of goods and services that can be transported.

This section describes rail traffic in the study area, including rail lines and subdivisions, rail yards, connections with the main lines, freight traffic, capacity, and rail operations at the project site. It then describes impacts on rail traffic that could result under the no-action alternative or as a result of the construction and routine operation[1] of the proposed action. Finally, this section presents any measures identified to mitigate impacts of the proposed action on rail traffic and any remaining unavoidable and significant impacts.

3.15.1 What is the study area for rail traffic?

The study area for rail traffic consists of the Puget Sound & Pacific Railroad (PS&P)[2] rail line, including the PS&P rail line junction with the BNSF Railway (BNSF)[3] main line in Centralia that could be affected during routine rail transport. Figure 3.15-1 illustrates the location of the PS&P rail line in relation to other rail lines in northwest Washington. Figures 3.15-2 and 3.15-3 present the general route of the PS&P rail line. Impacts related to increased rail and vessel traffic beyond the study area are described in Chapter 5, *Extended Rail and Vessel Transport*.

[1] Chapter 4, *Environmental Health and Safety*, addresses the potential impacts from increased risk of incidents (e.g., storage tank failure, train derailments, vessel collisions) and related consequences (e.g., release of crude oil).

[2] The PS&P rail line refers to the rail line between Centralia and the project site (which is called the Elma Subdivision by PS&P). For more information on PS&P subdivisions, see Section 3.15.4.1, *Rail Service between Centralia and Hoquiam*.

[3] Throughout this section, reference to the BNSF main line includes trains operated by the BNSF Railway Company (BNSF) and the Union Pacific Railroad (UP). BNSF owns the tracks that serve PS&P at Centralia. An operating agreement between BNSF and UP, however, allows BNSF's tracks to serve UP and PS&P. When a freight train transfers to the PS&P rail line from the BNSF main line, depending on the operator of that train, either BNSF or UP crews oversee the operation.

Figure 3.15-1. PS&P Rail Line in Regional Rail Context

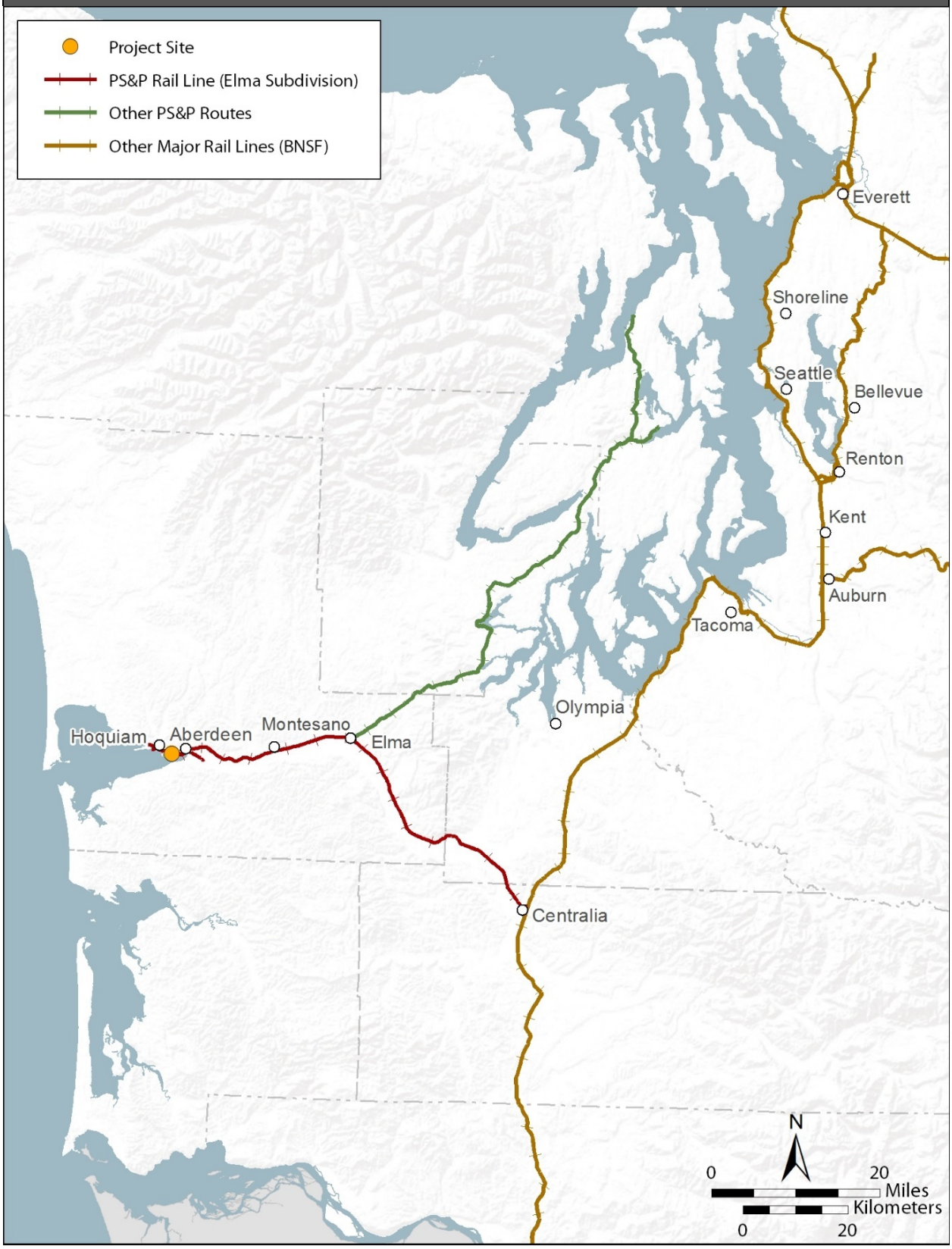


Figure 3.15-2. PS&P Rail Line General Route (East)

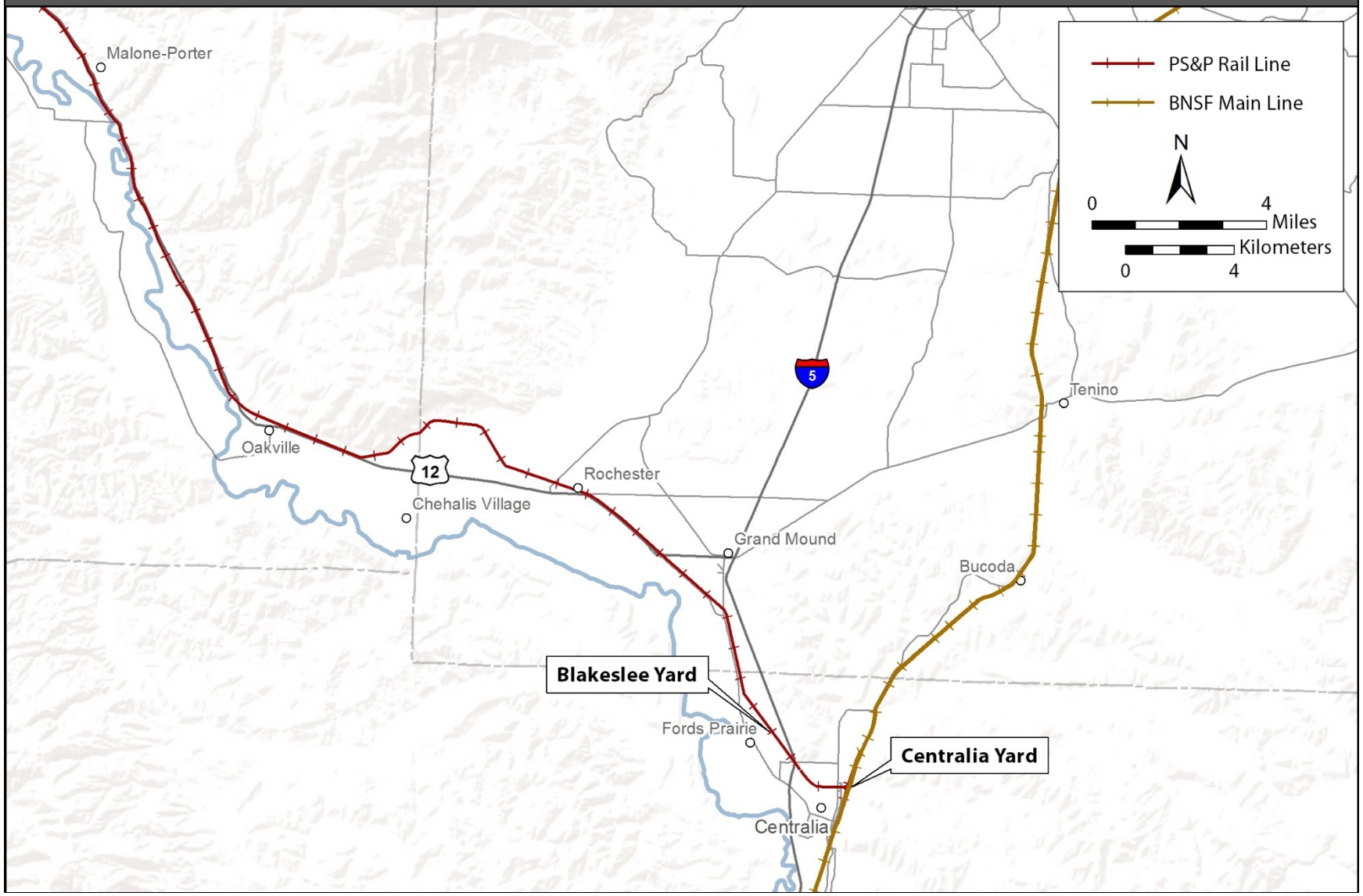
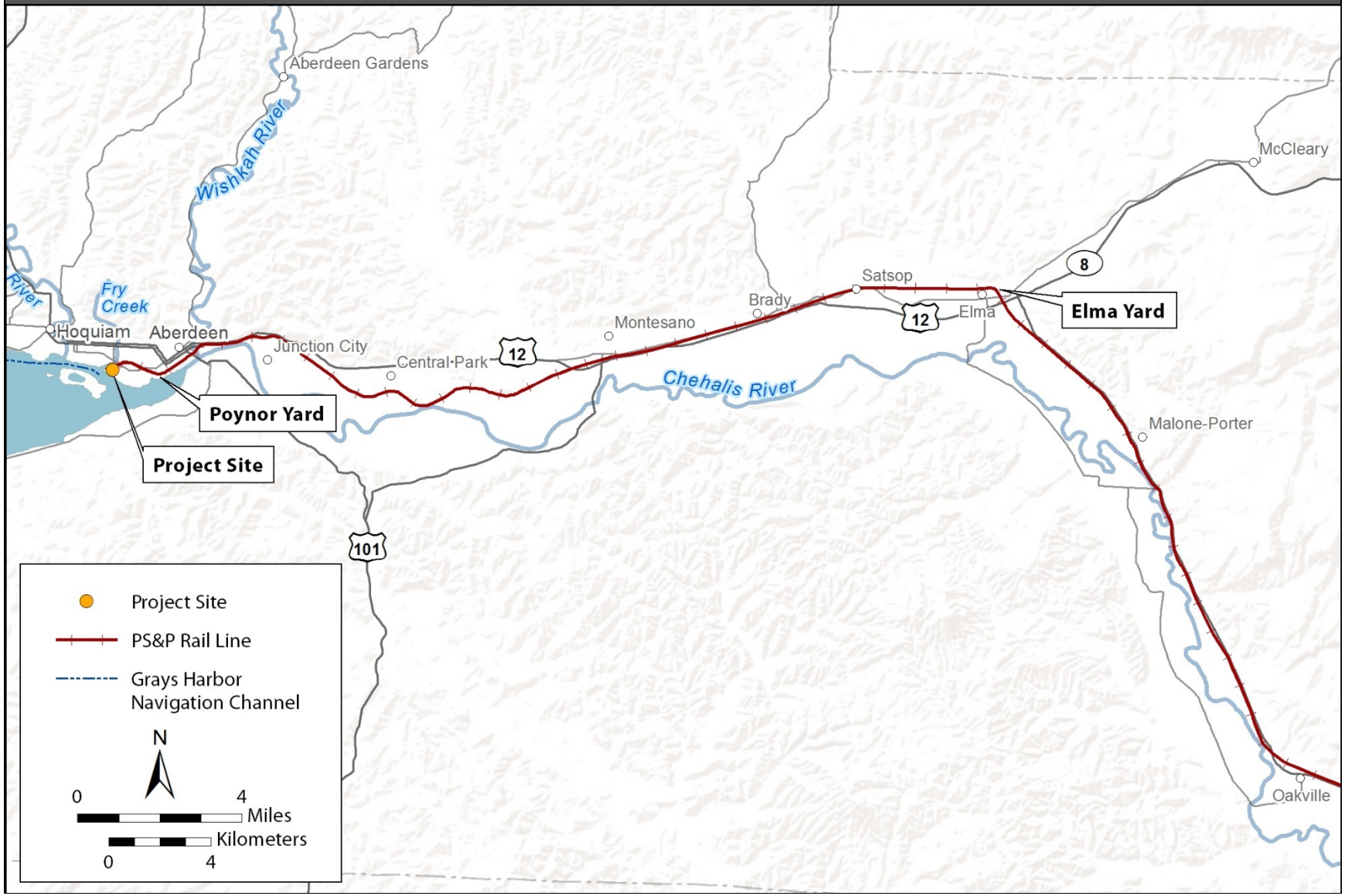


Figure 3.15-3. PS&P Rail Line General Route (West)



3.15.2 What laws and regulations apply to rail traffic?

Laws and regulations for determining potential impacts on rail traffic are summarized in Table 3.15-1. More information about these laws and regulations is provided in Appendix B, *Laws and Regulations.* Policies related to the transport of crude oil by rail are addressed in Chapter 4, *Environmental Health and Safety.*

Table 3.15-1. Laws and Regulations for Rail Traffic

Laws and Regulations	Description
Federal	
Interstate Commerce Commission Termination Act (49 U.S.C. 101)	Re-establishes the Surface Transportation Board and upholds the common carrier obligations of railroads; requires railroads to provide service upon reasonable request.
Federal Railroad Administration Regulations (49 CFR 200–299)	Establishes railroad regulations, including safety requirements related to track, operations, and cars. For example, Part 237 establishes requirements for bridge management programs, including personnel qualifications and responsibilities, determining bridge load capacities, protecting bridges from overweight loads, inspection, repair, modification, recordkeeping, and audits.
Pipeline and Hazardous Materials Safety Administration (49 CFR 105-110, 130, and 171-180)	Regulates the movement of hazardous materials.
Enhanced Tank Car Standards and Operational Controls for High-Hazard Flammable Trains (80 FR 26643)	The Final Rule, passed May 8, 2015, defines and regulates the operations of "high-hazard flammable trains."
State	
Title 81, Transportation – Railroads, Crossings (RCW 81.53)	Establishes requirements and process for railroad construction and extensions that would cross any existing railroad or highway at grade. Includes approval from the commission.
WSDOT Local Agency Guidelines M 36-63.28, June 2015, Chapter 32, Railroad/Highway Crossing Program	Focuses on adding protection that improves safety and efficiency of railroad/highway crossings. Provides a process for investigating alternatives for improving grade-crossing safety. Alternatives include closure, consolidation, and installation of warning devices.
WSDOT Design Manual M 22.01.10, July 2013, Chapter 1350, Railroad Grade Crossings	Provides specific guidance for the design of at-grade railroad crossings.
Rail Companies—Operation (WAC 480-62)	Establishes operating procedures for railroad companies operating in Washington State. Includes general and procedural rules, safety rules, safety standards at private crossings through which crude oil is transported, reporting requirement rules, and the establishment and distribution of a grade-crossing protective fund.
Local	
No local laws or regulations apply to rail traffic.	

Laws and Regulations	Description

Notes:

[a] Although states have limited regulatory authority over railroads, per agreements with FRA, WUTC inspects and issues violations for hazardous materials, track, signal and train control, and rail operations. WUTC also regulates the construction, closure, or modification of public railroad crossings. In addition, WUTC inspects and issues defect notices if a crossing does not meet minimum standards. However, WUTC has no jurisdiction over public crossings in first class cities, including the City of Aberdeen. State rail safety inspectors are trained by FRA via an agreement that allows the state to enforce FRA regulations. WUTC and WSDOT also play other roles in the planning and oversight of railroads in Washington State.

U.S.C. = United States Code; CFR = Code of Federal Regulations; FRA = Federal Railroad Administration; WUTC = Washington Utilities and Transportation Commission; WSDOT = Washington State Department of Transportation; RCW = Revised Code of Washington; WAC = Washington Administrative Code

3.15.3 How were impacts on rail traffic evaluated?

This section describes the sources of information and methods used to evaluate impacts.

3.15.3.1 Information Sources

Research and analysis for rail traffic entailed visiting sites along the PS&P rail line, interviewing PS&P staff, collecting and reviewing data, and conducting rail simulation modeling. Existing rail information was collected from state and federal agencies, the applicant, the Port of Grays Harbor (Port), and PS&P. Compiled data included the following items.

- Typical scheduled traffic
- Typical actual traffic
- Track geometry[4]
- Track construction
- Track right-of-way
- PS&P rail line crossing data (referred to as grade crossings)

Recently prepared agency studies provided a foundation for the rail traffic analysis. The following studies were used for this analysis.

- *Washington State 2014 Marine & Rail Oil Transportation Study* (Washington State Department of Ecology 2014, 2015)
- *Washington State Rail Plan, Integrated Freight and Passenger Rail Plan, 2013–2015* (Washington State Department of Transportation 2014a)
- *Washington State Freight Mobility Plan* (Washington State Department of Transportation 2014b)

During fall 2014, project sites and tours of the PS&P rail line were conducted via hi-rail.[5] Where feasible, rail tracks and current rail operations were observed.

[4] Track geometry refers to layout, design, and curvature of the rail line.
[5] Hi-rail is a road-rail vehicle that can operate both on rail tracks and a roadway.

3.15.3.2 Impact Analysis

Rail traffic data were compiled and analyzed per the following five steps.

1. Reviewed and compiled relevant rail characteristics. Elements included current physical track arrangement, traffic, speed and time, signals, traffic control, and grade crossings.
2. Held discussions with PS&P staff to determine planned future maintenance and operating improvements along the rail line.
3. Used a simulation model with basic manual stringlines[6] to analyze current scheduled traffic and typical traffic patterns. The stringlines are provided in Section K.2 of Appendix K, *Rail Traffic Technical Information*.
4. Modeled future traffic patterns with and without the proposed action for 2017 and 2037 and used the simulation to determine PS&P's ability to support new and/or additional freight service. Planned PS&P rail line improvements for 2037 were incorporated into the model to identify differences in rail operations and delays with and without the improvements. The methods for completing the modeling are described under *Rail Simulation Modeling.*
5. Identified physical and operational improvements that may be necessary for new service, as appropriate.

Rail Simulation Modeling

A typical approach to determining the ability of a rail line to support future rail traffic is to perform a simulation model. The simulation was completed to verify PS&P's ability to support additional trains (in each direction) and to determine any potential impacts on overall rail traffic and environmental and community resources. In addition, this simulation and analysis consider whether physical and operational improvements may be necessary to accommodate additional trains anticipated in relation to the proposed action.

The initial step of the simulation entailed a train performance calculator, which calculates the propulsive (e.g., gravity, locomotive power) and resistive (e.g., brakes, gravity, air resistance, friction) forces acting on the train at 1-second intervals. The calculation includes the effect of infrastructure on rail traffic (e.g., speed limits) by simulating the actions of the engineer controlling the train.

The train performance calculator input data include the following elements.

- Locomotive characteristics (e.g., horsepower, tractive effort, fuel consumption per hour per throttle position).
- Train characteristics (number of loaded and empty cars, weight of the cars when empty, weight of the train including lading, length, cross section in square feet, an air resistance factor based upon car type).
- Track characteristics (to the nearest 0.01 mile: turnouts, grade crossings, grade and change in grade, speed limits).

The simulation follows the location of current and future trains minute-by-minute along a specific segment of the PS&P rail line. The simulation included the following steps.

[6] A stringline analysis is a graphic representation of the movement of trains on a rail line.

- Representing the existing track configuration. Planned Port and PS&P track improvements were also included in the simulation for the 2037 analysis (Gomez pers. comm.).
- Locating (minute-by-minute) every train entering and leaving the area (current trains and anticipated future trains).
- Determining the conflicts between trains as they use the tracks and associated facilities.
- Determining the conflicts that could be solved by changing the time certain trains operate, as well as by determining if the time could be changed for trains related to the proposed action (trains have various schedule and maintenance requirements that need to be met).
- Determining the additional track and facilities needed to accommodate future train traffic.

Three scenarios were run.

- 2017 no action included existing infrastructure.
- 2037 no action included PS&P-identified rail infrastructure improvement projects designed to improve operating efficiency along the PS&P rail line if rail traffic increased up to 10 trains per day[7] (Gomez pers. comm.). These projects are currently not funded or programmed for implementation.
    - Extension of one track at Blakeslee Junction to 8,100 feet.
    - Addition of a siding immediately east of Montesano.
    - Addition of a siding at a place yet to be determined, but probably immediately east (south) of Elma.
    - Improvements to Wishkah River bridge to allow increase in speeds from 5 miles per hour (mph) up to 25 mph.
- 2037 proposed action included the 2037 no action baseline with the addition of the proposed rail traffic.

In addition to providing information regarding the operations of current and future rail traffic along the PS&P, the simulation model and analysis provided the foundation for the impacts analysis related to fuel consumption, grade-crossing occupancy and vehicle traffic delay, noise and vibration, and diesel emissions. Discussion of these topics is provided in Section 3.2, *Air Quality*, Section 3.6, *Energy and Natural Resources*, Section 3.7, *Noise and Vibration*, and Section 3.16, *Vehicle Traffic and Safety*. The potential impacts related to rail safety are discussed in Chapter 4, *Environmental Health and Safety*.

3.15.4 What rail traffic is in the study area?

This section describes rail traffic in the study area that could be affected by construction and routine operation of the proposed action.

[7] Although these projects are currently not funded or programmed for implementation, they were included in the simulation modeling for 2037 to determine if they would contribute to rail operational efficiency and decrease delay at grade crossings in the future.

The PS&P rail line is the sole rail connection to the project site and Hoquiam and Aberdeen. The rail line extends from Hoquiam to Centralia, where it connects with the BNSF main line. As a common carrier, PS&P is exclusively regulated by the federal government.

3.15.4.1 Rail Service between Centralia and Hoquiam

The PS&P rail line between Centralia and Hoquiam was constructed from 1889 through 1896. The original segment was constructed by the Puget Sound & Grays Harbor Railroad, then purchased and completed between Centralia and Hoquiam by Northern Pacific Railway.[8] Headquartered in Connecticut, Genesee & Wyoming, Inc., is the current owner of PS&P.

AS defined by the Surface Transportation Board, PS&P is considered a Class III railroad based on its annual revenue of less than $34.7 million. PS&P is also categorized as a short-line railroad, as defined by the Association of American Railroads because it is less than 350 miles long with an annual revenue under $40 million.

PS&P Subdivisions

The PS&P rail line serves 30 industries, including current activities at the project site. It provides a connection to the Naval Base Kitsap, brings unit trains of automobiles and grain to Grays Harbor for export on ships, and removes municipal solid waste from Kitsap County twice per week. PS&P owns and operates the line between Centralia and Hoquiam (Elma Subdivision) and the line between Elma and Shelton (Shelton Subdivision). PS&P also operates the U.S. Navy-owned line between Shelton and the Bangor Base (Bangor Subdivision) with a short segment between Bremerton Junction and Bremerton (Bremerton Subdivision). This portion of the line is designated as part of the Strategic Rail Corridor Network and, as such, must be maintained at levels dictated by the U.S. military to support current and potential defense mobilization demands (WorleyParsons 2014).

Table 3.15-2 provides an overview of PS&P subdivisions, areas it serves, and commodities and products it transports.

[8] In 1970, Northern Pacific merged with the Burlington Northern Railroad (now the BNSF Railway Company). In 1997, the line was sold to Puget Sound & Pacific Railroad (PS&P), a subsidiary of ParkSierra Railgroup. In 2002, ParkSierra Railgroup was purchased by RailAmerica, which was purchased by Genesee & Wyoming, Inc. in 2012.

Table 3.15-2. PS&P Subdivisions

Subdivision[a]	PS&P Rail Mileposts	Length (miles)	Location	Description
Elma	0.0–75.2[b]	59	Centralia (Blakeslee Junction) to Hoquiam	Main line owned and operated by PS&P, serves the industries of the Port and the project site. Commodities include grain, soybean, soda ash, automobiles, garbage, military trains, and bulk liquids.
Shelton	48.7–25.2	26	Elma to Shelton	Owned and operated by PS&P, commodities include lumber, garbage, and propane gas.
Bangor	25.2–42.8	48	Shelton to Bangor Base	Owned by the U.S. Navy, operated by PS&P. Same commodities as Shelton Subdivision plus military and other U.S. Government traffic from Naval Base Kitsap in Bremerton and Bangor Base.
Bremerton	0.0Z[c]–4.6Z	5	Bremerton Junction to Bremerton	Owned by the U.S. Navy, operated by PS&P. U.S. Government traffic from Naval Base Kitsap in Bremerton, and Bangor Base.

Source: WorleyParsons 2014

[a] The PS&P rail line is composed of four subdivisions. A subdivision is part of a larger section of a rail line (division), which is overseen by a superintendent.

[b] The milepost numbering skips a section from MP 13.3 to 29.8, resulting in the physical track miles being less than the notated signage. The current end of track is at MP 74.2.

[c] MP 32.1 on Bangor Subdivision.

MP = milepost

3.15.4.2 PS&P Rail Line Track Conditions and Physical Characteristics

A railroad is a fixed guideway transportation system. Unlike motor vehicles, trains must follow a track and can only change "lanes," turn, enter, or leave the route when a track has been specifically constructed for that purpose. Managing rail operations and identifying infrastructure needs involves determining exactly where trains need to enter and leave the route, change tracks, and turn onto another route. Physical rail characteristics must be considered when evaluating current and future rail traffic and a rail line's capacity. Section K.1 of Appendix K, *Rail Traffic Technical Information*, provides an explanation of these terms, as well as other railroad terminology used throughout this section. The following discussion describes characteristics of the PS&P rail line.

Main Line Track and Sidings

The PS&P rail main line extends between rail milepost (MP) 0.00 at Centralia and 70.0 at the Port of Grays Harbor. The track extends beyond Hoquiam at MP 74.2 (Figures 3.15-2 and 3.15-3).[9]

The entire line between Centralia and Hoquiam is single track. On a single-track line, segments of second track (sidings) must be located periodically along the line to allow trains to pass each other (passing or meeting). To be functional, a siding must be able to accommodate a complete train,

[9] Due to different surveys during construction, the rail milepost at Gate is both MP 13.3 and MP 29.8. Mileposts from Gate continue based on the MP 29.8 designation.

allowing the main track to be used by the passing or meeting train. There is only one siding between Centralia and Aberdeen, at Cedar Creek, about 4 miles west of Oakville. The yard at Blakeslee Junction, located in Centralia, can also serve as a siding.

The running time between sidings defines the capacity of the line. For example, if the longest running time between meeting points is 1 hour, the line can typically accommodate one train per hour when traffic is arranged with operation in alternating directions.

Curves and Grades

The PS&P rail line is relatively flat and straight. The route contains four 6-degree[10] curves and thirteen 4-degree curves. All other curves are approximately 3 degrees or less. All of the grades are quite short in length at around 0.1 or 0.2 mile. The steepest grade along the line is approximately 1% in eight locations. The speed limits are less than the limit on operating speed that would be imposed by track geometry or grades.

Rail Bridges

The PS&P line between the BNSF main line in Centralia (MP 0.0) and its terminus in Hoquiam (MP 74.2) has 55 rail bridges (including box culverts). There are 52 rail bridges (including box culverts) between Centralia and the project site. All bridges cross waterways (sloughs, rivers, creeks, or intermittent streams). The larger waterway crossings on the PS&P rail line are described in Table 3.15-3. The speed limit across rail bridges is generally 25 mph for all trains except as noted in the next subsection.

Refer to Section 3.15.4.5, *Ongoing Maintenance and Inspections,* for information on the Federal Railroad Administration's (FRA) bridge maintenance program and recent inspection results for the above bridges.

[10] In railroad engineering, a degree change takes place over a 100-foot distance.

Table 3.15-3. Rail Bridges in the Study Area Crossing Larger Waterways

Crossing	Mile Post	Length (feet)	Location (city/town)	Bridge Type	Structure Type
Skookumchuck River	1.68	155	Centralia	Single span of through-pin truss	Concrete abutments
Black River	12.64	130	Black River	Single span of through-pin truss	Concrete abutments
Satsop River	52.43	992	Satsop	24 spans of timber beams approaching single span of through-pin truss followed by 31 spans of timber beams	Timber pile bents under the timber beam spans and H pile towers under the through truss
Wynoochee River	59.00	591	Montesano	Two spans of reinforced concrete slab approaching single span of deck plate girder approaching two spans of through-pin truss followed by 16 spans of timber beams	Concrete stems under the slab, concrete abutment and pier under the deck plate girder, concrete piers under the through truss, and timber piles under the timber beams
Wishkah River	68.64	1,156	Aberdeen	28 spans of timber beams approaching two spans of through-pin truss approaching one span of steel beams followed by 31 spans of timber beams	Timber piles under the timber beams, concrete piers under the through truss, and concrete pier and timber piles under the steel beams

Source: American Short Line and Regional Railroad Association 2016.

Federal Railroad Administration Class of Track and Speeds

The PS&P tracks are registered with FRA as Class 2 tracks[11] with an overall maximum speed of 25 mph for freight trains.

The speed limit between Centralia and Poynor Yard in Aberdeen is generally 25 mph for all trains except as follows.

- Between Centralia and about 1.5 miles east of Grand Mound, the speed limit is 10 mph, and trains must be prepared to stop for other trains or obstructions within half the range of vision (yard limits operation). Depending on visibility, actual train speed may be substantially less than 10 mph. For example, structures on the inside of the curve between the connection with BNSF near Maple and B Streets in Centralia limit visibility. As a result, trains may move at 5 mph or less until extended visibility allows greater speed.
- Through a 4-mile segment in Elma, the speed limit is 25 mph, except for a 2,000-foot-long segment where the speed limit is 10 mph. Depending on visibility, trains may operate at substantially less than 10 mph.

[11] Class of track is defined in terms of rail tolerances, by 49 CFR 213. FRA has published the Track and Rail and *Infrastructure Integrity Compliance Manual, Volume II, Section 1 Track Safety Standards Classes 1 through 5* to provide explanation and commentary for these regulations.

- Over Devonshire Bridge (Wynoochee River), the speed limit is 10 mph. Current maintenance plans include repairing this bridge and increasing the speed limit to 25 mph.
- For about 1,000 feet at a point about 4 miles west of Montesano, the speed limit is 10 mph. The track is on the bank of the Chehalis River. The soil condition is such that maintenance to the tolerance required for 25 mph speed limit is difficult.
- Between approximately Junction City Road, east of Aberdeen, and the end of the line in Hoquiam, the speed limit is 10 mph. This area is within yard limits, so trains may move at a speed substantially less than the speed limit, depending upon visibility. This segment includes seven grade crossings along US Route 12 (US 12), east of the Wishkah River.
- Over the moveable bridges spanning the Wishkah and Hoquiam Rivers, the speed limit is 5 mph, in part because of the maintenance condition, but also because these are moveable bridges (swing bridges). The rails must separate to open the bridge and align again when the bridge is closed, which contributes to the speed limit of 5 mph.

In addition to the above exceptions to the speed limit, PS&P has committed to restricting the speed of crude oil trains to a maximum of 10 miles per hour in urban and residential areas and areas of significant potential environmental impact (Irvin pers. comm.).

3.15.4.3 Rail Yards

The Poynor Yard, Elma Yard, and Centralia/Blakeslee Yard serve the PS&P rail line between Centralia and Hoquiam (Figures 3.15-2 and 3.15-3).

Poynor Yard

Poynor Yard is in Aberdeen along the Chehalis River between South H Street and South Washington Street. Cars from the industries in Hoquiam and Aberdeen are moved to Poynor Yard for mechanical inspection and air brake testing before being coupled with other cars (to form a train). The yard has five tracks, which, depending on the track, can hold 17 to 27 cars each. The main track between the ends of the yard can hold 40 cars.

Trains leaving Aberdeen traveling east typically have more cars than a single yard track can hold. It is necessary to couple cars located on multiple tracks to create one train. The process, called *doubling*, involves pulling the cars on a yard track out of the yard and onto the main line. The coupled cars on the main line are then backed against cars on another yard track. Depending on the desired length of the train, this process may be repeated up to five times. Doubling a train out of the yard in Aberdeen can take up to 50 minutes. During that time, the main line between Aberdeen and the siding at Cedar Creek is occupied and no trains can be run to Aberdeen from Cedar Creek or Elma.

Elma Yard

A small yard at Elma is used to store cars for industries on the Shelton Subdivision and to sort cars destined to or received from industries on the Shelton Subdivision.

Centralia Yard and Blakeslee Yard

The Blakeslee Yard (operated by PS&P) receives cars destined to industries along the PS&P rail line from the BNSF main line and BNSF Centralia Yard and delivers cars from the industries to the BNSF

main line. When cars are delivered to these locations, PS&P sorts the cars by destination, using the yard tracks for sorting. The destination may be a specific industry or another location that has several industrial customers. Cars for those locations, such as Aberdeen, are locally sorted by industrial customer and then delivered. When PS&P takes away the cars that the customer has released, they are brought to either the Blakeslee Yard or the Centralia Yard, where they are sorted into cars for the BNSF main line.

3.15.4.4 PS&P Rail Line Connection with the BNSF Main Line in Centralia

At Centralia, trains moving to and from the PS&P rail line at 10 mph or less must separate from or merge with the flow of the BNSF through-traffic, which includes Union Pacific (UP) and Amtrak trains. Traffic on the BNSF main line through Centralia operates at a wide variety of speeds (Table 3.15-4).

Table 3.15-4. Typical Train Speeds along the BNSF Main Line through Centralia

Type of Train	Typical Speed through Centralia
PS&P train entering or merging the BNSF main line	Less than 10 mph
Amtrak	Up to 79 mph
Bulk commodity (e.g. grain trains)	30 to 45 mph
Other type of freight trains	30 to 60 mph

BNSF = BNSF Railway Company; PS&P = Puget Sound & Pacific Railroad; mph = miles per hour

The typical speeds cited above represent train movement along the BNSF main line; however, Amtrak trains slow down considerably and stop at the Amtrak station in Centralia; they are not traveling at 79 mph once they near the train station, which is approximately 0.5 mile south of the PS&P rail line and BNSF main line junction. In addition, some freight trains stop at Centralia to deliver cars to or pick up cars from the PS&P rail line, which also results in slower train speeds. These freight trains may be stopped at Centralia for as long as 1 hour, while the Amtrak trains are typically stopped at the Centralia station for 3 minutes.

3.15.4.5 Ongoing Maintenance and Inspections

Railroads are required by FRA to inspect and maintain railroads. Typical actions may include replacement of ballast, ties, and rail. Other continued railroad maintenance activities, such as bridge upgrades and grade-crossing improvements, help to maintain safety. Activities specific to the PS&P rail line in the study area are described below.

Track Maintenance and Inspections

PS&P maintains the line between Centralia and Aberdeen (Poynor Yard) to FRA Class 2 standards. The rail line is inspected electronically annually to find hidden defects. . As required by FRA, PS&P conducts weekly track inspections and continues to maintain and upgrade track.

PS&P has committed to the following operating guidelines related to track maintenance and inspection in handling any crude oil trains in the study area (Irvin pers. comm.)

- Conduct an additional weekly track inspection on parts of the railroad that handle crude oil (beyond what is required by FRA).

- Precede every crude oil train by a track inspector in a hi-rail truck to ensure that the route is intact and free of obstructions.
- Conduct tests of track geometry and employ two different test methods to detect flaws inside the rail.

In 2014, PS&P performed the following track upgrades.

- Installed 12,200 ties between MPs 0.60 and 5.0, 28.5 and 38.0, and 62.0 and 64.0.
- Relayed 7,840 feet of curve rail at MPs 1.8, 4.1, 41.5, 47.9, and 66.6.

Bridge Maintenance and Inspection

FRA regulates bridge safety standards under 49 Code of Federal Regulations (CFR) 237. The CFR requires each track owner to have a bridge management program in place (Subpart B - 237.31) with specific criteria, including an accurate inventory of bridges, information about safe load capacity, and specific program for bridge inspections (237.33). The inventory must include a unique identifier for each bridge, its location, configuration, type of construction, number of spans, and span lengths. Each bridge management program must schedule inspections by a qualified inspector once per calendar year for each bridge in railroad service (237.101). In addition, each track owner is required to keep bridge inspection records (237.109). FRA employs one full-time bridge inspector for Region 8, which consists of eight states. The bridge inspector generally investigates complaints and performs inspections as required. No routine bridge inspections are conducted by this FRA inspector.

FRA's Fixing America's Surface Transportation Act (FAST Act) provides a means for a state or political subdivision to obtain a public version of a bridge inspection report generated by a railroad for a bridge inspection within their respective jurisdiction. This is an avenue for states and local jurisdictions to monitor inspection information about railroad bridges in their areas.

In response to a request for information by the Washington State Department of Ecology via the FAST Act, FRA provided public bridge inspection reports generated by PS&P for the rail bridges that cross the larger waterways in the study area: Skookumchuck River (MP 1.68), Black River (MP 12.64), Satsop River (MP 52.43), Wynoochee River (MP 59.00), Chehalis River (MP 66.65 for a spur track), and Wishkah River (MP 68.24). The inspections were conducted within the past year and state that all six bridges are confirmed to have the capacity to safely carry the traffic being operated over them (American Short Line and Regional Railroad Association 2016). PS&P has stated that rail bridges will be inspected on a routine basis by trained railroad employees, expert contractors, and FRA. PS&P will then plan bridge maintenance work based on these inspections (Irvin pers. comm.).

In 2014, PS&P performed various bridge repairs at MPs 2.34, 12.64, 38.8, 46.9, 52.43, 63.93, and 68.64.

Train and Rail Car Inspections

Railroad operating rules require all employees to conduct a visual inspection for defects (e.g., overheated bearings, sticking brakes, sliding wheels, wheels not properly positioned on the rail, dragging equipment, insecure contents, signs of smoke or fire, headlight or marker improperly displayed, any other dangerous condition) of every passing train they encounter. If any defect in the train is found, the employee sends a radio message to the train, which is then stopped for inspection

by a crewmember. Cars that have a defect that a crewmember cannot repair are removed from the train and left for repairs. Trains operating on the PS&P rail line are also inspected at Poynor Yard.

FRA regulations require a complete mechanical inspection of each train before it leaves its initial station. Regulations also require mechanical inspections at intervals of 1,000 miles (1,500 miles under certain conditions). For trains traveling to Washington State along BNSF's Northwest and Montana Operating Divisions, an inspection would take place at Havre, Montana.

Electronic train defect detectors inspect passing trains for defects such as overheated bearings, broken wheels, dragging equipment, and other faults. When a defect is detected, the device transmits a message on the two-way radio communication channel. The train is then stopped for inspection by a crewmember. There is one electronic defect detector located on the PS&P rail line, near Oakville.

Future Maintenance Projects

PS&P has a capital improvement program, which includes a number of ongoing and periodic maintenance projects designed to maintain current capacity, safety, and operations. These projects address the normal wear and tear of a rail line, and will be needed as more trains (or more cars) transport commodities along the PS&P rail line. It is assumed that these maintenance projects, listed below, would occur between 2017 and 2037. The actual scope of these projects may vary depending on future rail traffic volume and the needs of PS&P's rail customers and would be determined based on applicable regulatory requirements.

- Install 9,500 new hardwood ties at various locations on the west end of the Elma Subdivision.
- Resurface approximately 15 miles of track.
- Upgrade three steel bridges.
- Upgrade five grade crossings in Aberdeen.
- Relay 90-pound rail at MP 72 and replace two turnouts in Hoquiam.
- Relay 11.2 miles of jointed 112-pound rail with continuous welded rail between Elma and Montesano.

3.15.4.6 Current Freight Rail Traffic

As stated previously, the PS&P rail line serves several industries and the U.S. military, which results in various rail traffic patterns between Centralia and Poynor Yard. Directional traffic along the PS&P rail line varies depending on customer and commodity. Current rail traffic on the PS&P rail line is described below by commodity.

- Automobiles (westbound) and empty automobile cars (eastbound).
- Grain (westbound) and empty grain cars (eastbound).
- Wood products (eastbound) and empty wood-product cars (westbound).
- Garbage (eastbound) and empty garbage cars (westbound).
- Chemicals and other liquids (both directions, typically to and from the project site, the site adjacent to the project site (REG, formerly Imperium Terminal Services), and Dow Chemical.

- Miscellaneous carload industrial material and products to and from a steel fabricator in Aberdeen, Port of Grays Harbor Warehouses.

Table 3.15-5 provides typical daily rail traffic information, based on one month of activity data provided by PS&P. Virtually all of this traffic is loaded in specialized cars. The cars return empty for another load rather than being loaded with another commodity for the return trip. Under existing conditions, approximately three trains transit the PS&P rail line daily.

Table 3.15-5. Typical Daily Rail Traffic by Commodity along the PS&P Rail Line under Existing Conditions

	Status by Direction		Typical Daily Trips[a]	Typical Number of Cars per Train
Commodity	**West**	**East**	**Daily**	
Auto	Full	Empty	0.5	65
Grain	Full	Empty	0.6	101
Mixed carload freight[b]				
Between Centralia and Aberdeen	*Varies*	*Varies*	*1.6*	*50*
Between Centralia and Elma	*Varies*	*Varies*	*0.2*	*50*
Between Elma and Aberdeen	*Varies*	*Varies*	*0.3*	*50*
Garbage (*Between Centralia and Elma only*)	Empty	Full	0.1	98
Total (between Centralia and Elma)			**3.0[c]**	
Total (between Elma and Aberdeen)			**3.1[c]**	

[a] A trip represents one-way travel. In other words, eastbound and westbound travel of a train is counted as two trips.
[b] Includes various products and commodities including lumber and wood products, plastics, cement, frozen foods, bulk liquids, and chemicals. Depending upon the customer and product, full train and empty train travel directions vary.
[c] Column totals do not sum due to rounding.

3.15.4.7 Current PS&P Rail Line Capacity and Operations

This section describes current PS&P rail line capacity and operations between Centralia and east Aberdeen and between east Aberdeen and the project site.

Between Centralia and East Aberdeen

Unlike passenger trains, freight trains do not run on a schedule. U.S. railroads evaluate each situation and dispatch trains based on a number of criteria, including available crew, number of cars, cost of fuel, and overall revenue. Analysis and projection of the effect of rail operations on a line's capacity requires analyzing the rail traffic and developing typical operations. Measurements, analysis, and projections are based on this hypothetical traffic plan.

Current PS&P rail traffic between Centralia and east Aberdeen is very light. In October 2014, PS&P provided a table of typical traffic for November 2013. The table was transformed into a stringline diagram, the graphical format universal to railroad operation. The stringline is a time-distance graph of train movements. From it, the relationship of trains to infrastructure and to each other becomes visible, and current and future rail capacity can be determined.

As presented in Section 3.15.3.2, *Impact Analysis, Rail Simulation Modeling*, the train performance calculator was used to simulate individual train movement along the rail line to provide a basis to

measure changes over time. To do so required considering each type of train (e.g., grain, auto, carload freight, and local freight) for the sample period and determining the number of cars composing a typical train. Train size and makeup of loaded and empty cars varies substantially; therefore, existing data were used to determine typical train type and features. Additional analysis of the traffic by train type, capacity of the tracks, and the total of number of cars as trains left and arrived, resulted in a year of typical eastbound and westbound traffic. The number of trains is not the same in both directions because of varying train length.

Once the modeling and analysis were completed, daily individual trips[12] were combined to create stringlines for the entire line. Stringline diagrams are provided in Section K.2 of Appendix K, *Rail Traffic Technical Information*. The stringline diagrams show that traffic is substantially less than capacity. The analysis indicates that the PS&P rail line has the theoretical capacity to handle up to 12 train trips per day.

As shown in Table 3.15-5, current rail traffic along the PS&P rail line consists of an average of three trips per day. However, trains take longer to make the trip than would be expected from a nonstop trip. The diagrams show conflicts where two trains would occupy a segment of track at the same time had the dispatcher not intervened. In these cases, one train would wait for the other unless their paths happened to cross at a location where they could pass each other (Blakeslee Junction, Cedar Creek siding, or if one train was originating or terminating on the line between Elma and Shelton).

The following operations information was determined based on an analysis of individual trains and typical traffic.

- Westbound trains sometimes wait between Centralia and Aberdeen for accommodation at Aberdeen.
- Eastbound trains going through Centralia on the BNSF main line sometimes wait west of Centralia until the BNSF crew arrives or for an opening in the flow of the BNSF and Amtrak traffic at Centralia, so that roadways are not blocked in Centralia while the train is waiting.
- Eastbound trains that terminate at the yards in Centralia sometimes wait west of Centralia for accommodation.
- Some trains leave *en route* cars that cannot be accommodated at the destination to be picked up by a subsequent train.

In summary, although trains may need to wait at either end of the PS&P rail line in Centralia or Aberdeen, there is mainline capacity to handle up to 12 trips per day. Therefore, capacity limitations on the PS&P rail line are not related to mainline deficiencies between Centralia and Aberdeen but to the lack of sufficient space for cars (e.g., sidings, yards) to break down and deliver cars to customers at both ends of the PS&P rail line in Centralia and Aberdeen. Capacity and operations between east Aberdeen and the project site are discussed in the next section.

Grade-crossing occupancy depends on the number of rail cars and train speed at the crossing. On average, each train transit occupies grade crossings between Centralia and east Aberdeen for between approximately 3 and 8 minutes (Table 3.15-5 illustrates the frequency of train transits). Appendix L, *Vehicle Modeling* provides the average daily occupancy time at all grade crossings.

[12] A trip represents one-way travel; in other words, an inbound trip and an outbound trip are counted as two trips.

Between East Aberdeen and the Project Site

PS&P rail line capacity is more constrained between east Aberdeen and the project site than between Centralia and east Aberdeen. Poynor Yard and adjacent track to the yard in Aberdeen have limited capacity for moving a locomotive (train engine) from one end of a train to the other (running around). Switching movements, including breaking down unit trains to deliver to industries in the Port area, require pushing multiple cars extracted from arriving trains a long distance over one or more grade crossings west of Poynor Yard. Switching movements from the buildup of trains at Poynor Yard also occupy grade crossings east of Poynor Yard, all the way to South Fleet Street in east Aberdeen for some trains. Yard operations also require movement at restricted speed, and it is often necessary to stop and have a crewmember get off the train and stand in the roadway to flag traffic before the train can proceed. Thus, extended occupancy times at the grade crossings between east Aberdeen and the project site are common.

Like mainline operations, yard operations are developed based on operational needs. Each day, the conductor of the train assigned to yard switching determines, from a list of work to be done (e.g., cars to move from the yard to an industry, cars to remove from an industry, cars to move from one place to another within an industry) how to perform the work. Appendix K, *Rail Traffic Technical Information*, provides information on the basics of rail operations and characteristics.

Using train performance calculator data and a detailed itinerary of a typical switching operation, a model of track and grade crossing occupancy was developed to characterize the existing condition. The following description represents typical rail operations east and west of Poynor Yard.

East of Poynor Yard

Due to the limited track lengths in the Poynor Yard, long trains leaving Aberdeen traveling east on the PS&P rail line are assembled in the Poynor Yard from short segments. The yard has five tracks that can hold 17 to 27 cars each. Trains leaving Aberdeen traveling east typically have more cars than a single yard track can hold, and cars must be doubled, as described in Section 3.15.4.3, *Rail Yards, Poynor Yard*. Section K.5 of Appendix K, *Rail Traffic Technical Information*, provides illustrations of the doubling process.

Doubling a train out of the yard can take up to 50 minutes and no westbound train can run into Aberdeen during this time. For each track of cars added to an eastbound train, cars attached to the engine are pulled to the east beyond the switch to allow the next track of cars to be added to the train. This train-building process can result in the grade crossings east of the Poynor Yard, including the grade crossings in east Aberdeen (Olympic Gateway Plaza area), being occupied. Table 3.15-6 illustrates existing grade crossing occupancy times for a single train transit by train type at the crossings closest to Poynor Yard (East Heron Street) and the crossing furthest from the yard (Fleet Street) in the Olympic Gateway Plaza area. Figure 3.15-4 illustrates the PS&P rail line east of Poynor Yard.

The grade-crossing occupancy times for eastbound grain and auto trains (each average 0.25 train per day) are between 36 and 44 minutes; the times are between 17 and 34 minutes for mixed carload freight trains. The grade-crossing occupancy times for all westbound trains are between 6 and 12 minutes. East Heron Street has the highest crossing occupancy times because it is the closest crossing in east Aberdeen to Poynor Yard.

The grade-crossing occupancy times in Table 3.15-6 are for each train transit. As shown in Table 3.15-5, the typical number of existing daily trips in this area is 3.1 for all trains. Using the typical number of trips per day for each train type (0.6 grain train trip, 0.5 auto train trip, and 2.1 mixed carload freight train trips), the total daily average crossing occupancy time for all trains is 1 hour 10 minutes at East Heron Street and 49 minutes at Fleet Street. The frequency of these trains by is shown in Table 3.15-5.

Table 3.15-6. Grade Crossing Occupancy Times[a] in East Aberdeen at Selected Crossings by Train Type and Direction for Each Train Transit

	Eastbound Trains		Westbound Trains	
Train Type[b]	**East Heron Street**	**Fleet Street**	**East Heron Street**	**Fleet Street**
Grain	44 minutes	37 minutes	11 minutes	9 minutes
Auto	43 minutes	36 minutes	12 minutes	10 minutes
Mixed carload freight (68 cars)	34 minutes	17 minutes	9 minutes	6 minutes
Mixed carload freight (37 cars)	16 minutes	14 minutes	9 minutes	6 minutes

a Occupancy times rounded to the nearest minute.
b See Table 3.15-5 for the frequency of these train types.

Figure 3.15-4. PS&P Rail Line Grade Crossings East of Poynor Yard

West of Poynor Yard

Rail operations west of Poynor Yard include trains moving directly between industrial facilities and Poynor Yard, and switching operations, which move rail cars among tracks in an industrial facility during the process of sorting cars or placing them in the required location for loading or unloading. Figure 3.15-5 illustrates the grade crossings west of Poynor Yard.

Figure 3.15-5. PS&P Rail Line Grade Crossings West of Poynor Yard

Any time an eastbound or westbound grain, auto, or mixed carload freight train is moved directly between Poynor Yard and industrial facilities west of Poynor Yard, the train occupies grade crossings between 3 and 9 minutes, depending on the train type and location (Table 3.15-7).

Table 3.15-7. Grade-Crossing Occupancy Times in East Aberdeen at Selected Crossings by Train Type and Direction for Each Train Transit[a]

	Eastbound Trains		Westbound Trains	
Train Type[b]	**West 1st Street**	**Port Industrial Road**	**West 1st Street**	**Port Industrial Road**
Grain	9 minutes	9 minutes	N/A[c]	8 minutes
Auto	8 minutes	8 minutes	N/A[c]	7 minutes

[a] Occupancy times rounded to the nearest minute.
[b] See Table 3.15-5 for the frequency of these train types. Mixed carload freight trains do not occupy these crossings.
[c] Not applicable. Train does not occupy crossing.

Switching operations, described below, between industrial facilities west of Poynor Yard (project site and REG, formerly Imperium Terminal Services site) occupy the grade crossings west of Poynor Yard. The maximum grade-crossing occupancy times are between 3 and 13 minutes from switching operations (Table 3.15-8).

Table 3.15-8. Maximum Grade Crossing Occupancy Times West of Poynor Yard from Switching Operations at Selected Crossings[a]

Grade Crossing	Applicant	REG, formerly Imperium Terminal Services
Port Industrial Road	5 minutes	3 minutes
West 1st Street	7 minutes	4 minutes
Industrial Road	9 minutes	13 minutes

[a] Occupancy times rounded to the nearest minute.

On a typical day, the applicant receives 10 cars and releases 10 cars. These cars are separated from other cars of an incoming mixed carload freight train in the Poynor Yard then moved by a switching locomotive to the project site for unloading. This process typically results in one to two trips onto and off the project site each day, to deliver and remove an average of 10 cars. These movements occupy the West 1st Street, South Maple Street, and Industrial Road crossings as shown in Table 3.15-8. In addition, the adjacent industrial site (REG, formerly Imperium Terminal Services) releases cars and receives cars that occupy grade crossings. Including all trains (grain, auto, and mixed carload freight trains) and switching operations (delivery of rail cars to and from the project site and adjacent site), the average daily grade-crossing occupancy time is 14 minutes at Port Industrial Road, 17 minutes at West 1st Street, and 43 minutes at Industrial Road.

3.15.4.8 Running Time between Centralia and Poynor Yard in Aberdeen

PS&P trains between the BNSF main line in Centralia and the Poynor Yard in Aberdeen during a 30-day sample period had the following average running times.

- The aggregate average nonstop running time for all trains was 2 hours 43 minutes.
- The average running time for all trains was 6 hours 3 minutes (includes stopping time).
- The longest running time was 22 hours 53 minutes.

The variances in running times are a direct result of the operational constraints identified in Section 3.15.4.7, *Current PS&P Capacity and Operations.* The capacity limitation on the PS&P line is not related to mainline deficiencies between Centralia and Aberdeen, but rather the lack of sufficient space for cars (e.g., sidings, yards) to break down and deliver cars to customers at these locations. Detailed information related to these running times can be found in the stringlines and accompanying data tables in Appendix K, Section K.2, *Rail Traffic Technical Information*.

PS&P has committed to the following operating guidelines related to safe transport of crude oil in the study area (Irvin pers. comm.).

- Operating crude oil trains with no planned stops between the proposed facility and the destination.
- Never leaving loaded crude oil or other hazardous materials trains unattended.
- Providing a crew of at least two people whenever crude oil is being transported.

3.15.5 What are the potential impacts on rail traffic?

This section describes impacts on rail traffic that could occur in the study area. Potential impacts of the no-action alternative are described first as a baseline for comparing the potential impacts of the proposed action.

3.15.5.1 No-Action Alternative

Under the no-action alternative, the applicant would continue to operate its existing facility as described in Chapter 2, Section 2.1.3.2, *Existing Operations*. Although the proposed action and related rail traffic would not occur, it is assumed that growth in the region would continue under the no-action alternative, which could lead to development of another industrial use at the project site. However, the Washington State Department of Transportation Freight Mobility Plan (2014b:75–76) projects zero growth in the number of trains along the PS&P rail line over the next 20 years.[13] Increased rail traffic, if any, would likely be in the form of additional cars in a typical train and not in the form of additional entire trains. Potential impacts on rail capacity (unrelated to the proposed action) are discussed below.

With no projected growth in freight rail traffic, rail traffic would remain the same as existing conditions, which are far below current capacity between Centralia and east Aberdeen. Rail traffic delays described in Section 3.15.4.7, *Current PS&P Capacity and Operations*, would continue under the no-action alternative. Implementation of the projects identified by PS&P (Section 3.15.3.2, *Impact Analysis, Rail Simulation Modeling*) would theoretically increase mainline capacity between Centralia and Poynor Yard from 12 trains per day to 19 trains per day. However, because rail traffic is currently substantially less than the capacity of the line (between but not including Centralia and Poynor Yard), the sidings would increase efficiency by reducing rail traffic delay and making rail operations more flexible.

Existing capacity constraints associated with rail operations at and near Poynor Yard would continue under the no-action alternative. Although improvements would provide for additional

[13] The rail traffic projections in the Freight Mobility Plan do not include the proposed action and the reasonably foreseeable future actions identified in Table 6.4-1 in Chapter 6, *Cumulative Impacts*, which would add new rail traffic to the PS&P rail line.

flexibility and alleviate, to some degree, the duration of occupied grade crossings, existing rail traffic would continue to result in occupying grade crossings in the Port of Grays Harbor and east Aberdeen areas, as described in Section 3.15.4.7, *Current PS&P Capacity and Operations*. Vehicle delays at grade crossings would continue under the no-action alternative, as discussed in Section 3.16, *Vehicle Traffic and Safety*.

3.15.5.2 Proposed Action

This section describes the impacts that could occur in the study area as a result of construction and routine operation of the proposed action. Impacts on vehicle traffic delay at grade crossings are discussed in Section 3.16, *Vehicle Traffic and Safety.* Impacts related to rail safety are discussed in Chapter 4, *Environmental Health and Safety*.

Construction

Construction of the proposed action would not modify existing PS&P rail line facilities and would have no impact on rail traffic.

Operations

Operation of the proposed action at maximum throughput would result in approximately 458 unit train trips per year, or approximately one trip per day on average. Table 3.15-9 summarizes trips under the proposed action. The trips identified in Table 3.15-9 are used to assess potential impacts of the proposed action; therefore, the discussion of potential impacts assumes the maximum annual throughput.

Table 3.15-9. Unit Train[a] Trips[b] at Maximum Throughput—Proposed Action

Average Daily	Average Weekly	Maximum Annual
1.25	8.8	458

[a] Assumes 120-car unit trains (1.25 miles in length).
[b] Trips represent one-way travel; an eastbound trip and a westbound trip would be counted as two trips.

The following sections describe impacts of the proposed action on PS&P rail line capacity and operations between Centralia and east Aberdeen, and between east Aberdeen and the project site.

Rail Capacity and Operation between Centralia and East Aberdeen

As discussed previously, stringline and train performance calculator analyses indicate that the PS&P rail line has the theoretical capacity to handle up to 12 trips per day. Adding the approximately 1.25 unit train trips per day on average under the proposed action to the projected 3.1 trips under the no-action alternative (same as existing conditions, Table 3.15-5), the rail line would have capacity for an additional 7.7 trips per day.

Train Occupancy Times at Grade Crossings

Increased rail trips along the PS&P rail line related to the proposed action would increase train occupancy times at grade crossings between Centralia and east Aberdeen. The far-right column of Table 3.15-10 lists the average daily grade-crossing occupancy time at selected crossings for all trains (grain, auto, mixed carload freight, and proposed action train trips) compared to the no-action

alternative. These crossings are already in the top 10 in the rail corridor for average daily traffic and blocked crossings (the other crossings are located in Aberdeen). Because rail traffic is not projected to increase between 2017 and 2037, other than that related to the proposed action, grade-crossing occupancy time would remain the same in both years. Impacts of these blockages on vehicles and pedestrians are discussed in Section 3.16, *Vehicle Traffic and Safety*.

Table 3.15-10. Average Daily Grade-Crossing Occupancy Time[a] at Selected Crossings between Centralia and East Aberdeen—No-Action Alternative and Proposed Action

Grade Crossing	Milepost	Location	No-Action Alternative	Proposed Action[b]
Tower Street (SR 507)	0.82	Centralia	26 minutes	39 minutes
Pearl Street (SR 507)	0.89	Centralia	26 minutes	39 minutes
West Reynolds Street	2.14	Centralia	17 minutes	28 minutes
Old Highway 99 SW	6.07	Unincorporated Thurston County	8 minutes	15 minutes
Monte Elma Road	51.98	Satsop	7 minutes	12 minutes

[a] Occupancy times rounded to the nearest minute.
[b] Times include no-action and proposed action trains.

Rail Capacity and Operation between East Aberdeen and the Project Site

Current operations at the project site would continue under the proposed action. However, the addition of unit train delivery and release would increase the length of time needed to perform these operations, as described below.

Switching Operations Into and Out of the Project Site

Switching operations of trains into and out of the project site would be similar to existing operations. Appendix K, *Rail Traffic Technical Information*, Section K. 3, *Proposed Switching Operations,* illustrates how these operations would occur. However, actual operations could vary and would depend on specific circumstances such as the availability of the crewmembers and space and facilities in Poynor Yard. The estimated process of delivering and releasing a 120-car unit train is summarized as follows.

Upon arrival, the unit train would stop at Poynor Yard. The crew would use the locomotive on the front (west) end of the train to back the head-end 80 cars into the yard tracks, about 20 cars to a track. This process would occupy the grade crossings between Port Industrial Road and Poynor Yard. After all cars are in the yard, the leading locomotive and buffer car would remain and the crew would board the distributed power unit, disconnect radio control, and push the remaining cars in the train to the project site.

A crewmember would ride the leading car into the project site to the end of the track. This crewmember would control the movement by giving directions to the engineer by radio. When the leading end of the train reaches the desired position near the end of the track, the movement would be stopped. The crewmember would walk back to the east end of the track, apply hand brakes to the cars, uncouple the remaining train, and instruct the engineer to back up until the train has cleared

the next delivery track. The crewmember would align the switches for the next track, board the leading end of the train, and repeat the procedure.

The project site would only accommodate 20 cars of a unit train (120 cars) for each rail spur, so the train would need to be delivered in six separate switching operations. The leading 20 cars would be pushed into a track and the remaining 20 would be pushed into the adjacent track.

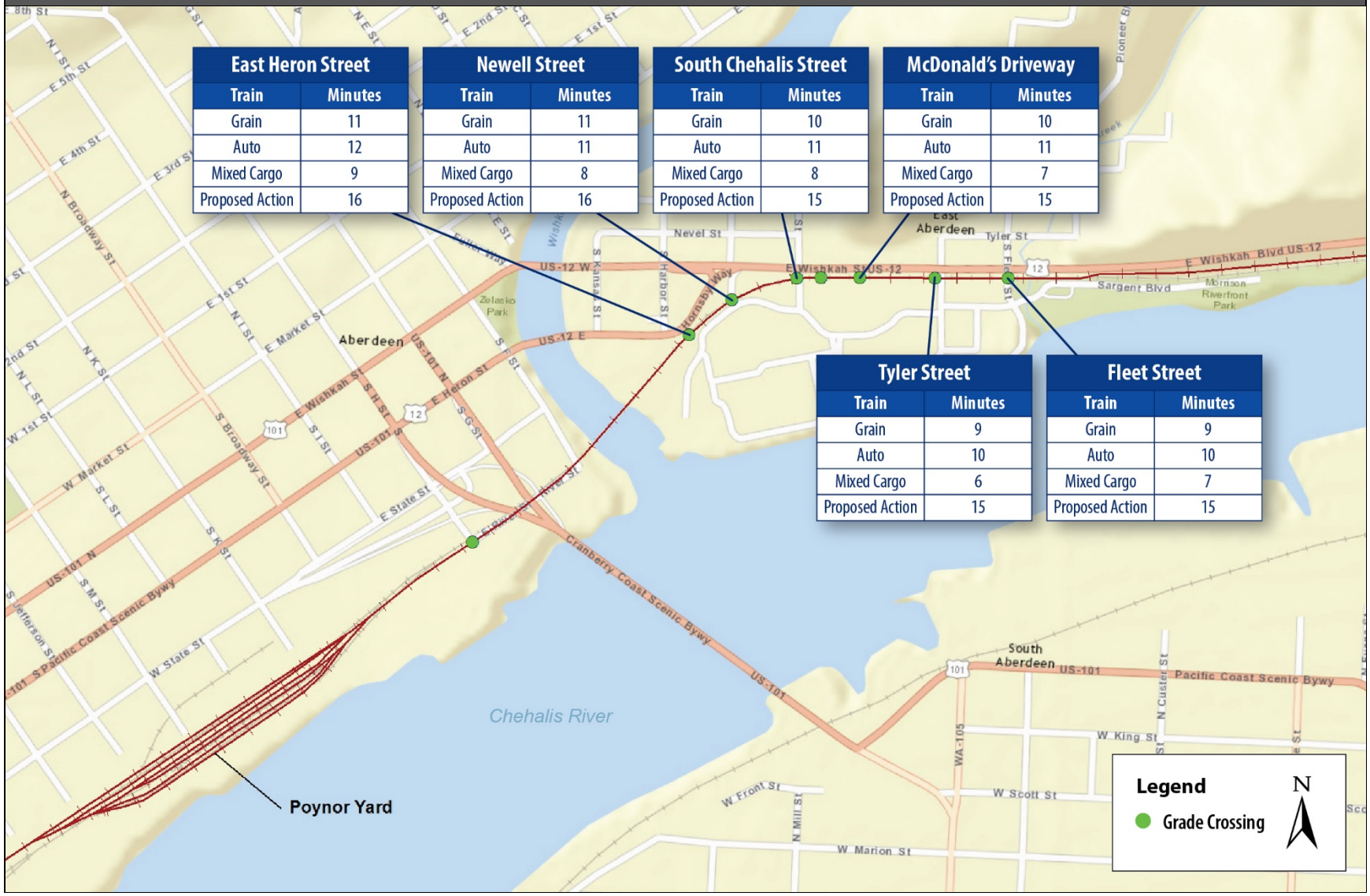
Once the first 40 cars are released (emptied) by the applicant, a crew would run a locomotive from Poynor Yard to the project site, couple to 20 cars in one track, add another 20 cars in the adjacent track, pull them to east of Poynor Yard, then double them into the yard. This process would be repeated three times for a full delivery of one unit train to the project site. The empty cars would be given a mechanical and air brake inspection in Poynor Yard then doubled together in the same manner as the empty train from the project site, blocking crossings for the same period. The delivery and releasing of cars would occupy the grade crossings between Poynor Yard and the project site.

When the cars are released to return empty, they would be moved to Poynor Yard for mechanical and air brake inspection before being assembled into a train and returned to BNSF. A crewmember would run a locomotive from Poynor Yard to the project site, couple to 20 cars in a track, add another 20 cars in an adjacent track, pull them to Poynor Yard, and double them into the yard. This entire process would be repeated two more times. The empty cars would be given a mechanical and air brake inspection in Poynor Yard, then the distributed power unit and buffer car would be coupled to the west end of a track of about 20 cars. The leading locomotive and buffer car would be coupled to the east end of about 20 cars in another track. The train would then be doubled several times until the entire 120 cars are coupled and the air brakes are connected. The process is time-consuming. The grade crossings east of Poynor Yard would be blocked for an extended period as described below. Section K.4 of Appendix K, *Rail Traffic Technical Information,* illustrates the operation in use to inspect empty trains at Poynor Yard prior to their movement onto the rail line and eventually onto the BNSF main line.

Train Occupancy Times at Grade Crossings

Proposed action unit trains would contain 120 cars; these trains are longer than existing trains serving the project site and would therefore increase train occupancy times at grade crossings between east Aberdeen (Olympic Gateway Plaza area) and the project site. Figures 3.15-6 and 3.15-7 illustrate westbound and eastbound occupancy times by train type in east Aberdeen. Table 3.15-11 illustrates the maximum occupancy times for the proposed action and no-action alternative trains at selected grade crossings.

Figure 3.15-6. Westbound Train Occupancy Times (per trip) by Train Type at Selected Grade Crossings East of Poynor Yard



East Heron Street	
Train	Minutes
Grain	11
Auto	12
Mixed Cargo	9
Proposed Action	16

Newell Street	
Train	Minutes
Grain	11
Auto	11
Mixed Cargo	8
Proposed Action	16

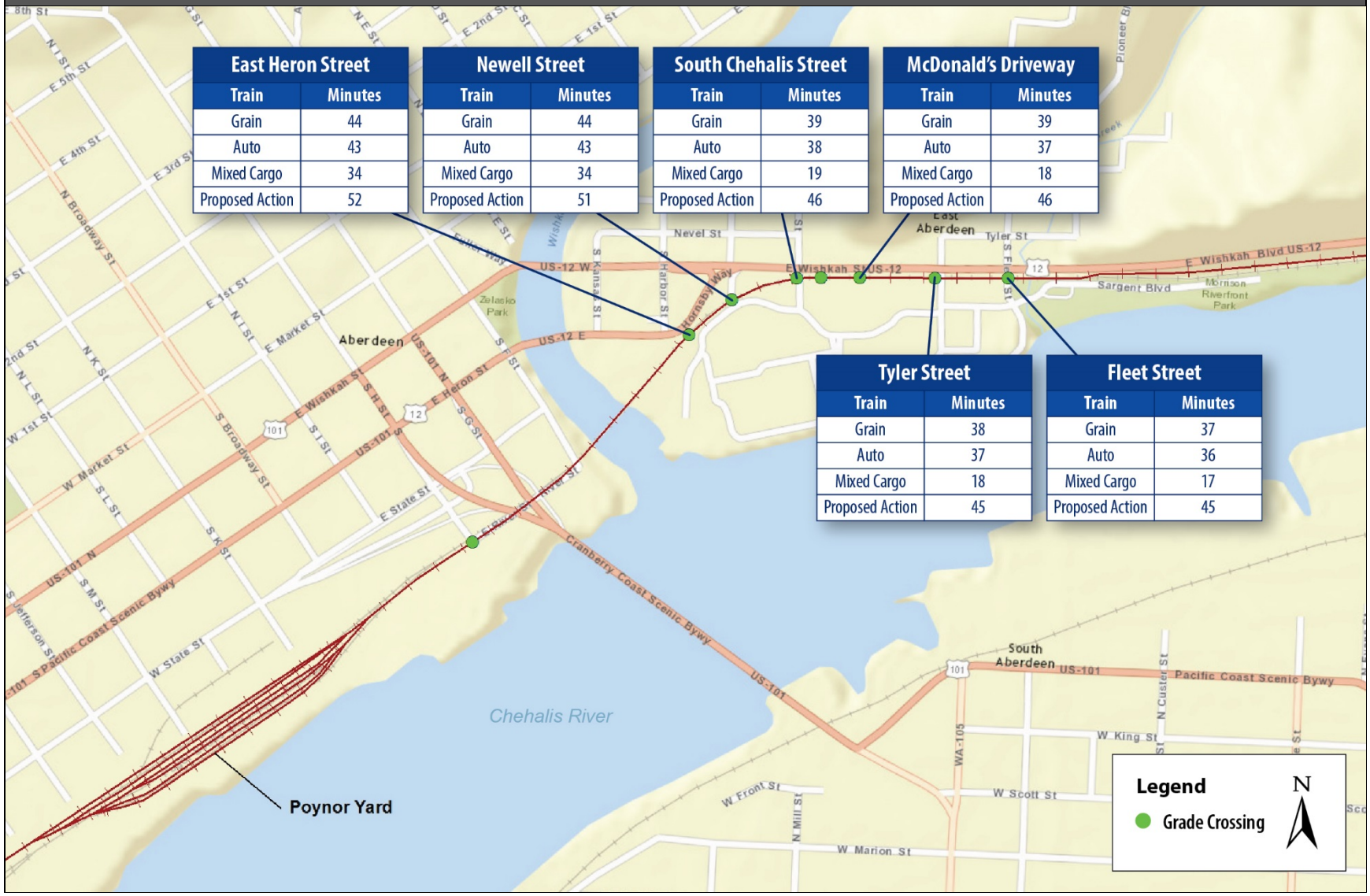
South Chehalis Street	
Train	Minutes
Grain	10
Auto	11
Mixed Cargo	8
Proposed Action	15

McDonald's Driveway	
Train	Minutes
Grain	10
Auto	11
Mixed Cargo	7
Proposed Action	15

Tyler Street	
Train	Minutes
Grain	9
Auto	10
Mixed Cargo	6
Proposed Action	15

Fleet Street	
Train	Minutes
Grain	9
Auto	10
Mixed Cargo	7
Proposed Action	15

Figure 3.15-7. Eastbound Train Occupancy Times (per trip) by Train Type at Selected Grade Crossings East of Poynor Yard



East Heron Street	
Train	Minutes
Grain	44
Auto	43
Mixed Cargo	34
Proposed Action	52

Newell Street	
Train	Minutes
Grain	44
Auto	43
Mixed Cargo	34
Proposed Action	51

South Chehalis Street	
Train	Minutes
Grain	39
Auto	38
Mixed Cargo	19
Proposed Action	46

McDonald's Driveway	
Train	Minutes
Grain	39
Auto	37
Mixed Cargo	18
Proposed Action	46

Tyler Street	
Train	Minutes
Grain	38
Auto	37
Mixed Cargo	18
Proposed Action	45

Fleet Street	
Train	Minutes
Grain	37
Auto	36
Mixed Cargo	17
Proposed Action	45

Table 3.15-11. Maximum Occupancy Time (per trip) at Selected Grade Crossings—No-Action Alternative and Proposed Action [a]

Grade Crossing	No-Action Alternative	Proposed Action
Fleet Street	37 minutes	45 minutes
East Heron Street	44 minutes	52 minutes
Port Industrial Road	9 minutes	10 minutes
West 1st Street	7 minutes	14 minutes
Industrial Road	13 minutes	22 minutes

[a] Occupancy times rounded to the nearest minute.

Unit train trips under the proposed action would increase the maximum train occupancy times at all grade crossings in Aberdeen. For example, the maximum train occupancy time at East Heron Street would increase from 44 minutes to 52 minutes under the proposed action. The increase in occupancy times at the grade crossings east of Poynor Yard would be from switching operations to build up departing trains at and east of the Poynor Yard. The increase in train occupancy times at the grade crossings west of Poynor Yard would be from arriving trains and switching operations to break down trains at and west of Poynor Yard.

Unit train trips under the proposed action would also increase the frequency of trains occupying grade crossings in Aberdeen by approximately 8.8 times per week on average. All grade crossings in the Olympic Gateway Plaza area (from East Heron Street to Fleet Street) would be occupied for more than 35 minutes on average 3.9 times per week from eastbound grain and auto trains under the no-action alternative. The addition of the proposed action train traffic to existing/no-action train traffic would increase occupancy times at grade crossings from 3.9 times per week to 8.3 times per week.

The far-right column of Table 3.15-12 illustrates the average daily train occupancy time at selected grade crossing for all trains (no-action and proposed action trains). Appendix L, *Vehicle Traffic Analysis*, provides the daily occupancy time at all crossings.

Table 3.15-12. Average Daily Train Occupancy Time[a] at Selected Grade Crossings—No-Action Alternative and Proposed Action

Grade Crossing	No-Action Alternative	Proposed Action[b]
Fleet Street	49 minutes	1 hour 26 minutes
East Heron Street	1 hour 10 minutes	1 hour 52 minutes
Port Industrial Road	14 minutes	39 minutes
West 1st Street	17 minutes	50 minutes
Industrial Road	43 minutes	1 hour 30 minutes

[a] Occupancy times rounded to the nearest minute.
[b] Times include no-action and proposed action trains.

The addition of proposed action trains would substantially increase the average daily occupancy at grade crossings in Aberdeen. For example, the East Heron Street crossing is currently occupied an average of 1 hour and 10 minutes daily from grain, auto, and mixed carload freight trains. With proposed action train trips, the East Heron Street crossing would be occupied an average of 1 hour and 52 minutes daily. Impacts of these blockages on vehicles and pedestrians are discussed in Section 3.16, *Vehicle Traffic and Safety*.

3.15.6 What required permits and plans apply to rail traffic?

No required permits or plans apply to rail traffic.

3.15.7 What mitigation measures would reduce impacts on rail traffic?

Impacts on rail traffic resulting from the proposed action are not considered significant and would not necessitate mitigation beyond the minimum requirements specified by applicable laws and regulations.

Mitigation measures to reduce impacts on vehicle traffic delay at grade crossings are presented in Section 3.16, *Vehicle Traffic and Safety.* Mitigation measures to reduce impacts on environmental health and safety from increased risk of incidents and related consequences are presented in Chapter 4, *Environmental Health and Safety*.

3.15.8 Would the proposed action have unavoidable and significant adverse impacts on rail traffic?

There would be no unavoidable and significant impacts. Potential impacts on vehicle traffic and safety from increased rail traffic are addressed in Section 3.16, *Vehicle Traffic and Safety*. Potential impacts related to increased risk of incidents and related consequences are addressed in Chapter 4, *Environmental Health and Safety*.

3.16 Vehicle Traffic and Safety

Vehicles provide transportation for individuals to travel to work, school, and for recreational purposes. Vehicles also are used for emergency response and for the delivery of commercial goods that support economic activity. Vehicle delays increase travel time for motorists and can affect quality of life and economic growth.

This section describes vehicle traffic and safety in the study area, including existing traffic congestion and safety conditions. It then describes impacts on vehicle traffic and safety that could result under the no-action alternative or as a result of the construction and routine operation[1] of the proposed action. Finally, this section presents any measures identified to mitigate impacts of the proposed action on vehicle traffic and safety and any remaining unavoidable and significant adverse impacts.

3.16.1 What is the study area for vehicle traffic and safety?

The study area for vehicle traffic and safety consists of the roadways near the project site that could be affected by increased vehicle traffic from construction and routine operation of the proposed action. The study area also includes the public roadways that cross the Puget Sound & Pacific Railroad (PS&P)[2] rail line.

3.16.2 What laws and regulations apply to vehicle traffic and safety?

The laws and regulations for determining potential impacts on vehicle traffic and safety are summarized in Table 3.16-1. More information about these laws and regulations and applicable land use policies is provided in Appendix B, *Laws and Regulations*. For additional details related to rail operations, see Section 3.15, *Rail Traffic*.

Table 3.16-1. Laws and Regulations for Vehicle Traffic and Safety

Laws and Regulations	Description
Federal	
Railroad Safety Act of 1970 (49 U.S.C. 20101–20144; 21301–21304)	Authorizes FRA with rulemaking authority over all areas of rail line safety.
Highway Safety Act (23 U.S.C. 4), Railroad Safety Act (49 CFR 200–299)	Gives FHWA and FRA regulatory jurisdiction over safety at federal highway/rail grade crossings.
Railroad Safety Enforcement Procedures (49 CFR 200-209)	Grants FRA authority to regulate safety, track, signaling, and rolling stock for common carrier rail lines that are part of the general rail line system of transportation.
Manual on Uniform Traffic Control Devices (23 U.S.C. 109(d))	Provides standards and guidelines for traffic control devices.

[1] Chapter 4, *Environmental Health and Safety*, addresses the potential impacts from increased risk of incidents (e.g., storage tank failure, train derailments, vessel collisions) and related consequences (e.g., release of crude oil).
[2] The PS&P rail line refers to the rail line between the BNSF main line in Centralia and the project site.

Laws and Regulations	Description
State	
Transportation System Policy Goals (RCW 47.04.280)	Establishes the following goals for the transportation system in Washington State: economic vitality, preservation, safety, mobility, environment, and stewardship.
Railroads—Operating Requirements and Regulations (RCW 81.48)	Establishes railroad operating requirements and regulations with regard to obstruction of trains, train speed, and safety.
Railroads—Crossings (RCW 81.53)	Provides standards, preference, and guidelines for highway rail crossings.
Motor Vehicles—Rules of the Road (RCW 46.61)	Establishes rules of the road for vehicle and rail crossings.
Grade-Crossing Petitions (WAC 480-62-150)	Requires that a petition is filed for creation or changes to a grade crossing.
Safety Standards at Private Crossings (WAC 480-62-270)	Regulates signage at private crossings through which crude oil is transported.
City Streets as Part of State Highways (RCW 47.24)	Regulates the maintenance and jurisdictional control for city streets that are part of state highways.
Local	
Traffic Regulations (AMC 10.64 and HMC 1.45)	Establishes regulations for vehicle traffic and emergency services in the respective cities.

FRA = Federal Railroad Administration U.S.C. = United States Code; FR = Federal Regulation RCW = Revised Code of Washington; OPA 90 = Oil Pollution Act of 1990

3.16.3 How were impacts on vehicle traffic and safety evaluated?

This section describes the sources of information methods used to evaluate impacts. Additional details are presented in Appendix L, *Vehicle Traffic Analysis*.

3.16.3.1 Information Sources

Several data sources were used to characterize vehicle traffic, including grade-crossing[3] delay and safety conditions.

- Annual average daily traffic volumes adjusted to the analysis year (2017 or 2037). The adjusted annual average daily traffic volumes were used to determine peak hour traffic volumes.
- Existing train traffic (average number of trains per day) and operating speed on the PS&P rail line (Federal Railroad Administration 2014a).
- Future vehicle and train traffic to and from the project site as estimated by the applicant (Chapter 2, *Proposed Action and Alternatives*).
- Train characteristics, including number of cars (train length) and speed.

[3] Grade crossings are intersections of a rail line and a highway at the same grade—no overpasses or underpasses separate the crossing.

Vehicle Traffic

Estimates of annual average daily traffic for vehicles at each public road crossing along the PS&P rail line were calculated for existing year, 2017, and 2037 based on data obtained from local agencies, Washington State Department of Transportation (WSDOT), and Federal Railroad Administration (FRA). Annual average daily and peak hour traffic volumes were factored to reflect the analysis years (2017 and 2037). Field observation and data collection supplemented available traffic volumes. These data were used to characterize estimated future vehicle traffic along area roadways adjacent to grade crossings of the PS&P rail line.

The following planning studies address vehicle delay and safety in the study area:

- The *U.S. 101 Regional Circulation Project Report* (Washington State Department of Transportation 2007) examined congestion along the US Route 101 (US 101) corridor, US Route 12 (US 12), and State Route (SR) 109 in Aberdeen, Hoquiam, and Cosmopolis. Intersections were found to be experiencing congestion issues and moderate levels of vehicle delay.
- A planning study by the Grays Harbor Council of Governments is underway. The East Aberdeen Mobility Project will identify ways to relieve congestion and improve safety along US 12 and potential improvements to access into the Olympic Gateway Plaza.

Emergency Access

Information related to emergency access at the Olympic Gateway Plaza and Port of Grays Harbor areas of Aberdeen was provided by the Aberdeen Fire Department and PS&P.

Vehicle Safety

Ten years of collision records (2003 to 2013) for the study area were obtained from WSDOT and FRA (Washington State Department of Transportation 2014; Federal Railroad Administration 2014a).

3.16.3.2 Impact Analysis

The following sections describe the methods for the impact analysis. More information on the methods is located in Appendix L, *Vehicle Traffic Analysis*.

Onsite

The onsite impact analysis considered the number of trips that would be generated by employees traveling to and from the project site during construction and operations. As noted in Chapter 2, *Proposed Action and Alternatives*, transport of crude oil associated with the proposed action would rely on rail and vessel transport. It is anticipated that tanker truck traffic would remain the same as for existing conditions and would not change average daily traffic on surrounding roadways.

Rail

The analysis of vehicle impacts along the PS&P rail line considered the potential impact on vehicle traffic and safety associated with rail traffic related to operation of the proposed action at maximum throughput. In other words, this analysis assumes that the proposed action would begin operating rail traffic at 100% throughput. However, a more gradual ramp-up may occur, during which additional infrastructure improvements, could offset some of the impacts identified in this section.

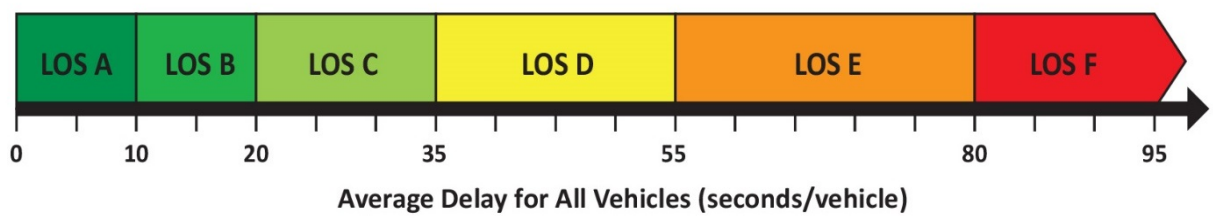
The potential vehicle impacts addressed in this analysis include increases in average vehicle delay in a 24-hour period (average vehicle delay), peak hour vehicle delay, vehicle queuing, vehicle safety, and emergency access. The analysis evaluates existing conditions (2015), opening year (2017) conditions when proposed action trains would begin to operate on the PS&P rail line, and 2037 conditions. This approach provides context for how the impacts of operations would evolve over time because of reasonably foreseeable increased growth, planned infrastructure changes, and phased regulatory requirements for improved transportation efficiency and safety.

Average Vehicle Delay

Unlike passenger trains, freight trains do not run on a schedule. Railroad companies evaluate each situation and dispatch trains based on a number of criteria, including available crew, number of cars, cost of fuel, and overall revenue. Analysis and projection of the impact of rail operations requires analyzing the rail traffic and developing typical operations. These operations measurements and support analysis and projections, as addressed in Section 3.15, *Rail Traffic*. Because trains along the PS&P rail line do not run on a schedule, this analysis uses average vehicle delay as the primary method to characterize vehicle delay at PS&P rail line grade crossings.

A level of service (LOS) scale rates the quality of traffic operations on a given transportation facility by using letter grades A through F (Transportation Research Board 2010). LOS designations were used to provide a qualitative measure of average vehicle delay at grade crossings (Figure 3.16-1). The letter grades are based on the average vehicle delay that drivers would experience at a PS&P grade crossing, with LOS A representing the least delayed conditions with an average delay for all vehicles between 0 and 10 seconds. A LOS F indicates the most delayed conditions (average vehicle delay of more than 80 seconds).

Figure 3.16-1. Level of Service Designations



According to WSDOT LOS standards, LOS D or better is acceptable for urban highways and LOS C or better is acceptable for rural highways under WSDOT jurisdiction in Grays Harbor County and Thurston County (Washington State Department of Transportation 2009). The local jurisdictions along the PS&P rail line do not have LOS standards for PS&P grade crossings. For the purposes of this EIS, deterioration of LOS below D was generally used to determine potential vehicle delay impacts at PS&P grade crossings.

Average vehicle delay was calculated at each public PS&P grade crossing in the study area to determine how the crossings would operate in 2017 and 2037[4] for the no-action alternative and the

[4] The annual traffic growth rate at PS&P rail line grade crossings between 2017 and 2037 was assumed to be 1.5% based on available traffic count data and input from the Washington State Department of Transportation.

proposed action. The average delay per vehicle in a 24-hour period is based on the estimated time each train would block the crossing, the average number of trains per day, and grade-crossing characteristics (such as annual average daily traffic and number of roadway lanes). This average vehicle delay in seconds per vehicle was then converted to the applicable LOS designation (Figure 3.16-1) to provide a qualitative measure of vehicle delay at PS&P grade crossings for comparison with the no-action alternative.

Peak Hour Vehicle Delay

As previously noted, it is not possible to predict when a train might travel on the PS&P rail line under existing conditions or related to the proposed action. To describe the highest potential vehicle delay impacts that could occur related to the proposed action, an analysis of vehicle delay during the peak traffic hour was completed. The peak traffic hour is the hour of the day when the highest number of vehicles travel study area roads. It was assumed that the longest unit train would travel during the peak hour of traffic. Vehicle traffic during the peak hour was assumed to be 11.5% of the annual average daily traffic data based on available traffic count data, except where location-specific hour traffic data were available. The LOS scale in Figure 3.16-1 was used to assess peak hour vehicle delay.

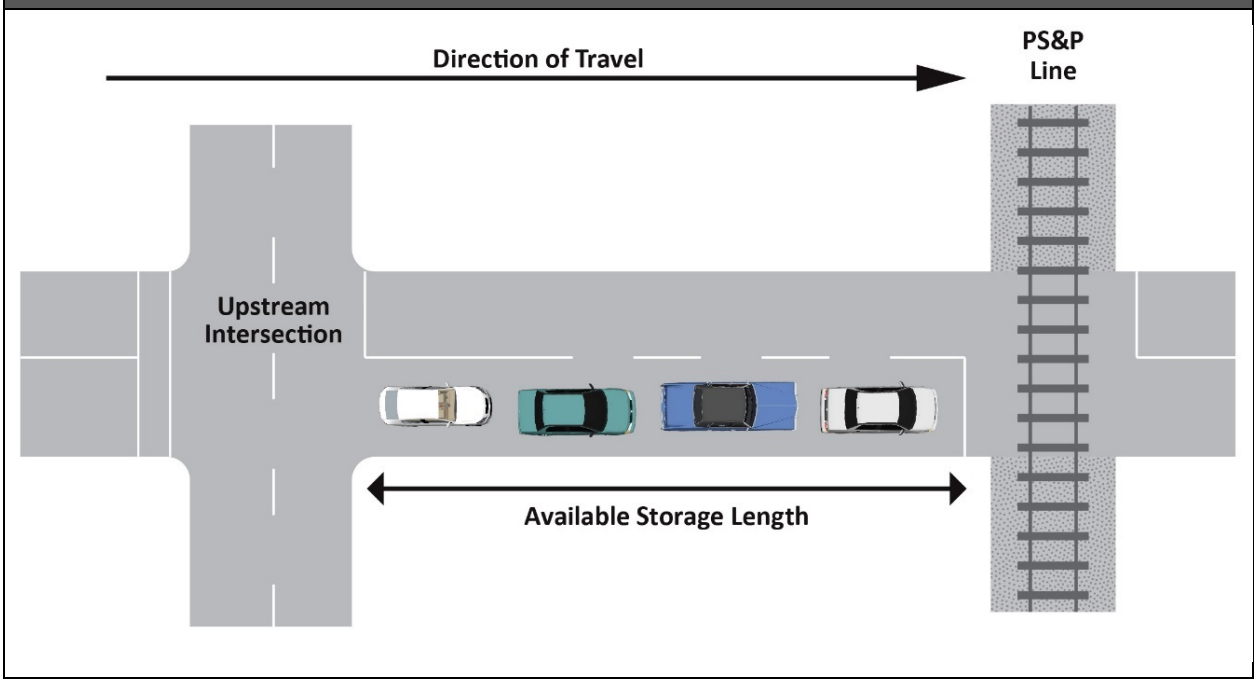
The peak hour vehicle delay assumes the longest train under consideration (a grain train for existing conditions and no-action alternative, and a unit train for the proposed action) would operate during the peak hour. This is a very conservative assumption because, based on the average number of trains operating per day under existing conditions, the no-act ion alternative, and the proposed action, there would be a low probability that a train related to the proposed action would travel during the peak traffic hour.

Vehicle Queuing

Vehicle delay from trains blocking grade crossings can affect upstream intersections. Each PS&P grade crossing has a storage length to store vehicles when the crossing is blocked. The available storage length is the distance between the crossing and upstream intersection (Figure 3.16-2). As vehicles queue, the distance that vehicles extend back from the crossing while waiting at a blocked crossing increases.

Years 2017 and 2037 vehicle volumes were used to calculate average queue length to determine if the queue length exceeded the available storage capacity. Queue length, which is the total average length of vehicles per lane, was calculated based on the number of vehicles delayed due to gate down times throughout a 24-hour period and an average vehicle length of 20 feet. Queue lengths were calculated at 25 key crossings in the study area.

Figure 3.16-2. Illustration of Available Storage Length



Vehicle Safety

Vehicle safety at PS&P grade crossings was analyzed by estimating future accident frequency and the corresponding predicted interval between accidents with and without the addition of proposed action rail traffic. The FRA GradeDec.Net model was used to analyze public PS&P grade crossings (Federal Railroad Administration 2014b). This model accounts for accident history and frequency of trains at existing at-grade crossings, volume of vehicle traffic, existing safety devices at the at-grade crossings, and other factors to determine the potential impacts of an increase in rail traffic. For grade crossings not included in the GradeDec.Net model, the FRA accident prediction formula was used to calculate a total predicted annual accident rate.

Emergency Access

An increase in vehicle delay at PS&P grade crossings could affect emergency access and response time. A qualitative analysis was conducted to identify potential impacts on emergency vehicle response and access under the proposed action at PS&P grade crossings. The analysis identified areas along the PS&P rail line where the emergency vehicle response and access would substantially change.

3.16.4 What are the existing vehicle traffic and safety conditions in the study area?

This section describes vehicle traffic and safety conditions in the study area that could be affected by construction and operation of the proposed action. The specific roadways and grade crossings considered in the analysis are presented in Appendix L, *Vehicle Traffic Analysis.*

3.16.4.1 Vehicle Traffic

This section provides a summary of existing vehicle traffic conditions related to onsite operations at the project site and from existing rail traffic along the PS&P rail line.

Onsite

Under existing conditions, vehicle trips generated by employees regularly on site are estimated to be 15 per day.

Rail

This section provides general information about vehicle traffic in the context of the PS&P grade crossings in the study area, key areas of vehicle delay in the study area, and planning studies to address vehicle delay. Appendix L, *Vehicle Traffic Analysis*, identifies the emergency service providers in the study area.

The road network from Centralia consists of arterial, collector, and local roads that cross and parallel the PS&P rail line. Figure 3.15-2 and Figure 3.15-3 in Section 3.15, *Rail Traffic*, illustrate the PS&P rail line. There are 81 public at-grade crossings of the PS&P rail line between Centralia and the project site. Information on the PS&P grade crossings in the study area is summarized as follows.

- Roadways with grade crossings on the PS&P rail line are classified as follows: four arterials, 13 collectors, and 64 local roads.
- The annual average daily traffic in both directions at the 81 grade crossings ranges from approximately 20 vehicles (at four crossings) to approximately 17,310 vehicles (at Port Industrial Road in Aberdeen).
- The annual average daily traffic at the 81 crossings is approximately 1,425 vehicles. However, 60 of the 81 crossings have an average daily traffic of less than 900 vehicles.

Table 3.16-2 illustrates the 10 grade crossings with the highest average daily traffic from Centralia to the project site, and the existing LOS for average and peak hour vehicle delay (grade crossings west of Poynor Yard are shown in Figure 3.16-3; grade crossings east of Poynor Yard are shown in Figure 3.16-4). Three crossings are located in Centralia, one is located in unincorporated Thurston County and Satsop, and five crossings are located in Aberdeen.

Vehicle delay occurs in several areas along the PS&P rail line. The two most substantial areas of vehicle traffic along the PS&P rail line are in Centralia and Aberdeen, as shown in Table 3.16-2.

Table 3.16-2. Top 10 Grade Crossings by Annual Average Daily Traffic

Grade Crossing	Milepost	Location	Approximate 2015 Annual Average Daily Traffic	Level of Service (Average Vehicle Delay)	Level of Service (Peak Hour)
Tower Street (SR 507)	0.82	Centralia	7,785	A	F
Pearl Street (SR 507)	0.89	Centralia	13,340	A	F
West Reynolds Street	2.14	Centralia	6,190	A	C
Old Highway 99 SW	6.07	Unincorporated Thurston County	9,850	A	C
Monte Elma Road	51.98	Satsop	4,625	A	A
Tyler Street	68.23	Aberdeen	3,925	B	F
South Chehalis Street	68.36	Aberdeen	4,760	C	F
Port Industrial Road	70.06	Aberdeen	17,310	A	F
West 1st Street	70.41	Aberdeen	4,485	A	E
Industrial Road	71.04	Aberdeen	5,620	B	F

SR = State Route

Centralia

Traffic congestion issues exist in Centralia at the Tower Street and Pearl Street PS&P grade crossings when trains are delayed in entering the BNSF Railway Company (BNSF) main line and wait on the PS&P rail tracks, blocking the Tower Street and Pearl Street crossings. Delays are also experienced if a train were to pass during the Tower Street and Pearl Street crossings during the peak traffic periods.

Aberdeen

Traffic along the US 101 and US 12 corridors between Aberdeen and Hoquiam is becoming more congested due to growth at the Port of Grays Harbor and overall vehicle traffic growth from population growth (Grays Harbor Council of Governments 2009).

In the Olympic Gateway Plaza and Port of Grays Harbor areas in Aberdeen, existing vehicle delay is worsened by current switching operations[5] at Poynor Yard. As described in Section 3.15, *Rail Traffic*, trains leaving Aberdeen traveling east typically have more cars than one yard track can hold, and it is necessary to couple cars located on multiple tracks in Poynor Yard to create one eastbound train. These operations block the six grade crossings east of the Wishkah River in the Olympic Gateway Plaza area. Figure 3.16-4 illustrates the location of these crossings. East Heron Street, the crossing

[5] Switching operations are generally related to disassembling unit trains by setting rail cars on multiple tracks, rearranging rail cars to facilitate loading or unloading, sorting rail cars by destination, delivering rail cars to an industry, picking up rail cars from an industry, or assembling unit trains from rail cars on multiple tracks.

furthest to the west and closest to Poynor Yard, has the longest blockage time. Fleet Street, the crossing furthest to the east and furthest from Poynor Yard has the shortest blockage time of the crossings in the Olympic Gateway Plaza area. Section 3.15, *Rail Traffic*, describes the duration and frequency that trains block these crossings. All entrances to the Olympic Gateway Plaza can be blocked an average of four times per week for approximately 35 minutes. As a result, the Grays Harbor Council of Governments is leading a study, called the East Aberdeen Mobility Project, to examine ways to relieve congestion, improve safety along US 12, and improve access into the Olympic Gateway Plaza. Options being considered include possible grade- separated entrances to the plaza.

Currently, in the case of a train blocking intersections at the Olympic Gateway Plaza, PS&P has established the following procedures with Aberdeen and Hoquiam Fire Departments for all rail intersections (Connell pers. comm.; Hubbard pers. comm. [A]). Based on the movement and direction of a train, first responders would proceed to the first entrance that would be cleared and enter once the train has passed. If the train is stopped or first responders are not sure of the train direction, emergency personnel would call 911 Dispatch. The 911 Dispatch would call the PS&P Dispatch and advise them of the need to expedite entrance. PS&P Dispatch would then notify the train crew to start the process of clearing a crossing.

If the fire department is dispatched to this area and determines that access will be blocked for a significant duration, the Aberdeen Fire Department can provide initial medical care by loading personnel and equipment into the Battalion Chief's response vehicle and accessing the area via the existing underpass in the railroad trestle located in the parking lot of the Best Western Plus Hotel at 701 East Heron Street (Hubbard pers. comm. [A]). Interim response to a fire at the Olympic Gateway Plaza would be provided using the onsite fire sprinkler systems in those occupancies equipped with such systems (Hubbard pers. comm. [B]).

In the Port of Grays Harbor area, switching operations related to existing operations at the project site and adjacent industrial site currently block the crossings west of Poynor Yard for between 3 and 13 minutes. These crossings include Port Industrial Road, West 1st Street, and Industrial Road. Figure 3.16-3 illustrates the location of these crossings. Section 3.15, *Rail Traffic*, describes the duration and frequency that trains block each of these crossings.

3.16.4.2 Vehicle Safety

Collision records in the study area from 2003 to 2013 identified one collision involving a train that resulted in a possible injury at the Olympic Gateway Plaza access between Chehalis Street and Tyler Street in Aberdeen (Washington State Department of Transportation 2014; Federal Railroad Administration 2014a). The collision involved a right-turning vehicle not yielding the right-of-way to a slow-moving train.

As required, PS&P provides information at grade crossings. This information includes a toll-free phone number and crossing identification number so the public can report any incidents, malfunctioning warning devices, stalled vehicles, or other dangerous conditions. PS&P participates in Operation Lifesaver, a nationwide public education program to help prevent collisions, injuries, and fatalities at highway and rail grade crossings. (Irvin pers. comm.)

Under FRA's Train Horn Rule, locomotive engineers must begin to sound train horns at least 15 seconds and no more than 20 seconds in advance of all public grade crossings to notify people and vehicles of approaching trains.

3.16.5 What are the potential impacts on vehicle traffic and safety?

This section describes vehicle traffic and safety impacts that could occur in the study area. Potential impacts of the no-action alternative are described first as a baseline for comparing the potential impacts of the proposed action.

3.16.5.1 No-Action Alternative

Under the no-action alternative, the applicant would continue to operate its existing facility as described in Chapter 2, Section 2.1.3.2, *Existing Operations*. As noted in Section 3.16.4.1, *Vehicle Traffic*, existing rail operations that serve the project site and the immediately surrounding industrial area currently contribute to existing vehicle delays. Under the no-action alternative, these operations would continue to result in vehicle delays and grade-crossing safety concerns that are expected to increase slightly between 2017 and 2037, primarily as the result of predicted increases in vehicle traffic. Rail traffic anticipated under the no-action alternative is discussed in Section 3.15, *Rail Traffic*.

The complete results of the vehicle analysis are presented in Appendix L, *Vehicle Traffic Analysis*. The following summarizes key vehicle traffic and safety findings under the no-action alternative in 2017 and 2037. The analysis addresses three topics: vehicle delay (year 2017), vehicle delay (year 2037), and vehicle safety.

Vehicle Delay (Year 2017)

The following sections describe vehicle delay from ongoing operations at the project site and from rail operations along the PS&P rail line that would be expected in 2017 under the no-action alternative.

Onsite

Because the proposed action would not be constructed, the number of trips generated at the project site is anticipated to be the same as described for existing conditions.

Rail

Average Vehicle Delay

All PS&P grade crossings under the no-action alternative would operate at LOS C or better in 2017; no grade crossings would operate at or below LOS D in 2017.

Peak Hour Vehicle Delay

All crossings that would operate at LOS E or F are located in Centralia and Aberdeen (Olympic Gateway Plaza area and Port of Grays Harbor area). Under the no-action alternative, substantial vehicle delay would occur in these areas if a grain train, the longest train currently operating on the PS&P rail line, passes through the corridor during the peak traffic hour. Table 3.16-3 illustrates the grade crossings that would operate at LOS E or F during the peak traffic hour. All seven crossings in east Aberdeen in the Olympic Gateway Plaza area would operate at LOS F during the peak traffic hour. All crossings between Port Industrial Road and the project site would operate at LOS E or F.

Table 3.16-3. Grade Crossings Operating Below Level of Service D during the Peak Traffic Hour—No-Action Alternative (2017)

Grade Crossing	Level of Service (Peak Hour Delay)
Centralia	
Tower Street (SR 507)	F
Pearl Street (SR 507)	F
East Aberdeen (Olympic Gateway Plaza Area)	
Fleet Street	F
Tyler Street	F
McDonalds Entrance	F
Dairy Queen Entrance	F
South Chehalis Street	F
Newell Street	F
East Heron Street	F
Port of Grays Harbor	
Port Industrial Road	F
West 1st Street	E
North Maple Street	F
Industrial Road	F

SR = State Route

Average Vehicle Queuing

Table 3.16-4 illustrates the grade crossings that would exceed the available storage length under the no-action alternative in 2017. The queue lengths at these crossings would back into upstream intersections.

Table 3.16-4. Average Queue Lengths Exceeding Available Storage Length—No-Action Alternative (2017)

Grade Crossing	Queue Direction	Crossing Location	Upstream Intersection Affected by Queue
Centralia			
Tower Street (SR 507)	Northbound	SR 507 northbound in central Centralia.	4th Street
Pearl Street (SR 507)	Southbound	SR 507 southbound in central Centralia.	6th Street
East Aberdeen (Olympic Gateway Plaza Area)			
Fleet Street	Northbound	Exit from Olympic Gateway Plaza at US 12.	Olympic Gateway Plaza parking lot
Tyler Street	Northbound	Exit from Olympic Gateway Plaza at US 12	Olympic Gateway Plaza parking lot
Chehalis Street	Northbound	Exit from Olympic Gateway Plaza at US 12	Olympic Gateway Plaza parking lot
East Heron Street	Eastbound Right-Turn	Right-turn from US 12 eastbound to Olympic Gateway Plaza.	South F Street

SR = State Route

Two crossings are located in Centralia (SR 507 in central Centralia) and four crossings are in east Aberdeen in the Olympic Gateway Plaza area. Crossings in the Olympic Gateway Plaza area would experience substantial queuing under existing conditions and queuing would continue or increase under the no-action alternative as traffic volumes increase.

Vehicle Delay (Year 2037)

The following sections describe vehicle delay from ongoing operations at the project site and from rail operations along the PS&P rail line that would be expected in 2037 under the no-action alternative. This scenario accounts for increased growth in vehicle traffic during the analysis period and the fact that some improvements to and along the PS&P rail line are likely to be made that could partially offset the potential for increased vehicle delay during this period.

Onsite

If the proposed action is not constructed, it is possible that another industrial use could occur at the project site; however because it is not possible to predict, it is assumed that the number of trips generated at the project site would not change between 2017 and 2037).

Rail

Average Vehicle Delay

All PS&P grade crossings under the no-action alternative would operate at LOS C or better in 2037; no crossings would operate at or below LOS D.

In general, the average vehicle delay would decrease between 2017 and 2037 in east Aberdeen (Olympic Gateway Plaza area) because of infrastructure improvements to the Wishkah River bridge that would allow speeds to increase from 5 miles per hour up to 25 miles per hour. Trains would move through grade crossings faster, thereby reducing vehicle delay at east Aberdeen crossings.

Future roadway improvements could further improve congestion and improve LOS. For example, as mentioned previously, possible options to alleviate congestion along US 12 in Aberdeen related to the East Aberdeen Mobility Project are under consideration, including the creation of grade-separated crossings; however, because the preferred alternative has not yet been determined and funding has not been identified, this project was not considered in transportation modeling.

Peak Hour Vehicle Delay

The same crossings that would operate at LOS E or F in 2017, as identified in Table 3.16-3, would also operate below LOS E or F in 2037. In addition, two crossings with a low annual daily traffic west of Poynor Yard (Washington Street and Heron Street) would operate at LOS F.

Average Queuing

The Industrial Road crossing would exceed the available storage length in 2037. In addition, the same PS&P grade crossings that would exceed available storage length in 2017 would also exceed available storage length in 2037.

- Centralia: Tower Street and Pearl Street
- East Aberdeen (Olympic Gateway Plaza area): Fleet Street, Tyler Street, Chehalis Street, East Heron Street

The queue lengths at Pearl Street and Tower Street crossings in Centralia and the Industrial Road crossing adjacent to the project site would grow by approximately 30% due to the anticipated growth in vehicle traffic between 2017 and 2037. This growth in vehicle traffic would extend queue lengths at crossings. However, the east Aberdeen crossings that would exceed available storage length in 2017 would only grow by approximately 10% by 2037 due to assumed rail improvements that would improve train speeds in east Aberdeen (Olympic Gateway Plaza area) and reduce the amount of time trains occupy PS&P grade crossings in east Aberdeen.

Emergency Vehicle Access

Average vehicle delay in 2017 between Centralia and Aberdeen is estimated to be between approximately 7 and 17 minutes daily. Under the no-action alternative, substantial vehicle delay would occur in these areas if a grain train, the longest train currently operating on the PS&P rail line, were to pass through the corridor during the peak traffic hour. Emergency service providers would also experience this delay if an emergency vehicle encountered a train at a PS&P grade crossing. Additionally, as noted above, there are times (an average of four times per week) when all access to the Olympic Gateway Plaza is blocked for approximately 35 minutes. The communication and response procedures for emergency access to this area would be the same as described above for existing conditions. Although other locations along the PS&P rail line would continue to have limited vehicle access under the no-action alternative, these areas would not be affected for more than the typical amount of time for a train to pass (approximately 3 minutes), or there are alternative routes for emergency vehicles to take in the event of train.

Vehicle Safety

Under the no-action alternative, the predicted accident frequency of a train and motor vehicle collision would increase slightly between 2017 and 2037 because of the anticipated increase in annual average daily traffic at PS&P grade crossings.

In 2017, PS&P grade crossings that would have the shortest predicted interval between accidents would be in Aberdeen. This is due to rail operations east of the Poynor Yard (Olympic Gateway Plaza area) and west of the Poynor Yard (Port of Grays Harbor area), and the associated increased frequency of trains at these crossings from switching operations compared to the PS&P rail line east of Aberdeen. The grade crossings with the predicted highest interval between accidents include Industrial Road in the Port of Grays Harbor area, and the Dairy Queen and McDonald's driveways in the Olympic Gateway Plaza area. As with vehicle delay, accident frequencies would generally improve by 2037 for some crossings. This is due to planned improvement projects that were assumed to be implemented by 2037.[6] Additionally, infrastructure improvements considered for the East Aberdeen Mobility Project were not included in the safety analysis, but would likely improve both delay and safety at crossings in the Olympic Gateway Plaza area. The results of predicted accident intervals at PS&P grade crossings in 2017 and 2037 are provided in Appendix L, *Vehicle Traffic Analysis.*

The *Railroad-Highway Grade Crossing Handbook–Revised Second Edition* (Federal Highway Administration 2007) indicates that active devices with automatic gates should be considered as an option when certain criteria are met. One criterion is if the expected accident frequency, as calculated by the U.S. Department of Transportation Accident Prediction formula, exceeds 0.075. As shown in Appendix L, *Vehicle Traffic Analysis*, no crossings would exceed this frequency.

3.16.5.2 Proposed Action

This section describes the vehicle traffic and safety impacts that could occur in the study area as a result of construction and routine operation of the proposed action. First, this section describes impacts from construction of the proposed action. It then describes impacts of routine operation at the project site and of routine rail and vessel transport to and from the project site.

Construction

As described in Chapter 2, *Proposed Action and Alternatives*, construction of the proposed action could occur in two phases, with Phase 1 lasting 10 to 12 months and requiring approximately 86 workers and Phase 2 lasting around 10 months and requiring approximately 49 workers. It is assumed that for every one worker there would be one trip to and from the project site. Therefore, Phase 1 construction would generate approximately 172 vehicle trips and Phase 2 would generate approximately 98 vehicle trips.

Average annual daily traffic on Industrial Road adjacent to the project site is estimated to be 5,800 vehicles in 2017. Therefore, construction-related vehicle traffic would result in an approximately 3.0% increase in traffic on Industrial Road adjacent to the site during Phase 1. Construction-related traffic would likely take varying routes to the project site and workers would have fluctuating schedules that would further spread out the potential for impacts over space and time. Additional

[6] Appendix L, *Vehicle Traffic Analysis,* illustrates the planned infrastructure projects listed in WSDOT's 2014–2019 Transportation Improvement Plan that were included in the safety analysis. These projects include adding an early warning system and crossing gates, installing crossing gates and signs, and removing an existing crossing.

vehicle trips to and from the site associated with this temporary increase in construction workers and the delivery of construction equipment and materials could increase vehicle delays and queue lengths at intersections surrounding the project site. However, the potential for additional construction-related vehicle trips to affect vehicle delay times, including emergency vehicle delay times would be low.

In addition to construction vehicle traffic, increased rail traffic from delivery of construction materials could increase vehicle delays. However, the anticipated delay would typically be very similar to existing conditions because construction equipment and materials, if delivered by train, would likely occur in the form of additional cars on existing freight trains and would not increase the average number of trains per day to any appreciable extent. For these reasons, proposed action vehicle traffic would not be expected to cause a change in the LOS for the average vehicle for any of the PS&P grade crossings.

Operations

Onsite

Operation of the proposed action would result in an additional 50 employee vehicle trips per day to and from the project site (Shoemake pers. comm.). Assuming two trips per employee, this would result in a less than 1.0% increase in the average daily traffic on Industrial Road, and adjacent roadways would experience a negligible increase to average daily traffic. For these reasons, onsite operation of the proposed action would not contribute to a noticeable increase in vehicle delay.

Rail

As described in Section 3.15, *Rail Traffic*, operation of the proposed action at maximum throughput would add 458 unit[7] per year (1.25 trips per day on average) along the PS&P rail line to approximately 1,100 train trips per year (three trips per day on average under the no-action alternative. This increase in train traffic would result in increased occupancy of PS&P grade crossings (Section 3.15, *Rail Traffic*). In general, these blockages would increase vehicle delay and reduce access.

The following sections outline the results of the vehicle traffic analysis under the proposed action. The results focus on selected PS&P grade crossings with the most potential for a vehicle to experience delay (i.e., highest average annual daily traffic) and the crossings that would have the most substantial vehicle delay impacts (i.e., LOS designation declines to E or F and queue lengths increase beyond existing storage capacity). Appendix L, *Vehicle Traffic Analysis* provides the results for all PS&P grade crossings. Similar to the no-action alternative, the analysis addresses four topics: vehicle delay (year 2017), vehicle delay (year 2037), emergency vehicle access, and vehicle safety.

Vehicle Delay (Year 2017)

The following sections describe vehicle delay at the project site and along the PS&P rail line in 2017 under the proposed action. As noted previously, this analysis assumes maximum throughput is achieved within the first year of operation. The following describes the average vehicle delay, peak hour vehicle delay, and average queuing in 2017 for PS&P grade crossings.

[7] A trip represents one-way travel; in other words, an inbound trip and an outbound trip are counted as two trips.

Average Vehicle Delay

Increased rail trips along the PS&P rail line related to the proposed action would increase average vehicle delay compared to the no-action alternative, because the average number of train trips would increase from approximately three trips per day to 4.25 trips per day. However, for the majority of the PS&P grade crossings, the increase in crossing blockage time would not result in a substantial decline in vehicle delay compared to the no-action alternative because the potential to encounter a train at any crossing for the average vehicle would be low. In addition, as previously described, the annual average daily traffic for a majority of crossings is low. Sixty of the 81 public PS&P grade crossings have an annual average daily traffic of fewer than 900 vehicles. The approximate total vehicle delay in a 24-hour period between Centralia and Aberdeen would be between approximately 11 and 29 minutes daily under the proposed action compared to between 7 and 17 minutes under the no-action alternative. Therefore, the total blockage time would increase up to approximately 12 minutes in a 24-hour period. Because traffic volumes are low at a majority of the crossings, an increase in train trips on the PS&P rail line would not substantially increase the average vehicle delay at most PS&P grade crossings compared to the no-action alternative.

Table 3.16-5 provides a summary of average vehicle delay at the grade crossings with the highest annual average daily traffic. Because these crossings have the highest annual average daily traffic, vehicles at these crossings have highest probability to experience vehicle delay at PS&P grade crossings.

Table 3.16-5. Level of Service at Selected Grade Crossings—Proposed Action (2017)

Grade Crossing	Milepost	Location	Approximate 2017 Annual Average Daily Traffic	No-Action Alternative	Propose d Action
Tower Street (SR 507)	0.82	Centralia	8,025	A	A
Pearl Street (SR 507)	0.89	Centralia	13,755	A	B
West Reynolds Street	2.14	Centralia	6,380	A	A
Old Highway 99 SW	6.07	Unincorporated Thurston County	10,160	A	A
Monte Elma Road	51.98	Satsop	4,770	A	A
Tyler Street	68.23	Aberdeen	4,050	B	D
South Chehalis Street	68.36	Aberdeen	4,905	C	D
Port Industrial Road	70.06	Aberdeen	17,845	A	A
West 1st Street	70.41	Aberdeen	4,625	A	B
Industrial Road	71.04	Aberdeen	5,795	B	D

SR = State Route

As shown in Table 3.16-5, PS&P rail line grade crossings in Aberdeen (Olympic Gateway Plaza area and Port of Grays Harbor area) would experience the most substantial increase in average vehicle delay with the addition of proposed action trains. All grade crossings that would operate at or below LOS D in 2017 are located in Aberdeen. These grade crossings are located in two general areas.

- *Port of Grays Harbor area.* As illustrated in Figure 3.16-3, the Industrial Road crossing at the project site would operate at LOS D. The increase in the average vehicle delay is due to switching operations at the Poynor Yard to break down unit trains, and the delivery of the rail cars across Industrial Road to the project site, as described in Section 3.15, *Rail Traffic*. All other crossings in the area would operate at LOS A or B.
- *Olympic Gateway Plaza area.* As illustrated in Figure 3.16-4, average vehicle delay would worsen at the Olympic Gateway Plaza with the proposed action. As described in Section 3.15, *Rail Traffic*, existing activities to build trains at the Poynor Yard require eastbound trains to extend across the Wishkah River bridge and block crossings in the Olympic Gateway Plaza area. The addition of an average of 1.25 trips per day (an average of 0.6 trip eastbound) under the proposed action would lengthen the average vehicle delay at these crossings. The level of service at the East Heron Street and Newell Street crossings, the western-most crossings in the Olympic Gateway Plaza area, would degrade below LOS D under the proposed action. The PS&P grade crossings east of Newell Street at the Olympic Gateway Plaza area would degrade from LOS B or C to LOS D.

In summary, PS&P rail operations related to the proposed action would cause substantial LOS deterioration at two intersections that would otherwise be predicted to operate at or above LOS D under the no-action alternative: East Heron Street and Newell Street (both in the Olympic Gateway Plaza area) (Figure 3.16-4).

Figure 3.16-3. 2017 Vehicle Delay at Selected PS&P Grade Crossings West of Poynor Yard

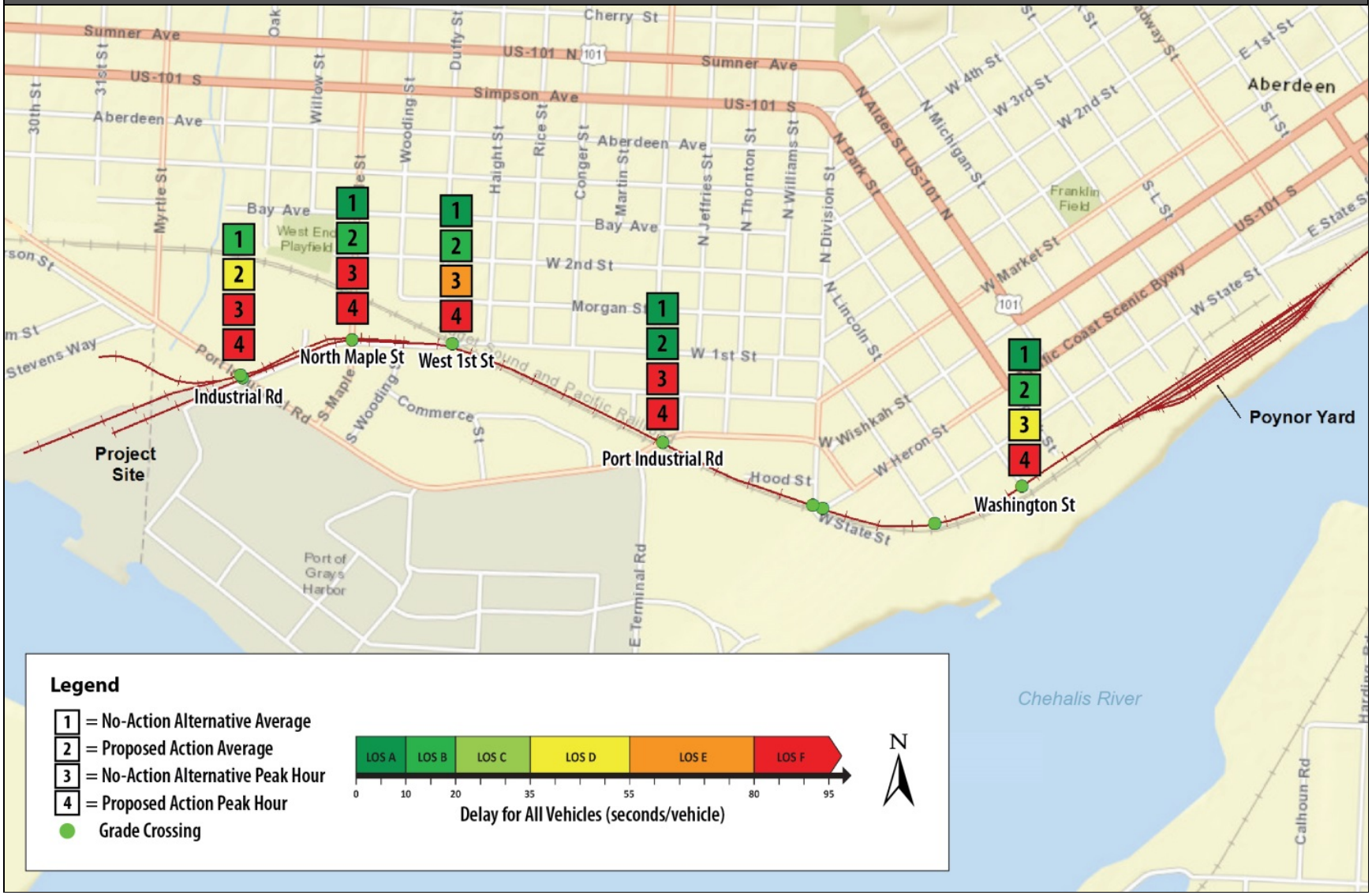
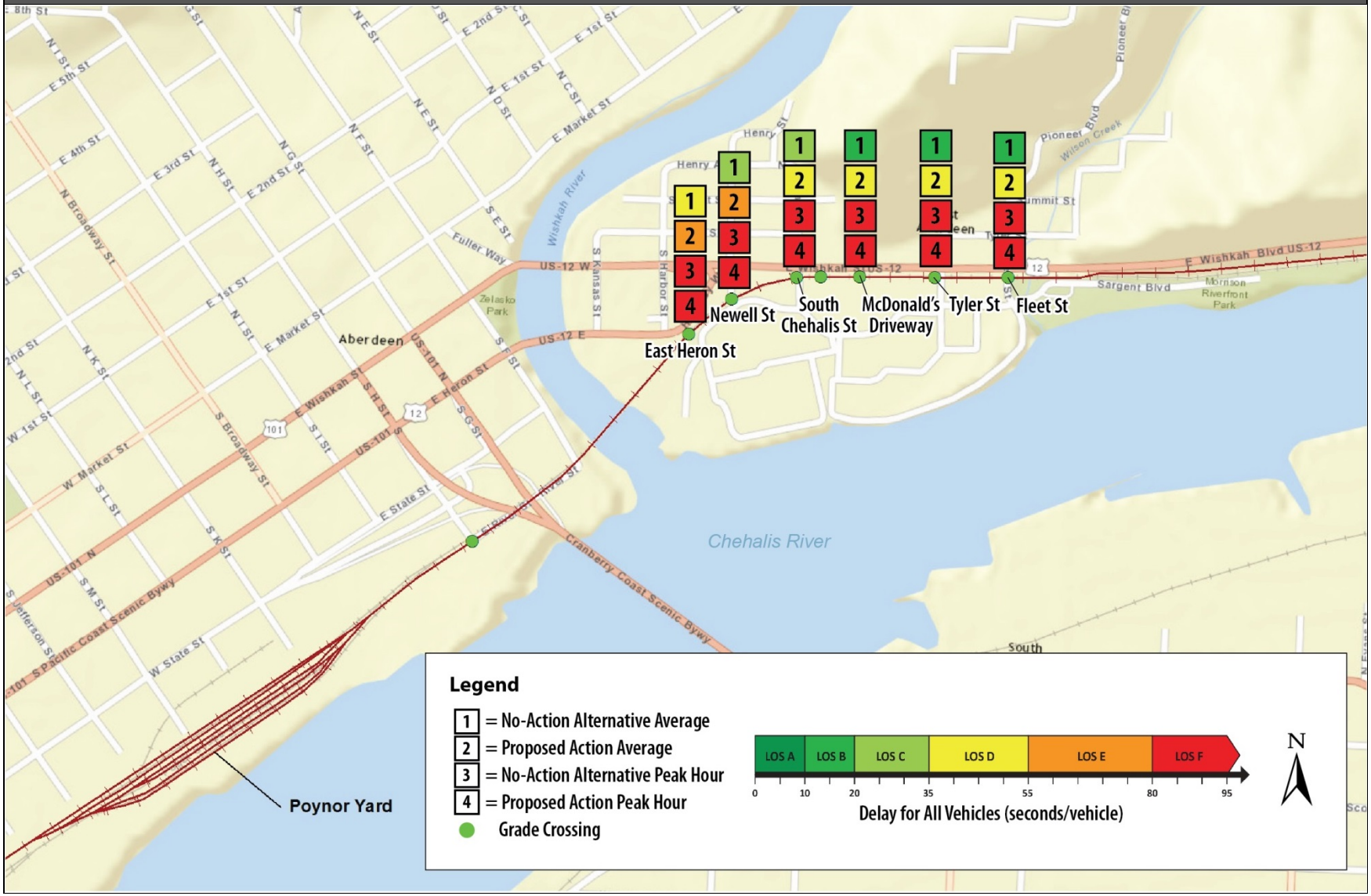


Figure 3.16-4. 2017 Vehicle Delay at Selected PS&P Grade Crossings East of Poynor Yard



Section 3.16.7.1, *Applicant Mitigation,* identifies applicant mitigation to reduce vehicle delay impacts.

As noted in Section 3.16.3.2, *Impact Analysis*, the average vehicle delay analysis represents a conservative analysis for the average vehicle, because it is based on the following assumptions.

- **Maximum throughput.** The applicant would begin maximum throughput operations in 2017.
- **No trip diversion**. The vehicle delay analysis did not consider trip diversion (alternative routes for automobile traffic). Including trip diversion in the analysis would likely indicate shorter average vehicle delay at the Port of Grays Harbor area PS&P rail line crossings (grade crossings) because at some locations other routes would avoid crossing the PS&P rail line. For example, some vehicles at the Port Industrial Road crossing could divert to US 101 to travel to central Hoquiam. In the Olympic Gateway Plaza area, vehicles attempting to use the grade crossings on the west end of the plaza could divert to the crossings on the east end of the plaza (such as Fleet Street and Tyler Street). Those crossings would not be blocked for as long as the crossings on the west end of the Olympic Gateway Plaza (such as East Heron Street and Newell Street).
- **No planned rail infrastructure.** New infrastructure implemented in 2017 that could provide for increased train speeds (Section 3.15, *Rail Traffic*) could reduce vehicle delay at grade crossings. Infrastructure improvements were not included in the analysis.
- **Assumed throughput that affects switching operations**. A sensitivity analysis was conducted to determine the LOS for 50% throughput (i.e., requiring half the number of unit trips) in 2017. This analysis concluded that one of the two grade crossings that would operate below LOS D for maximum throughput (Newell Street) would operate at LOS D for 50% throughput. East Heron Street would operate at LOS E. All other grade crossings would operate at LOS D or better. Therefore, the analysis showed that while there would be an improvement in vehicle delay for 50% throughput, East Heron Street would continue to operate below LOS D.

Peak Hour Vehicle Delay

An analysis evaluated the potential vehicle delay of a proposed action train operating during the peak traffic hour. Because a proposed action train would be longer (120 rail cars) than an existing grain train (101 rail cars) analyzed under the 2017 no-action alternative for the peak hour scenario, the same grade crossings that would operate below LOS D (Table 3.16-3) would also operate below LOS D with the proposed action.

Table 3.16-6 provides a summary of summary of peak hour vehicle delay at the grade crossings with the highest annual average daily traffic.

Table 3.16-6. Level of Service (Peak Hour Vehicle Delay) at Selected Grade Crossings—Proposed Action (2017)

Grade Crossing	Milepost	Location	No-Action Alternative	Proposed Action
Tower Street (SR 507)	0.82	Centralia	F	F
Pearl Street (SR 507)	0.89	Centralia	F	F
West Reynolds Street	2.14	Centralia	C	D
Old Highway 99 SW	6.07	Unincorporated Thurston County	C	D
Monte Elma Road	51.98	Satsop	A	B
Tyler Street	68.23	Aberdeen	F	F
South Chehalis Street	68.36	Aberdeen	F	F
Port Industrial Road	70.06	Aberdeen	F	F
West 1st Street	70.41	Aberdeen	E	F
Industrial Road	71.04	Aberdeen	F	F

SR = State Route

The peak hour vehicle delay would be most substantial in Centralia and Aberdeen. In Aberdeen, rail operations on the PS&P rail line are heavily influenced by activities related to Poynor Yard, as described in Section 3.15, *Rail Traffic*. Peak hour vehicle delay can be summarized as follows.

- Centralia: Similar to the no-action alternative (Table 3.16-3), the Tower Street and Pearl Street crossings would operate at LOS F. The H Street crossing would operate at LOS E.
- Olympic Gateway Plaza area: Similar to the no-action alternative, all grade crossings would operate at LOS F (Figure 3.16-3).
- Port of Grays Harbor area: All grade crossings would operate at LOS F (Figure 3.16-4).

Therefore, in Aberdeen, the peak hour analysis concludes that PS&P rail operations related to the proposed action would cause substantial LOS deterioration at one intersection that would otherwise be predicted to operate at or above LOS D under the no-action alternative. Section 3.16.7.1, *Applicant Mitigation*, identifies measures to reduce vehicle delay impacts.

Average Queuing

Increased vehicle delay from trains blocking grade crossings can have secondary impacts on nearby intersections. As vehicles begin to queue while waiting for the crossing to open, increased roadway congestion can affect upstream intersections. Table 3.16-7 illustrates the grade crossings that would have a queue that would exceed available storage length under the proposed action in 2017. This table also illustrates the increase in the queue length in number of cars compared to the no-action alternative. Of the grade crossings shown in the table, storage capacity is already exceeded under the no-action alternative, except for at Newell Street, West 1st Street, and Industrial Road. While the proposed action would cause storage capacity problems at all the listed crossings, the problems already exist except at these crossings.

Table 3.16-7. Average Queue Lengths that Exceed Available Storage Length at Grade Crossings—Proposed Action (2017)

Grade Crossing	Queue Direction	Queue Location Description	Increase in Average Queue Length (Number of Cars)[a]
Centralia			
Tower Street (SR 507)	Northbound	SR 507 northbound in central Centralia. Upstream affected intersection is 4th Street.	1
Pearl Street (SR 507)	Southbound	SR 507 southbound in central Centralia. Upstream affected intersection is 6th Street.	2
East Aberdeen/Olympic Gateway Plaza Area[b]			
Fleet Street	Northbound	Exit from Olympic Gateway Plaza at US 12.	2
Tyler Street	Northbound	Exit from Olympic Gateway Plaza at US 12	3
Chehalis Street	Northbound	Exit from Olympic Gateway Plaza at US 12	3
Newell Street[c]	Northbound	Exit from Olympic Gateway Plaza at US 12	1
East Heron Street	Eastbound right-turn lane	Right-turn from SR 12 eastbound to Olympic Gateway Plaza. Upstream affected intersection is South F Street.	8
Port of Grays Harbor Area[b]			
West 1st Street[c]	Eastbound and westbound	East of the project site and Port Industrial Road. Upstream affected intersection is Maple Street (eastbound) and Haight Street (westbound).	9
Industrial Road[c]	Eastbound and westbound	Adjacent to project site. Upstream affected intersection is South and Myrtle Street (eastbound) and Maple Street (westbound).	14

Notes:
[a] Increase in average queue length compared to the no-action alternative. Assumes 20 feet per car. For example, the proposed action average queue length at Fleet Street would be 40 feet longer than the no-action alternative.
[b] Grade crossing shown on Figures 3.16-3 and 3.16-4.
[c] Would not exceed available storage length under the no-action alternative. All other grade crossings would exceed available storage length under the no-action alternative.
SR = State Route

The table illustrates that average queue lengths under the proposed action show a relatively small increase compared to queue lengths under the no-action alternative. Queue lengths at the Tower Street and Pearl Street crossings in central Centralia, five of the seven Olympic Gateway Plaza area crossings, and two of the Port of Grays Harbor area crossings would be longer than the no-action alternative. At the Olympic Gateway Plaza area, the East Heron Street right-turn queue would extend approximately eight cars longer than under the no-action alternative. The grade crossing at East Heron Street conflicts with Olympic Gateway Plaza traffic traveling eastbound on US 12, and serves as a bottleneck. During an eastbound train event, the queue length could extend past F Street (upstream intersection) on the west side of the Wishkah River. In the Port of Grays Harbor area, West 1st Street and Industrial Road crossing queue lengths would extend approximately 9 and 14 cars longer, respectively, than the no-action alternative.

Similar to the vehicle delay analysis, the queuing analysis did not consider trip diversion. Including trip diversion in the analysis would likely indicate shorter average queue lengths at the Port of Grays Harbor area because there are other routes to avoid the grade crossings. For example, some vehicles could divert to US 101 to travel to central Hoquiam. In the Olympic Gateway Plaza area, vehicles attempting to use the crossings on the west end of the plaza (East Heron Street and Newell Street) could divert to the crossings on the east end of the plaza (Fleet Street and Tyler Street) because those crossings would not be blocked for as long.

Vehicle Delay (Year 2037)

As noted in Chapter 2, *Proposed Action and Alternatives*, transport of crude oil associated through the proposed facility would rely on rail and vessel transport. It is anticipated that tanker truck traffic would remain the same as for existing conditions and would not affect average daily traffic on surrounding roadways. The potential grade-crossing safety and delay impacts of increased rail traffic related to the proposed action are discussed below.

For the majority of the grade crossings, the blockage time would not result in a substantial vehicle delay in 2037 because the potential to encounter a train at any crossing for any vehicle would be small. In addition, as previously described, the annual average daily traffic for a majority of crossings is low. Because traffic volumes are low at a majority of the crossings, an increase in train trips on the PS&P rail line would not substantially increase the average vehicle delay at most grade crossings.

Table 3.16-8 provides a summary of average vehicle delay at the grade crossings with the highest annual average daily traffic.

Table 3.16-8. Level of Service at Selected Grade Crossings—Proposed Action (2037)

Grade Crossing	Milepost	Location	Approximate 2037 Annual Average Daily Traffic	No-Action Alternative	Proposed Action
Tower Street (SR 507)	0.82	Centralia	10,375	A	A
Pearl Street (SR 507)	0.89	Centralia	17,790	A	B
West Reynolds Street	2.14	Centralia	8,250	A	A
Old Highway 99 SW	6.07	Unincorporated Thurston County	13,135	A	A
Monte Elma Road	51.98	Satsop	6,170	A	A
Tyler Street	68.23	Aberdeen	5,235	A	C
South Chehalis Street	68.36	Aberdeen	6,345	B	C
Port Industrial Road	70.06	Aberdeen	23,075	A	A
West 1st Street	70.41	Aberdeen	5,980	A	B
Industrial Road	71.04	Aberdeen	7,495	B	D

SR = State Route

As noted under the 2037 no-action alternative, with the incorporation of PS&P infrastructure improvements that could allow for increased speeds in East Aberdeen (up to 20 miles per hour), the

predicted declines in LOS would be slightly less than they would be under 2017 conditions. For this reason, in 2037, only one grade crossing (Heron Street) would operate below LOS D.

Average queue lengths would increase compared to 2017 proposed action conditions due to the increase in traffic between 2017 and 2037. Average queue lengths would also increase compared to no-action alternative conditions because of the blockage time associated with the addition of proposed action trains along the PS&P rail line. The grade crossings that would exceed the available storage length would be the same as 2017 (Table 3.16-7), except at Port Industrial Road, which would have a substantial queue length that would extend east of Division Street. The queue lengths at Pearl Street and Tower Street crossings in Centralia and the Port of Grays Harbor would grow by approximately 30% due to the anticipated growth in vehicle traffic between 2017 and 2037. The increase in queue lengths at grade crossings in east Aberdeen would grow less than 30% due to assumed rail infrastructure improvements that would improve train speeds in this area and reduce the amount of time trains occupy grade crossings in east Aberdeen by 2037.

Solutions being evaluated by ongoing regional planning efforts (such as the East Aberdeen Mobility Project) would alleviate some of the vehicle delay impacts related to the proposed action if such improvements are implemented by 2037. Further regional efforts to evaluate the potential for additional storage capacity would also help to mitigate increased delay at those locations.

Emergency Vehicle Access

As described in the vehicle delay analysis, average vehicle and peak hour delay would increase with the addition of proposed action trains because more trains would operate on the PS&P rail line. Because vehicle delay would increase, emergency vehicle delay would also increase at grade crossings. The following sections describe the impacts on emergency vehicle access, focused on the PS&P rail line between Centralia and Aberdeen, in Centralia, and in Aberdeen (Olympic Gateway Plaza and Port of Grays Harbor areas)

Between Centralia and Aberdeen

For the grade crossings between Centralia and Aberdeen, the average vehicle delay would slightly increase compared to the no-action alternative. As described previously, the projected 2017 daily crossing time between Centralia and Aberdeen would be between 11 and 29 minutes compared to between 7 and 17 minutes under the no-action alternative (Appendix L, *Vehicle Traffic Analysis*, provides daily crossing blockage times for all grade crossings). Therefore, the average delay at grade crossings would increase 4 to 12 minutes in a 24-hour period from the addition of proposed action trains.

The addition of proposed action trains would affect emergency response times if an emergency vehicle was blocked at a grade crossing occupied by a proposed action train. The potential for the proposed action to affect emergency response would also depend on whether the dispatched emergency vehicle would need to cross the PS&P rail line and the availability of alternative routes if a train occupies the crossing at the time of the call.

There are land uses along the grade crossing where no alternate access is provided; crossing the PS&P rail line is required. Because the frequency of train traffic on the PS&P rail line would increase, the probability of an increase in emergency response time at these crossings would also increase. This impact would only occur if an emergency vehicle experienced a delay related a proposed action train that would operate on average 1.25 times per day. Section 3.16.7.1, *Applicant Mitigation,*

identifies mitigation to reduce emergency response delay at grade crossings under the proposed action.

As described previously, vehicle delay would be most substantial in Centralia and Aberdeen. Therefore, emergency response in Centralia and Aberdeen would experience the most delay from blocked grade crossings under the proposed action.

Centralia

The grade crossings in Centralia (BNSF main line to Reynolds Street crossing) are located in an urban area with a well-connected roadway network. The projected 2017 daily crossing time at grade crossings in Centralia would be 28 to 39 minutes compared to between approximately 17 and 26 minutes under the no-action alternative. Because emergency response providers are located on both sides of the PS&P rail line, similar to existing conditions, emergency response calls could be dispatched to stations that would not be blocked at a grade crossing. Section 3.16.7.1, *Applicant Mitigation,* identifies mitigation to reduce the impact of increased emergency response delay at grade crossings under the proposed action.

Olympic Gateway Plaza Area (Aberdeen)

Figures 3.15-6 and 3.15-7 in Section 3.15, *Rail Traffic*, illustrate the duration that existing and proposed action eastbound and westbound trains would occupy grade crossings in east Aberdeen for each train type. In summary, in the Olympic Gateway Plaza area, an eastbound train—the maximum train event under the proposed action—would block the Fleet Street crossing (the grade crossing furthest to the east and least affected by Poynor Yard activities) for approximately 45 minutes under the proposed action compared to 37 minutes under the no-action alternative (eastbound grain train).

All crossings in the Olympic Gateway Plaza area (from East Heron Street to Fleet Street) would be occupied for more than 35 minutes on average 3.8 times per week from eastbound grain and auto trains under the no-action alternative. Adding proposed action eastbound trains, these crossings would be occupied for more than 35 minutes on average 8.2 times per week. Section 3.15, *Rail Traffic*, provides additional information on blocked crossings in east Aberdeen.

Vehicle delays in the Olympic Gateway Plaza area are substantial because the six grade crossings at the plaza provide the only vehicular emergency access to and from the plaza area and Morrison Riverfront Park, immediately east of the plaza. Emergency response vehicles would experience more frequent and longer delays to access these areas. The communication and response procedures for providing emergency access to the Olympic Gateway Plaza area if a train is blocking all crossings, described for existing conditions, would also apply under the proposed action.

Port of Grays Harbor Area (Aberdeen)

Vehicular access west of Poynor Yard and south of the PS&P rail line is completely blocked on the existing roadways during train events. Section 3.15, *Rail Traffic*, illustrates the average and maximum duration that trains would occupy grade crossings in Aberdeen. Emergency vehicle access blockage under the proposed action would be affected in two areas, described as follows.

- **Between Poynor Yard and East of Port Industrial Road.** West of Poynor Yard and east of Port Industrial Road are the Washington Street, Monroe Street, Heron Street, and Division Street crossings. Figures 3.15-4 and 3.15-5 Section 3.15, *Rail Traffic*, illustrate the location of these

grade crossings. Proposed action trains would block these crossings for a maximum of 24 minutes compared to between 4 and 8 minutes, depending on train type, under the no-action alternative. In addition, the frequency of crossing blockages would increase under the proposed action. Therefore, the grade crossings that provide emergency vehicular access to the industrial land uses west of Poynor Yard and south of the PS&P rail line would be completely blocked more frequently and for longer periods.

An unpaved road on the south side of the PS&P rail line accessed from the F Street crossing (east of Poynor Yard) could provide access to the industrial land uses south of the PS&P rail line in this area. Alternative access is also available through the SR 520 construction site from East Terminal Road. Access to this private and public property, including private gates, would allow for more timely response. Section 3.16.7.1, *Applicant Mitigation,* identifies applicant mitigation for emergency vehicle access to reduce the impact on emergency response to this area when a train blocks these grade crossings.

- **Between Port Industrial Road and the Project Site.** All land uses south of the PS&P rail line between the Port Industrial Road crossing and the project site, including Home Depot and the Port of Grays Harbor, would be blocked from the land uses north of the PS&P rail line for approximately 10 minutes when a proposed action train arrives. The Port Industrial Road crossing would be the first grade crossing that would open to provide vehicular access to this area and would clear after approximately 10 minutes. The alternative route described above could also provide access to these Port and commercial properties. Section 3.16.7.1, *Applicant Mitigation*, identifies applicant mitigation to reduce the impact on emergency response to this area when a train blocks these crossings.

Vehicle Safety

Increased rail traffic related to the proposed action could increase the frequency of accidents along the PS&P rail line compared to the no-action alternative. The impacts on grade-crossing safety specific to each grade crossing for accidents involving trains and vehicles are summarized in Appendix L, *Vehicle Traffic Analysis.* This appendix provides the total predicted accident rate, predicted intervals between accidents, and the decrease in years between the predicted intervals in the analysis year versus the no-action alternative for all the grade crossings along the PS&P rail line.

In 2017, the grade crossings that would have the shortest predicted intervals between accidents would be in Aberdeen, due to rail operations east of the Poynor Yard (Olympic Gateway Plaza area) and west of the Poynor Yard (Port of Grays Harbor area) that would increase frequency of train passbys at these crossings. These crossings include Industrial Road in the Port of Grays Harbor area, and the Dairy Queen and McDonalds driveways at the Olympic Gateway Plaza area. As with vehicle delay, accident frequencies would generally improve by 2037 for some crossings. This is due to improvements such as grade-crossing protections that are assumed to be implemented by 2037. Additionally, although infrastructure improvements considered for the East Aberdeen Mobility Project were not included in the safety analysis, any improvements would likely improve both delay and safety at crossings in the Olympic Gateway Plaza area.

The *Railroad-Highway Grade Crossing Handbook–Revised Second Edition* (Federal Highway Administration 2007) indicates that active devices with automatic gates should be considered when certain criteria are met. One criterion is if the expected accident frequency, as calculated by the U.S. Department of Transportation Accident Prediction formula, exceeds 0.075. As shown in Appendix L, *Vehicle Traffic Analysis*, no grade crossings would exceed this frequency using this formula.

Therefore, using this threshold, the relative increase in the potential for accidents related to the proposed action would not exceed this threshold.

3.16.6 What required permits apply to vehicle traffic and safety?

No required permits or plans apply to vehicle traffic and safety.

3.16.7 What mitigation measures would reduce impacts on vehicle traffic and safety?

This section describes the applicant mitigation as well as other measures that would reduce vehicle traffic and safety impacts from construction and routine operation of the proposed action. Mitigation measures to address capabilities of local emergency responders to respond to an incident at the project site and along the PS&P rail line are presented in Chapter 4, Sections 4.4.3, *What mitigation measures would reduce impacts related to terminal operations at the project site?* and 4.5.3, *What mitigation measures would reduce impacts related to rail transport?* respectively.

Strategies that could reduce vehicle delay at grade crossings include grade separation, grade crossing closures, and railroad infrastructure improvements.

- **Grade separation.** A grade separation is created when a bridge or underpass allows the roadway to pass over or under the rail line, completely separating vehicles from trains and therefore eliminating vehicle delay at the grade crossing. Grade separation is typically recommended for existing grade crossings when design thresholds are exceeded. Design thresholds look at the number of cars and trains traveling through the crossing, vehicle speeds, train speeds, the number and type of tracks, and the number of roadway lanes. Grade separation requires a substantial investment and can be disruptive to communities if businesses or homes adjacent to the intersection must be condemned or relocated. WSDOT estimates that creating grade separation in Washington State at a single crossing costs approximately $15 to $20 million. Because of the high cost of grade separation, the number of grade crossings in Aberdeen with substantial vehicle delay (at the Olympic Gateway Plaza and Port of Grays Harbor areas) and the private property and community impacts that would result from grade separation at the crossings with substantial vehicle delay, grade separation in Aberdeen is not a reasonable option to reduce vehicle delay.
- **Crossing closures.** While closing certain grade crossings could improve vehicle safety, closing crossings would worsen vehicle delay by diverting motorists to other grade crossings. This trip diversion would extend queue lengths at other grade crossings and negatively affect vehicle delay. In addition, state and local governments do not have the authority to close rail crossings. For these reasons, closing grade crossings is not a reasonable option to reduce vehicle delay.
- **Railroad infrastructure improvements.** Vehicle delay could be reduced by adding new railroad infrastructure on the PS&P rail line. As discussed in Section 3.15, *Rail Traffic*, additional improvements to the PS&P infrastructure in Aberdeen have limited potential to reduce blocked crossing time substantially. However, PS&P infrastructure improvements between the Olympic Gateway Plaza and the project site could be explored further with regional stakeholders.

3.16.7.1 Applicant Mitigation

The applicant will implement the following mitigation measures.

- To mitigate vehicle traffic impacts associated with rail operations of the proposed action, the applicant will work with the City of Hoquiam, City of Aberdeen, Port of Grays Harbor, Grays Harbor Council of Governments, and PS&P to address vehicle delay between the project site and Poynor Yard. WSDOT, the City of Hoquiam, City of Aberdeen, and Port of Grays Harbor will approve proposed measures for the areas where they are responsible for vehicle delay. The applicant will ensure measures are in place prior to beginning the proposed operations. The proposed changes should include an evaluation of impacts on potentially affected low-income and minority populations.
- To mitigate vehicle traffic impacts associated with rail operations related to the proposed action, the applicant will work with the City of Hoquiam, City of Aberdeen, Port of Grays Harbor, Grays Harbor Council of Governments, and PS&P to address vehicle delays at PS&P grade crossings into and out of the Olympic Gateway Plaza. WSDOT, the City of Hoquiam, City of Aberdeen, and Port of Grays Harbor will approve proposed measures for the areas where they are responsible for vehicle safety. The applicant will ensure acceptable measures are in place prior to beginning the proposed project operations. The proposed changes should include an evaluation of impacts on potentially affected low-income and minority populations.
- To reduce the potential for increased delay of emergency vehicles at PS&P grade crossings during project operations, the applicant will work with local emergency service providers to provide advance notification of incoming trains.
- To improve the timeliness of emergency response, the applicant will work with the Aberdeen and Hoquiam Fire Departments and private landowners along the unpaved road on the south side of the PS&P rail line and west of F Street to identify options for first responder access to properties in this area.
- To address the potential for emergency access conflicts to areas along the PS&P rail line during unplanned unit train stoppages, the applicant will work with PS&P and local emergency service providers along the PS&P rail line to develop and implement a notification protocol to inform local emergency service providers and other interested parties of the duration and magnitude of the unplanned stoppages. The notification protocol will be in place prior to the beginning of operations involving transport of crude oil.

3.16.7.2 Other Measures to Be Considered

Overall, impacts of vehicle safety resulting from the proposed action are considered low; however, the following measures could further improve vehicle safety along the PS&P rail line. Measures to reduce vehicle delay could include modifying PS&P operations to limit switching activities during peak traffic hours, adding new PS&P infrastructure to reduce grade-crossing occupancy time, adding new queue storage capacity at grade crossings that exceed available storage length, or implementing an early warning system to provide advance information when trains are crossing to travelers and emergency service providers.

- To improve vehicle delay and safety in East Aberdeen, the Grays Harbor Council of Governments should continue working with the appropriate jurisdictions and PS&P to evaluate options for

improving existing congestion and delay, access, and safety issues along US 12 and the Olympic Gateway Plaza.

- To reduce the risk of an accident on the PS&P rail line, PS&P should work with local jurisdiction including WSDOT and the Washington Utilities Transportation Commission to ensure all of the public grade crossings meet Manual on Uniform Traffic Control Devices (23 U.S.C. 109(d)) guidance to include a yield or stop sign on every cross-buck post.
- To reduce the risk of an accident at grade crossings, PS&P should install flashers, gates, and/or cantilever active-warning devices at crossings when agreed upon by the railroad and jurisdictional authorities to improve vehicle and rail safety conditions. Install these upgrades before initiating oil train traffic on the line.
- To reduce the risk of an accident at grade crossings, PS&P should coordinate with applicable jurisdictions to ensure that trees, brush, and weeds are cleared from all grade crossings as far as possible to ensure clear lines of sight for all motorists approaching rail crossings.

3.16.8 Would the proposed action have unavoidable and significant adverse impacts on vehicle traffic and safety?

Implementation of the mitigation measures described above could reduce impacts on vehicle traffic, but average and peak hour vehicle delays at the following grade crossings in Aberdeen would remain significant.

- Average hour: East Heron Street and Newell Street (Olympic Gateway Plaza area).
- Peak hour: Washington Street (Port of Grays Harbor area).

Addressing vehicle delay at the grade crossings at the Olympic Gateway Plaza area and between Poynor Yard and the project site would require the participation of a broad group of stakeholders in coordination with ongoing regional transportation planning efforts. Ongoing regional transportation planning efforts such as the East Aberdeen Mobility Project could reduce vehicle delay impacts and improve safety conditions at the Olympic Gateway Plaza area. In addition, other regional transportation planning efforts to reduce vehicle delay (such as grade separation, early-warning system, grade-crossing protections), would also help to reduce vehicle delay.

3.17 Vessel Traffic

This section describes vessel traffic in the study area, including characteristics of Grays Harbor and the Grays Harbor Navigation Channel; vessel types, uses, and destinations; vessel traffic; and traffic management. It then describes impacts on vessel traffic that could result under the no-action alternative or as a result of the construction and routine operation[1] of the proposed action. Finally, this section presents any measures identified to mitigate impacts of the proposed action and any remaining significant and unavoidable impacts.

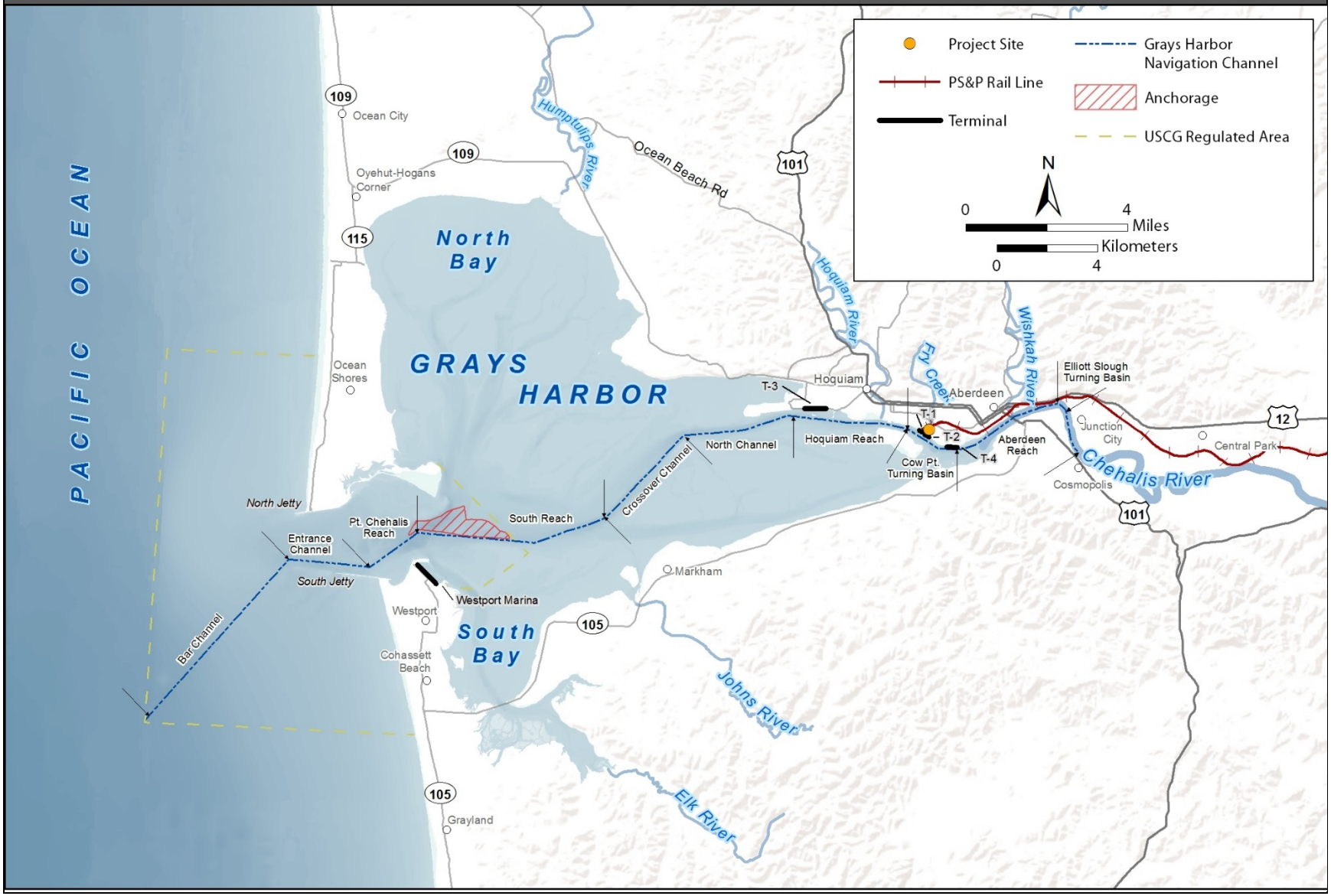
3.17.1 What is the study area for vessel traffic?

The study area for vessel traffic consists of the Terminal 1 berth and the entirety of Grays Harbor, including the navigation channel[2] into and out of the harbor out to 3 nautical miles from the mouth of the harbor (Figure 3.17-1). Chapter 5, *Extended Rail and Vessel Transport*, addresses impacts related to vessel transportation beyond this study area.

[1] Chapter 4, *Environmental Health and Safety*, addresses the potential impacts from increased risk of incidents (e.g., storage tank failures, train derailments, vessel collisions) and related consequences (e.g., release of crude oil). Chapter 4 also addresses impacts related to vessel safety.

[2] The Grays Harbor Navigation Channel provides access for deep-draft vessels to Port of Grays Harbor facilities in the harbor. Nearly 23 nautical miles long, it begins approximately 4 miles offshore, runs in a predominantly easterly direction past Westport, Hoquiam, and Aberdeen, and ends at Cosmopolis near the mouth of the Chehalis River. The depth of the channel is maintained by the U.S. Army Corps of Engineers.

Figure 3.17-1. Port of Grays Harbor



3.17.2 What laws and regulations apply to vessel traffic?

Laws and regulations for determining potential impacts on vessel traffic are summarized in Table 3.17-1. More information about these laws and regulations is provided in Appendix B, *Laws and Regulations*.

Table 3.17-1. Laws and Regulations for Vessel Traffic

Laws and Regulations	Description
Federal	
Ports and Waterways Safety Act of 1972 (31 U.S.C. 1221 et seq.)	Authorizes the U.S. Coast Guard to provide for navigation and vessel safety; protect the marine environment; and protect life, property, and structures in, on, or immediately adjacent to the navigable waters of the United States.
Port and Tanker Safety Act of 1978 (33 U.S.C. 1221 et seq.)	Grants the U.S. Coast Guard broad and extensive authority to supervise and control all types of vessels, foreign and domestic, operating in U.S. navigable waters.
Navigation and Navigable Waters, Subchapter E: Inland Navigation Rules (33 CFR 83–90)	Apply to all vessels on the inland waters of the United States and complement the International Regulations for Preventing Collisions at Sea 1972, which are applicable in International Waters.
Federal Pilotage Requirements (46 CFR 15.610 and 15.812)	Identifies the type of vessels that require a federally licensed master or mate and identifies federal pilotage requirements for U.S.-inspected vessels on coastwise voyages.[a]
State	
Washington State Pilotage Act (RCW 88.16)	Establishes requirements for compulsory pilotage provisions in certain waters of the state, including Grays Harbor.
Local	
No local laws or regulations apply to vessel traffic.	

[a] A coastwise voyage by sea is a voyage in which a U.S.-flagged vessel proceeds from one port or place in the United States to another port or place in the U.S. while engaged in trade (46 CFR 46.05-15).

U.S.C. = United States Code; CFR = Code of Federal Regulations; RCW = Revised Code of Washington

3.17.3 How were impacts on vessel traffic evaluated?

This section describes the sources of information and methods used to evaluate impacts.

3.17.3.1 Information Sources

Information about vessel traffic in the study area, including characteristics of Grays Harbor and the navigation channel; vessel types, uses, and destinations; vessel traffic; and traffic management was obtained from the following sources.

- *Vessel Traffic Impact Analysis for Westway and Imperium* (WorleyParsons 2014).
- Nautical charts and data on observed water levels at tidal station 9441102 in Westport, Washington (National Oceanic and Atmospheric Administration 2014a).
- National Oceanic and Atmospheric Administration. 2014b. *U.S. Coast Pilot 7 Pacific Coast*. 2014 (46th Edition). August 31, 2014.
- U.S. Army Corps of Engineers (USACE) Waterborne Commerce Statistics Center (U.S. Army Corps of Engineers 2014b).

- *Navigation Improvement Project General Investigation Feasibility Study, Grays Harbor, Washington* (U.S. Army Corps of Engineers 2014).
- *Washington State 2014 Marine and Rail Oil Transportation Study* (Washington State Department of Ecology 2014, 2015).
- Laws and regulations granting the U.S. Coast Guard authority to provide for navigation and vessel safety in navigable waters of the United States.
- *Harbor Safety Plan for Grays Harbor* (Grays Harbor Safety Committee 2014).
- Personal communication with Port of Grays Harbor (Port) pilots and staff.
- Information on commercial, recreational, and tribal fishing obtained from the Washington Department of Fish and Wildlife and the Quinault Indian Nation.
- Pacific Northwest Marine Cargo Forecast Update and Rail Capacity Assessment Final Report (Pacific Northwest Rail Coalition 2011).

3.17.3.2 Impact Analysis

The vessel traffic analysis evaluated the capacity of the navigation channel, Terminal 1 berth, and pilot and escort tugs relative to the increase in large commercial vessel trips[3] under the proposed action, and potential conflicts of these vessels with smaller recreational and fishing vessels in the harbor.

- **Channel capacity.** The channel capacity analysis was completed by first determining existing and future traffic related to large commercial vessels[4] (2017 and 2037) without the proposed action. Future vessel traffic was determined by applying moderate compound annual growth rates to vessel trips associated with the present commodity volumes shipped from the Port. The growth rates used for commercial product forecasts were 1.2% for forest products (including wood chips), 0.7% for food and farm products, 3.9% for manufactured equipment (machinery and auto), and 6.8% for chemicals (e.g., methanol). Forecast volumes of vegetable oil and biofuels were kept constant.

  The channel capacity analysis compared forecast vessel trips to the navigable windows available for these vessels to assess whether the capacity of the navigation channel would be exceeded on an annual basis with the addition of traffic anticipated under the proposed action. The channel capacity analysis considered a mix of vessel types for transport of crude oil under the proposed action and channel capacity constraints under three channel depth scenarios.

- **Berth capacity**. The berth capacity analysis compared berth occupancy at Terminal 1 under the proposed action to berth availability. Berth occupancy times for tank barges and tankers, 24 and 48 hours, respectively, account for vessel/barge docking, preloading activities (e.g., Declaration of Security, Declaration of Inspection, possible U.S. Coast Guard inspections, oil spill prevention measures, vessel inspection by surveyor), loading[5] of product, gauging of vessel holds by

[3] In the EIS, a trip also means a pilotage assignment or job.
[4] The channel capacity analysis considers the large commercial vessels, which are restricted to the navigation channel due to the depth of their drafts.
[5] Loading rates, as identified in the applicant's Notice of Construction Application (Trinity Consultants 2015), would vary between 10,000 and 20,000 barrels per hour. Based on these loading rates, a tank barge with a 150,000-barrel capacity would require between 7.5 and 15 hours to load; a tanker with a 360,000-barrel capacity would require between 18 and 36 hours to load.

surveyor, and preparation for departure (e.g., hose retraction, taking on of stores). Additionally, the tanker estimate accounts for time that may be needed to wait for an ideal tidal window for transit.

- **Pilot and tug capacity.** The pilots and tug analysis was completed by qualitatively assessing whether the potential increase in demand for state-licensed pilots and escort tugs could be met with the pilots and tugs currently under contract with the Port.
- **Conflicts with recreational and fishing vessels.** Potential conflicts of large commercial vessels with smaller recreational and fishing vessels in the harbor were evaluated by determining the extent of traffic related to these smaller vessels in the harbor (number of vessels, nature, geographic extent, and timing of operations) and qualitatively assessing the extent of the disruption to these vessel operations because of large commercial vessel traffic within the navigation channel.

3.17.4 What vessel traffic currently occurs in the study area?

Vessel traffic in the study area includes a mix of large commercial vessels and smaller fishing (commercial, tribal, and recreational) and recreational vessels. Depending on the type of operation, the vessel traffic in the study area varies in intensity, both geographically and seasonally. This section describes existing vessel traffic and navigational considerations, including the vessel traffic management system.

3.17.4.1 Grays Harbor

Grays Harbor is a large, naturally formed bay on the west coast of Washington State. It is an estuary fed by multiple rivers and creeks, the most significant being the Chehalis River. Offshore, extending approximately 2 miles from the mouth of the bay is an entrance bar[6] composed of sand and silt, which is subject to the effects of tide, current, and ocean forces. The bay enclosed in Grays Harbor is filled by many shoals[7] and flats, some of which are bare at low water and are cut by numerous channels. Grays Harbor experiences semidiurnal tides, meaning that it has two uneven tidal cycles each day (two high tides and two low tides). The harbor has two jetties at its entrance approximately 1.17 nautical miles (7,120 feet) apart (Figure 3.17-1). The two jetties were originally constructed from 1889 to 1913 for harbor navigation.

The entrance bar, coupled with strong and sometimes erratic currents, can present a navigational challenge to vessels entering or leaving Grays Harbor. Periods of limited visibility due to fog, rain, or darkness can add to this challenge. Submerged sections of the north and south jetties at the harbor entrance extend seaward about 0.2 and 0.9 mile, respectively. Hazardous breakers can occasionally be present near these jetties, especially during periods of heavy weather (National Oceanic and Atmospheric Administration 2014b:459).

Figure 3.17-1 shows the navigation channel through Grays Harbor and out to the Pacific Ocean, identifying individual reaches and Port terminals.

[6] A bar is a large mass of sand or earth, formed by the surge of the sea. Bars located at the entrance of a harbor often render navigation extremely dangerous, but confer tranquility once inside.
[7] Shoals are an accumulation of sand and silt that reduce the depth of the navigation channel for transiting vessels.

3.17.4.2 Large Commercial Vessels

Large commercial vessels traveling in Grays Harbor call at facilities maintained by the Port or at privately owned wharfs located farther east (Figure 3.17-2). Bulk exports (especially shipments of grain, soybeans, and other agricultural products) are the largest volume of commodity handled at Port facilities (Washington State Department of Ecology 2015). The Port terminals, terminal operators, vessels, and products transported are described below (Grays Harbor Safety Committee 2014:9; National Oceanic and Atmospheric Administration 2014b:462; U.S. Army Corps of Engineers 2012:74, 156).

- Terminal 1 is a bulk liquid storage and marine and rail transfer facility. It has one deepwater berth and access to the Puget Sound & Pacific Railroad (PS&P) rail line. The applicant and Imperium Terminal Services receive tank vessels transporting bulk liquids.
- Terminal 2 is a loading facility for both dry and bulk liquid products and is served by the Port's loop track. Ag Processing, Inc. receives dry-cargo vessels transporting bulk agricultural materials (e.g., grain).
- Terminal 3 is a 150-acre industrial site with vessel and rail access. This terminal is currently unoccupied; it the proposed site of a Grays Harbor Rail Terminal development. Willis Enterprises receive dry-cargo vessels transporting wood products.
- Terminal 4 is the largest of the four terminals. It is a storage and transfer facility with two deepwater berths and on-dock rail service. Terminal 4 serves as the primary terminal for automobiles, logs, and bulk cargo.

Most of the large commercial vessels operating in Grays Harbor comprise the following types of vessels.

- **Tank vessels** carry bulk liquids, including oil, methanol, nontoxic vegetable oils, and biodiesel. They consist of self-propelled **tankers** and **tank barges** that require an escort tug.
- **Cargo vessels** carry grain, wood, and other dry projects. They consist of self-propelled **cargo ships**, **cargo barges** that require a tug, and **RoRo vessels** (roll-on/roll-off) that carry wheeled vehicles (Figure 3-17-3). In this document, the term *cargo vessel* refers to vessels carrying dry cargo only (not liquid cargo).

All of the large commercial vessels, except for the cargo barges, are considered deep-draft[8] vessels. Because of their draft depths, these vessels are restricted in their ability to maneuver in Grays Harbor area and are limited to transit in the navigation channel and at the Port terminal berths. The shallower-draft cargo barges are not restricted to the navigation channel and can travel to locations at the mouth of the Chehalis River and further upstream (see Section 3.17.5.2, *Proposed Action,* for further discussion of typical tank vessels and their design drafts).

[8] Vessel draft is the vertical distance between the water line and the bottom of the vessel.

Figure 3.17-2. Sources of Large Commercial Vessel Activity in the Study Area

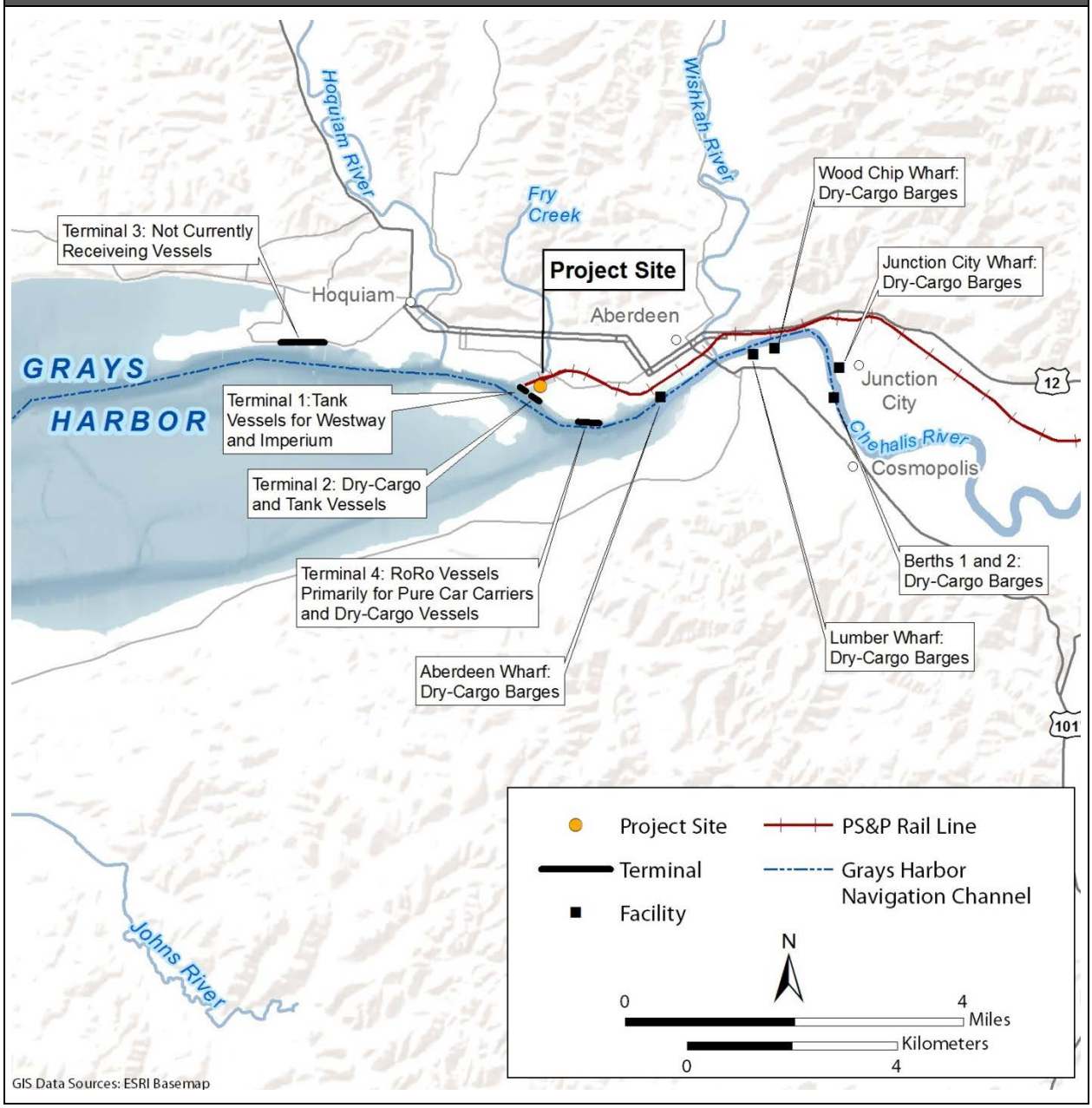
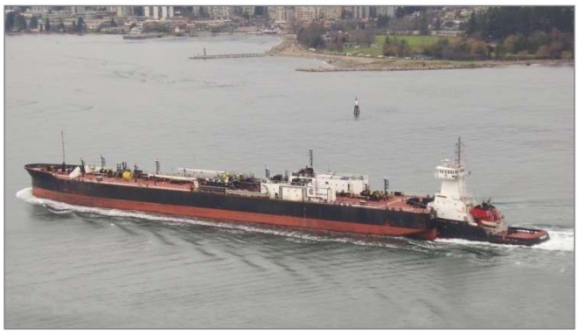


Figure 3.17-3. Typical Large Commercial Vessels Using Grays Harbor

Tanker
Primary use: bulk liquid transfer
Deadweight tonnage: 53,100 metric tons
Capacity: 320,000 barrels
Length: 612 feet; Breadth: 106 feet



Tank Barge
Primary use: bulk liquid transfer
Deadweight tonnage: 20,000 metric tons
Capacity: 155,000 barrels
Length: 604 feet; Breadth: 75 feet

Cargo Ship
Primary use: dry bulk cargo
Deadweight tonnage: 43,000 metric tons
Length: 656 feet; Breadth: 105 feet

Cargo Barge
Primary use: dry bulk cargo
Deadweight tonnage: 11,000 metric tons
Length: 512 feet; Breadth: 85 feet

RoRo Vessel (Cargo Ship)
Primary use: automobiles
Deadweight tonnage: 11,760 metric tons
Length: 600 feet; Breadth: 103 feet

Commercial Fishing Vessel
Primary use: fishing
Deadweight tonnage: 100–2,000 metric tons
Length: 82–262 feet; Breadth: 20–40 feet

Source: WorleyParsons 2014

Large Commercial Vessel Operations

This section describes the operational considerations relevant to large commercial vessels in the study area.

Vessel Operator and Crew Responsibilities

The vessel operator is responsible for scheduling—in advance of the vessel arriving at the Port—all activities associated with navigation, berthing, vessel safety, and security while in Grays Harbor. The vessel operator procures the state-licensed pilot through the Port consistent with applicable federal and state regulations, if required (Federal Pilotage Requirements 46 Code of Federal Regulations [CFR] 15.610 and 16.812 and Washington State Pilotage Act Revised Code of Washington [RCW] 88.16). The role of the Port, pilots, and the Port's tenants and vessel agents in facilitating large commercial vessel traffic in Grays Harbor is further described in Section 3.17.4.4, *Vessel Traffic Management*.

The vessel operator also contracts with an approved ship's stevedore[9] to handle the vessel side of the operations during vessel loading and unloading. The ship's crew handles all of the underway tasks, including berthing and departure activities, under the direction of the pilot and or ship's master. The crew is also responsible for maintaining the anchor watch when a vessel is anchored in Grays Harbor. When the incoming or outgoing vessel is a laden tank barge, it is escorted by a tug according to harbor safety guidelines; the escort tug's captain brings the vessel all the way to the terminal (WorleyParsons 2014).

Tug Services

The Port provides various services such as pilotage, ship assistance (with tugs), line handling, and terminal stevedoring (WorleyParsons 2014) to large commercial vessels operating in the study area. The Port has a contract with Brusco Tug & Barge through 2016 for tug escorting and docking services; the contract specifies requirements for bollard strength and engine capacity.

Brusco Tug & Barge has three harbor tugs stationed in Grays Harbor that are exclusively available for commercial vessel assistance in the harbor. These three tugs manage the escorts required for the current numbers and types of commercial vessels transiting Grays Harbor. One of the tugs is a highly maneuverable Z-drive tug[10] with a towing power of more than 100,000 pounds and a fire monitor. It has an installed tank to carry foam for spraying from the fire monitor, if necessary. The other two tugs are highly maneuverable ship-assist tugs. An additional Z-drive tug with the same capabilities that belongs to Grays Harbor is currently operating on the Columbia River. Should operations change to require the second Z-drive tug to remain on standby within the harbor, it would be transferred to Grays Harbor (Campbell pers. comm. [A]).

The Z-drive tug is capable of leaving Grays Harbor to assist a disabled or damaged vessel at sea and to provide fire-fighting support. The Z-drive tug currently operating on the Columbia River could provide the same assistance; travel time would be approximately 12 hours from its current station on the Columbia River. Additionally, the emergency response towing vessel at Neah Bay, located at the far northwest corner of Washington State, is available to assist vessels off the coast of

[9] Stevedores (longshore workers) connect hoses for bulk liquid transfer operations and provide assistance for vessels at the terminal.
[10] A Z-drive tug is so named because of the appearance of the mechanical transmission used to connect the driving energy to the thruster device.

Washington and in Puget Sound. It could assist with vessels in a difficult situation in or near Grays Harbor. Under normal weather conditions, it could take an average of 12 hours to reach the harbor. Under adverse weather conditions, transit time to Grays Harbor could be as much as 18 hours.

Anchorage Areas

Incoming vessels may be anchored near the entrance to Grays Harbor while awaiting a vessel to leave Terminal 1 or to transit through the navigation channel. Vessels may also be anchored after loading if entrance bar conditions are not suitable for immediate transit seaward. Vessel anchorage areas are located just inside the harbor, as shown on Figure 3.17-1.

Anchorage areas available in Grays Harbor for commercial vessels are frequently reevaluated and assigned through a joint effort assessment by the pilots, the U.S. Coast Guard, and USACE. The pilots and the U.S. Coast Guard monitor conditions at the anchorage areas based on their daily observations while navigating Grays Harbor and the continuously updated sounding data for Grays Harbor and its navigation channel, which they receive from USACE (WorleyParsons 2014). The current deep-draft vessel anchorage areas can accommodate three large deep-draft vessels with adequate capacity for the vessel to swing on the anchor in response to wind or currents (D'Angelo pers. comm.). The Grays Harbor Safety Plan includes standards of care for anchorage operations (Grays Harbor Safety Committee 2014).

Grays Harbor Navigation Channel

The navigation channel provides access for deep-draft vessels to Port facilities in the harbor. Nearly 23 nautical miles long, it begins approximately 4 miles offshore, runs in a predominantly easterly direction past Westport, Hoquiam, and Aberdeen, and ends at Cosmopolis near the mouth of the Chehalis River. The bar area outlined by yellow lines in Figure 3.17-1 is the Regulated Navigation Area established by the U.S. Coast Guard. Grays Harbor has a complex navigation route due to the bar at the entrance, a constrained channel, and limited depth. Constrained by shoals and flats, the navigation channel narrows to 0.6 mile wide with a number of turns where course changes are required (Washington State Department of Ecology 2015). USACE is responsible for maintaining the navigation channel by periodically dredging and removing obstructions. The depths at which USACE maintains the channel reaches are referred to as project depths. Because of shoaling, actual channel depths may vary considerably from project depths between maintenance dredging. Shoaling in the middle of the channel restricts a vessel's draft, while shoaling along the edges of the channel can affect vessel squat[11] and the ability of vessels to pass in the channel. The following sections describe the terms used for channel depths in this analysis.

The following navigation rules (Inland Navigation Rules, Rules 9, 13, and 18) apply to the navigation channel, which gives tankers and tank barges the right-of-way within the channel (WorleyParsons 2014).

- A vessel of less than 20 meters in length, a sailing vessel, or a vessel engaged in fishing shall not impede the passage of any other vessel navigating within a narrow channel or fairway.
- A vessel shall not cross a narrow passage or fairway if such crossing impedes the passage of a vessel that can safely navigate only within such channel or fairway.

[11] Vessel squat is the tendency of a vessel to draw more water astern (i.e., behind or toward the rear of the vessel) when it is moving through a water body. The streamlines of return flow are speeded up under the ship. This causes a drop in the pressure, resulting in the ship dropping vertically in the water and, effectively, increasing draft.

- In a narrow channel or fairway, any overtaking has to be permitted by the vessel being overtaken.
- All sailing, fishing vessels and power-driven vessels shall keep out of the way of a vessel restricted in her ability to maneuver.

2014 Controlling Depths

The National Oceanic and Atmospheric Administration is responsible for maintaining navigational charts. Periodic surveys by USACE and the National Oceanic and Atmospheric Administration determine the actual or *controlling* depth of water in the navigation channel at the time of the survey. Controlling depths are the depths that dictate the maximum draft of vessels (based on the minimum depths of the water). Controlling depths for each reach (section) of the navigation channel, based on surveys from December 2013 and corrected through August 2014, are presented in Table 3.17-2. According to the latest surveys, there is a substantial difference between the project or design depth (described below) of the navigation channel and the actual surveyed depth, referring to as controlling depth, in some reaches.[12] Based on the latest surveys, the Crossover Channel Reach, with a controlling depth of 27 feet mean lower low water (MLLW), is currently limiting vessel draft in Grays Harbor. Therefore, 27 feet MLLW represents the 2014 controlling depth.

2014 Project Depth

Each reach (section) of the navigation channel has project dimensions (depth, width, height), as authorized by Congress. Project dimensions for each reach of the navigation channel are presented in Table 3.17-2. Project depths range from 46 feet MLLW in the Bar Channel Reach to 36 feet MLLW in the North Channel, Hoquiam, and Cow Point Reaches. Vessels traveling between the Bar Channel Reach and terminals are limited by the shallowest reach of the navigation channel. Therefore, 36 feet MLLW represents the 2014 project depth.

[12] For example, a controlling channel depth of 27 feet mean lower low water (MLLW) in the middle half of the Crossover Channel Reach of the navigation channel (Table 3.17-2) is 9 feet less than the federally authorized project depth of 36 feet MLLW. Controlling depths in the middle half of the North Channel and Hoquiam Reaches of the navigation channel (Figure 3.17-1) are 6 feet and 4 feet less than the project depth, respectively.

Table 3.17-2. Port of Grays Harbor Navigation Channel Controlling Depths and Project Dimensions

	Controlling Depths at MLLW (feet)			Project Dimensions		
Channel Reach	**Left Outside Quarter**	**Middle Half**	**Right Outside Quarter**	**Width (feet)**	**Length (nautical miles)**	**Depth MLLW (feet)**
Bar Channel	45	46	46	1,000	4.6	46
Entrance Channel	35	41	30	900–600	1.8	42
Pt. Chehalis Reach	37	35	28	600	1.2	40
South Reach	29	35	35	600–350	4.1	36
Crossover Channel	22	27	23	350–450	2.5	36
North Channel	27	30	23	450–350	2.4	36
Hoquiam Reach	19.	32	26	350	1.9	36
Cow Point Reach	24	36	33	350–900	1.8	36
Aberdeen Reach	18	22	26	550–200	2.6	32
Turning Basin	30	29	23	200–550	0.3	32
Thence to Cosmopolis	23	25	27	200	0.8	32

MLLW = mean lower low water

2017 Project Depth

The USACE Seattle District recently completed a General Investigation Feasibility Study (U.S. Army Corps of Engineers 2014a:21) at the request of the Port to investigate deepening the navigation channel to a legislatively authorized depth of 38 feet MLLW. The project would deepen the navigation channel to a new project depth of 38 feet MLLW between South Reach and Cow Point Reach. Dredging for channel deepening is anticipated to occur between 2016 and 2017. Upon completion of the project, the limiting depth for the transit between the Bar Channel Reach and Port terminals would be 38 feet MLLW. Therefore, 38 feet MLLW represents the 2017 project depth.

Channel Depth Constraints

Channel depth constraints must be considered when large commercial vessels navigate the channel. Pilots are responsible for knowledge of local conditions, including channel depth and tides, and must account for changes in conditions when guiding vessels through the harbor. Vessel operators planning to transit Grays Harbor must consider many factors when planning arrival times to ensure there is sufficient water under the ship's keel[13] at all times to keep the vessel from touching the bottom. To prevent vessel grounding, the pilot and vessel operator must know the vessel's maximum draft (accounting for vessel squat), margins of safety for under-keel clearance, and the anticipated depth of the water in the navigation channel (based on charted depths and tidal corrections). Each of these considerations is discussed further below.

Vessel Draft

Vessel draft is the vertical distance between the water line and the bottom of the keel (Figure 3.17-4). Drafts for large commercial vessels vary depending on the vessel and degree that

[13] The keel runs in the middle of the ship, from the bow to the stern and serves as the primary source of structural strength of the hull.

the vessel is loaded or in ballast.[14] Cargo vessels tend to have a deeper draft than cargo barges. Tankers such as the Panamax-size vessels accommodated in Grays Harbor tend to have a deeper draft than tank barges. In addition to vessel type, vessel loading is a primary determinant of vessel draft, with fully or partially loaded vessels having deeper drafts than empty vessels.

Vessel Squat

Vessel squat describes the tendency of a ship to sink vertically toward the seabed when it is moving through shallow water or a channel. Vessel squat increases the draft of the vessel and reduces under-keel clearance. Figure 3.17-4 shows that at 0 feet of tide height, a deep-draft vessel actually has less under-keel clearance due to squat as the vessel moves through the navigation channel. The effect of squat in the figure is represented by a 1-foot vertical drop and an overall reduction in under-keel clearance by that same amount. Ship speed is a main factor for vessel squat.

Under-Keel Clearance

Under-keel clearance is the vertical distance between the deepest point of the vessel's hull and the seabed (Figure 3.17-4). When entering Grays Harbor, an under-keel clearance of 10% after squat is recommended to ensure sufficient water under the keel and reduce the risk of vessel grounding (D'Angelo pers. comm.). For example, if the vessel's maximum draft is 33 feet, an additional 3.3 feet of water should be maintained under the keel, meaning the channel depth would need to be no less than 36.3 feet deep to accommodate safe passage of the vessel.

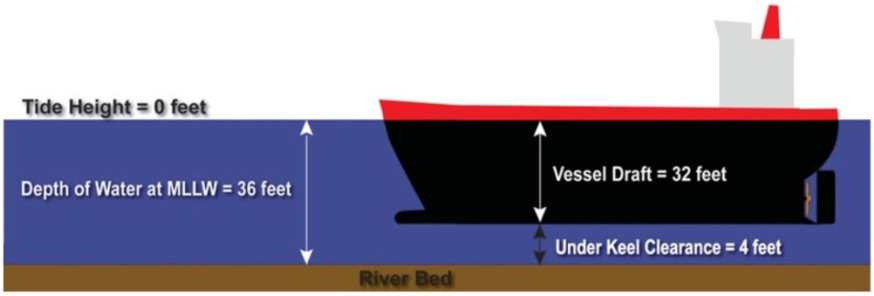
Tidal Influences on Channel Depth

Grays Harbor experiences two high tides and two low tides each day of different heights. Water depth on the charts (nautical maps) and surveys for the west coast is referenced in terms of MLLW.[15] To determine the depth of water available at any given time, the calculated height of the tide is added to the number listed on the chart. For example, if the chart lists the depth at 36 feet and the current height of the tide is 5 feet, the depth of water at that time and place would be 41 feet. Figure 3.17-4 shows that when a vessel with 32 feet of draft transits a channel that is 36 feet deep during a tide height of 5 feet, there are 9 feet of clearance under the keel. Because the tide is in a near-constant state of ebb and flow, the pilot and vessel operator must plan the vessel transit with knowledge of the level of the tide at all points along the intended route.

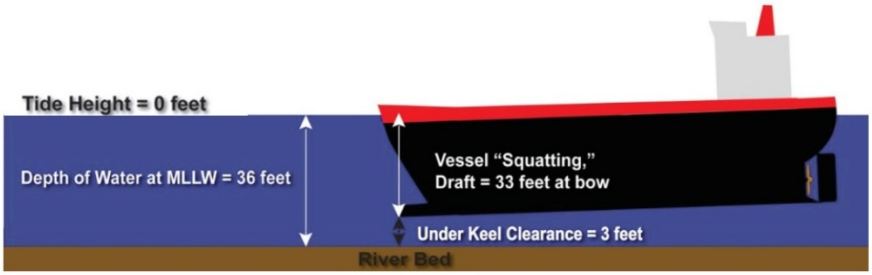
[14] Vessels *in ballast* have had their tanks loaded with seawater to increase vessel stability.

[15] Mean lower low water (MLLW) is the average of the lower low water height of each tidal day observed over the National Tidal Datum Epoch. The number of navigable windows available at a tidal elevation equal to or more than 8 feet includes windows available at tidal elevations equal to or more than 9 and 10 feet. Therefore, the number of navigable windows declines with increasing tidal elevation. While an estimated 1,627 navigable windows per year occur when the tide is 4 or more feet MLLW, only an estimated 21 navigable windows per year occur when the tide is 10 or more feet MLLW.

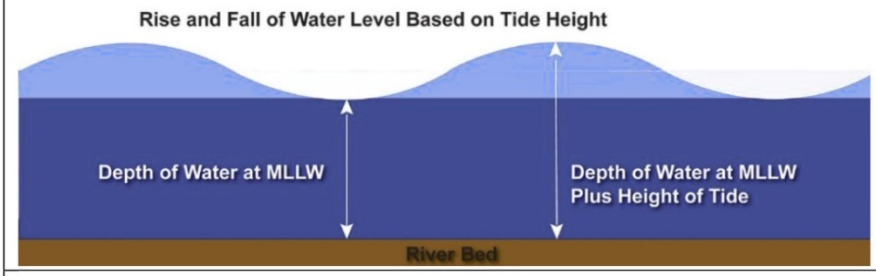
Figure 3.17-4. Example of Factors Affecting Under-Keel Clearance



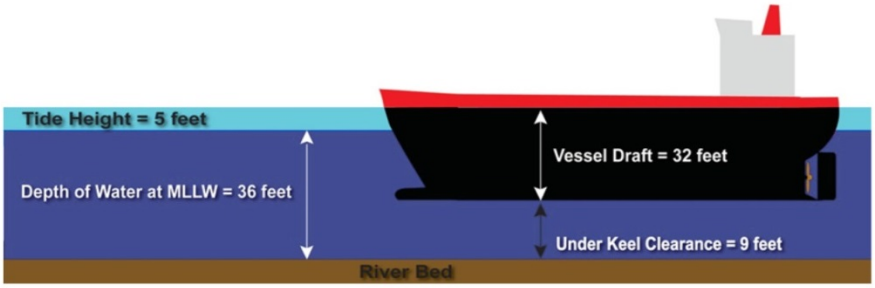
If the vessel has a 32-foot draft, the channel is at project depth of 36 feet MLLW, and tide is at 0 feet, under-keel clearance is 4 feet.



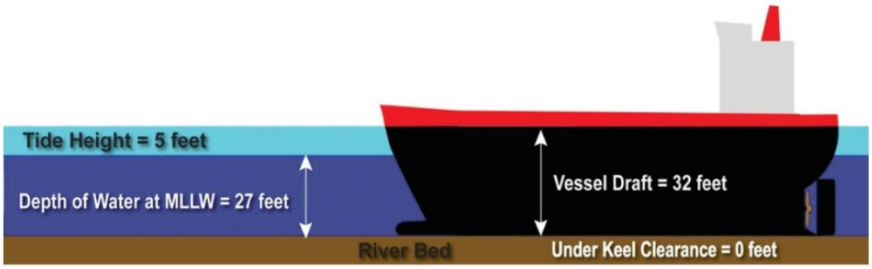
This vessel is squatting. It is down 1 foot at the bow, reducing under-keel clearance to 3 feet.



To determine the depth of water available at any given time, the calculated height of the tide is added to the charted depth.



If a vessel has a 32-foot draft, the channel is ai project depth of 36 feet MLLW, and tide is at 5 feet, under-keel clearance is 9 feet.



In the Crossover Channel, channel depth is 27 feet MLLW. A vessel with 32-foot draft will run aground at tides under 5 feet.

b

Navigable Windows and Maximum Vessel Draft

Entry into Grays Harbor by large commercial vessels is scheduled and arranged by the Port and pilots. Pilots consider factors such as tides, weather, channel depth, pier availability, and vessel type when preparing to enter a port. It takes approximately 2 hours for vessels to transit the navigation channel between the entrance buoy (3 nautical miles from the mouth of the harbor) and Terminal 1. Grays Harbor experiences two high tides and two low tides each day of different heights. According to the U.S. Coast Pilot 7, the mean rise of the tide in Grays Harbor is about 9 feet (National Oceanic and Atmospheric Administration 2014b:259).[16]

Transit by deep-draft vessels through the navigation channel is typically planned when tidal elevations are close to high tides. This provides an additional measure of safety because the distance between the bottom of the ship and the bottom of the channel is greater. Pilots scheduled most deep-draft vessel transits (between 74 and 94% over 8 years, from 2005 to 2012) through the navigation channel when tidal elevations were at 5 feet or above MLLW (U.S. Army Corps of Engineers 2014a:21).

Table 3.17-3 summarizes the number of 2-hour windows, referred to as navigable windows, available at tidal elevations between 4 and 10 feet, based on monthly tidal data for 2012 for the Westport tidal station (National Oceanic and Atmospheric Administration 2014c).

Table 3.17-3. Number of Navigable Windows per Year by Tidal Elevation

	Tidal Elevation (feet MLLW)						
	≥4	≥5	≥6	≥7	≥8	≥9	≥10
Navigable windows per year[a]	1,627	1,274	904	593	298	102	21

[a] Navigable (2-hour) windows are cumulative. For example, the number of navigable two-hour windows available at a tidal elevation of ≥8 feet, includes windows available at tidal elevations ≥9 feet and ≥10 feet.
MLLW = mean lower low water

Table 3.17-4 describes limitations on vessel draft during transit through the navigation channel at tidal elevations between 4 and 10 feet, under three channel depth scenarios.

- 2014 controlling depth: 27 feet MLLW
- 2014 project depth: 36 feet MLLW
- 2017 project depth: 38 feet MLLW

Channel depth is the primary limitation for transiting deep-draft vessels, because it establishes the maximum depth of water available within the range of tidal elevation. For each combination of tidal elevation and channel depth, the depth of water available in the channel is calculated, as well as the maximum vessel draft that could transit the channel. The estimated maximum vessel draft able to transit the channel is conservative, and accounts for tidal influences, vessel squat, and a 10% margin of safety for under-keel clearance, as described in *Channel Depth Constraints.* Actual maximum vessel draft able to navigate the channel at each channel depth and tidal elevation may vary from

[16] To estimate the frequency that vessels with varying drafts would be able to navigate the channel under different channel conditions, the number of navigable windows and maximum vessel draft were estimated for each tidal elevation between 4 and 10 feet above MLLW, using 2012 tidal heights.

what is described in Table 3.17-4, depending on actual channel conditions at the time of transit and specifications of the transiting vessel.

Table 3.17-4. Maximum Vessel Draft by Tidal Elevation and Channel Depth

	Tidal Elevation (feet)						
Channel Condition	**≥4**	**≥5**	**≥6**	**≥7**	**≥8**	**≥9**	**≥10**
2014 Controlling Depth (27 feet MLLW)							
Water depth (feet)[a]	31	32	33	34	35	36	37
Maximum vessel draft (feet)[b]	27	28	29	29.5	30	31	32
2014 Project Depth (36 feet MLLW)							
Water depth (feet)[a]	40	41	42	43	44	45	46
Maximum vessel draft (feet)[b]	35	36	37	38	39	39.5	40
2017 Project Depth (38 feet MLLW)							
Water depth (feet)[a]	42	43	44	45	46	47	48
Maximum vessel draft (feet)[b]	37	38	39	39.5	40	41	42

[a] Water depth equals the channel depth at MLLW + tidal elevation.
[b] Maximum vessel draft accounting for vessel squat and a 10% margin of safety for under-keel clearance.
MLLW = mean lower low water

These tables show that as vessel draft increases, the number of navigational windows available for transiting Grays Harbor decreases. For example, at the current controlling depth, vessels with a 32-foot draft require a tidal elevation of 10 feet or more. This amount of water is available only 21 times a year. However, pilots may find greater flexibility at the time of navigation, based on current conditions and expert knowledge of local waters.

Under the 2014 project depth of 36 feet MLLW or 2017 project depth of 38 feet MLLW, maximum vessel draft at each tidal elevation increases (Table 3.17-4), providing more navigable windows for deeper-draft vessels.

Large Commercial Vessel Traffic

Recent trends in large commercial vessel traffic at the Port were considered over a 5-year period from 2008to 2012 (U.S. Army Corps of Engineers 2014b). Over this period, there were 1,448 cargo vessel trips and 67 tank vessel trips.[17]

Table 3.17-5 details annual cargo vessel trips by vessel draft. Over this 5-year period, cargo barge trips declined by 77%, while cargo ships trips roughly doubled.

[17] A trip represents one-way travel; in other words, an inbound trip and an outbound trip are counted as two trips.

Table 3.17-5. Distribution of Cargo Vessel Trips by Vessel Draft (2008–2012)

Vessel Draft (feet)	Cargo Barge Trips						Cargo Ship Trips[a]					
	2008	2009	2010	2011	2012	Total	2008	2009	2010	2011	2012	Total
0–5	209	103	89	145	37	583	0	0	0	0	0	0
6–9	16	3	0	3	5	27	2	0	0	0	12	14
10–12	37	30	28	15	16	126	3	0	0	0	27	30
13–14	18	6	9	10	10	53	26	8	0	0	10	44
15–17	12	2	0	0	0	14	2	0	1	0	0	3
18–20	0	0	0	0	0	0	12	8	19	12	6	57
21–23	0	0	0	0	0	0	18	22	27	12	28	107
24–26	0	0	0	0	0	0	2	13	24	32	31	102
27–29	0	0	0	0	0	0	7	6	15	28	40	96
30–32	0	0	0	0	0	0	10	6	20	10	14	60
33–35	0	0	0	0	0	0	18	12	15	13	11	69
36–38	0	0	0	0	0	0	5	10	10	6	15	46
39–40	0	0	0	0	0	0	0	1	1	2	13	17
Total	**292**	**144**	**126**	**173**	**68**	**803**	**105**	**86**	**132**	**115**	**207**	**645**

Source: U.S. Army Corps of Engineers 2014b
[a] This source uses the term *dry-cargo;* includes RoRo vessels.

Table 3.17-6 summarizes annual tank vessel trips by vessel draft. Over the 5-year period, 65 of the 66 trips were made by tankers.

Table 3.17-6. Distribution of Tank Vessel Trips by Vessel Draft (2008–2012)

Vessel Draft (feet)	Tank Barge Trips						Tanker Trips					
	2008	2009	2010	2011	2012	Total	2008	2009	2010	2011	2012	Total
15–17	0	0	0	1	0	1	0	0	0	2	0	2
18–20	0	0	0	0	0	0	1	1	0	7	0	9
21–23	0	0	0	0	0	0	3	3	1	3	0	10
24–26	0	0	0	0	0	0	5	0	1	6	0	12
27–29	0	0	0	0	0	0	4	1	1	5	4	15
30–32	0	0	0	0	0	0	4	1	0	4	0	9
33–35	0	0	0	0	0	0	3	2	0	0	2	7
36–38	0	0	0	0	0	0	0	1	0	1	0	2
Total	**0**	**0**	**0**	**1**	**0**	**1**	**20**	**9**	**3**	**28**	**6**	**66**

Source: U.S. Army Corps of Engineers 2014b

Table 3.17-7 summarizes annual vessel trips by vessel type and ranges of vessel draft over the 5-year period. Vessel data were summarized for three ranges of vessel drafts: less than 21 feet, 21 to 32 feet, and more than 32 feet. These ranges in vessel draft represent different levels of navigational flexibility. Under current channel conditions, vessels that have drafts under 21 feet have minimal navigational constraint; vessels that have drafts between 21 and 32 feet are likely to find navigable windows, especially at higher tidal elevations; and vessels that have drafts deeper than 32 feet would be highly constrained.

An average of 290 trips were made by cargo vessels each year, compared to an average of 13 trips annually by tank vessels. Cargo vessels typically had a shallower draft than tank vessels. Approximately 66% of cargo vessels had drafts less than 21 feet, but 69% of tank vessels had drafts between 21 and 32 feet. There were an average of 26 trips per year by cargo vessels with drafts more than 32 feet, and an average of only two tank vessel trips per year with drafts more than 32 feet.

Overall, 1,515 trips were recorded over the 5-year period: 96% cargo vessel trips and 4% tank vessel trips. Of all vessel trips, approximately 64% were by vessels with drafts less than 21 feet, 27% by vessels with drafts between 21 and 32 feet, and 9% by vessels with drafts over 32 feet.

Comparing the actual number of trips (Table 3.17-7) to the estimated number of navigable windows by vessel draft confirms that the assumptions of this analysis are conservative. For example, 41 trips were made by vessels with drafts of more than 32 feet in 2012 compared to an estimated 21 navigable windows per year.

Table 3.17-7. Vessel Trips by Year, Vessel Type, and Vessel Draft (2008–2012)

	Trips by Year						
Vessel Type or Draft	**2008**	**2009**	**2010**	**2011**	**2012**	**Total**	**Avg/yr**
Cargo Vessels by Type[a]							
Barge	292	144	126	173	68	803	161
Ship	105	86	132	115	207	645	129
Total	397	230	258	288	275	1,448	290
Cargo Vessels by Draft							
<21 feet	337	160	146	185	123	951	190
21–32 feet	37	47	86	82	113	365	73
> 32 feet	23	23	26	21	39	132	26
Tank Vessels by Type							
Tank barge	0	0	0	1	0	1	<1
Tanker	20	9	3	28	6	66	13
Total	20	9	3	29	6	67	13
Tank Vessels by Draft							
< 21 feet	1	1	0	10	0	12	2
21–32 feet	16	5	3	18	4	46	9
> 32 feet	3	3	0	1	2	9	2
All Vessels by Type							
Cargo barges and tank barges	292	144	126	174	68	804	161
Cargo ships and tankers	125	95	135	143	213	711	142
Total	**417**	**239**	**261**	**317**	**281**	**1,515**	**303**
All Vessels by Draft							
< 21 feet	338	161	146	195	123	963	193
21–32 feet	53	52	89	100	117	411	82
> 32 feet	26	26	26	22	41	141	28

Source: U.S. Army Corps of Engineers 2014b
[a] This source uses the term *dry-cargo;* includes RoRo vessels.

3.17.4.3 Fishing and Recreational Vessels

Fishing and recreational vessels are much smaller than the large cargo ships and tank vessels already discussed and can move about the harbor without being restricted to the navigation channel because of their shallower drafts. Recreational and tribal fishing are addressed in more detail in Section 3.10, *Recreation*, and Section 3.12, *Tribal Resources*, respectively.

Commercial Fishing Operations

Commercial fishing in the study area includes gillnetting[18] and crabbing. Commercial salmon gillnetters harvest an average of 4,700 coho and 2,000 chum annually (Scharpf pers. comm.). For Grays Harbor and Chehalis River, state regulations set strict rules and fishing schedules on commercial gillnetting. Commercial fishers are restricted to drift gillnet use where the fisher deploys the net from the bow or stern of the fishing vessel perpendicular to the navigation channel.

[18] Drift nets only.

Fishers attempt to deploy gillnets to cover as much of the channel as possible to maximize catch. The net is allowed to drift with the currents, sweeping the channel for fish. Fishers need to actively monitor the net and need to be prepared to adjust the net position in the channel to avoid known hazards (e.g., logs, shallow bars, and potentially other vessels).

Commercial regulations for Grays Harbor limit gillnet soak times (from when the net first enters water to when it is completely removed) to less than 45 minutes (Washington Department of Fish and Wildlife 2014a). At the end of a drift, the fisher retrieves the net, removing fish at the same time. As reference, information from the Quinault Indian Nation (2015:11) reports time to retrieve a net between 5 minutes at the quickest to 2 hours if the net is loaded with fish.

The commercial gillnet fishing period occurs in the fall (September through November) on permissible days and times in designated areas in the harbor and river (Salmon—Grays Harbor Fall Fishery, WAC 220-36-023). Approximately 15 to 25 boats participate each year up to 5 days per week during the open season (Scharpf pers. comm.) During the open season, permitted areas for commercial gillnetting in the harbor include North Bay and the eastern half of Grays Harbor (Figure 3.17-5). Permitted commercial gillnetting in the Chehalis River occurs from the harbor to the extent shown on Figure 3.17-5, during the same open fishing season as Grays Harbor. However, most commercial fishing occurs in the navigation channel from the Hoquiam River east (Scharpf pers. comm.). The South Bay and central portion of the harbor have been closed to commercial gillnetting since 2005 because of its impacts on Grays Harbor chum and Chehalis River–origin fall Chinook (Washington Department of Fish and Wildlife 2013). Although this area has been closed to commercial fishing for years and is not anticipated to be reopened in the near future, this area could be reopened if salmon stocks increase in numbers (Scharpf pers. comm.).

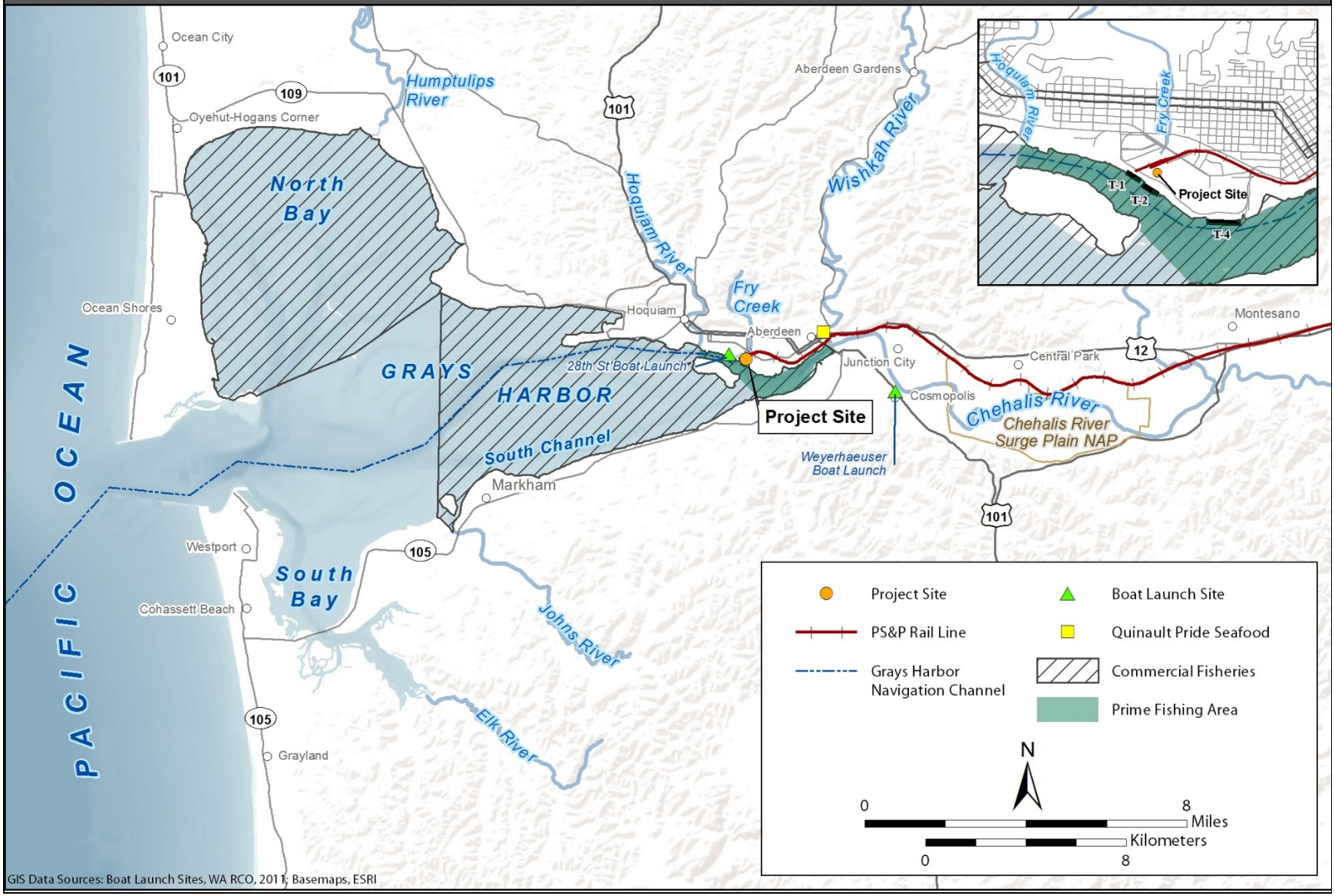
Commercial crabbing occurs along the Washington coast and in Grays Harbor. Over 200 licensed Washington commercial crab fishers participate during the crabbing season (Washington Department of Fish and Wildlife 2015), which is managed by the state. In Grays Harbor, the commercial crabbing season typically runs from December 1 through September 15 (Washington Department of Fish and Wildlife 2015). Unlike gillnetting, all areas of Grays Harbor are permitted for commercial crabbing. Nontreaty commercial crab harvests in Grays Harbor vary annually and have averaged approximately 91,000 pounds per year between 1997 and 2014 (Washington Department of Fish and Wildlife 2014b).

Commercial Fishing Boat Launches and Marinas

The following marinas and public boat launches at the harbor service commercial fishing vessels. The Westport Marina, on the southern peninsula near the entrance to Grays Harbor (Figure 3.17-5), houses more than 200 commercial fishing vessels, including 26 tribal fishing boats, and numerous recreational boats. The marina consists of 21 floats with moorage space for 650 charter, commercial, and sport-fishing vessels (for vessels up to 200 feet). The marina is known as Washington State's largest fish-landing port and, in addition to mooring, provides many boating and fishery services, including loading and fuel docks, a public boat launch, boat manufacturing and repair services, shore-side seafood processing, support service facilities, and fishing supplies.

The Ocean Shores Marina is located on the northern peninsula near the entrance to Grays Harbor but is not currently maintained or open to the public. Additionally, commercial fishing vessels access the harbor via the 28th Street Boat Launch (adjacent to the project site) and the Weyerhaeuser Boat Ramp in Cosmopolis (along the Chehalis River).

Figure 3.17-5. Areas of Commercial Fishing in the Study Area



Commercial Fishing and Recreational Vessel Traffic

Although there can be as many as 400 or more commercial, tribal and recreational vessels in the harbor during peak fishing times (Scharpf pers. comm.), fishing activities are highly seasonal and occur primarily in the fall with the highest point in September. Commercial and recreational boaters are not limited to the navigation channel and must obey the navigational rules (Inland Navigation Rules 33 CFR 83) to give way to the larger commercial vessels that are limited in their ability to maneuver. All vessels fishing in the navigation channel may have to move gillnets out of the way or risk damage or loss. Under existing conditions, this disruption occurs primarily in the fall during the fall salmon run. In addition, ocean-fishing vessels may use the navigation channel to transport their catch to the harbor. Fishing and recreational vessels move throughout the harbor differently than large commercial vessels. To lessen the danger of hazardous conditions during incoming or outgoing tides, bar crossings are often timed during slack high or low tides, whereas large commercial vessels tend to navigate through the channel when tidal elevations are more than 5 feet.

3.17.4.4 Vessel Traffic Management

The Port, pilots, and the U.S. Coast Guard are responsible for vessel traffic management in Grays Harbor. Currently, the Port uses an informal vessel management and tracking system for Grays Harbor. The Port monitors and controls vessel movements by routinely communicating with the vessel operators, pilots, and terminals to schedule berths, pilots, and other resources for all arriving and departing vessels. The U.S. Coast Guard is responsible for establishing navigation rules and for vessel safety in U.S. waters.

The Port, the pilots, the Board of Pilotage Commissioners (state), the U.S. Coast Guard, and port tenants work together to manage large commercial vessels. There are federal requirements for notification to the U.S. Coast Guard and state requirements for notification to state agencies in the case of any commercial vessel problems that could lead to accidents (46 CFR 4.05-1 and 4.05-2 and WAC 173-303 and 173-182).

U.S. Coast Guard and Washington state inspectors board commercial vessels regularly to check for documentation and certificates, and to inspect the material condition of the vessel to identify problems. When a vessel, domestic or foreign, is in waters of the United States, the Ports and Waterways Safety Act (33 U.S.C. 1221–1232) bestows significant authority on the Coast Guard Captain of the Port to provide for the protection and security of vessels, harbors, and waterfront facilities. Under 33 CFR 6.04-1 and 6.04-8 the Captain of the Port is authorized to control the movement of vessels within the Captain of the Port zone whenever such action is necessary to prevent damage or injury to a vessel, waterfront facility, or waters of the United States.

Within Grays Harbor, the Port, pilots, and port tenants communicate daily by radio and in regular stakeholder meetings to manage large commercial vessel traffic. Pilots, escort tugs, and captains of commercial vessels and barges inside Grays Harbor communicate using radio channels or sound signals. Commercial vessels and barges are required to maintain watch and carry a properly working radio with backup, in addition to understanding and having the capability to produce sound signals and tones to communicate different meanings.

An automatic identification system antenna is in place at Westport and is used by the Merchant Exchange of Puget Sound, Merchant Exchange of Portland, Pacific Merchant Shipping Association, and the Columbia River Steamship Association to receive data about vessel movements. Members of

these organizations, including pilots, can receive real-time information about vessel movements in Grays Harbor for their use. The Port of Grays Harbor and the applicant are not listed as members (Marine Exchange of Puget Sound 2016). The Port of Grays Harbor does not have a formal vessel traffic management system that monitors the vessel traffic picture in Grays Harbor in real time.

Port of Grays Harbor and Washington State Pilots

The Port is involved when vessels call at berths owned and operated by the Port. The Port and Washington State-licensed pilots work closely together when managing vessel movements. The Port's tenants and vessel agents are responsible for providing safe and operationally reliable vessels and commodity information to the Port that directly affects both of the Port's and pilot's traffic management decision-making (WorleyParsons 2014).

Federal and state regulations identify pilotage requirements for vessels in Grays Harbor. The pilot is responsible for supporting the vessel's captain and itinerary to and from the entrance to Grays Harbor, requesting adequate escort tug services, and navigating the vessels in the channel.

- For foreign-flagged vessels, including oil tankers, a state-licensed pilot is required.
- For U.S.-flagged vessels there is a requirement for either a federal- or state-licensed pilot. For U.S.-flagged oil tankers operating between U.S. ports, a federally licensed pilot is required. While a state-licensed pilot is typically used in Grays Harbor for these vessels, it is not required.[19] U.S.-flagged tank barges (including articulated tank barges) operating between U.S. ports also require a federally licensed pilot but not a state-licensed pilot.

The vessel's agent contacts the Port's on-duty pilot. There are two state-licensed pilots at the Port. The vessel's agent provides the pilot with information on vessel characteristics such as size, condition, and the cargo being transported. The pilot then makes an initial assessment of the vessel to schedule the vessel movements and escort tug assistance. The assessment is based on the vessel's physical characteristics and condition, propulsion, commodity type, other known vessel calls, escort tug requirements and availability, forecasted weather, and environmental and tidal conditions, among other factors (WorleyParsons 2014). The pilot announces vessel arrivals and departures on VHF Channels 13 and 16 after boarding an inbound vessel near the entrance buoy and an outbound vessel at the terminal respectively; these calls are made each time a pilot moves a vessel, including when departing anchor and shifting berths. Unless a state pilot is requested by the vessel agent, the captain of a U.S.-flagged barge traveling along the coast is authorized to fulfill these functions. Pilots and ship captains continually reassess environmental conditions and equipment needs before bringing a vessel into Grays Harbor. When approaching Grays Harbor, the vessel calls the pilot over a designated VHF radio channel. Even as the pilot is transported to board the vessel, the pilot assesses the environment and vessel and decides if conditions are safe to bring the vessel in or if additional tug assistance is needed (WorleyParsons 2014). The pilot is responsible for managing tugs.

U.S. Coast Guard

The local the U.S. Coast Guard station in Grays Harbor (Coast Guard Station Grays Harbor) has authority over the area ranging from Queets River on the Washington coast south to the Long Beach

[19] RCW 88.16 requires a state-licensed pilot on any registered U.S. flagged oil tanker of 5,000 gross tons or greater operating between U.S. ports for Puget Sound and the Columbia River.

Peninsula, including Willapa Bay. The station has four vessels that perform search-and-rescue missions and has the capability and authority to carry out law enforcement activities within its jurisdiction (U.S. Coast Guard 2015). The station is under the direction of the Captain of the Port for Sector Columbia River, a unit located in Warrenton, Oregon and part of the Thirteenth Coast Guard District.

The Captain of the Port has the authority to close the bar at Grays Harbor if the weather conditions are too severe for vessels to transit. If the entrance to the Port is closed due to weather conditions, the Port, the U.S. Coast Guard, and state-licensed pilots coordinate ship logistics until the Captain of the Port reopens the entrance (WorleyParsons 2014).

The U.S. Coast Guard is also responsible for establishing and enforcing Inland Navigation Rules (33 CFR 83), which applies to all vessels in Grays Harbor and off the coast of the U.S. The Rules of the Road are meant to facilitate safe maritime travel. All vessels, including recreational and commercial, are required to understand and comply with the Rules of the Road. The U.S. Coast Guard works with USACE to determine the navigation channel's physical characteristics, which dictate local rules such as speed, passing clearances, and anchorage locations.

3.17.5 What are the potential impacts on vessel traffic?

This section describes the impacts on vessel traffic that could occur in the study area. Potential impacts of the no-action alternative are described first as a baseline for comparing the potential impacts of the proposed action.

3.17.5.1 No-Action Alternative

Under the no-action alternative, the applicant would continue to operate its existing facility as described in Chapter 2, Section 2.1.3.2, *Existing Operations.* Although the proposed action and related vessel traffic would not occur, it is assumed that growth in the region would continue under the no-action alternative. Large commercial vessel traffic is projected to increase over time in response to anticipated growth. The impacts of this projected increase (unrelated to the proposed action) on berth capacity, channel capacity, and commercial fishing are discussed below. The potential impacts on recreational and tribal fishing are discussed in Section 3.10, *Recreation*, and Section 3.12, *Tribal Resources*, respectively.

Channel Capacity

Under the no-action alternative, large commercial vessel trips are projected to increase between 2017 and 2037 due to increased trade of commodities, as shown in Table 3.17-8. Cargo vessel trips are projected to increase from 292 to 368 between 2017 and 2037, while tank vessel trips are projected to increase from 46 to 68 over the same period. Total large commercial vessel trips are projected to increase from 338 in 2017 to 436 in 2037 (Table 3.17-8).

Table 3.17-8. Forecast Number of Large Commercial Vessel Trips through Grays Harbor—No-Action Alternative

	Trips[a]	
Type of Vessel	**2017**	**2037**
Cargo vessels		
Ship	220	276
Barge	72	92
Tank vessels		
Tankers and tank barges	46	68
Total	**338**	**436**

[a] A trip represents one-way travel; in other words, an inbound trip and an outbound trip are counted as two trips.

Similar to current conditions, a mix mainly cargo vessels and some tank vessels (tankers and tank barges) would be the likely vessel types transporting cargo to the Port terminals and further inland along the Chehalis River.

Cargo barges traveling to destinations at the mouth of the Chehalis River or further inland are forecast to account for approximately 21% of total large commercial vessel trips through Grays Harbor in 2017 (Table 3.17-8). These vessels would likely have drafts between 0 and 17 feet, consistent with vessel data reported between 2008 and 2012 (Table 3.17-5).

Up to half of the cargo ships and tank vessel trips would be made by vessels in ballast, assuming that they are in ballast on either the inbound or the outbound trip. Vessels transiting in ballast would have a shallower draft than vessels laden with cargo. Using vessel data (U.S. Army Corps of Engineers 2014a), ballasted vessels are expected to operate at a draft of less than 27 feet.

Based on these assumptions, it is estimated that a substantial proportion (approximately 61%) of the vessel trips under the no-action alternative would be made by vessels that draft less than 27 feet. As described for existing conditions, these vessels are minimally constrained by tidal elevations at any of the three channel depths considered in this analysis.

The remaining vessel trips (approximately 39%) are projected to be laden cargo ships and tank vessels (with drafts between 27 and 39 feet). Pilots schedule most transits of these vessels when tidal elevations are at 5 feet or above MLLW (U.S. Army Corps of Engineers 2014a:21). As described for existing conditions, 1,274 navigable windows are available each year at these tidal elevations, which far exceeds the total number of annual vessel trips projected for the no-action alternative in 2017 (338 trips) and 2037 (436 trips).

Although navigational windows become more restricted at drafts of 30 feet and more under the 2014 controlling depth (or 39 and 40 feet under the 2014 and 2017 project depths, respectively), vessel operators are able to make choices that influence vessel draft to increase navigational opportunities. For example, a vessel operator may choose to use a shallower-draft vessel to ensure greater navigational flexibility or use a larger vessel (or a more heavily laden vessel) for economic or other reasons and time the trip according to accommodate the more restricted opportunities.

Because the number of navigable windows when tidal elevations are at 5 feet (1,274) or more far exceeds the total number of forecast vessel trips in 2017 (338 trips) or 2037 (436 trips), the channel capacity would not be exceeded under the no-action alternative.

Berth Capacity

Berth capacity at Terminal 1, or its availability for vessel calls, is a function of operational downtime, facility storage and production, ideal tidal conditions for vessel movement, adverse weather conditions, and maintenance. Berth availability is distinct from berth utilization. Berth utilization is the amount of time the berth is actually occupied by a vessel, while berth availability refers to the amount of time that the berth is available for occupancy. Consistent with standard industry best practices for bulk liquid terminals, the average annual operational berth downtime when a berth is unavailable for use is around 10%. In other words, a berth is available up to 90% of the time. This equates to 328 days per year that the Terminal 1 berth would be available to receive vessel calls. As long as the anticipated number of vessel calls to Terminal 1 do not require more than 90% berth availability, the Terminal 1 berth capacity is more than adequate for growth under the no-action alternative (WorleyParsons 2014).

Vessels calling at Terminal 1 to load bulk liquids would be either tank barges or tankers. The operational assumption is that a tank barge would occupy the berth for 24 hours, accounting for plant start-up, prebooming,[20] production, and closedown, before the berth becomes available again. A tanker would occupy the berth for 48 hours (conservatively), accounting for the same berthing conditions but a longer berth occupancy time, which would include waiting for an appropriate tide window for turning and exiting (WorleyParsons 2014). Under the no-action alternative, up to approximately 34 vessels would call at the Terminal 1 berth, which would result in approximately 58 days of berth occupancy[21] of the available 328 days. Therefore, berth capacity would not be exceeded under the no-action alternative.

Pilot and Tug Capacity

Under the no-action alternative, the total number of trips by large commercial vessels is forecast to reach 338 trips in 2017 and 436 trips in 2037. The Port currently employs three state-licensed pilots, which allows two pilots to be on duty at any given time. Foreign-flagged ships and U.S. vessels engaged in foreign trade are required to use a state-licensed pilot by law. While not required, many U.S. vessels engaged in coastwise trade also use a state-licensed pilot on a voluntary basis, or as a matter of company policy because of the state-licensed pilot's expertise and experience guiding vessels in local waters.

Even if all large commercial vessels hired a state-licensed pilot to navigate to and from the Port under the no-action alternative, this would result in a maximum of 436 annual assignments, or approximately 145 annual assignments for each of the three state-licensed pilots employed by the Port. Under this scenario, each state-licensed pilot would pilot vessels to or from the Port a maximum of 145 days out of 365 days, which would not exceed the capacity of state-licensed pilots to pilot large commercial vessels in Grays Harbor.

Brusco Tug & Barge has three harbor tugs stationed in Grays Harbor that are exclusively available for commercial vessel assistance within the harbor. These three tugs are sufficient to escort the projected large commercial vessel traffic transiting Grays Harbor. Therefore, the availability of

[20] Deploying containment booming equipment or alternative measures.

[21] Assumes 16 tankers related to 2017 activities (32 days), and 1 tanker (2 days) and 10 tank barges (10 days) related to 2037 activities, and 7 tankers related to 2017 activities (14 days) at the adjacent Imperium Terminal Services facility.

state-licensed pilots and tugs is not anticipated to limit the number of vessels transiting the navigation channel under the no-action alternative.

Conflicts with Commercial Fishing

Under the no-action alternative, large commercial vessel trips in the navigation channel are projected to increase from 338 in 2017 to 436 in 2037 (Table 3.17-8). This traffic could slightly increase the potential for impacts on commercial fishing compared to existing conditions. However, as noted in Section 3.17.4.3, *Fishing and Recreational Vessels*, and shown in Figure 3.17-5, no major access points for fishing and recreational vessels would be close enough to be affected by large commercial vessel traffic under the no-action alternative. Additionally, although vessels would occupy the berth more frequently, the potential impacts related to vessel traffic would be limited to the time required for a vessel to move through the navigation channel (approximately 2 hours one way).

3.17.5.2 Proposed Action

This section describes the impacts that could occur in the study area as a result of construction and routine operation of the proposed action. First, this section describes impacts from construction of the proposed action. It then describes impacts of routine operation at the project site and of routine vessel transport to and from the project site.

Construction

Construction of the proposed action would involve no in-water work and no transport of materials by vessel. Therefore, it would have no impact on vessel traffic.

Operations

Under the proposed action, the maximum throughput of crude oil at would be 17.9 million barrels annually. Specifications of the typical vessels that could be used to transport crude oil, including tank barges and tankers, are summarized in Table 3.17-9. The table shows how many vessels would be needed for the proposed annual throughput amounts of crude oil based on vessel capacity.

Table 3.17-9. Typical Vessels Used for Transport of Crude Oil and Number of Calls or Trips Necessary to Transport Proposed Throughput—Proposed Action

			Number of Vessels to Transport Proposed Throughput[a]	
Vessel Type	**Capacity (barrels)**	**Design Draft (feet)**	**Individual Vessels Calls at Terminal 1 Dock**	**Vessel Trips[a]**
Crowley 550-Class tank barge	150,000	27.5	119	238
Crowley 650-Class tank barge	185,000	30	96	192
Crowley 750-Class tank barge	330,000	35	54	108
Panamax tanker[b]	350,000	39.5	51	102

[a] At maximum throughput; number assumes transport of total throughput is undertaken by a single vessel type.
[b] Capacity can range from 300,000 to 600,000; however, larger Panamax class tankers are typically loaded in the 350,000-barrel range.

Any combination of tank barges and tankers, including those listed in Table 3.17-9, could be used to transport bulk liquids from Terminal 1. While the type of ship is expected to be determined by the applicant's customer, the ships would be identified in advance and would be required to meet all vessel regulations for U.S. and Washington waters. The type of ship used will also be based on the controlling depth of the navigation channel. While vessels with a larger capacity tend to be more economical, their deeper drafts may limit their opportunities to transit the navigation channel, causing waiting periods and inefficiencies. Because of the channel depth limitations, the Panamax tanker (965 feet long, 106 feet wide, with a 39.5-foot draft) would be the largest vessel expected to enter Grays Harbor.

Barges have a smaller capacity and more flexibility to transit the navigation channel due to their shallower draft, but more vessel trips are required to transport the same volume of bulk liquids that the larger tankers could transport (Table 3.17-9).

This analysis assumes that tank barges such as the Crowley 550-Class tank barge, or similar vessel, would be used to transport crude oil from Terminal 1. The Crowley 550-Class tank barge has a length of 605 feet, width of 78 feet and draft of 27 feet 6 inches. This barge is designed for an escort tug to fit into a specially articulated notch in the stern of the barge to allow the tug and barge to move together.

Using this type of tank barge for the analysis results in the most vessel trips and is the most likely scenario under current channel conditions (controlling depth of 27 feet MLLW). Under this scenario, operation of the proposed action at maximum throughput would result in an additional 119 annual vessel calls at Terminal 1 or an additional 238 vessel trips through the navigation channel. This annual vessel traffic would correspond to an average of 0.7 trip on a daily basis or an average of 4.6 trips on a weekly basis (Table 3.17-10). If vessels with a higher capacity call at Terminal 1, the number of vessel trips would be reduced.

Table 3.17-10. Vessel Trips—Proposed Action

Average Daily	Average Weekly	Maximum Annual
0.7	4.6	238

[a] Assumes highest level of vessel traffic using Crowley 550-Class tank barges.

Table 3.17-11 presents increases in tank vessel trips under the proposed action in the context of forecast increases in baseline trips of large commercial vessels in 2017 and 2037. Between 2017 and 2037, under the no-action alternative, cargo vessel trips are forecast to increase from 292 to 368 per year due to annual growth in trade of commodities, and tank vessel trips are forecast to increase from 46 to 68 per year. Adding the proposed action trips to forecasted growth in vessel traffic would increase the total number of trips to 576 in 2017 and 674 trips in 2037. This equals approximately 1.6 vessel trips a day in 2017 and 1.8 vessel trips a day in 2037.

Table 3.17-11. Forecast Number of Large Commercial Vessel Trips—Proposed Action (2017–2037)

Type of Vessel	2017	2037
Baseline		
Cargo ships	220	276
Cargo barges	72	92
Tank vessels[a]	46	68
Proposed Action		
Tank vessels	238	238
Total trips	**576**	**674**

[a] Number includes existing vessels (assumed tankers) and future growth (assumed 1 tanker and 10 barges).

Channel Capacity

Approximately 56% of the trips would be cargo barges traveling to locations along the Chehalis River or unladen vessels in ballast. As described for the no-action alternative, these vessels would likely draft less than 27 feet and would be minimally constrained by tidal elevations at any of the three channel depths considered in this analysis.

The remaining vessels trips (approximately 44%) are projected to be laden cargo ships and tank vessels (with drafts between 27 and 39 feet). As described for the no-action alternative, pilots typically schedule transits of these vessels when tidal elevations are at 5 feet or above MLLW (U.S. Army Corps of Engineers 2014a:21). At these tidal elevations, 1,274 navigable windows are available each year, which exceeds the total number of trips in 2017 and 2037 (576 to 674).

Although navigational windows become more restricted at drafts of 30 feet and more under the 2014 controlling depth (or 39 and 40 feet under the 2014 and 2017 project depths, respectively), vessel operators are able to make choices that influence vessel draft to increase navigational opportunities. For example, a vessel operator may choose to use a shallower-draft vessel to ensure greater navigational flexibility or use a larger vessel (or a more heavily laden vessel) for economic or other reasons and time the trip according to accommodate the more restricted opportunities.

Because the number of navigable windows exceeds the total number of vessel trips, the channel capacity would not be exceeded under the proposed action.

Berth Capacity

Berth capacity at Terminal 1, as discussed for the no-action alternative, is adequate as long as the total days of occupation do not exceed 328 days per year. When tank vessels call at the Terminal 1 berth, they are estimated to occupy the berth for 24 hours (tank barges) to 48 hours (tankers). If only tank barges call at Terminal 1, the 119 vessels per year for the proposed action at maximum throughput would result in 119 days of berth occupancy, out of 328 days that the berth would be available. If tankers call at Terminal 1 instead of tank barges, the berth occupancy time would increase, but the number of vessel calls would decrease. For example, if only Panamax tankers call at Terminal 1, approximately 51 vessel calls per year would be required (Table 3.17-9), and the berth would be occupied for 102 out of 328 days.

Adding days of Terminal 1 berth occupancy related to the proposed action (a maximum of 119 days) to the number of days of berth occupancy by vessels related to existing and forecast methanol

operations (44 days[22]) at the project site and to the existing biodiesel operations at the adjacent Imperium facility (14 days[23]), the berth would be occupied for a maximum of 177 days. This occupancy level is well below the 328 days of estimated berth availability. Therefore, the proposed action would not have a substantial impact on berth capacity.

Pilot and Tug Capacity

State-Licensed Pilots

As discussed for the no-action alternative, only foreign-flagged vessels and U.S. vessels engaged in foreign trade are required to use a state-licensed pilot by regulation. However, many U.S. vessels engaged in coastwise calling at Washington State ports seek the assistance of a state-licensed pilot on a voluntary basis, or as a matter of company policy, even though it is not required by regulation. The Port currently employs three state-licensed pilots and two pilots are on duty at any given time.

Under the proposed action, the total number of trips (proposed action and baseline) by large commercial vessels is forecast to reach 576 trips in 2017 and 674 trips in 2037. If all large commercial vessels hire a state-licensed pilot to navigate to and from the Port, this would result in a maximum of 674 annual assignments in 2037, or approximately 225 annual assignments for each of three state-licensed pilots employed by the Port. Under this scenario, each state-licensed pilot would pilot vessels to or from the Port a maximum of 225 days out of 365 days, which would not exceed the capacity of state-licensed pilots currently employed by the Port.

Additionally, pilots may pilot more than one vessel per day. Pilot trips in Grays Harbor are approximately 2 hours Because Grays Harbor has a semidiurnal tidal cycle (two high tides per day), there is more than one navigable window each day to pilot a vessel to or from the Port.

The Puget Sound Pilot Commission is responsible for Washington State licensed pilots and evaluates the need for pilots regularly. If additional pilots were needed, they could be hired and trained. It takes approximately 9 months for a new pilot to obtain a state license to handle smaller vessels and approximately 2.5 years to get fully qualified. If necessary, due to an unanticipated pilot shortage, the Puget Sound Pilot Commission could provide support to the Port by temporarily reassigning a qualified state-licensed pilot from Puget Sound to Grays Harbor (Larson pers. comm.).

Based on interviews with the Port, the Pilotage Commission, and a Grays Harbor state-licensed pilot and on forecasted vessel numbers under the proposed action, the current number of state-licensed pilots available for Grays Harbor[24] is adequate for the pilotage services required by the Port under current and foreseeable vessel traffic conditions.

Tugs

Brusco Tug & Barge has three harbor tugs stationed in Grays Harbor that are exclusively available for commercial vessel assistance in the harbor. During normal operations, two tugs (one at the bow

[22] Assumes 16 tankers related to existing activities (32 days), and 1 tanker (2 days) and 10 tank barges (10 days) related to projected activities.
[23] Assumes seven tankers related to existing activities (14 days) at the adjacent Imperium Terminal Services facility.
[24] Allowing for reassignment of pilots from Puget Sound.

and one at the stern) assist large commercial vessels (cargo ships and tank vessels) with docking and undocking maneuvers at the terminal berths.

Tugs are also used to escort vessels through the harbor to reduce the potential for a vessel incident such as loss of steering or propulsion that could affect vessel traffic and pose a safety risk. Existing regulations do not require tank vessels to be accompanied by escort tugs through Grays Harbor. However, it is standard practice for large commercial vessels transiting Grays Harbor[25] to use one or two tugs, depending on the weather conditions and vessel-specific factors (e.g., the amount of vessel infrastructure above water, or steering or propulsion problems). With larger car carriers and big bulk cargo vessels, a third tug may be used to assist with docking, undocking, or transiting when conditions warrant, such as when there are high winds (D'Angelo pers. comm.).

The Harbor Safety Plan for Grays Harbor has a standard of care (similar to a best management practice) that recommends escort tugs for all laden tank vessels carrying oil. The standards recommend the following practices, subject to pilot determination.

- At least one escort tug will meet an arriving laden tank vessel or barge carrying oil at the Grays Harbor entrance and escort it to the Hoquiam River where two tugs will assist the vessel during mooring procedures.
- At least one escort tug will accompany a departing laden tank vessel carrying oil from the terminal to the entrance of Grays Harbor.

Chapter 4, Section 4.6.3, *What mitigation measures would reduce impacts related to vessel transport?* includes proposed mitigation measures related to use of escort tugs through Grays Harbor to reduce potential risk of incident under the proposed action.

Including vessels under the proposed action at maximum throughput, large commercial vessel trips through Grays Harbor are forecast to reach 576 in 2017 and 674 in 2037, approximately two vessel trips per day on average. Based on the projected traffic levels and the fact that tugs can be moved between the Port terminals to assist with docking and undocking, the three tugs currently stationed in the harbor are adequate to support vessel operations at the Port under the proposed action.

Conflicts with Commercial Fishing

Increased vessel traffic related to the proposed action could affect commercial fishing activities by restricting access to certain areas in the harbor. Because vessel traffic under the proposed action would be limited to the navigation channel and Terminal 1 berth, impacts on commercial fishing in the harbor but outside the channel are not expected.

Adding proposed action vessels to baseline vessels would result in occupancy of the Terminal 1 berth up to approximately 177 days per year compared to 58 days per year under the no-action days per week compared to an average of 1 day per week without the proposed action. Additionally, operation of the proposed action at maximum throughput would add 238 tank vessel trips per year (0.7 trip per day on average) along the navigation channel to projected large commercial vessel trips under the no-action alternative—between 338 and 436 large commercial vessel[26] trips per year in 2017 and 2037, respectively, or approximately one trip per day on average.

[25] Transit time for tug(s) escorting a laden tank vessel to the entrance buoy is approximately 2 hours. The tug (or tugs) takes just 1 hour to return to the dock after escorting a tank vessel (Campbell pers. comm. [B]).
[26] The term *large commercial vessels* refers collectively to tank and cargo vessels.

As noted in Section 3.17.4.3, *Fishing and Recreational Vessels,* one of the prime commercial fishing areas for salmon is located in the navigation channel east of the Hoquiam River. Access to this area would be restricted during vessel loading and tank vessel transits. During periods of maximum catch for Chinook, coho, or chum salmon, the fall fishery may be open 2 to 4 days per week and for limited periods (e.g., 8:00 a.m. to 12:00 noon). Approximately 15 to 20 boats may participate each year and the fishery is open is approximately 7 days (Scharpf pers. comm.). Commercial fisheries do not occur during other times of the year; therefore, vessel traffic at other times of the year would not affect commercial fisheries in Grays Harbor.

Assuming a 24-hour maximum berth occupancy and vessels evenly dispersed over the week, it is likely a vessel would be at the dock or traveling through the navigation channel during a portion of the open fishing season. Depending on the specific circumstances of each interaction (e.g., chance of a vessel calling during an open fishing window, distribution of the fish within the channel, number of fishers on any given day), it is difficult to predict whether increased occupancy at Terminal 1 would significantly affect any single fisher's daily catch. However, if a vessel is at berth during the fall fishery, fishers would have the option to fish longer (complete more drifts) or may choose to fish other preferred locations in Grays Harbor (such as other portions of the navigation channel, farther away from the shoreline or father upstream). However, opportunities to relocate during intense fishing periods may be limited if the other areas are occupied by fishers. Although it is difficult to predict whether the increased vessel traffic would result in an overall inability of a fisher to reach their limit, increased traffic could limit access to commercial fishing areas.

As noted in Section 3.17.4.3, *Fishing and Recreational Vessels,* ocean-fishing vessels may use the navigation channel to transport their catch to the harbor. To lessen the danger of hazardous conditions during incoming or outgoing tides, bar crossings are often timed during slack high or low tides, whereas large commercial vessels tend to navigate through the channel when tidal elevations are more than 5 feet. Additionally, as noted previously, commercial fishers can navigate around larger vessels limited to the navigation channel to avoid potential impacts.

Implementation of mitigation measures described in Section 3.17.7.1, *Applicant Mitigation*, to provide advance notice of arrivals and departures would reduce impacts on commercial fishing.

An analysis of impacts from increased risk of incidents (e.g., vessel collisions) and related consequences (e.g., release of crude oil) is provided in Chapter 4, *Environmental Health and Safety.*

3.17.6 What required permits apply to vessel traffic?

No required permits or plans apply to vessel traffic.

3.17.7 What mitigation measures would reduce impacts on vessel traffic?

This section describes the applicant mitigation that would reduce impacts on vessel traffic from construction and routine operation of the proposed action. Mitigation measures to address risks related to vessel transport of crude oil in the study area are presented in Chapter 4, Section 4.6.3, *What mitigation measures would reduce impacts related to vessel transport?*

3.17.7.1 Applicant Mitigation

The applicant will implement the following mitigation.

- To improve vessel management and situational awareness and to reduce potential risk of incident of vessel collision or allision in Grays Harbor, the applicant will fund and work with U.S. Coast Guard, Ecology, Port of Grays Harbor, and Grays Harbor Safety Committee to propose, develop, and implement a formalized vessel management system. The vessel management system will include the ability to schedule, track, and monitor vessel movements in the harbor and off the entrance to the harbor. The vessel management system will be active prior to the applicant beginning the proposed operations. If a rule is adopted under RCW 88.16, Pilotage Act, prior to beginning operations, the requirements of the new rule would be followed.

  The vessel management system will assist in the following actions.

  - Ensure vessel traffic is limited while a laden tank vessel is in the navigation channel.
  - Prohibit the transit of any other deep-draft vessels within the south channel reach (just off Westport) to Terminal 1 in both directions whenever a laden tank vessel is transiting within the same channel.
  - Include real-time automatic identification system tracking and monitoring.
- To improve vessel management and reduce the risk of an incident, the applicant will coordinate with the Port of Grays Harbor and as a member of the Grays Harbor Safety Committee, work to develop and implement specific procedures for escorting, tethering, refueling and emergency maneuvering to control laden tank vessels. The procedures must be drafted prior to the proposed operations beginning. These procedures should be included in the Grays Harbor Safety Plan. At a minimum, these must include the following elements.
  - Escort configurations and maneuvering characteristics of escorted tankers and tank barges.
  - Specific emergency connection and tethering procedures for connection of escort tugs to tankers and tank barges.
  - Specific maneuvers necessary for the escort tug to maintain control of the tanker while transiting Grays Harbor waters specifically during incidents of loss of propulsion or steering or in bad weather.
  - Appropriate safe speed of transit in Grays Harbor when escort tugs are tethered.
  - Guidelines for tanker or tank barge bridge team to rapidly recognize and respond to a loss of power or steering. By improving recognition and reaction time, the escort tugs can more effectively steer the vessel through the navigation channel upon incident.
  - Requirement for a pretransit conference.
  - Requirements for refueling of the vessel.
- While commercial fishing boats are required to follow the U.S. Coast Guard navigation rules, to improve awareness of vessel traffic in the navigation channel, the applicant will work with the Grays Harbor Safety Committee, including the U.S. Coast Guard and Port of Grays Harbor, to establish procedures to announce project-related vessel traffic arrivals and departures over a designated VHF marine radio channel at least 1 hour before arrival and departure.

3.17.8 Would the proposed action have unavoidable significant adverse impacts on vessel traffic?

Under existing fishing conditions, increased vessel traffic could cause a disruption when commercial fishers are in the navigation channel. This conflict is most likely to occur related to harvest of salmon (Chinook, chum, and coho) during the fall fishery. Although vessel operations related to the proposed action are reasonably certain, it is not possible to determine how the proposed action could affect a commercial fisher's daily catch because of other unpredictable factors (number of fishers, fish distribution, timing, and duration of fishing window on any given day of any given week). Potential impacts related to increased risk of vessel incidents and related consequences are addressed in Chapter 4, *Environmental Health and Safety*.

Chapter 4
Environmental Health and Safety

4.1 Introduction

The proposed action would involve the handling and storage of crude oil on the project site. Additionally, crude oil would be transported by rail to the project site and by vessel from the project site to end destinations. Spills of oil related to the proposed action could occur on land or in water, at any time of day or night, and in any weather condition. It is impossible to know exactly when a spill is going to happen and how much oil is likely to be spilled. However, it is possible to identify risks based on the materials involved, where they are stored, how they are stored, the corridors through which they would travel, and typical weather conditions. While preventing a spill is the best strategy for avoiding potential damage to human health and the environment, once a spill occurs, a rapid, aggressive, and organized response can contain and control the spill and minimize damage.

4.1.1 What is the scope of this analysis?

This chapter presents the analysis of environmental health and safety impacts associated with incidents involving spills of crude oil,[1] fires, or explosions[2] during onsite handling and storage and offsite rail and vessel transport. The subsections that follow describe the scope of the analysis, study area, general approach used in this analysis, applicable regulations, and general risk considerations as developed with guidance from the co-lead agencies. The remaining sections of this chapter address potential impacts for terminal (onsite) operations, from rail transport, and from vessel transport. These sections also identify the existing requirements for each area and additional mitigation measures to offset potential impacts. The thresholds and measures were developed based on direction and guidance from the co-lead agencies. The chapter concludes with an analysis of the general environmental impacts of oil spills, fires, or explosions on the resources identified in Chapter 3, *Affected Environment, Impacts, and Mitigation.*

Impacts on environmental health and safety related to rail and vessel transport beyond the study area described below are addressed in Chapter 5, *Extended Rail and Vessel Transport*. Cumulative impacts on environmental health and safety are addressed in Chapter 6, *Cumulative Impacts*. Information on the economic and social costs of oil spills are addressed in Chapter 7, *Economics, Social Policy, and Cost-Benefit Analysis.*

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[1] The analysis presented in this chapter focuses on Bakken crude oil but generally applies to any crude oil proposed for storage and handling by the applicant (i.e., diluted bitumen). In places where there is a material change in risk or consequence due to the chemical properties of a specific material (e.g., Bakken crude oil versus diluted bitumen), the difference is discussed specific to the material in question. Potential hazardous materials impacts associated with onsite operations are addressed in Section 3.14, *Hazardous Materials*.

[2] The term *explosion* is defined as a sudden, violent, and destructive blowing apart of something. A technical definition of explosion is a violent expansion in which energy is transmitted outward as a shock wave. For purposes of the EIS, the more general first definition is used.

4.1.2 What is the study area?

The study area for environmental health and safety includes humans and resources that could be harmed in the event of a spill during operation at the project site, during rail transport along the Puget Sound & Pacific Railroad (PS&P) rail line—from Centralia, Washington, to the project site—and during vessel transport along the Grays Harbor Navigation Channel.[3] These resources are described generally in this chapter and in detail in Chapter 3, *Affected Environment, Impacts, and Mitigation Measures*.

Because transport of oil would extend beyond this study area, the risks of rail transport beyond the PS&P rail line (on the BNSF and Union Pacific main lines) and beyond state waters (during transit along the west coast and abroad) are discussed qualitatively in Chapter 5, *Extended Rail and Vessel Transport*.

4.1.3 What is the approach to this analysis?

4.1.3.1 Information Sources

Numerous sources provided information on materials, risks, and transportation, as cited in the appropriate sections. A guiding source of information was the *Washington State 2014 Marine and Rail Oil Transportation Study* published by the Washington State Department of Ecology (Ecology) in March 2015 (Washington State Department of Ecology 2015).

The Washington State Legislature directed Ecology, in consultation with the Washington Utilities and Transportation Commission, Washington Military Department's Emergency Management Division, Federal Railroad Administration, and Washington State Department of Transportation to conduct a study on marine and rail oil transportation. In June 2014, Governor Inslee issued an Oil Transport Directive to Ecology outlining key components to be addressed. The Legislature's and Governor's actions were driven by the rapid changes in how crude oil is moving through rail corridors and over Washington waters, creating new safety and environmental risks. The study focused on developing recommendations to foster public health and safety, environmental protection, and respect for tribal treaty rights. Recommendations and information from the study are included as appropriate throughout this draft environmental impact statement.

New oil transportation safety legislation was passed in 2015 at the request of Governor Inslee. The legislation became effective July 1, 2015, in Engrossed Substitute House Bill (ESHB) 1449. The bill addresses financial assurance requirements for facilities and vessels, oil spill prevention plans and oil spill contingency plans, oil tanker tug escorts, and emergency response planning. Final and draft rules are discussed further in Section 4.2, *Applicable Regulations*.

4.1.3.2 Risk Analysis

Risk management involves the systematic identification, evaluation, and control of impacts that may arise from uncertain future events such as spills, fires, explosions, toxic releases, or natural

[3] The proposed action would result in increased rail and vessel traffic related to the transport of crude oil to and from the project site. Therefore, resources that could be affected during rail and vessel transportation are considered in this analysis.

disasters. Assessing a risk to a particular resource requires identifying possible hazards, evaluating the frequency of adverse events and the magnitude of their consequences, and determining appropriate measures for prevention or mitigation. By anticipating the level of risk and the potential impacts, preventive and mitigation measures can be implemented to reduce the frequency of an event, the impacts, or both.

Because it is not possible to predict the timing or exact magnitude of a spill, this chapter focuses on spill scenarios. Scenarios were developed for a range of potential incidents involving the terminal, trains, and vessels. These scenarios considered spills, fires, and explosions related to existing conditions (no-action alternative), operation of the proposed action at the project site and during rail and vessel transport, and worst-case spills. The semi-quantitative or screening risk assessment considered scenarios of the following types of incidents.

- Incidents involving handling and storage of crude oil at the project site.
- Incidents involving trains transporting crude oil and bulk materials along the PS&P rail line.
- Incidents involving vessels transporting crude oil and bulk materials in Grays Harbor.

The scenarios considered various sizes of potential spills based on the activity (such as transport or transferring oil) and size of tank, rail cars, and vessels. Spill scenarios are referred to using the amount of material spilled. The potential impacts would be related to the amount spilled, location, and other conditions. Table 4.1-1 presents these spill scenarios by source (project site, rail transport, vessel transport) and spill size.

Scenarios were chosen using expert opinion on locations where spills may more typically occur, such as during railcar unloading or vessel loading, or where they would result in worst-case spills, such as a vessel incident at the entrance to Grays Harbor. The quantity of oil spilled for the scenarios was based on the regulatory definitions of worst-case spill for the relevant source: onshore facility, vessel, and rail transport (WAC 173-182-030 and 480-62-300).

For an onshore facility, the worst-case spill would involve the entire volume of the largest aboveground storage tank (approximately 8.4 million gallons or 200,000 barrels of crude oil for the proposed action). The spill scenario for vessel loading at the facility was estimated taking into account the proposed transfer rate to the vessel multiplied by approximately 1 minute and 25 seconds to account for the maximum shutdown response time.

For rail transport, the worst-case spill on the PS&P rail line would involve approximately 17.75 rail cars. This reasonable worst-case spill quantity was calculated per WAC 480-62-300. It uses the percent of the largest train load of crude oil calculated by dividing the maximum operating speed by 65 and then multiplied by 2. The maximum operating speed is the top speed for the railroad company, which for PS&P is 25 miles per hour.

For a vessel, the worst-case spill would involve the vessel's entire cargo and fuel. The largest tankers would be Panamax class with the capacity to hold up to 14.7 million gallons (350,000 barrels). An additional 420,000 gallons (10,000 barrels) was added to represent the fuel onboard the vessel.

Table 4.1-1. Oil Spill Scenarios by Size

Source	Spill Scenario
Small	
Project site	Up to 2,100 gallons (50 barrels) spilled when transferring oil from rail cars or to vessels at the project site
Rail transport	Up to 1,000 gallons (24 barrels) spilled during a derailment along the PS&P rail line
Medium	
Project site	Roughly10,000 gallons (238 barrels) spilled when transferring oil to a vessel at the project site
	Roughly 50,400 gallons (1,200 barrels) spilled from pipeline or storage tank at the project site
Rail transport	Roughly 30,000 gallons (714 barrels or the contents of one full tank car) spilled during a derailment along the PS&P rail line
Large	
Project site	Up to 8.4 million gallons (200,000 barrels, the entire contents of 1 full storage tank) spilled on project site
Rail transport	Roughly 90,000 gallons (2,140 barrels or the contents of three full tank cars) spilled during a derailment along the PS&P rail line
	Roughly 150,000 gallons (3,570 barrels or the contents of five full tank cars) spilled during a derailment along the PS&P rail line
	Roughly 900,000 gallons (21,400 barrels or the contents of 30 full tank cars) spilled during a derailment along the PS&P rail line
Vessel transport	Up to 105,000 gallons (2,500 barrels) spilled into Grays Harbor from a vessel collision
	Up to 1.2 million gallons (29,000 barrels) from a vessel grounding in Grays Harbor
	Up to 15.1 million gallons (360,000 barrels or the entire contents of one full tanker, including fuel) spilled into Grays Harbor from a vessel allision at harbor entrance

The risk assessment determined the likelihood that a spill would occur. In general, the larger the spill, the less likely that the spill would be expected to occur. The following methods were used to determine likelihood of occurrence.

- For spills at the project site, operations information, such as the number of rail car unloadings, vessel loadings, and storage tanks in use, was combined with historical information on spills associated with these activities to determine the likelihood of spills.
- For spills along the PS&P rail line, the number of rail trips carrying crude oil was combined with historical information from the Federal Rail Administration on incidents along the PS&P rail line and across the country to determine the likelihood of spills.
- For spills during vessel transport, the number of vessel trips carrying crude oil was combined with historical information on vessel incidents to determine the likelihood of spills.

The risk assessment considered the type of operations, transportation routes for trains and vessels, and historical incident data to determine the likelihood of an incident happening. The analysis looked at risks in 2017 and in 2037 to reflect changes that might occur over the lifetime of the proposed action. The impacts identified in these years would apply for the lifetime of the proposed action, and the proposed mitigation measures are intended to apply for the lifetime of the proposed action.

The analysis, which is described in Appendix M, *Risk Assessment Technical Report*, estimated the *chance* of each spill scenario occurring in a given year. The *likelihood of an incident* can also be thought of as follows.

- **Likely to happen.** Involves regular transportation and facility operations or conditions that would be expected *to frequently happen*.
- **Unlikely to happen.** Involves unusual operations or conditions that would be expected *to rarely happen*.

4.1.3.3 Chance of a Spill Reaching Water

A spill of oil or hazardous material that reaches water has a greater potential to affect the environment or people. A spill on land would affect resources but, in general, would be easier to contain and clean up. Water can move oil or other materials over a bigger area and increase the complexity of a spill. Weather conditions, tides, river flows, and wind patterns greatly affect the movement of oil or hazardous materials in water as discussed in Section 4.3, *Risk Considerations*. To provide a general idea of the movement and extent of the area that could be affected by an oil spill to water, oil spill models were done for Grays Harbor and the Chehalis River (Appendix N, *Oil Spill Modeling*).

Federal and state regulations require equipment and design features, such as containment areas to catch spills or equipment like emergency shutoffs. These requirements are factors in determining the amount of oil that could reach water and are described in Section 4.1, *Environmental Health Risks—Terminal (Onsite)*; Section 4.5, *Environmental Health—Rail Transport*; and Section 4.6, *Environmental Health—Vessel Transport.* The likelihood of a spill reaching water can be described as follows.

- **Likely to reach water.** Incident occurs on or near the water and outside of a containment area.
- **Unlikely to reach water.** All or most of the spill is within a containment area or incident is not near water.

4.1.3.4 Potential to Affect the Environment

Impacts from an incident such as an oil spill, fire, or explosion vary widely based on the material type and amount, location, proximity to water, and weather conditions. The size of a spill does not alone determine the potential impacts. A small spill in a sensitive area could have significant impacts, as could a large spill or explosion. Therefore, impacts are not specifically identified for each spill scenario but are discussed generally in Section 4.7, *Impacts on Resources*.

4.2 Applicable Regulations

Laws and regulations relevant to determining potential impacts on environmental health and safety are summarized in Table 4.2-1. More information about the applicable laws and regulations is provided in Appendix B, *Laws and Regulations*.

Table 4.2-1. Laws and Regulations for Environmental Health and Safety

Laws and Regulations	Description
Federal	
Anchorages under Ports and Waterways Safety Act (33 CFR 109)	Authorizes USCG to specify times of movement, restrict operations, and direct anchoring of vessels under hazardous conditions.
Financial Responsibility for Water Pollution (Vessels) and Oil Pollution Act, Limits of Liability (Vessels and Deepwater Ports) (33 CFR 138)	Establishes requirements for responsible parties to demonstrate financial ability to meet potential liability for costs and damages.
Facilities Transferring Oil or Hazardous Materials in Bulk (33 CFR 154)	Requires facilities transferring oil or other hazardous materials in bulk to submit an operations manual to USCG for approval.
Vessel Contingency and Response Plans (33 CFR 155)	Requires development, implementation, and annual review of a vessel response plan approved by USCG.
Oil and Hazardous Material Transfer Operations (33 CFR 156)	Specifies procedures and requirements for transferring oil and other hazardous materials to/from vessels.
Oil Pollution Prevention (40 CFR 112)	Requires facilities to prepare and implement a spill prevention control and countermeasure plan in accordance with good engineering practices.
Pipeline and Hazardous Materials Safety Administration (49 CFR 105–110, 130, and 171–180)	Regulates the movement of hazardous materials. 49 CFR 130 requires that a basic oil spill response plan is developed for rail cars carrying liquid petroleum or nonpetroleum oil with a capacity of 3,500 gallons or more.
Oil Pollution Act of 1990 (33 U.S.C. 40)	Expands the federal government's ability to prevent and respond to oil spills and preserves state authority to establish laws governing oil spill prevention and response.
Clean Water Act (33 U.S.C. 1251 et seq.)	Establishes the basic structure for regulating discharges of pollutants into navigable waters of the United States by regulating point pollution sources, such as stormwater discharges, and contains specific provisions related to the incidental release of oil and other hazardous substances into U.S. waters.
Limits on Liability (33 U.S.C. 2704)	Establishes limits on liability of a responsible party to incur costs from an incident.
Hazardous Materials Transportation Act (49 U.S.C. 51)	Regulates all aspects of hazardous materials packaging, handling, and transportation for vessel, truck, and rail.
Enhanced Tank Car Standards and Operational Controls for High-Hazard Flammable Trains (80 FR 26643)	The final rule, passed May 8, 2015, defines and regulates the operations of high-hazard flammable trains.

Laws and Regulations	Description
State	
Transportation Regulations (RCW 81)	Regulates transportation in Washington State and administers railroad safety provisions allowed under 49 U.S.C. 20106 and state law (RCW 81.04.540), rules for the equipment used by common carriers (RCW 81.44), and railroad crossings (RCW 81.53).
Pilotage Act (RCW 88.16)	Establishes requirements for compulsory pilotage provisions in certain waters of the state, including Grays Harbor.
Transport of Petroleum Products – Financial Responsibility (RCW 88.40)	Defines and prescribes financial responsibility requirements for vessels that transport petroleum products across state waters and facilities that store, handle, or transfer oil or hazardous substances near navigable waters of the state.
Vessel Oil Spill Prevention and Response (RCW 88.46)	Establishes rules and regulations for tank vessels that carry oil and enter navigable waters of the state.
Oil and Hazardous Substance Spill Prevention and Response (Oil Spill Act) (RCW 90.56)	Establishes programs to reduce the risk and develop an approach to respond to oil and hazardous substance spills; provides a simplified process to calculate damages from an oil spill; holds responsible parties liable for damages resulting from injuries to public resources.
Hazardous Chemical Emergency Response Planning and Community Right-to-Know Act of 1986 (WAC 118-40)	Establishes requirements for federal, state, and local governments, and industry to improve hazardous chemical preparedness and response through coordination and planning; provisions include public notification about chemicals used at facilities.
Railroad Companies—Operations (WAC 480-62)	Establishes safety standards at private crossings and reporting requirements for railroads to demonstrate insurance coverage to cover losses from a reasonable worst-case spill and report average crude oil train lengths. Defines a reasonable worst-case spill and expands regulatory fees for railroads.
Facility Oil Handling Standards (WAC 173-180)	Establishes minimum standards for safe oil transfer operations to meet a zero spill goal established by the legislature.
Oil Spill Contingency Plan Requirements (WAC 173-182)	Requires larger oil handling facilities and commercial vessels to have state-approved oil spill contingency plans that describe their ability to respond to oil spills. Identifies specific standards for Grays Harbor.
Oil Spill Natural Resources Damage Assessment (WAC 173-183)	Establishes procedures for convening a resource damage assessment committee, pre-assessment screening of damages, and selecting the damage assessment method.
Vessel Oil Transfer Advance Notice and Containment Requirements (WAC 173-184)	Requires facility operators who transfer oil to provide Ecology with a 24-hour advance notice of transfer.
Oil Movement by Rail and Pipeline Notification (WAC 173-185)	Establishes notification requirements and procedures for crude oil shipments to facilities by rail and by transmission pipelines. Advance notice is required for facilities that receive crude oil by rail. It includes information procedures for sharing information with emergency responders, local governments, and the public.
Oil Spill Contingency Plan—Railroad (WAC 173-186)	Establishes railroad oil spill contingency plan requirements, drill and equipment verifications.

Laws and Regulations	Description
Local	
No local regulations apply to environmental health and safety.	

CFR = Code of Federal Regulations; USCG = U.S. Coast Guard; U.S.C. = United States Code; FR = Federal Register; RCW = Revised Code of Washington; WAC = Washington Administrative Code; Ecology = Washington State Department of Ecology

Regulations developed pursuant to these laws establish the basis for prevention, preparedness, and response to potential spills. The Washington State Department of Ecology (Ecology) has responsibility in Washington State for preventing and planning for oil spills in state waters and organizing a rapid and coordinated response to oil and hazardous substance spills wherever they occur in the state.

Table 4.2-2 summarizes the federal and state agencies that provide oversight of prevention, preparedness, and response activities.

Table 4.2-2. Agency Oversight of Prevention, Preparedness, and Response Activities

Source of Oil Discharge or Other Hazardous Materials Release	Federal Agency Responsible for Prevention/ Preparedness	Lead Federal Agency for Response Actions	State Agency Responsible for Prevention/ Preparedness	Lead State Agency for Response Action
Terminal (Onsite)				
Facility (vessel loading facilities)	USCG	USCG	Ecology	Ecology
Facility (rail unloading facilities and storage tanks)	EPA	EPA	Ecology	Ecology
Offsite Transport				
PS&P	USDOT, PHMSA, FRA	EPA	Ecology	Ecology
Vessels	USCG	USCG	Ecology	Ecology

Source: Adapted from Ramseur 2012:22.
USCG = U.S. Coast Guard; Ecology = Washington State Department of Ecology; EPA = U.S. Environmental Protection Agency; PS&P = Puget Sound & Pacific Railroad; USDOT = U.S. Department of Transportation; PHMSA = Pipeline and Hazardous Materials Safety Administration; FRA = Federal Railroad Administration

4.2.1 What framework prevents incidents from happening?

Preventing a spill is the best strategy for avoiding damage to human health and the environment. Federal and state agencies share responsibility for establishing prevention guidelines. The U.S. Coast Guard (USCG) and U.S. Environmental Protection Agency (EPA) are responsible for implementing federal prevention plans for vessels and facilities (33 Code of Federal Regulations [CFR] 154, Operations Manual; 33 CFR 156, Oil and Hazardous Material Transfer Operations, 40 CFR 112, Spill Prevention, Control and Countermeasure Plans). USCG also regulates vessels and oil transfer operations over water. Ecology's Spill Prevention, Preparedness and Response Program regulates facilities that handle oil, tank vessels (tankers and tank barges) operating in Washington State waters, and oil transfer operations over water (Washington Administrative Code [WAC] 173-180 Facility Oil Handling Standards; WAC 173-184 Vessel Oil Transfer Advance Notice and Containment Requirements). Ecology inspectors may conduct vessel and facility inspections to ensure compliance

with state pollution prevention requirements. Federal and state laws also require specific facility, vessel, and rail car design elements to prevent and contain spills and operational measures to reduce the risk of a spill and to contain it immediately. The U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA) and the Federal Railroad Administration (FRA) are the agencies responsible for federal regulation of railroads. Detailed information on the regulatory requirements for spill prevention is provided in Appendix B, *Laws and Regulations*.

4.2.1.1 Terminal (Onsite)

Facilities that store and handle oil and hazardous substances must meet federal and state design standards, equipment, and training requirements to prevent pollutants from reaching the environment. Facilities must submit operation, oil transfer, spill prevention, and training plans to federal and state agencies prior to beginning operations. Facility operators must adhere to specific standards for facility operations, including oil transfers, and ensure that all personnel are appropriately trained.

4.2.1.2 Rail

In May 2015, PHMSA adopted a final rule that defines and regulates high-hazard flammable trains. The final rule implements new safety standards for trains that would be used to transport oil (80 *Federal Register* [FR] 26643). The final rule revises the Hazardous Materials Regulations (49 CFR 171–180) to define a high-hazard flammable train as a single train that contains 20 or more loaded tank cars of Class 3 (flammable liquid) materials in a continuous block, or 35 or more loaded tank cars distributed throughout a train. This rule affects crude oil primarily as it is the only Class 3 material transported in trains consisting of 20 cars or more. The primary intent of the revision is to update and clarify the regulations to prevent and mitigate the consequences of a train incident involving flammable liquids, should one occur.

Additionally, new tank cars constructed after October 1, 2015, are required to meet enhanced design or performance criteria for thicker walls. Existing tank cars must be retrofitted on a prescriptive retrofit schedule. In August 2016, PHMSA announced amendments (81 *Federal Register* [FR] 157; 2016) to 49 CFR 173 and 179 that codify the requirements of Fixing America's Surface Transportation Act (FAST Act) of 2015. The rule revises the phase-out schedule for all DOT Specification 111 rail cars. It also expands the requirements to use enhanced rail cars regardless of train length, to equip all new tank cars with a thermal protection blanket, and to equip older tank cars with top fittings protection and a thermal protection blanket to meet new design standards on a specified timeline.

The National Transportation Safety Board (NTSB) also plays a role in evaluating safe rail transport and continues to review accident data and to make safety recommendations for rail track infrastructure, rolling stock, and routing alternatives. NTSB has investigated many railroad accidents involving hazardous materials and has issued safety recommendations in all areas of railroad maintenance, including recommending that railroads develop rail inspection and maintenance programs based on damage-tolerance principles. More specifically, NTSB has recommended railroads take into account, at a minimum, accumulated tonnage, track geometry, rail surface conditions, rail head wear, rail steel specifications, track support, residual stresses in the rail, rail defect growth rates, and temperature differentials. NTSB has also recommended that the Association of American Railroads standards be revised to require nondestructive testing of axels

prior to reuse and is investigating similar recommendations related to other types of defects. NTSB continues to work with PHMSA and FRA to improve rerouting methods to consider additional risk mitigation actions when a single route is the only choice and sensitive areas cannot otherwise be avoided (National Transportation Safety Board 2016).

4.2.1.3 Vessel

Vessel operators must submit oil or hazardous material transfer plans and spill response plans. Ecology, EPA, and USCG conduct inspections of facilities, vessels, and transfer operations to ensure the plans are being followed. Vessels transporting oil have required construction design features (double bottoms and sides), mechanical measures (oil discharge monitoring systems and emergency shutdown devices), and navigational equipment (depth sounders and electronic position fixing devices to verify position and prevent collisions or groundings) that contribute to the prevention of oil spills to water. If oil is spilled from a tank vessel during loading or offloading, each loading manifold and each transfer connection point has a containment area. The containment is designed according to the size of the transfer hose to capture small spills and prevent the spill from reaching the water.

4.2.2 What framework prepares for an incident?

Federal and state regulations identify steps to prepare for an incident. Similarly, vessel and rail operators as well as facility operators are required to develop contingency plans to describe their ability to respond to spills (33 CFR 155, Vessel Contingency and Response Plans; 49 CFR 130, Rail Oil Spill Response Plans; WAC 173-182, Oil Spill Contingency Plan Requirements; WAC 173-186, Oil Spill Contingency Plan—Railroad). The applicant must demonstrate that they have access to oil spill response equipment (e.g., boom) and storage necessary to contain and clean up the oil. Vessel, rail, and facility operators who have a contingency plan often use contractors to provide response equipment and response support teams. The adequacy of contingency plans is tested through scheduled and unannounced drills.

The National Contingency Plan, the Northwest Area Contingency Plan, local response plans, facility plans, and transportation regulations provide coordinated preparation for an oil spill or hazardous substance release. These contingency plans establish roles and responsibilities, identify resources, and identify response procedures to protect life and to reduce and mitigate the effects of the discharge of a pollutant on the environment and property. Contingency plans typically have four major elements.

- Hazard identification
- Vulnerability analysis
- Risk assessment
- Response actions

The following sections summarize the contingency plans that prepare for an incident. Detailed information on the regulatory requirements for spill contingency planning is provided in Appendix B, *Laws and Regulations*.

4.2.2.1 National Contingency Plan

The National Contingency Plan is a multiagency plan for governmental responses to oil spills. The National Contingency Plan establishes national response capability and overall coordination among the responders and contingency plans for oil spills through the National Response System (Section 4.2.3.1, *National Response System*). The National Response System consists of three organizational levels: national, regional, and local at the facility. If an oil spill or a hazardous material response incident escalates beyond the limits of state resources, additional federal assets are available and can be requested for an incident.

Under the National Contingency Plan, the federal on-scene-coordinator is designated as either USCG or EPA, depending on the location of the spill. Ecology is the designated state on-scene coordinator for spill response (RCW 90.56.020). The Washington Emergency Management Department is the designated state on-scene coordinator for natural disasters. The Washington State Patrol or state fire marshal is the designated state on-scene coordinator for fires.

4.2.2.2 Northwest Area Contingency Plan

The Northwest Area Contingency Plan is the planning framework for oil and hazardous substance spill response in Washington, Idaho, and Oregon. This plan is developed and implemented by federal, state, and local agencies. The plan includes but is not limited to the following elements.

- A description of the area covered by the plan, including the areas of special economic or environmental importance that might be damaged by a spill.
- Roles and responsibilities of an owner or operator and of federal, state, and local agencies in spill response and in mitigating or preventing a substantial threat of a discharge.
- A list of equipment (including firefighting equipment) and personnel available to respond to oil spills.
- Site-specific geographic response plans (GRPs).

GRPs are part of Northwest Area Contingency Plan. Each plan is written for a specific area (e.g., the Chehalis River or Grays Harbor) and includes tactical response strategies tailored to a particular shore or waterway at risk of injury from oil. GRPs have two main objectives: to identify sensitive resources at risk of injury from oil spills and to direct response actions related to sensitive resource protection during the initial hours of a response.[1] GRP response strategies are designed for use with persistent heavy oils that float on water.

These plans help coordinate response efforts by the responsible party and federal and state agencies. Strategies in the plan are deployed by responders after the immediate concern of controlling and containing the source of a spill has been addressed. GRPs contain maps and descriptions of natural, cultural, and economic resources and identify strategies to reduce harm to those resources. They also prioritize which response strategies should be implemented based on the location of the spill.

[1] Geographic response plans are available on the Washington State Department of Ecology's website at http://www.ecy.wa.gov/programs/spills/preparedness/GRP/index.html

- **Grays Harbor Geographic Response Plan.** This GRP defines information specific to the entire Grays Harbor estuary (the mouth of the Chehalis River to the east, the North Bay, and the South Bay) and the major islands within the estuary (Goose, Sand, Whitcomb, Grass, Laidlaw, and Rennie Islands) plus everything encompassed by these features.
- **Chehalis River Geographic Response Plan.** This GRP was completed in June 2015. The plan includes waters upstream of the eastern boundary of the Grays Harbor GRP near Cosmopolis and covers 120 miles of the river as it winds east/southeast to Centralia and Chehalis, then west to the South Fork Chehalis River and West Fork Chehalis River.

4.2.2.3 Local Response Plans

Emergency response planning is managed through the local emergency planning committees, which consist of representatives from local government, emergency response officials, environmental and citizen groups, industry and other interested parties. Grays Harbor, Lewis, and Thurston Counties each have a local emergency planning committee.

4.2.2.4 Westway Terminal Company LLC Operations Manual

Under existing conditions, the applicant is required to take spill prevention and response precautions in accordance with its USCG-approved operations manual for the storage, handling, and transfer of methanol. These procedures are currently in place because methanol is considered a hazardous substance designated under section 102(a) of the Comprehensive Environmental Response, Compensation, and Liability Act and the potential for contamination of U.S. waters regulated by USCG consistent with the National Contingency Plan and 33 CFR 154. This plan would identify sensitive environments for fish and wildlife, training and exercise procedures, notification procedures, and facility response activities for different spill sizes. The applicant currently operates without Ecology oil spill plans because methanol does not fall under the definition of oil for Washington State. Additional information on Westway Terminal Company's current procedures is described in Chapter 3, Section 3.14, *Hazardous Materials*. The federal and state requirements would apply to the proposed action.

4.2.2.5 Rail and Vessel Oil Spill Plans

PS&P does not currently transport oil in bulk and, therefore, does not have an oil spill response plan. Prior to transport of oil in bulk, PS&P would be required to submit an oil spill response plan to Ecology and FRA for approval. In August 2016, Ecology adopted final rules (WAC 173-186) establishing railroad oil spill contingency plan requirements and drill and equipment verifications. In July 2016, PHMSA proposed a new federal rule (81 FR 146) updating and clarifying the comprehensive oil spill response plan requirements for high-hazard flammable trains. The proposed revisions to 49 CFR 130, 171, 173, and 174, also include codifying emergency notification procedures, requiring that operators be prepared to respond to a worst-case discharge, and establishing methods for testing initial boiling point for flammable liquids. The final rules and proposed changes issued by PHMSA (80 FR 26643; 2015 and 81 FR 146; 2016, respectively) and Ecology (WAC 173-186) establish notification procedures for railroads. Specifically, the revised rules require railroads to notify state, local, and tribal officials with appropriate contact information. These entities may request information related to the routing of hazardous materials through their jurisdictions. The federal rule replaces the earlier order to notify state emergency response commissions or other appropriate state-delegated entities about the operation of oil trains through

their states. The federal rule became effective July 7, 2015) when the information-sharing portion of the routing requirements went into full effect. Facilities and railroads are required to report crude oil delivery by rail to Washington State. State officials will then provide the information to local first responders and to the public quarterly in an aggregated form on the state website.

Although it is not known which vessel operators would be transporting oil related to the proposed action, vessels operating in the study area would be required to have USCG-approved operations manuals and federal and state contingency and response plans consistent with the regulations listed in Table 4.2-1.

4.2.2.6 Drills and Exercises

State oil spill contingency plan holders must meet federal and state requirements to plan and carry out drills and exercises in accordance with 33 CFR 154 and 155 (Section 154.1955 for facilities and Section 155.1060 for vessels) and WAC 173-182 and 173-186 so that all components of the contingency plan are exercised at least once every 3 years. USCG and EPA are responsible for implementing the federal preparedness drill program. Ecology's Spills Program reviews and approves contingency plans and conducts drills and exercises. Washington State follows a modified triennial cycle for drills, as found in the federal National Preparedness for Response Drill Program to test each component of the plan. The following drills are included in each 3-year cycle (WAC 173-182-710 Type and Frequency of Drills).

- Tabletop[2] drill every year.
- Equipment deployment drills, two per year. These include deployments for the GRPs and equipment used for the response. Response to land based spills, emergency shut offs and initial safety assessment are also tested in deployment drills.
- Unannounced drills as initiated by Ecology.
- Wildlife deployment drill once every 3 years for wildlife equipment and handlers.
- Tank vessel "umbrella plans," including Washington State Maritime Cooperative, once every 3 years.

4.2.3 What framework provides responses to an incident?

Oil spill and hazardous material spill response and contingency plans are formalized at the national, regional, state and facility level. Local and state first responders will likely be the first to respond to an incident (Table 4.2-2). The response framework includes a well-established and coordinated system for notification and evaluation of an incident, including having appropriate resources available and deployed. If an incident occurs, the best approach for containing and controlling a spill or fire is to respond rapidly, aggressively, and in a well-coordinated manner. A response will be more likely to meet these standards if response measures have been planned ahead of time.

[2] Tabletop drills involve bringing key personnel together to discuss how to implement a contingency plan using different scenarios.

For each contingency plan holder, response equipment must be identified as part of the plan to meet requirements of a worst-case spill. The federal and Washington State rules use an approach where equipment is cascaded into the area within regulatory periods. Equipment is listed by plan holders and response contractors on the Western Response Resource list.[3] This equipment is available for use in a facility, rail, or vessel spill.

4.2.3.1 National Response System

The federal National Response System is a scalable, flexible, and adaptable guide for responding to oil and other hazardous material spills. The system coordinates key roles and responsibilities across the nation. The National Response System provides a team of trained personnel for the federal on-scene coordinator. Team members have received specialized training for oil spill and hazardous materials releases.

Responses are managed using the National Incident Management System. This system establishes unified command structure, which includes federal, state, local on-scene-coordinators, and tribal and agency representatives with jurisdiction. Within the unified command structure, the representatives make decisions as a team, sharing resources and information to mitigate the situation. The unified command structure is used for emergency response, fire, disaster, wildfire, and law enforcement operations. It provides an effective framework for responding to various incidents.

4.2.3.2 State and Local First Responders

Ecology response teams are based in Bellingham, Bellevue, Olympia, Vancouver, Yakima, and Spokane. These teams are available year-round, 24 hours a day, to respond to incidences.

Local and state fire, police, or emergency personnel are likely to be the first responders to an incident, whether at the terminal, on the PS&P rail line, or in the harbor. Information about response capabilities in each of these areas is discussed in Sections 4.4, 4.5, and 4.6, respectively. First responders would provide an initial investigation and enact defensive operations until appropriate and adequate resources are on scene. While there are several fire departments in the study area, they currently do not have the appropriate equipment for initial responses to hazardous materials incidents, such as a large oil spill, fire, or explosion to sufficiently address existing risks (Washington State Department of Ecology 2015). A recent Washington Emergency Management Division survey of local fire departments and emergency managers showed that "35% of respondents (statewide) do not have access to a Type I Hazardous Response Team and 12% have no access to any type of hazardous response team at all" (Washington State Department of Ecology 2015).

4.2.3.1 State and County Comprehensive Emergency Management Plan

The Washington State Comprehensive Emergency Management Plan describes how state agencies work together to respond to emergencies. The Washington State Patrol investigates reports of fires and hazardous material incidents through the director of fire protection or the state fire marshal. The Washington State Emergency Management Department and Ecology are also notified of these incidents.

[3] www.wrrl.us

The Grays Harbor County Department of Emergency Management maintains the County's Comprehensive Emergency Management Plan (Grays Harbor County undated), which provides guidance for local fire departments and other agencies that would respond to an oil spill or hazardous material incident in the study area.

4.2.3.2 Spill Notification Requirements

Oil and hazardous substance spills must be reported under federal and state law. The spiller is always responsible for reporting a spill. Any spill that causes any of the following conditions must be reported to federal and state agencies and appropriate spill response actions must be taken.

- A violation of applicable water quality standards.
- A film, sheen, or discoloration on the surface of the water or adjoining shorelines.
- A sludge or emulsion deposited beneath the surface of the water or on the adjoining shoreline.

The entity responsible for the spill (often referred to as the responsible party) must make the notifications and take response actions.

- **Facilities**. Any person owning or operating the facility.
- **Rail.** The railroad owner or operator.
- **Vessels.** In the case of a vessel, any person owning, operating, or demise chartering the vessel.

Under federal law, spills must be reported to the National Response Center, a 24-hour operations center that gathers information and notifies appropriate agencies, including state agencies.

Under state law, Ecology must be notified when any amount of regulated waste or hazardous material that poses an imminent threat to life, health or the environment is released to the air, land, or water, or whenever oil is spilled on land or to waters of the state. Ecology responds to emergency incidents involving releases and spills of oil and hazardous materials that have the potential to harm the natural environment and affect public health. Under state regulations, facilities (WAC 118-40-300) and vessel (WAC 88.46.100; RCW 90.56.280) owners or operators must notify the state immediately of all hazardous material releases and oil spills. This notification requirement is in addition to the federal notification requirement.

The Washington State Oil Spill Contingency Plan (WAC 173-182) requires that the applicant's contingency plan include procedures to notify appropriate parties immediately when a spill has occurred. The plan must identify who is responsible for implementing the notification process. The plan will include a list of the names and phone numbers of required notifications to government agencies, response contractors, local government, tribes and spill management team members and will have a clear order of priority for immediate notification.

4.2.3.3 Oil Spill Response Contractors

The applicant must maintain an oil spill response contractor for oil spill response. These contractors provide spill response equipment and trained personnel. The Western Response Resource List outlines various types of response equipment maintained by participating private and public response organizations in the Pacific Northwest. Additional resources from across the United States are available as needed.

4.3 Risk Considerations

Impacts of a spill of oil or any hazardous material, should one occur, depend on multiple factors, such as the chemical properties of the spilled material and the environmental conditions at the time of the spill. These factors are described below.

4.3.1 How do the characteristics of spilled materials contribute to potential impacts?

The proposed action would involve the handling, storage, and transport of crude oil. These materials, described in the following subsections, have unique characteristics that contribute to spill risks and impacts.

4.3.1.1 Material Characteristics

Hazardous Materials Classification

The federal hazardous material regulations (49 CFR 171–180) require the proper classification and characterization of a material, which, in turn, determine its transportation requirements. Hazardous materials are categorized by analysis and experience into hazard classes and packing groups based on the risks they present during transportation. Characterization includes identifying the effects a material has on both the reliability and safety of the packaging that contains it. Crude oil's properties and characterization may vary considerably based on time, location, method of extraction, temperature at time of extraction or processing, and the type and extent of processing of the material (Section 4.3.1.2, *Crude Oil Properties*).

Currently, as shipped, crude oil is classified as Class 3 flammable liquid. The U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA) issued a safety alert on January 2, 2014, warning of potential crude oil variability. The alert emphasized conducting proper and sufficient testing to ensure accurate characterization and classification. The safety alert expressed PHMSA's concern that unprocessed crude oil may affect the integrity of packaging or present additional hazards related to corrosiveness, sulfur content, and dissolved gas content. The final rule issued by PHSMA in May 2015 (80 FR 26643) requires accurate classification and enhanced standards for transportation of highly flammable materials, including Bakken crude oil. The specifics of these requirements and the implications for safety in the study area are discussed in Section 4.5, *Environmental Health Risks—Rail Transport.*

Flashpoint

Flashpoint is the temperature at which a fuel will ignite when exposed to an open flame. The flashpoint is used as an index of fire hazard for hazardous materials. A Class 3 flammable liquid has a flashpoint of not more than 140°F (60°C) (49 CFR 173.120). The flashpoints of the crude oils considered under the proposed action—Bakken crude oil and diluted bitumen—are presented in Table 4.3-1 along with other crude oils and petroleum products for comparison purposes.

Table 4.3-1. Flashpoints of Crude Oils and Petroleum Products

Material	Flashpoint[a]
In Situ heavy crude	304°F / 151°C
Bakken crude oil	-73°F or -58°C to 230°F or 110°C
Heavy crude oil (conventional)	-22°F or -30°C to 140°F or 60°C
Light sweet crude	16°F/ -9°C
Diluted bitumen	-31°F/ -35°C
Gasoline	-31°F/ -35°C

[a] Chemical properties of crude oils and petroleum products are high individualized depending upon the source of the crude oil or the petroleum product. Flashpoints derived from other studies will most likely vary from the ones in this table.

Sources: Jokuty 2005 in Tsaprailis 2014; American Fuel & Petrochemical Manufacturers 2014; Polaris 2013.

Persistent and Nonpersistent Oils

Persistence describes how long oil persists in the environment and how the material may behave as it weathers or changes over time. Persistence is one of many factors that determine the impacts of an oil spill and the type and effectiveness of the recovery methods employed. Therefore, along with the amount of oil spilled, the physical characteristics of the area, and the local weather conditions, the persistence of the oil is incorporated into the development of response plans and evaluation criteria used by Washington State, the U.S. Coast Guard (USCG), and the U.S. Environmental Protection Agency (EPA). The definitions of persistent and nonpersistent oils are listed in Table 4.3-2.

Table 4.3-2. Definitions of Oil Persistency for Response Plan Regulations

Nonpersistent oils (Group I)	A petroleum-based oil that consists of hydrocarbon fractions: At least 50% of which, by volume, distills at a temperature of 340°C (645°F) At least 95% of which, by volume, distills at a temperature of 370°C (700°F)
Persistent oils (Group II to Group V)	Group II: specific gravity less than 0.85 Group III: specific gravity equal to or greater than 0.85 and less than 0.95 Group IV: specific gravity equal to or greater than 0.95 and less than 1.0 Group V: specific gravity equal to or greater than 1.0

Source: 40 CFR Part 112, Appendix E to Part 112 - Determination and Evaluation of Required Response Resources for Facility Response Plans, 33 CFR Part 155.1020 Definitions.

Generally, nonpersistent oils (Group I oils) such as diesel, kerosene, and gasoline have lower viscosity and dissipate quickly in the environment. However, rapid dissipation does not diminish the acute toxic effects of such oils on organisms if materials are spilled in higher quantities or on public health if the fumes are confined.

Persistent oils (Groups II through V) are heavier oils with higher viscosity that persist longer in the environment. Crude oil is a persistent oil. Bakken crude oil is a Group II oil and diluted bitumen is a Group III oil when transported and arguably behaves like a Group V oil upon weathering (Section 4.3.1.2, *Crude Oil Properties*).

4.3.1.2 Crude Oil Properties

Bakken Crude Oil

Bakken crude oil is considered an "unconventional" crude oil due to the unconventional method in which it is mined. Bakken crude is produced by hydraulic fracturing (fracking). Because of the way it is mined, Bakken crude is referred to as a shale oil. Large known shale oil reserves include the Bakken formation straddling North Dakota and Montana and parts of Saskatchewan and Manitoba (Canada) (Lee et al. 2015: 69).

As discussed in Chapter 3, Section 3.14, *Hazardous Materials*, Bakken crude oil is typically characterized as a light crude oil; it contains more volatile components and flows more easily (is less viscous) than heavier types of crude oil. Under response plan regulations (Table 4.3-2), Bakken crude oil is considered a Group II Persistent Oil. From a cleanup perspective, Bakken crude oil is easier to remove from the environment than heavier oils (Lee et al. 2015: 226). However, the volatility and flammability of Bakken oil could pose a concern for responders.

Diluted Bitumen

The bitumen imported into the United States is produced from Canadian oil sands. Bitumen is a highly viscous, nearly solid type of petroleum that occurs in natural deposits along with clay, sand, and water. Like Bakken, bitumen is also mined using unconventional methods. For transport, bitumen is diluted with diluents such as natural gas condensates, naphtha, or other light oils and called diluted bitumen (also known as *dilbit*). (Lee et al. 2015: 36, 73; National Research Council 2013: 34–35 and 47). Although dilbit is classified as a crude oil, the added diluent means that, when spilled into the environment, dilbit will behave differently than other heavy oils (National Oceanic and Atmospheric Administration 2015). As noted, dilbit is a Group III persistent oil when transported. Group III oils have a specific gravity equal to or more than 0.85 and less than 0.95. The specific gravity of fresh water is 1, which means that dilbit is less dense than fresh water and, if spilled in the environment, would initially float in fresh water and salt water. However, if spilled dilbit were to remain in the marine environment, the lighter components would evaporate and, as experienced during the 2010 Enbridge spill in the Kalamazoo River, Michigan, the leftover residue becomes denser than what was spilled initially.[1] The responders for the Enbridge spill found that after the oil remained in the environment for a few hours or days, it sank because its composition changed (weathered).[2]

Weathering Behavior

Oil weathering (how the physical and chemical characteristics of the spilled oil change over time) can affect the persistence of oil in the environment. The processes involved in weathering include the potential for spreading, evaporation, dispersion, emulsification, sinking, and biodegradation. Factors influencing the weathering behavior of Bakken oil and dilbit are summarized below and

[1] The 2010 Marshall Spill (Kalamazoo River in Kalamazoo, Michigan) from the Enbridge Pipeline occurred after a 30-inch pipeline ruptured on Monday, July 26, 2010, near Marshall, Michigan. The release was estimated at 843,000 gallons of diluted bitumen.

[2] During a study conducted in Gainford, Alberta in 2013 over a 10-day period, spilled dilbit crude oil did not submerge or sink under simulated weather conditions (Witt O'Brien's et al. 2013: 61). However, the study authors note that after weathering (particularly in a fresh water environment) and with the addition of sediment dilbit could become submerged (Witt O'Brien's et al. 2013: 41 and 60).

discussed in Appendix N, *Oil Spill Modeling*. Weathering behavior, or how spilled oil changes over time and persists in the environment, greatly influences how best to respond to an oil spill and the potential for environmental impacts.

Although crude oils generally contain the same classes of compounds, the amounts of the different compounds in each type of crude oil vary, producing different effects when the oil weathers in the environment. Table 4.3-3 shows a comparison of important crude oil properties, like viscosity, among different crude oils before a spill and after additional weathering.

Table 4.3-3. Comparison of Important Crude Oil Properties Prior to Release

Type of Crude Oil	Adhesion (g/m^2)	Density (g/cm^3)	Viscosity (mPa-s)	Flashpoint (°C/°F)
Light crude[a]	0	0.77	1	-30/-22
Weathered light crude[b]	9	0.84	5	95/203
Medium crude[c]	12	0.85	8	-10/14
Weathered medium crude	33	0.90	112	>110/>230
Heavy crude[d]	75	0.94	820	-3/26.6
Weathered heavy crude	600	0.98	475,000	>95/>203
Diluted bitumen[e]	98	0.92	270	-35/-31
Weathered diluted bitumen	1,580	1.002	50,000	>70/>158

Source: National Academies of Sciences, Engineering, and Medicine 2016.
[a] Scotia Light.
[b] After additional weathering.
[c] West Texas Intermediate.
[d] Sockeye Sour.
[e] Cold Lake Blend.
g/m^2 = gram per square meter; g/cm^3 = gram per cubic meter; mPa-s = millipascal-second

Crude oil exhibiting lower adhesion is easier to remove from the environment. Density is one indicator of whether the crude oil is likely to sink. Crude oils with a density approaching or greater than 1 gram per cubic meter are more likely to sink, particularly if they come in contact with even small amounts of sand, clay, or suspended sediment (National Academies of Sciences, Engineering, and Medicine 2016: 29). Viscosity is a measure of a flow resistance and influences how rapidly spilled oil spreads and how easy it may be to collect with traditional collection equipment. The flashpoint influences the extent to which the crude oil may be likely to ignite. A liquid with a flashpoint of less than 140°F (60°C) is considered to be flammable (U.S. Department of Transportation 2016).

Table 4.3-3 shows that Bakken crude (a light crude) exhibits relatively lower adhesion, density, viscosity, and flashpoint when compared to other types of heavier crude oils, with the exception of dilbit's flashpoint. In addition to the characteristics of the spilled oil, the effects of crude oil on the environment depend a great deal on how the oil is spilled and into what type of environment it is spilled.

Table 4.3-4 provides a qualitative comparison of the physical properties between weathered Bakken crude oil and other light crude oils if spilled in the environment and the comparative effects on cleanup. Light crude oils, such as Bakken, are slightly less viscous than medium crude oils and significantly less viscous than heavy crudes and will spread rapidly on the water's surface if spilled in a marine environment without a source of ignition. If ignited, however, Bakken crude oil will

burn. Firefighters and incident responders will determine the best methods to fight the fire. This could include applying firefighting foam, cooling tank cars with water, or monitoring the fire (U.S. Department of Transportation 2016). In the absence of an ignition source, the evaporation rate of a light crude oil like Bakken can be substantial (between 30 and 50% of the amount spilled) (Lee et al. 2015: 78). The oil remaining in the environment is less altered than weathered dilbit and more easily cleaned using traditional recovery methods (skimmers and sorbent materials).

Table 4.3-4. Comparative Discussion of Behavior of Bakken Crude Oil versus Other Light Crude Oils for Response and Cleanup Considerations

Property	Bakken Compared to Other Light Crude Oils	Cleanup Considerations
Viscosity	Similar to other light crudes.	Bakken crude oil will quickly spread and evaporate when spilled on water.
Density	Similar to other light crudes.	Oil will float on water's surface and can be recovered using conventional forms of spill response.
Flashpoint	Lower flashpoint than most other crudes in the U.S.	Is a flammable liquid. Should keep away from ignition sources.
Adhesion	No data	Adhesion is not a property of concern for light crude oils due to high rate of evaporation.

Sources: Washington State Department of Ecology 2015; Commonwealth of Massachusetts Department of Environmental Protection 2016.

Table 4.3-3 shows that dilbit tends to be more adhesive, dense, and viscous than other crude oils; however, the diluents that are added to bitumen to facilitate transport are volatile. Prior to a spill in the environment, dilbit is most likely to be classified as a flammable liquid for transport by rail or vessel, although weathered dilbit is not flammable. When dilbit spills and weathers, the diluent evaporates and the residual oil will increasingly adhere to surfaces (National Academies of Sciences, Engineering, and Medicine 2016). The density of dilbit prior to a spill is comparable to that of other oils classified as Group III or IV oils (Table 4.3-3). However, weathered dilbit rapidly approaches the density of a Group V oil, becoming greater than 1 and therefore more likely to sink in water. This property of dilbit may result in more spilled oil persisting in the environment if it is not recovered rapidly (using a vacuum, skimming, or manually) compared to other crude oils. This affects how rapidly on-water collection equipment would be required at the scene of a spill. As the diluent evaporates, the remaining dilbit residue becomes extremely viscous; more so than the weathered residue of other commonly transported crude oils (light and medium crudes), making it harder to collect with the required on-water containment and skimming equipment.

Weathered dilbit is best compared to the behavior of heavier crudes in the environment (rather than light and medium crudes), but there are important differences even between dilbit and heavy crude oils. Table 4.3-5 provides a qualitative comparison of the physical properties between weathered dilbit and heavy crude oils if spilled in the environment and the comparative effects on cleanup. Chapter 4, *Spill Response Planning and Implementation*, of the 2016 National Academies of Sciences, Engineering, and Medicine (2016) study contains additional information about the properties of dilbit and heavy crude and their implications for spill response.

Table 4.3-5. Comparative Behavior of Dilbit versus Other Heavy Crude Oils for Response and Cleanup Considerations

Property[a]	Dilbit Compared to Other Heavy Crude Oils	Cleanup Considerations
Viscosity	Slightly less viscous prior to release than a heavy crude oil. Rapidly approaches same level of viscosity to a heavy crude after initial weathering.	Although less viscous than a heavy crude spilled dilbit will leave more residue in the environment than the heavy crude as the diluents evaporate.
Density	Densities of weathered dilbit can approach and possibly exceed that of heavier crude oils.	The longer dilbit remains in the environment the more likely it will submerge unlike most other crude oils.
Flashpoint	Due to diluents, flashpoint prior to release is similar to light crude (lower than heavy crude). After a release, flashpoint increases as diluents evaporate.	Rapid containment of spilled dilbit is complicated due to flammability and volatile vapors unlike heavier crudes.
Adhesion[b]	More adhesive than heavy crude. Adhesiveness increases with additional weathering.	Adhesion of dilbit to the surfaces of rocks, manmade structures, and vegetation can impede cleanup.

Source: National Academies of Sciences, Engineering, and Medicine 2016.

[a] The properties as presented in this column are interrelated and affected by the ambient temperature and other environmental conditions.

[b] Adhesion is not a property that is measured during industry-standard analyses of crude oils but it is an important variable for spill cleanup.

4.3.2 What environmental factors contribute to potential impacts from an incident?

Factors such as the amount of oil spilled, product characteristics and persistence, physical characteristics of the area, local weather conditions, and water flow conditions can influence the outcome of a spill. These factors are important to consider for planning and responding to spills. This section provides information for these factors and describes how they influence the spill consequences.

4.3.2.1 Air Dispersion

Volatile vapors released from a spill may create flammable atmospheres or inhalation hazards. Air monitoring should be implemented as soon as possible by first responders. Responders should wear appropriate respiratory protection based on air monitoring results, such as air-purifying respirators or self-contained breathing apparatus to avoid potential exposure when responding. Climatic patterns that may affect the dispersion of vapors in the study area are presented in Appendix D, *Air Data.*

4.3.2.2 Weather Conditions

Weather conditions can influence the movement and spread of oil in the environment. Weather in the study area is typically windy and rainy in winter and relatively cool in summer, with some periods of fog in summer and, to a lesser degree, in the fall. Wind and fog conditions are often local to Grays Harbor. Winds recorded at Bowerman Airport (in Grays Harbor) are generally from the east or northeast during the winter and the west or southwest or directly from the south (less

frequently) during the summer. The strongest winds, more frequent during winter storms from October through March, reach gale force (34 to 40 knots) 3 to 6% of the time. Average wind speeds year round are generally 9 to 10 miles per hour. Storms are less frequent in the spring and summer.

In the winter, rain falls on about 15 to 25 days per month. Rainfall diminishes to 8 to 15 days per month in the spring and 5 to 10 days per month in the summer. Average temperatures range from 35 to 50°F in midwinter to a high of 68 to 69°F in the hottest summer months (July to August).

Weather near the lower Chehalis River is similar to weather in Grays Harbor. Further inland along the river toward Centralia, the weather is similarly mild. The interior of western Washington has slightly less measurable rainfall on record than along the coast (150 days each year versus 190 days along the coast) and temperatures are generally 10 degrees warmer in the summer months.

4.3.2.3 Water Flow

In addition to fog and swells caused by high winds, water flow conditions in the Bar Channel Reach of the Grays Harbor Navigation Channel (at the entrance of the harbor) vary depending on ebb or flood tidal currents, speed of the Chehalis River runoff, wind, and ocean swells just outside the entrance. Average current velocity is about 1.9 knots on the flood and 2.8 knots on the ebb but velocities have been known to reach 5 knots. The direction of the current near the bar can be erratic, running north close inshore and south offshore. In the harbor, current velocities in the navigation channels seldom exceed 3 knots. The tidal cycle in Grays Harbor is mixed semidiurnal (two high tides and two low tides in a 24-hour period with varied heights), which means that tidal height relative to mean low water ranges from less than 1 foot to almost 9 feet twice a day.

The discharge rate (flow) in the Chehalis River Basin is characterized by seasonal variation, with sharp rises of relatively short duration from October to March corresponding to the period of heaviest rainfall (U.S. Army Corps of Engineers 2003). A low flow of 731 cubic feet per second is based on the period of record (1952 to 2013) for the U.S. Geological Survey stream gauge at Porter, Washington. Higher flow events range from a 2-year flood (31,000 cubic feet per second) to a 100-year flood (83,000 cubic feet per second). Flow velocities for these flow events in the lower Chehalis River average 1.3 cubic feet per second for the low flow case, 4.0 cubic feet per second for the 2-year flow case, and 4.8 cubic feet per second for the 100-year flow case. These average velocities are influenced by the shallow gradient of the river and the backwater effect of the tidally influenced portion of the river. While these velocities can vary based on the tides, they are typical for a river with similar topography and hydrologic characteristics.

4.4 Environmental Health Risks—Terminal (Onsite)

This section addresses the potential environmental health risks (specifically the likelihood of spills, fires, or explosions of various sizes) associated with operations at the terminal (onsite). This section first describes the environmental health risks that would exist under the no-action alternative to provide context for how risks would change with the addition of the proposed action. It then describes the potential risks related to oil spills, fires, and explosions associated with terminal operations under the proposed action. This section describes the existing planning, preparedness, and response framework intended to address risks at the terminal and identifies additional applicant mitigation measures to further address risks. The section concludes with a discussion of the unavoidable and significant adverse impacts of the proposed action and an explanation of financial responsibility for emergency response and cleanup activities if an incident occurred at the terminal.

4.4.1 What are the existing risks?

This section describes the existing risks and potential environmental health risks (frequencies and consequences of different scenarios) that could occur under the no-action alternative, which would represent a continuation of the existing risks. The environmental health risks at the existing facility include the potential for exposure of people and the environment to the liquids and chemicals that are currently stored, handled, and transported on site. Exposure to these materials could occur due to incidents caused by human error, equipment failure, or in extreme cases, natural disasters, such as earthquakes or other seismic-related events. Depending on the circumstances of an incident and the properties of the chemicals, the people, plants, and animals in the environment could suffer direct toxic impacts or secondary impacts from exposure to vapors. In some cases, incidents could result in the potential for fires or explosions.

4.4.1.1 Oil Spills

Under the no-action alternative, the methanol distribution facility would continue similar to existing conditions. As described in Chapter 3, Section 3.14, *Hazardous Materials*, the environmental health risks would be related primarily to exposure to hazardous materials such as fuels used in facility vehicles, solvents, cleaning agents, paints, oil filters, used oil, batteries, aerosol cans, and fire-fighting foam. Spills of these chemicals and those stored in bulk, including methanol, could occur as the result of human error (e.g., improper use, not following required handling and storage protocols) or equipment failure (e.g., leaking vehicles or minor hose leaks). As noted in Section 3.14, *Hazardous Materials*, most spills that occurred under these circumstances would be expected to be relatively small and easily contained.

The greatest potential for larger-scale spills would be related to incidents involving materials that are handled, stored, or transported in bulk. Under the no-action alternative, these would continue to include methanol. During existing operations, the greatest potential for impact from larger-scale spills would be associated with vessel transfers. This is because vessels carry the greatest volumes at one time and they travel and transfer oil exclusively over water where spills are not as easily contained.

Because it is not possible to predict the timing or exact magnitude of an incident, the following spill scenarios were considered to provide an understanding of the range of risks under the no-action alternative. For additional details about the analysis of risks under the no-action alternative, see Appendix M, *Risk Assessment Technical Report*.

Because the potential impacts of exposure to spills would vary depending on the specific circumstances at the time of the incident, the potential environmental impacts are addressed in general terms in Chapter 3, Section 3.14, *Hazardous Materials*.

- The **small rail-unloading spill scenario** (up to 2,100 gallons [50 barrels]) could occur once in 25 years. Reported data have shown that most of these spills would be fewer than 200 gallons. Because the spill amount is less than the unloading area containment, the spill is expected to be contained.
- The **small vessel-loading spill scenario** (up to 2,100 gallons [50 barrels]) could occur once in 37 years. Reported data have shown that most of these spills would be fewer than 200 gallons. Some methanol is likely to be contained on the facility, on the deck of the vessel, or on the dock but could spill to surface waters or to the ground.
- The **medium vessel-loading spill scenario** (represented by 10,000 gallons [238 barrels]) could occur once in 588 years. A small amount of the methanol would be contained on the facility or vessel but the remainder could spill to water.
- The **medium pipeline or storage tank spill scenario** (represented by 50,400 gallons [1,200 barrels]) could occur once in 2,500 years. This volume of spill could occur in the event of a pipeline rupture or a smaller storage tank failure. Depending on circumstances of the event, it is possible that the existing containment areas would contain the majority of a spill of this size; however, if extensive infrastructure damage were to occur, as might be the case in the event of an earthquake, widespread environmental damage could occur.
- The **large storage tank spill scenario** (up to 3.4 million gallons [80,000 barrels]) could occur once in 50,000 years. This release of the entire contents of a storage tank resulting from storage tank or containment failure could occur as a result of a material failure, containment failure, or a seismic or tsunami event. Some of the methanol would be caught in the containment area but the remaining oil could spill to land or water. If extensive infrastructure damage were to occur, widespread environmental damage would be likely.

4.4.1.2 Fires or Explosions

Under the no-action alternative, there would be the possibility of fires or explosions related to the ongoing methanol operations. Although no incidents have occurred at the existing facility, one explosion at the adjacent Imperium Terminal Services site was reported on December 2, 2009, when a 10,000-gallon tank containing heated glycerin exploded because of over-pressurization. The explosion damaged a 5,000-gallon tank of sulfuric acid (U.S. Environmental Protection Agency 2009 and Butorac pers. comm.). No one was injured and no sulfuric acid or glycerin reached the water because of the incident.

While the materials released would not be crude oil, the existing operations still handle and store flammable materials, such as methanol, which might ignite if spilled and exposed to an ignition source. The chance of an explosion is dependent on the material involved and the configuration of the release, including the amount of combustible gases present. Explosions would be less likely to

occur than a fire, as not all flammable materials are explosive and not all releases would have the necessary amount of confinement to support an explosion.

4.4.1.3 Response

The existing methanol facility, other Port facilities, commercial uses, and the City of Hoquiam and Aberdeen residents rely on the Hoquiam Fire Department and the Aberdeen Fire Department for initial incident response. As noted in Section 4.2, *Applicable Regulations,* and described below, local emergency services has limited equipment for hazardous materials responses.

Hoquiam Fire Department

The Hoquiam Fire Department provides 24-hour fire protection and emergency medical services (EMS) to the city of Hoquiam. The department's headquarters station is located at 625 8th Street and a second station, closer to the project site, is located at 517 Ontario Street. The headquarters station is approximately 2 miles from the project site; the second station on Ontario Street is approximately 1 mile from the project site. In the event of a spill or fire at the project site, personnel from one or both stations may be dispatched, depending on other obligations. The fire department consists of seven personnel that rotate through three shifts to have three full-time personnel on call at one time. Currently, the station responds to approximately 3,000 calls per year. A majority of these are related to emergency medical services with a small percentage being fire-related. One fire truck/engine and one ambulance are stationed at the Ontario Street station; both are in need of replacement to be able to adequately respond to a fire or emergency call at the project site (Dean pers. comm.).

In addition to fire trucks, a foam trailer, stored at the Ontario Street station, carries four 265-gallon alcohol-resistant aqueous film-forming foam (AR-AFFF) totes and a 300-gallon Purple K dry extinguisher. The totes do not have pumping capabilities and must be paired with a fire engine to pump and apply the foam. The Hoquiam Fire Department works with the Aberdeen Fire Department through a mutual aid agreement that dictates that both departments respond to calls together.

Aberdeen Fire Department

The Aberdeen Fire Department provides fire protection and EMS to the city of Aberdeen and EMS coverage outside of the city. Specifically, the Aberdeen Fire Department is responsible for providing initial fire response for railway incidents on the east side of the Port of Grays Harbor, Poynor Yard, and the rail line through East Aberdeen.

The department includes two stations, the north-side headquarters station at 700 West Market Street and a substation in south Aberdeen at 700 West Curtis Street. Staffing at both stations includes approximately 33 uniformed personnel, one EMS account specialist, and one department chaplain. Eight to 10 personnel staff both stations daily and firefighters are trained in paramedic and emergency medical technician-level services. In 2013, the fire department responded to 4,696 service calls (453 fire-related and 4,243 emergency medical response-related) (City of Aberdeen Fire Department 2014). Per comments submitted on the public Draft EIS, Aberdeen currently has one fire truck, one ladder, and one ambulance.

The response to a fire or hazardous material incident would include one command unit with one battalion chief, one ladder truck with two personnel, one fire engine with three personnel, and one ambulance with two personnel. On escalating incidents, the fire chief and assistant chief respond

and off-duty personnel are called back to service using predetermined alarm escalations (Hubbard pers. comm.).

Hazardous Materials Response

A hazardous materials response at the project site would involve personnel and equipment from The Aberdeen and City of Hoquiam Fire Departments under the mutual aid agreement. The State of Washington requires that fire fighters receive training in hazardous materials response and fire fighters from the City of Aberdeen and City of Hoquiam have been trained to the Hazardous Materials Operations level. This 32-hour course at the Washington Fire Training Academy provides first responders with the understanding and skills necessary to detect the presence of hazardous materials, identify the hazards associated with the materials, and take defensive action against the materials.

Other Local Response Assets

The Cosmopolis Fire Department is a volunteer fire department located approximately 4.5 miles southeast of the project site (City of Cosmopolis Fire Department undated). Additional municipal fire departments that could support an emergency at the project site are the City of Westport and the City of Ocean Shores Fire Departments. Both are located along the perimeter of the harbor, to the southwest or northwest of Hoquiam, respectively. Response time to an emergency at the project site is dependent on vehicle travel times over surface roads, which could take from 30 to 60 minutes for either department depending upon traffic. The Westport Fire Department is called upon occasionally (approximately four times a year) to the Westport Boat Basin to investigate sheens on the water (Benn pers. comm.).

In addition to the above-listed municipal fire departments, Grays Harbor Fire Protection Districts are available to provide personnel and fire apparatus in the event of an emergency within their respective areas of operation. Refer to Table 4.5-1 in Section 4.5, *Environmental Health Risks—Rail Transport*, for additional information.

Emergency Response Plans

The applicant has an Occupational Safety and Health Administration-mandated Emergency Action Plan for the existing facility. The Emergency Action Plan details actions to be taken by employees on site in the event of an emergency and stipulates notifications to the National Response Center, the U.S. Coast Guard, and the U.S. Environmental Protection Agency in the case of a spill, fire, or explosion.

The Grays Harbor County Local Emergency Planning Committee represents local government, emergency response officials, environmental and citizen groups, industry and other interested parties for the purpose of local emergency awareness and planning for a hazardous material incident within the county. The committee is not a response organization but its membership consists of local, state, and federal first responders.[1] The committee supports community preparedness by encouraging open communication, training, and periodic drills and exercises. The

[1] The Local Emergency Planning Committees meet and plan under the auspices of the State Emergency Response Commission established for the purposes of implementing Title III of the Superfund Amendments and Reauthorization Act passed in 1986 by the federal government and adopted by Washington State in 1987.

Grays Harbor County committee manages the development, maintenance, and promulgation of the County Comprehensive Emergency Management Plan, which is the guidance for local fire departments and other agencies responding to an oil spill or hazardous material incident that takes place at the project site.

4.4.2 What are the potential risks?

Under the proposed action, additional risks would include the possibility of spills of oil that could adversely affect people and the natural environment. The greatest potential for larger-scale spills would occur during the proposed rail unloading, storage, and vessel-loading activities. Under the proposed action, the likelihood of a spill occurring would be greater compared with the no-action alternative, primarily because of the increased number of storage tanks and corresponding increased total volume of crude oil stored on site and increased rail and vessel-unloading and loading activities. Additionally, there would be new environmental health risks related to the potential exposure of people and the natural environment to crude oil.

This section describes the proposed facility and activities that could result in increased risks of a spill, determines the change in the likelihood of a spill occurring under the proposed action, identifies mitigating factors currently in place to minimize the impacts of an incident, and describes the potential extent of a spill and the response actions that would occur. This section also describes the risks of fires or explosions related to the proposed action and the response actions that would occur in the event of a fire or explosion at the project site.

Westway currently has four storage tanks on the northern portion of the site. Each tank has the capacity to hold approximately 80,000 barrels. Under the proposed action, up to five 200,000-barrel floating-roof tanks would be added to store crude oil. The tanks are required to have containment areas able to collect the capacity of the largest tank plus precipitation. However, containment could fail in a catastrophic event. Leaks from the tank or piping within the containment would be expected to remain in the containment and be collected for proper disposal. Tanks are typically isolated using valves unless in use, so a leak or rupture from piping outside of the containment would likely be limited to the quantity of the substance in the piping.

Rail car and vessel unloading and loading would also occur under the proposed action. The rail unloading area would also include a containment area with a capacity to hold the contents of one rail car (typically 30,000 gallons) plus precipitation. Rail-unloading activities (up to approximately 27,594 times annually) would comprise the greatest number of active transfers because of the number of rail cars that must be unloaded on a daily basis. Spills could also occur during the vessel-loading activities (up to 119 additional loadings[2] annually) with releases directly to the water or to containment. Small-quantity containment areas are required at valve connections for transfer operations. Rail activities are more common than vessel activities and this higher frequency poses a greater potential for releases from unloading hoses or connection failures.

[2] As noted in Section 3.17, *Vessel Traffic*, any combination of tank barges and tankers, including those listed in Table 3.17-9, could be used to transport bulk liquids from Terminal 1. For the purposes of this analysis, the maximum number anticipated would be associated with the use of all tank barges. As discussed in Section 4.6, *Environmental Health Risks—Vessel Transport*, reducing the number of vessel trips by using larger vessels would lower the likelihood of a spill; however, in the event that a spill occurred, the spill could be larger.

4.4.2.1 Oil Spills

Oil Spill Risk

Historically, no oil or hazardous materials spills to the water have occurred from the project site since the applicant began activities in Grays Harbor. In 2009, one biodiesel spill of 5,000 gallons occurred at Imperium Terminal Services, and the oil was confined to the containment area with no impact on water. The cause for the spill was mechanical failure.

A summary of West Coast oil spill data for 2014 reported 1,193 spills, of which 15 spills were over 10,000 gallons. More than 79% of the spills were to land. Over the past 13 years, the major spill causes were identified as equipment failure (55%) and human error (30%) (Pacific States/British Columbia Oil Spill Task Force 2015).

Although no major spills have been reported at the project site, the proposed action would increase daily operations, particularly the frequency of loading vessels and unloading rail cars with crude oil. As such, the proposed action would result in the potential for more frequent spills of bulk liquids relative to the no-action alternative, although the orders of magnitude for large spills are very similar. Additionally, the proposed action would introduce bulk handling and storage of crude oil, which is not currently present in the study area. The likelihood of very large releases from storage tank failures would remain low.

A risk assessment (Appendix M, *Risk Assessment Technical Report*) determined the potential frequency of spills of different sizes based on planning requirements applicable to the terminal operations. Incidents with the potential to result in oil spills could occur as the result of various factors, such as human error, equipment failure, and natural events like earthquakes. Activities at the project site most likely to result in oil spills include rail unloading, onsite pipeline transport, tank storage, and vessel loading. The risk assessment applied failure rates for each of these types of events combined with the number of tanks or loadings and unloadings anticipated for the proposed action to derive the likelihood of each scenario. Appendix M provides a discussion of the risk scenarios and the methods used to determine spill frequencies.

As noted previously, it is not possible to predict the timing or magnitude of an incident involving the release of crude oil; therefore, the following spill scenarios were considered to provide an understanding of the types of risks under the proposed action. The likelihood of each spill scenario occurring under the proposed action and related risks are summarized below. For more information about the assumptions, methods, and sources of data used to determine the likelihood of these spills occurring, see Appendix M, *Risk Assessment Technical Report*.

- The **small rail-unloading spill scenario** (up to 2,100 gallons [50 barrels]) could occur once in 9 years. The spill amount is less than the unloading area containment so the spill is expected to be contained.
- The **small vessel-loading spill scenario** (up to 2,100 gallons [50 barrels]) could occur once in 8 years. Some oil is likely to be contained on the facility, on the deck of the vessel, or on the dock but could spill to surface waters or to ground.
- The **medium vessel-loading spill scenario** (represented by 10,000 gallons [238 barrels]) could occur once in 136 years. A small amount of the oil would be contained on the facility or vessel but the remaining oil could spill to water.

- The **medium pipeline or storage tank spill scenario** (represented by 10,000 gallons [238 barrels]) could occur once in 2,000 years. Depending on the circumstances of the event, it is possible that the existing containment areas would contain the majority of a spill of this size; however, if extensive infrastructure damage were to occur, as might be the cause if the cause was an earthquake widespread environmental damage could occur.
- The **large storage tank failure spill scenario** (up to 8.4 million gallons [200,000 barrels]) could occur once in 40,000 years. This release of the entire contents of a storage tank resulting from storage tank or containment failure could occur as a result of a material failure, containment failure, or seismic or tsunami event. Some of the oil would be caught in the containment area but the remaining oil could spill to land or water.

To provide additional information about the risks of a spill and to inform prevention, preparedness, and response planning, oil spill modeling was completed for a subset of the spill scenarios. The purpose of this modeling was to demonstrate the potential extent of spilled oil within the available parameters of the models used and to illustrate the relative influence of various factors, including the location of the spill, material spilled, weather conditions, and hydrologic flow conditions, on the movement of spilled oil. As presented in Appendix N, *Oil Spill Modeling,* the modeling demonstrates that the movement of spilled oil in the harbor can vary dramatically depending on these factors. For more information about the assumptions, methods, and limitations of the modeling, refer to Appendix N.

Depending on these conditions and assuming no efforts were taken to contain the spill, modeling showed that oil could move from the project site to the far shores of the estuary within 24 hours or could remain near the spill site. Spilled oil could also move out of Grays Harbor and up or down the coast, depending on the specific conditions at the time of the incident. Because the potential impacts of exposure to spills on human health and the environment would vary depending on the specific size and circumstances of the spill, impacts affecting the following resources are addressed in general terms in Section 4.7, *Impacts on Resources*.

- Water
- Plants
- Animals
- Aesthetics
- Recreation
- Commercial fishing
- Cultural resources
- Tribal resources
- Air
- Human health
- Public services

Oil Spill Prevention

As discussed in Section 4.2, *Applicable Regulations*, facilities that store and handle oil and hazardous substances must meet federal and state design standards, equipment, training, and operation requirements to prevent spilled oil or hazardous materials from reaching the environment. Washington State has specific regulatory spill prevention, training, and pollution containment equipment standards for Class 1 facilities such as large, fixed, shoreside facilities that transfer materials to or from tank vessels. The facility would be designated a Class 1 facility under the proposed action and subject to Class 1 spill prevention, training and operational standards.

Storage Tank Containment

The proposed facility would be designed and constructed in accordance with 40 CFR 112, 33 CFR 154, and WAC 173–180. The applicant would be required to install appropriate containment and diversionary structures or equipment such as dikes, berms, and retaining walls to prevent discharged oil from reaching navigable waters. The containment must be capable of containing the contents of the largest tank plus precipitation.

Design Standards

State construction and design standards for facilities (WAC 173–180) include oil transfer requirements, containment boom, fixed lighting, effective voice communication requirements, emergency shutdown equipment and procedures, storage tank and pipeline construction and inspection standards, and hose and loading arm specifications. Oil and hazardous material pollution containment equipment, such as sorbent materials and boom, would be positioned in the facility and accessible to employees (33 CFR 154.545).

All hazardous substances must be accounted for in the facility design standards in accordance with state and federal laws and regulations to prevent incidents and to minimize the environmental impact of incidents. For example, all storage tanks and rail car unloading areas would be protected with fire-fighting foam capabilities (foam blanketing fire protection). Tanks would be equipped with high-level alarms, over-pressure protection, floating roofs, and emergency overflows into containment (Imperium Terminal Services 2013:25). Floating roofs could provide vapor containment to reduce air toxics by sitting on the surface of the tank contents, reducing the potential for vapor generation.

Training and Certification Program for Oil-Handling Personnel

Washington State requires that a specific training and certification program be in place for certain employees at Class 1 facilities. The purpose of the training is to reduce the risk of oil spills due to human error (WAC 173–180–510). Personnel involved in oil transfers must be trained in emergency response and oil transfer procedures (WAC 173–180 Part E, Training and Certification and 33 CFR 154). Personnel are stationed near shutoff equipment to quickly stop the flow of oil in the case of a spill and begin notifications and initial responses. The program must be reviewed and approved by the State of Washington.

Advance Notice of Crude Oil Deliveries

WAC 173-185-070 requires owners and operators of a facility that will receive crude oil from a railroad car to provide Washington State Department of Ecology (Ecology) with advance notice of deliveries. The information must be provided weekly. The information must include contact

information, region of origin of crude oil, rail route in Washington, gravity of crude oil and scheduled delivery date and volume. Ecology will share the advance notice information with the state emergency management division and any county, city, tribal, port, or local government emergency response agency upon request. Information will be published quarterly on Ecology's website including the mode of transport, origin of oil, number of volume of reported spills during transport and delivery, and number of railroad cars delivering crude oil. Information on the route, week, and type of crude oil will be aggregated.

Oil Spill Response

Spill response actions would follow the protocols and procedures set forth in Section 4.2.3, *What framework provides responses to an incident?* As noted, in Section 4.2.3, the local emergency service providers described under Section 4.4.1, *What are the existing risks?* would likely be the first responders to an oil spill at the project site. As noted previously, crude-by-rail transport would be a new activity in the study area and therefore could present challenges to local responders not addressed in existing basic training. Moreover, the foam trailer stored at the Ontario Street station requires pumping capability to be effective. Adequate staffing and equipment to deploy and apply the foam is not currently addressed in local protocols (Hubbard pers. comm.). The potential impact of the proposed action on local emergency service providers are addressed in Section 4.7, *Impacts on Resources*.

Depending on the severity of the incident, when considering impacts on public health and the environment, the U.S. Environmental Protection Agency, U.S. Coast Guard, and Washington State Department of Ecology (Ecology) may take a more aggressive role in the initial response operations to ensure that the responsible party is taking appropriate and timely action to mitigate damages to the environment.

Applicant Contingency Planning

The site contingency plan required for the proposed action required of the applicant will provide specific oil spill response actions and will include information on the specific equipment, valves, pipelines, and loading arms. Typical actions for responding to a spill are as follows.

- Notify companies and agencies that are responsible for the cleanup effort.
- Get trained personnel and equipment to the site quickly.
- Ensure the safety of responders and the public.
- Define the size, position, and content of the spill; its direction and speed of movement; and its likelihood of affecting sensitive habitats.
- Stop the flow of oil, if possible, and preventing ignition.
- Contain the spill to a limited area.
- Remove the oil.
- Dispose of the oil once it has been removed from the water or land.
- Investigate immediate and contributing causes for the spill.
- Apply lessons learned to prevent future spills.

Facility Response Plan

The existing facility response plan would be updated as required by U.S. Coast Guard regulations (33 CFR 154 Subpart F) and state regulations (WAC 173–182) to include contingencies for situations that could create a risk of spill of oil, fire or explosion.

Geographic Response Plans

As mentioned in Section 4.2, *Applicable Regulations*, the Grays Harbor and the Chehalis River Geographic Response Plans (GRPs) contain specific response strategies in the event of an oil spill (from any source) into or threatening waters and related environmental resources within the study area. For example, the Grays Harbor GRP contains response strategies relevant to an oil spill that would affect the lower Chehalis River (including response strategies related to tributaries or wetlands that connect to the river), the North and South Bays, and Bowerman Basin (near Grays Harbor airport). GRP strategies are designed for use with persistent heavy oils that float on water and may not be suitable for other petroleum products or hazardous substances. Response strategies for coastal shorelines along the Pacific Ocean west of Grays Harbor are also included (Ocean City, Ocean Shores, Westport, Cohasset Beach, and Grayland) in case of an oil spill that drifts outside of the harbor entrance or that leaks from a vessel located near the harbor entrance. The Chehalis River GRP geographically covers the river from Cosmopolis, picking up where the Grays Harbor GRP ends, and follows the river southeast to Centralia, concluding at Pe Ell.

GRPs do not describe all actions comprehensively. For example spill containment and on-water recovery are the first priorities. Neither are not described in GRPs. Response strategies described in GRPs encompass the placement of a boom to achieve any of the following results.

- To close off access of spilled oil into environmentally sensitive sites (such as the Oyhut Wildlife Recreation Area near the harbor entrance).
- To deflect oil moving on the river or within the harbor into a containment area for collection (with vacuum trucks and sorbent materials).
- To divert oil away from areas that are sensitive and/or hard to clean.

Culvert blocks or underflow dams are also response strategies presented in the GRPs to aid in shoreline protection and oil collection. The GRPs contain supplemental information related to the response strategies that support their implementation. For example, the Grays Harbor GRP includes a table with recommended boom lengths, appropriate boom deflection angles, and the number of required anchors to support boom placement for a range of different current speeds. Predesignated staging area locations (for equipment and personnel) and relevant logistics for their use are clearly described.

The response strategies are prioritized in the GRPs to reflect the sensitivity of threatened environmental resources or potential public health concerns (as in the case of spill proximity to populated areas or water intakes). In some cases economic considerations may dictate response priorities (for example preventing oil from affecting shellfish harvest areas or a marina). These priorities are considered prior to a spill and reflected accordingly in the GRPs to prevent a delay in the allocation of response assets during a spill response.

Each GRP identifies potential spill origin points in order to plan for a variety of potential spill sources. There is no attribution in the GRPs for the cause of the spill at the spill origin points. Each spill origin point has a multitude of associated response strategies within the GRPs due to the

likelihood that spilled oil will spread on and flow with water until it is contained and removed. For example, the Grays Harbor GRP contains over 40 site-specific strategies to combat the spread of spilled oil from spill origin point designations GH-C, located near Grays Harbor entrance, and GH-B, located near the mouth of the Chehalis River, and in the lower southeast quadrant of Grays Harbor. These site-specific strategies are designed for individual areas, not for the entire Grays Harbor area.

In addition to the site-specific information contained in the GRPs, relevant information in other sections of the larger Northwest Area Contingency Plan (Section 4.2.2.2, *Northwest Area Contingency Plan*) supplements the site-specific strategies (Region 10 Regional Response Team 2016). For example, *Chapter 3000 – Operations* contains a section titled *Operational Safety Issues Associated with Bakken Crude Oil*. Another section, *Northwest Area Shoreline Countermeasures Manual and Matrices*, contains an in-depth description of 10 shoreline types (ranging from fine- to medium-grained sand beaches to salt and freshwater marshes) and appropriate cleanup considerations for each type.

4.4.2.2 Fires or Explosions

Fire or Explosion Risk

As noted in Section 3.14, *Hazardous Materials*, crude oil is flammable but would generally be in a liquid and not gaseous form. Typically, terminal activities resulting in a spill would have limited potential to result in ignition because terminals are designed to reduce ignition potential as noted in Section 4.2, *Applicable Regulations.*

An incident involving a spill could result in a fire or explosion if there is an ignition source and combustible gases are present in a quantity that could ignite. The incident could cause sparking, which could ignite the spill. The extent of the damage would depend on numerous factors, including the cause of the incident, any fire suppression capabilities, and the timing and nature of response actions. It would also depend on the material: Bakken crude oil is more flammable than other heavier crude oils. The flammability of diluted bitumen varies based on the diluent (diluting agent) used.

Although fires or explosions can result spills caused by collisions and derailments, long-term historical data show that most spills do not result in fires or explosions. A fire or explosion would be less likely to occur than a spill. However, a spill of any size poses the risk of a fire or explosion, depending on the conditions.

Additional information regarding the risks of fire and explosions from onsite operations is provided in Appendix M, *Risk Assessment Technical Report*.

Because the potential impacts of exposure to fires or explosions on human health and the environment would vary depending on the specific size and circumstances of the spill, impacts affecting the following resources are addressed in general terms in Section 4.7, *Impacts on Resources*.

- Air
- Human health
- Plants
- Animals

- Aesthetics
- Recreation
- Commercial fishing
- Cultural resources
- Tribal resources
- Public services

Fire or Explosion Prevention

The proposed facility would meet national and state design codes for fire protection. These include tank separation distances, containment requirements, pressure relief valves, and fire suppression or protection systems. Numerous containment areas on the project site would control or limit where a release could spread; these also would reduce the chance of an ignited release effecting other equipment or traveling off site via land or water. Shutoff valves would limit the quantity of material released. In addition, ignition and possible explosions would be limited through a range of physical and procedural precautions and facility personnel would be appropriately trained as required by existing regulations. Fire suppression and firefighting equipment would be located on site.

Measures that reduce the chance of ignition include but are not limited to the following:

- Install floating roofs to limit vapor generation in confined areas.
- Eliminate ignition sources.
- Use nonsparking tools and explosion-proof equipment.
- Separate tanks by appropriate distance.
- Ground all equipment.

Fire or Explosion Response

Should a release occur, the emergency response plans listed above address the roles, responsibilities, and actions to take, depending on how much was spilled, and where and whether ignition has already occurred. The National Fire Protection Agency has issued codes and standards for all types of facilities and storage, including oil-handling facilities. The agency also regularly analyzes historic events to improve codes and standards (National Fire Protection Agency 2014, 2015). Typical responses to an explosion are as follows.

- Implement emergency response plan.
- Protect public health and safety.
- Make notifications.
- Conduct hazard assessment and risk evaluation.
- Conduct continuous air monitoring, as appropriate.
- Confine the spill.

- For fire suppression, isolate or evacuate based on the product (e.g., the Emergency Response Guide No. 128 for petroleum crude oil recommends isolation and initial evacuation for 0.5 mile in all directions).
- Begin fire suppression operations.
- Clean up spill.
- Investigate immediate and contributing causes for the incident.
- Apply lessons learned to prevent future incidents.

Emergency response actions would follow the protocols and procedures set forth in Section 4.2.3, *What framework provides responses to an incident?* As noted, in Section 4.2.3, the local emergency service providers described in Section 4.4.1, *What are the existing risks?* would likely be first responders to a fire or explosion at the project site. The potential impact of the proposed action on human health, resources and local emergency service providers are addressed in Section 4.7, *Impacts on Resources*.

4.4.3 What mitigation measures would reduce impacts related to terminal operations at the project site?

This section describes the applicant mitigation and other measures that would reduce environmental health and safety impacts at the terminal from the proposed action. These mitigation measures are in addition to regulatory compliance and best practices discussed above.

4.4.3.1 Voluntary Measures and Design Features

The applicant has committed to the following voluntary measure to address risks related to crude oil operations at the project site.

- Supply three totes of AR-AFFF at the project site for use by local fire departments.

4.4.3.2 Applicant Mitigation

The applicant will implement the following mitigation.

- To improve response effectiveness in the case of a spill, provide information to support oil spill modeling, identify specialized spill response or prevention equipment for the facility prevention plan and contingency plan, and assist with determinations of safe and effective conditions for prebooming, the applicant will purchase an equipment and software package to supplement information on environmental conditions. Information will include tides, currents, wave heights, wind (speed and direction), air temperature, water temperature, and barometric pressure. This information should be provided for the following locations: at the facility, at the entrance to Grays Harbor, at Oakville on the Chehalis River. In addition, the applicant will purchase and stage a current measuring device that includes direction and velocity at the facility dock. The system will be in place before construction begins. Data will be provided to Ecology at 6, 12, and 18 months after the system is in place. At least 12 months of data will be provided before operations begin.
- To improve contingency planning and response actions and to minimize potential impacts, the applicant will gather and provide data to improve the GNOME Location File for Grays Harbor.

The data will assist in developing trajectories for the GNOME and TAP oil spill models. To support model development and use, the applicant will collect remote sensing data at the facility location, at the entrance to Grays Harbor, at Oakville on the Chehalis River. The data provided will be sufficient so that the models can complete the following actions:

- Predict how wind, currents, and other processes might move and spread oil spilled on the water.
- Depict a relative distribution of spilled oil movement in Grays Harbor from the entrance to the Pacific Ocean to a point upstream in the Chehalis River near Oakville, Washington.
- Predict a spills trajectory based on a worst-case spill scenario from spills at the terminal, from vessels transiting to and from the terminal, and from derailments along the PS&P rail line.

The applicant will coordinate with Ecology to ensure the data meets the identified criteria. A peer review of the model will be funded by the applicant using a third-party reviewer as approved by Ecology. Data will be gathered and the peer review conducted before operations for the proposed facility begin.

- To improve oil recovery in the case of a spill during vessel loading at the dock, the applicant will retain a licensed engineer to perform an independent engineering analysis and feasibility study. The engineer will determine the number of days per year it is safe and effective to preboom oil transfers and will identify site-specific improvements. The applicant will submit the study to Ecology for review and approval before operations begin. If approved, the applicant will implement improvements from the study.

  If the study identifies no feasible alternative or until the changes are in place, and if prebooming is not feasible, the applicant will implement the following alternative measures during oil transfers in addition to those measures already required by regulation:

  - One oil spill response vessel with crew, skimmer, and at least 1,000 feet of boom at the dock.
  - On-water tank barge storage devices (not including bladders) prestaged at the dock with the skimmer to ensure a minimum of 450 barrels of recovery ready to be deployed.

- To reduce the risks and impacts from an oil spill, prior to beginning the proposed operations the applicant will conduct a study to identify an appropriate level of financial responsibility for the potential costs for response and cleanup of oil spills, natural resource damages, and costs to state and affected counties and cities for their response actions. The study should address the factors in RCW 88.40.025, Evidence of Financial Responsibility for Onshore or Offshore Facilities, including a reasonable worst-case spill volume; the cost of cleaning up the spilled oil; the frequency of operations at the facility; prevention measures employed by the facility that could reduce impacts through spill containment, immediate discovery, and shutoff times; and the damages that could result from the spill (including restoration). The study should identify any constraints related to the commercial availability and affordability of financial responsibility. Based on the study, Ecology will determine the appropriate level of financial responsibility and require the applicant to demonstrate their financial responsibility to the satisfaction of Ecology. Proof of financial responsibility will be included as documentation in the applicant's contingency plan.

- To improve oil recovery in the case of a spill, equipment required at hour 6 under WAC 173–182–355 must be resident in Grays Harbor. Additionally, the applicant must purchase and stage the following equipment in Grays Harbor:
  - An additional 200 feet of boom and temporary storage of at least 196 barrels with the ability to collect, contain, and separate collected oil from water. The additional boom should be capable of encountering oil at advancing speeds of at least 2 knots in waves. This boom will be of a type appropriate for the operating environment.
  - An additional 1,000 feet of shore seal boom.
- To improve oil recovery in the case of a spill of crude oil that weathers, sinks or submerges, the applicant will ensure access through agreements or contracts to have the following equipment available. The equipment will be capable of being on scene within 12 hours of spill notification and the means of access will be documented in the applicant's contingency plan and available prior to beginning operations.
  - Sonar, sampling equipment or other methods to locate the oil on the bottom or suspended in the water column.
  - Containment boom, sorbent boom, silt curtains, or other methods to contain the oil that may remain floating on the surface or to reduce spreading on the bottom.
  - Dredges, pumps, or other equipment necessary to recover oil from the bottom and shoreline.
  - Equipment necessary to assess the impact of such discharges.
  - Other appropriate equipment necessary to respond to a discharge involving the type of oil handled, stored, or transported.
- To reduce the impacts from an oil spill, the applicant will establish and implement a procedure for blocking all drains on the dock prior to oil transfers and observing the area for discharges before removal. This best practice will be documented in the facility operations manual for approval by Ecology.
- To improve preparedness for incidents, including oils spills, explosions, and fires, the applicant will ensure an emergency preparedness workshop is conducted prior to beginning project operations. The applicant will coordinate the workshop with Ecology. The workshop will be no more than 1 day in length. It will be held prior to beginning operations and thereafter will become part of the facility drill program. The initial workshop will focus on familiarizing local emergency responders, tribes, and communities with the contents of the Northwest Area Contingency Plan, the Grays Harbor and Chehalis GRPs, other local response plans, the facility response plan, and the measures that are in place for a rapid and effective spill response
- To improve the capability of local emergency responders to respond to spills, fires, or explosions at or near the project site, the applicant will contribute a fair share of the total cost to replace the City Hoquiam Fire Department's fire apparatus to ensure it is able to handle crude oil fires. Equipment must be available and operational prior to beginning operations. The applicant will consult with the local fire departments to determine specifications for the equipment. The total applicant contribution will be determined by the City and applicant through negotiation at the time of the equipment purchase.

- To improve response times and communication in the event of an incident that could affect tribal resources, the applicant will include tribal contacts (names and/or phone numbers) in notification protocols in the oil spill contingency plan.
- To reduce risks related to an explosion or fire onsite, the applicant will meet with local emergency management officials including representatives from the City of Hoquiam and City of Aberdeen Fire Departments to identify training needs for local responders who will respond to an emergency on the project site. This effort will include development and execution of a training program for those responders to increase level of awareness and understanding of the hazards associated with a rail tank car incident or a storage tank incident onsite. The training will include identification of notification protocols, use of personal protective equipment, and equipment deployment procedures. This training will be completed before the applicant begins receiving oil trains and will be offered at least annually.

4.4.3.3 Other Measures to Be Considered

Potential impacts associated with the proposed action could be further reduced by implementing the following measures.

- To improve communications to the public in the case of an incident, the Port of Grays Harbor should develop a formal system for notifying potentially affected residents and businesses. The notification process should also address Spanish speakers and accommodate low-literacy readers.[3]
- To improve response times and communication if an incident could affect tribal resources, the following measures should be considered.
    - The Confederated Tribes of the Chehalis Reservation and the Quinault Indian Nation should identify members or staff to be contacted in the case of an incident with potential impacts on tribal resources.
    - PS&P and the Port of Grays Harbor should include notification of tribal contacts in internal procedure and planning documents.

4.4.4 Would the proposed action result in unavoidable and significant adverse environmental impacts related to terminal operations at the project site?

Regulatory requirements for prevention of, preparedness for, and response to incidents involving the release of crude oil, and mitigation measures to reduce impacts are detailed above. However, no mitigation measures would completely eliminate the possibility of a spill, fire, or explosion, nor would they completely eliminate the adverse consequences of a spill, fire, or explosion. Depending on the location of the incident, amount spilled, type of crude oil, and environmental conditions, such as the time of year, water flows, and weather conditions, the potential adverse environmental impacts could be significant.

[3] Chapter 7, *Economics, Social Policy and Cost-Benefit Analysis*, provides information on common languages in the study area.

The following resources could experience significant impacts as described in Section 4.7, *Impacts on Resources*.

- Water
- Plants
- Animals
- Aesthetics
- Recreation
- Commercial fishing
- Cultural resources
- Tribal resources
- Public services
- Air
- Human health

4.4.5 Who would pay for the response and cleanup of an onsite spill?

Generally, the polluter pays for costs and damages associated with oil spills. For incidents at the project site, the applicant would be the responsible party. The federal government has established high limits on that liability. Washington State places no limits on liability of polluters to third parties, allowing recovery of cleanup costs and natural resource damages beyond the federal limit (Table 4.4-1). To cover removal costs above the federal limits of liability, the U.S. Congress established a one billion dollar Oil Spill Liability Trust Fund to pay for expeditious oil removal and uncompensated damages.

Washington State law requires owners or operators of facilities to provide evidence of their financial ability to pay for damages that might occur during a reasonable worst-case spill of oil from the facility into the navigable waters of the state. The method to determine this is described in Section 4.4.3.2, *Applicant Mitigation.*

Washington State law requires the party responsible for a spill of oil or hazardous substances to state waters to pay for the following costs.

- Their own costs to cleanup and remove oil spills.
- Damages to persons or property, including natural resources.
- Reimbursement to the state for necessary expenses for investigating, containing, removing, or treating oil related to an incident.

The responsible party may also be required to pay a penalty for violation of state law or rule.

Table 4.4-1. Limits of Liability for Spill Removal Costs

Reference	Applicability	Limits of Liability
33 U.S.C. 2704(a)(4)	Oil handling facilities	$350 million or less taking into account size, storage capacity, oil throughput, proximity to sensitive areas, type of oil handled, history of discharges, and other factors relevant to risks posed by the class or category of facility this limit may be reduced to less than $350 million but not less than $8 million.
RCW 88.40	Oil handling facilities	Washington State places no limits on liability.

U.S.C. = United States Code; RCW = Revised Code of Washington

4.5 Environmental Health Risks—Rail Transport

This section addresses the potential environmental health risks (specifically the likelihood of derailments, spills, fires, and explosions of various sizes) associated with offsite rail transport along the Puget Sound & Pacific Railroad (PS&P) rail line. This section first describes the environmental health risks that would exist under the no-action alternative to provide context for how risks would change with the addition of the proposed action. It then describes the potential risks related to oil spills, fires, or explosions associated with rail transport under the proposed action. It then describes the existing planning, preparedness, and response framework in place that is intended to address risks at the terminal and identifies additional applicant mitigation measures. The section concludes with a discussion of potentially unavoidable and significant adverse impacts of the proposed action and an explanation of financial responsibility for emergency response and cleanup activities if an incident occurred during rail transport.

4.5.1 What are the existing risks?

Under the no-action alternative, the environmental health and safety risks (frequencies and consequences of different scenarios) during rail transport would include the potential for rail incidents that could harm people or the natural environment, particularly if the incidents resulted in spills of hazardous materials. These risks would be similar to existing conditions because a substantial increase in rail traffic on the PS&P rail line is not likely during the analysis period. Currently, three trains per day on average travel from Centralia to the Port of Grays Harbor carrying grain, autos, and mixed freight. A small number of cars carry hazardous materials. As discussed in Chapter 3, Section 3.15, *Rail Traffic*, train length could increase; however, additional train trips other than those related to the proposed action are not likely.

4.5.1.1 Risk of Spills for Existing Conditions and No-Action Alternative

Under existing conditions, rail traffic consists primarily of grain, auto, and mixed freight trains. Only a few cars on these trains carry oil or hazardous materials. These materials are primarily related to the applicant's existing operations and include methanol and other industrial operations near the project site, such as vegetable oil, sodium methylate, biodiesel, and glycerin.

There have been six derailments on the PS&P rail line since 2014. These derailments did not involve rail cars carrying oil and there was no oil spilled; however, these occurrences provide incident data. Detailed information on the incidents is included in Appendix M, *Risk Assessment Technical Report.* As noted in Section 4.2, *Applicable Regulations*, the National Transportation Safety Board continues to evaluate Federal Railroad Administration (FRA) accident data and work with the FRA and the U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA) to make recommendations to improve safe transport of flammable liquids by rail.

- On April 29, 2014, two cars derailed at 5 miles per hour (mph) at South Washington Street in Aberdeen due to wide gauge (track separation).
- On May 9, 2014, seven cars derailed at 6 mph at Heron Street in Aberdeen due to wide gauge.
- On May 15, 2014, 10 cars derailed at 10 mph near Montesano due to thermal track misalignment.

- On May 21, 2014, 11 cars derailed at 5 mph at Blakeslee Junction due to a combination of train makeup and track geometry design.
- On December 29, 2015, six empty freight cars derailed in Montesano when an automobile stopped in a grade crossing.
- On May 31, 2016, eight rail cars in a 100-car train carrying grain to the Port of Grays Harbor derailed at 17 mph in the Central Park area. Six of those cars were on their side. There were no injuries. The cause of the derailment was a broken rail (Connell pers. comm.).

In 2014, PS&P installed more than 12,000 new ties, reinstalled more than 7,800 feet of curved rail, and made various repairs at bridges. The 3-year capital plan includes additional new ties, new track surface, bridge upgrades, additional tracks, replacing jointed rails, and other improvements, but these have not been funded or permitted.

Under the no-action alternative, the risks of spills would continue similar to existing conditions. Because it is not possible to predict the timing or exact magnitude of an incident, the following spill scenarios were considered to provide an understanding of the range of risks under the no-action alternative. The likelihood of each spill scenario occurring is presented below. For additional details about the analysis of risks under the no-action alternative, see Appendix M, *Risk Assessment Technical Report*.

- The **partial one rail car rail transport spill scenario** (up to 1,000 gallons [24 barrels]) could occur once in 85 years. This represents what could occur from a partial spill from one or several rail cars.
- The **one rail car spill scenario** (roughly 30,000 gallons [714 barrels]) could occur once in 48 years.
- The **three rail car spill scenario** (roughly 90,000 gallons [2,140 barrels]) could occur once in 3,100 years.

4.5.1.2 Fires or Explosion

While the materials transported currently and under the no-action alternative do not include crude oil, the existing rail transport still involves flammable materials such as methanol and biodiesel, which, if released in an incident, could ignite. The chance of a fire or an explosion is dependent on the material involved and the conditions of the incident. The potential impacts on resources would depend on the location, weather conditions, and other factors. The impacts are described in Section 4.7, *Impacts on Resources*.

4.5.1.3 Response Resources

Closest to the project site, the municipal fire departments described in Section 4.4.1.3, *Response*, and the Grays Harbor Fire Protection Districts 2, 6, 14, and 15 are available to provide personnel and fire apparatus in the event of an emergency in accordance with the countywide mutual aid agreement (Grays Harbor County n.d.).

Further east of Aberdeen, the PS&P rail corridor passes through numerous fire protection districts and some cities within Grays Harbor, Thurston, and Lewis Counties. The fire protection districts represent vast and mostly rural unincorporated areas, and not all stations within the districts will be available to respond immediately to an emergency along the rail corridor if called upon. Table 4.5-1

lists the stations and fire protection districts, number of personnel, and primary fire fighting vehicles in the first two columns.

The third column in Table 4.5-1 shows the latest protection class assigned to the fire protection districts or municipal fire department by the Washington Surveying and Rating Bureau. The bureau assigns each community a protection class of 1 through 10, where 1 indicates exemplary fire protection capabilities, and 10 indicates that the capabilities, if any, are insufficient for insurance credit.

This classification is relevant to fire protection services for citizens and property owners and is based upon an objective evaluation of the fire department equipment and personnel training, water supply, emergency communications systems, and fire prevention activities (fire code enforcement, public education, and building code enforcement). The protection class is not a complete measure of a fire department's and community's preparedness to respond to an emergency along the rail corridor in their area but it does provide one metric for the relevant capabilities required for hazardous material response on the rail line.

Personnel and equipment from Grays Harbor Fire Protection Districts 1 (Oakville), 2, 5 (Elma and Porter), 10, and 14 (Markham) would be first responders in the project site or along the rail line in the event of an incident. The fire department in the City of Oakville is merged with Fire Protection District 1 and has a mutual aid agreement with the City of Oakville and other cities in Fire Protection District 1. A similar arrangement exists in Fire Protection District 5 between the fire protection district and the City of Elma. There are 19 fire stations along the PS&P rail line. For information about emergency service access in the study area, refer to Chapter 3, Section 3.16, *Vehicle Traffic and Safety*.

Capabilities at the local level differ between fire departments. The local fire departments along the PS&P rail line do not have technical hazardous material teams. Air monitoring capabilities vary based on equipment and personnel trained. Supporting resources may be available from surrounding jurisdictions. Under RCW 43.43.961, the Fire Service Resource Mobilization Plan provides personnel, equipment, and other logistical resources from around the state when a fire or other emergency, like a hazardous material release, exceeds the firefighting and hazardous material capacity of local jurisdictions (Washington State Patrol Office of the State Fire Marshal 2014: 5). State agencies that share responsibility as primary agencies for a hazardous material response are Washington State Department of Ecology (Ecology) and the Washington State Patrol (Washington State Emergency Management Division 2011). If a fire or hazardous material response incident escalates beyond the limits of local resources, additional federal and state assets can be requested for an incident.

Table 4.5-1. Emergency Response Capabilities along the PS&P Rail Line

Designation[a]	Personnel	Equipment[b]	Protection Class	PS&P, Project Site, or Both
Grays Harbor County				
City of Hoquiam (2 stations)	21 full time personnel (5 to 7 personnel on staff per shift	1 main engine (requires replacement), 1 ladder truck, one foam tender	PC 5	Both
City of Aberdeen (2 stations)	37 full time personnel	2 front out engines and 1 reserve engine	PC 5	Both
City of Ocean Shores (2 stations)	12 crew members, 18 volunteers, 1 fire chief	3 main engines, 1 ladder truck	PC 5	Near project site
City of Westport	17 volunteers[c]	2 pumpers, 1 water and air tender, 1 ladder truck	PC 6	Near project site
City of Cosmopolis	17 volunteers[c]	2 main engines with pumpers	Not available	Near project site
Markham/Fire Protection District 14	22 volunteers[c]	1 main engine, 2 pumper tenders, brush truck	PC 8	PS&P
Fire Protection District 10 (Wishkah; 2 stations further north located in the most populated areas of the fire district)	19 volunteers[c]	4 main engines, 2 fire tenders	PC 8	PS&P
Fire Protection District 2 (includes Central Park, Brady, and Wynoochee; 3 stations)	2 full time personnel, 39 volunteers	4 main engines, 2 fire tenders; Central Park station is in Aberdeen	PC 6	PS&P
City of Montesano	3 full time personnel, 27 volunteers	3 main engines, 1 ladder truck	PC 5	PS&P
Fire Protection District 5 (includes Satsop, Porter, and Elma; 4 stations including City of Elma)	16 full time personnel, 40 volunteers	4 main engines, 4 water tenders, 1 wildland unit	PC 7 PC6	PS&P
City of Oakville/Fire Protection District 1	1 part-time paid chief; 21 volunteers	2 pumpers, 2 water tenders	PC 7	PS&P
Thurston County				
Fire Protection District 1 (includes Rochester and Grand Mound; 12 stations nearby)	4 full time personnel, 30 volunteers	13 fire engines, 6 ladder trucks	PC 5	PS&P
Lewis County				
Fords Prairie/Fire Protection District 12 (City of Centralia, Riverside Fire Department; 8 stations)	21 full time personnel, 44 volunteers	9 fire engines, 1 ladder truck, 5 water tenders	PC 5	PS&P

[a] One station unless noted otherwise.
[b] Does not include emergency support vehicles such as fire chief's truck or ambulances; may be spread out several stations.
[c] No paid personnel.
Sources: Campbell pers. comm., Dean pers. comm., Knodel pers. comm.

4.5.2 What are the potential risks of the proposed action?

Under the proposed action, the environmental health and safety risks along the PS&P rail line would include the possibility of rail incidents that could harm people or the natural environment, particularly if larger spills of oil or the other proposed bulk liquids occurred. These risks would be greater than under the no-action alternative because more trains would be operating. Additionally, trains traveling to the project site would consist of unit trains (longer trains carrying a single commodity) of oil. Increasing the number of cars carrying high-hazard commodities increases the chance of environmental harm in the event of a rail incident.

This section describes factors influencing the potential increase in risks along the PS&P rail line, including the change in the likelihood of a spill occurring under the proposed action. Mitigating factors currently in place to reduce the impacts of a spill and describes the potential extent of a spill and the response actions that would occur are described. The risks of fires or explosions related to the proposed action and the response actions that would occur in the event of a fire or explosion along the PS&P rail line are described.

On a national level, the number of rail cars carrying crude oil has increased nearly 44 times in the last 6 years, from 9,500 carloads in 2008. In 2010, 20 million barrels of crude oil were moved by rail. In 2014, 385 million barrels of crude oil were moved by rail, and in 2015, 323 million barrels of crude oil were moved by rail (U.S. Energy Information Administration 2016). Following the national trend, Washington State has experienced dramatic changes in the amount and types of oil transported by rail. The new oil types include heavy crude oils such as bitumen from Canada and Bakken crude from North Dakota.

Rail incidents involving crude oil or other harmful materials typically result in small releases. For example the average petroleum release size of 738 gallons (17.6 barrels), from 2001 to 2012, is based on nationwide spills as reported in the *Rail Transportation Impact Analysis for Imperium* (WorleyParsons 2014:146) using Association of American Railroads data. However, recent incidents in Lac-Mégantic, Québec; Casselton, North Dakota; Aliceville, Alabama; and Lynchburg, Virginia have been more significant.

According to the Rail Transportation and Engineering Center at the University of Illinois (Lui et al. 2012), for rail operations under 10 miles per hour (mph), the main causes of derailments are track and human factors such as improper train handling, braking operations, and improper use of switches. For rail operations above 25 mph, equipment issues were the main cause for derailments. For speeds between 11 and 25 mph, track, miscellaneous, equipment, and human factors all contributed. The PS&P rail line maximum speed is 25 mph and slower for certain areas as described below. A separate study (Anderson and Barkan 2004) identified speed as the critical factor in predicting the severity of a derailment. The length of the train is also an important factor. In general, the greater the mass and speed, the greater the force and potential impacts.

A May 2014 emergency order issued by the U.S. Department of Transportation required railroads to notify Washington State of the frequency and oil volumes for trains carrying 1 million gallons (23,800 barrels) or more of Bakken crude. Ecology report on marine and rail oil transportation identified concerns about oil transportation in the state (Washington State Department of Ecology 2015). PHMSA's final rule (49 CFR 171–180) sets requirements for routing assessments and notifications (Section 4.2.1.2, *Rail*). The revised rule establishes requirements for high-hazard flammable trains including end-of train telemetry devices, distributed power braking systems and electronically controlled pneumatic braking system. For purposes of these braking requirements, a

high-hazard flammable train is defined as a train of 70 or more loaded tank cars containing Class 3 flammable liquids traveling at speeds of more than 30 mph. The PS&P rail line maximum speed is 25 mph so these requirements would not apply. A proposed mitigation measure would have a functioning two-way end-of-train device or distributed power for operations on the PS&P rail line to the local yard.

The PS&P rail line in the study area covers 59 miles of Track Class 2 lines. Per FRA (2007), the track must meet all the requirements for its designated track class. These standards, discussed in Chapter 3, Section 3.15, *Rail Traffic,* apply to the following elements.

- Track surface (the evenness or uniformity of track).
- Track alignment (the variation in curvature of each rail of the track).
- Required number of cross ties.
- Alignment of the rail ends at joints.
- Frequencies of inspections for different components.

Nationwide, historic incident rates are higher on Class 2 track than they are on Class 3 track, primarily because of the different design and maintenance standards for these tracks. All traffic in the study area moves at 25 mile per hour or less, as per Track Class 2 standards (Chapter 3, Section 3.15, *Rail Traffic*). Some bridges have lower speed limits: 10 mph over Devonshire Bridge (Wynoochee River) and 5 miles per hour over the moveable bridges over the Wishkah and Hoquiam Rivers.

Operation of the proposed action at maximum throughput would add approximately one unit train trip[1] per day on average (458 per year maximum) along the PS&P rail line to the existing average of three train trips per day (1,235 per year) under the no-action alternative (Section 3.15, *Rail Traffic*). This would increase the potential for incidental releases of oil and hazardous substances, pollutants, and contaminants during offsite transport.

Crude oil is not currently moved along the PS&P rail line; however, as discussed in Chapter 5, *Extended Rail and Vessel Transport*, crude oil is moved along railroads in Washington State and throughout the United States and Canada. As discussed in Chapter 5, Section 5.4.2.4, *Existing Risks along the Rail Routes*, some of the recent incidents involving crude oil trains have been the result of track infrastructure problems. A proposed mitigation measure states that the applicant will not accept crude oil until PS&P verifies track integrity based on an evaluation of load limits.

4.5.2.1 Oil Spills

Oil Spill Risk

The risk of an oil spill from train operations typically relates to the risk of one or more derailed tank cars. A derailment does not mean a spill will happen; a train can derail with no spill resulting. A small leak could also occur during transport of the rail car but the spill quantity at a single point along the rail would likely be small because the leak could occur over several miles of track.

A risk assessment (Appendix M, *Risk Assessment Technical Report*) determined the potential frequency of spills of different sizes based on planning requirements applicable to rail transport. A

[1] A trip represents one-way travel; in other words, an inbound trip and an outbound trip are counted as two trips.

rail car can suffer structural damage and a resulting spill of cargo as the result of a derailment that may include collision with another object or with other cars, depending on the specific circumstances of the incident. The evaluation of rail transport risks considers scenarios that would result in the release of part of a single car up to 30 rail cars. The risk assessment applied accident rate data tailored to the PS&P operation, along with information on the types of rail cars used, the distribution of the number of cars expected to derail and release, and the number of rail trips anticipated for the proposed action to derive the frequency estimates for each scenario below. Appendix M provides a discussion of the risk scenarios and the methods used to determine spill frequencies.

Because of the increased number of rail trips to and from the project site, the proposed action would result in the potential for more frequent spills of bulk liquids relative to the no-action alternative, although the orders of magnitude for large spills are very similar. Additionally, the proposed action would introduce bulk handling and storage of crude oil, which is not currently present in the study area. The likelihood of very large releases would remain low.

As noted previously, it is not possible to predict the timing or exact magnitude of an incident; therefore, the following spill scenarios were considered to provide an understanding of the range of risks under the proposed action. The likelihood of each spill scenario occurring related to rail transport associated with the proposed action and associated spill sizes are summarized below.

- The **partial one rail car transport spill scenario** (up to 1,000 gallons [24 barrels]) could occur once in 100 years with current rail cars; with rail car improvements (80 FR 26643) this would extend to once in 105 years. Some amount of the spill would be contained in the ballast under the tracks but some amount could run out onto the ground in the immediate vicinity of the tracks. If the spill occurred over or near a waterway, some amount could spill into water.
- The **one rail car spill scenario** (roughly 30,000 gallons [714 barrels]) could occur once in 36 years with current rail cars; with rail car improvements, this would extend to once in 43 years.
- The **three rail car spill scenario** (roughly 90,000 gallons [2,140 barrels]) could occur once in 250 years with current rail cars; with rail car improvements, this would extend to once in 370 years.
- The **five rail car spill scenario** (roughly 150,000 gallons [3,570 barrels] or the contents of five rail cars) could occur once in 4,800 years with current rail cars; with rail car improvements, this would extend to once in 11,000 years.
- The **30 rail car spill scenario** (roughly 900,000 gallons [21,400 barrels] or the contents of 30 rail cars) could occur once in 10,000 years with current rail cars; with rail car improvements, this would extend to once in 74,000 years.

Along the PS&P rail line in the study area, a spill could affect a sensitive area or habitat of concern. Table 4.5-2 lists sensitive habitat areas and identifies the approximate length of exposure and its relative portion of the total route along the PS&P rail line. This percentage can be applied to the estimated chances of a release to determine the possibility that a specific release might occur in a particular area. This does not consider the extent of the spread, just the chance that a spill occurs in the area. For example, according to the assessment explained in Appendix M, *Risk Assessment Technical Report*, the chance of a spill equal to one rail car (30,000 gallons [714 barrels]) occurring anywhere along the PS&P rail line is once in 36 years. The likelihood of this occurring near the marbled murrelet critical habitat would be predicted based on the percentage of marbled murrelet

critical habitat along the route. Because this habitat occupies approximately 5% of the route, the likelihood of a spill would be 5% of the total chance, or once in 490 years.

Table 4.5-2. Sensitive Habitats along the PS&P Rail Line

Sensitive Habitat	Approximate Length of Exposure	Percent of Total Route
Three marbled murrelet critical habitat areas	3 miles	5%
Three crossings of bull trout streams designated as critical habitat areas	2 miles (approximate exposure considering track leading to and from crossings)	3%
Chehalis River Surge Plain Natural Area	6 miles	10%
Stretch of Chehalis River close to the rail line, designated as critical habitat for bull trout Critical habitat for the Oregon spotted frog along Black River Locations of two sensitive plant species (multiple locations between US Route 12 and the Black River crossing)	10 miles (all occur in same general area)	17%
Source: Appendix M, *Risk Assessment Technical Report*		

To provide additional information about the risks of a spill and to inform prevention, preparedness, and response planning relevant to the proposed action, oil spill modeling examined the movement of oil in the Chehalis River. The model uses two release points: one near Porter Creek Road near Oakville and the other at the Wynochee Bridge crossing. As presented in Appendix N, *Oil Spill Modeling*, the movement of spilled oil in the Chehalis River can vary dramatically, depending on weather conditions and hydrologic flow conditions. Depending on the size and location of the release, oil could move into the estuary in as few as 7.6 hours (100-year flood conditions) or in 4.5 days (low-flow conditions) if no response efforts contain the oil. Because the potential impacts of exposure to spills on human health and the environment would vary depending on the specific and circumstances of the spill, impacts on the following resources are addressed in Section 4.7, *Impacts on Resources*.

- Water
- Plants
- Animals
- Aesthetics
- Recreation
- Commercial fishing
- Cultural resources
- Tribal resources
- Air
- Human health
- Public services

Oil Spill Prevention

As discussed in Section 4.2, *Applicable Regulations*, railroad operators that transport oil and hazardous materials are required to meet federal and state standards for locomotives and rail cars. They must also develop contingency and response plans to prevent spills from reaching the environment. Railroads must submit an incident report for derailments to FRA. Lessons learned from these reports can be incorporated into future contingency planning.

Improved Safety of High-Hazard Flammable Trains

As described in Section 4.2.1.2, *Rail*, PHMSA has issued a final rule that defines and regulates high-hazard flammable trains (49 CFR 171–180). The proposed requirements would improve the safety of crude oil and ethanol shipments by rail (80 FR 26643). The following steps outlined in the rule are intended to improve the safety of high-hazard flammable trains.

- Improve classification and characterization of crude oil to ensure the type of rail car used is appropriate.
- Provide appropriate railroad contact information to state, local, and tribal officials who contact a railroad to seek information about routing hazardous materials through their jurisdictions. This helps secure the exchange of sensitive information.
- Reduce operating speeds to no more than 40 mph. The PS&P rail line is already limited to 25 mph as Class II track and there are slower speed limits in areas.
- Require all high-hazard flammable trains to be equipped with alternative brake signal propagation systems of either electronic controlled pneumatic brakes, a two-way end of train device, or distributed power.
- Require new and existing tank cars to meet specific design requirements or performance criteria (e.g., thermal, top fittings, and bottom outlet protection; tank head and shell puncture resistance).

Advance Notice of Crude Oil Deliveries

WAC 173-185-070 requires owners and operators of a facility that will receive crude oil from a railroad car to provide Ecology of advance notice of deliveries. The information must be provided weekly. The information must include contact information, region of origin of crude oil, rail route in Washington, gravity of crude oil, and scheduled delivery date and volume. Ecology will share the advance notice information with the state emergency management division and any county, city, tribal, port, or local government emergency response agency upon request. Information will be published quarterly on Ecology's website including the mode of transport, origin of oil, number of reported spills during transport and delivery, and number of railroad cars delivering crude oil. Information on the route, week, and type of crude oil will be aggregated.

Oil Spill Response

Spill response actions would follow the protocols and procedures set forth in Section 4.2.3, *What framework provides responses to an incident?* As noted in Section 4.2.3, the local emergency service providers described under Section 4.5.1, *What are the existing risks?* would likely be the first responders to an oil spill at the project site.

For first responders from the local jurisdictions or the railroad emergency response team, the posture for an oil or hazardous material spill on the rail is the same—defensive and protective. The

local responders will do what is necessary to evaluate and report on the situation, keep themselves and the public safe, and monitor response and cleanup operations for compliance with local ordinances and permits. The potential impact of the proposed action on local emergency service providers are addressed in Section 4.7, *Impacts on Resources*.

Depending on the severity of the incident, when considering impacts on public health and the environment, agencies with oil spill responsibilities such as Ecology, the U.S. Environmental Protection Agency, and the U.S. Coast Guard may take a more aggressive role in the initial response operations to ensure that the responsible party is taking appropriate and timely action to mitigate damages to the environment.

Railroad

Washington State passed ESHB 1449 in 2015, authorizing Ecology to adopt rules to require PS&P to prepare an oil spill contingency plan. The plan would, among other things, demonstrate that PS&P has the capacity to remove oil and minimize any damage to the environment resulting from a worst-case spill. Prior to adoption of rules, the federal oil spill response plans will be used to meet the state requirement.

WAC 173-186, Oil Spill Contingency Planning—Railroads, is expected to be effective October 2016. The new rule establishes following requirements for railroads, including PS&P:

- Establish notification requirements and call out procedures.
- Define training and personnel resources to fill roles in oil spill management teams.
- Identify resources at risk from rail spills.
- Establish equipment planning standards for responding to railroad oil spills.
- Establish Best Achievable Protection planning requirements for railroads.
- Establish a drill program and drill evaluation criteria for railroad plan holders.
- Establish recordkeeping, noncompliance, and compliance information.

Typical actions for responding to a spill from a crude oil train derailment (if there is no fire) are as follows. Similar actions would be taken for all products proposed to be transported.

- Implement emergency response plan required under federal law. This includes notifications and initial actions for incidents.
- Protect public health and safety.
- Contact railroad emergency contact.
- Contact shipper (owner of the oil) using the shipping papers, railroad emergency contact, or CHEMTREC.
- Conduct hazard assessment and risk evaluation.
- Conduct continuous air monitoring, as appropriate.
- Confine the spill.
- Apply foam for vapor suppression, if available.

- Isolate or evacuate based on recommendations in the product-based emergency response guide (for example, Guide No. 128 for petroleum crude oil recommends initial downwind evacuation for at least 1,000 feet).

The Aberdeen Fire Department stated in its public comment letter on the Draft EIS (Hubbard and Malizia pers. comm.) that the fire department is able to make notifications to initiate the geographic response plan including notification of the appropriate local, county, and state agencies and initiate contact with the railroad. The fire department would also initiate the product identification actions in Guide 128 of the Emergency Response Guidebook and would provide for life safety by following the recommended evacuation distances. The Aberdeen Fire Department does not have the equipment or resources necessary to confine a large spill or apply Class B or alcohol-resistant aqueous film-forming foam (AR-AFFF) for vapor suppression.

The responsible party must respond with the appropriate resources to contain the situation and clean up the spill. The federal basic oil spill response plan (49 CFR 130) currently applicable to rail operators with oil shipments of a capacity of 3,500 to 42,000 gallons per car does not require equipment to be contracted and available for an immediate response to an oil spill incident. In August 2014, PHMSA issued an advanced notice of proposed rulemaking seeking comment on potential revisions to its regulation to require high-hazard flammable trains to prepare comprehensive oil spill response plans (79 FR 45080). The comprehensive plans would require better coordination, identification of personnel, equipment, and training for responses to spills, and submission of the plan to FRA. In July 2016, PHMSA issued noticed of the proposed rulemaking for oil spill response planning and information sharing. Final rules are anticipated for September 2016.

Geographic Response

As mentioned previously, the Grays Harbor and the Chehalis River Geographic Response Plans (GRP) contain specific response strategies in the event of an oil spill (from any source) into or threatening waters and related environmental resources along the PS&P rail line. For example, the Grays Harbor GRP contains 16 response strategies relevant to an oil spill that affects the Chehalis River (this number does not include response strategies related to tributaries or wetlands that connect to the river). These strategies encompass boom placement to close off movement of spilled oil into environmentally sensitive sites (such as the Elliot Slough in Aberdeen), to deflect oil moving on the river into a containment area for collection (with vacuum trucks and sorbent materials), or to divert oil away from areas that are sensitive and/or hard to clean. Culvert blocks or underflow dams are also response strategies presented within the GRPs to aid in shoreline protection and oil collection. The GRPs also contain supplemental information related to the response strategies that support their implementation. For example, the Chehalis River GRP includes a table with appropriate boom deflection angles for a range of water speeds and another table with stream flow data (averaged over several years) recorded at various points in the Chehalis River and its tributaries.

The response strategies are prioritized in the GRPs to reflect the sensitivity of threatened environmental resources or potential public health concerns (as in the case of spill proximity to populated areas or water intakes). In some cases, economic considerations may dictate response priorities (for example preventing oil from affecting a dock area near a waterside restaurant or a marina). These priorities are discussed prior to a spill and reflected accordingly in the GRPs to prevent a delay in the allocation of potentially scarce response assets during an active spill response.

Each GRP identifies potential spill origin points. Table 4.5-3 provides the identification labels for the points that could originate from a project-related rail incident and affect sensitive sites due to

proximity of the rail line to the Chehalis River or a tributary (there is no attribution in the GRPs for the cause of the spill at the spill origin points).

Table 4.5-3. Geographic Response Planning Spill Origin Points along the PS&P Rail Line

Spill Origin Point Designation	Geographic Designation
Grays Harbor Geographic Response Plan	
GH-A	Chehalis River Upstream of Cosmopolis
GH-B	Aberdeen/Hoquiam/Port of Grays Harbor
Chehalis River Geographic Response Plan *(draft)*	
CHER-O	Central Park
CHER-N	Wynoochee River
CHER-M	Wenzel Slough
CHER-K	Porter
CHER-J	Oakville
CHER-I	Black River

Each spill origin point has a multitude of associated response strategies within the GRPs due to the inevitable likelihood that spilled oil will spread on and flow with water until it is contained and removed.

In addition to the site-specific information in the GRPs, there is relevant information in other sections of the larger Northwest Area Contingency Plan (Section 4.2.2.2, *Northwest Area Contingency Plan*) that supplements the site-specific strategies that would also address potential risks related to the proposed action (Region 10 Regional Response Team 2016). For example, Chapter 3000 – Operations, contains a section titled *Operational Safety Issues Associated with Bakken Crude Oil* and another section titled *Fast Water Oil Spill Response*, which would inform local responders in the event of a rail incident. Section 9302 of the Northwest Area Contingency Plan is entirely dedicated to responder decision tools for oil spill response in fast water currents.

4.5.2.2 Fires or Explosions

Fire or Explosion Risk

As noted in Section 3.14, *Hazardous Materials*, crude oil is flammable. An incident involving a spill could result in a fire or explosion if there is an ignition source and combustible gases are present in a quantity that could ignite. The incident could cause sparking, which could ignite the spill. Explosions are most likely when a spill is ignited and the resulting fire impinges on another tank or rail car. As the material in these adjacent tanks or rail cars heat up, the pressure builds and may eventually burst the container. The extent of the damage depends on the exact configuration of the release and fire compared to the location of the other tanks or rail cars, any fire suppression capabilities, and the timing and nature of response actions. It also depends on the material: Bakken crude oil is more flammable than other heavier crude oils. The flammability of diluted bitumen varies based on the diluent (diluting agent) used. Chapter 4, Section 4.7.2.1, *Recent Fires and Explosions Involving Crude Oil Trains,* and Chapter 7, Section 7.3.4.2, *Potential Costs Related to Environmental Health and Safety Concerns*, provide information about recent incidents involving the transport of crude oil.

Although fires or explosions can result from spills resulting from events like collisions and derailments, long-term historical data show that most spills do not result in fires or explosions. A fire or explosion would be less likely to occur than a spill. While there have been multiple recent derailments of trains on main lines that resulted in fires or explosions, the chance of an extreme derailment is very limited in the study area because of the relatively slower speeds on the PS&P rail line compared to typical mainline speeds. In general, large derailments from high-speed trains lead to releases from multiple rail cars. The energy involved in high-speed derailments and the resulting scatter of rail cars yield the greatest chance of a fire that affects other rail cars and possibly result in an explosion. However, a spill of any size poses the potential risk of a fire or explosion depending on the conditions.

Additional information regarding the risks of fire and explosions during rail transport is provided in Appendix M, *Risk Assessment Technical Report*.

Because the potential impacts of exposure to fires and explosions on human health and the environment would vary depending on the specific size and circumstances of the spill, impacts affecting the following resources are addressed in general terms in Section 4.7, *Impacts on Resources*.

- Air
- Human health
- Plants
- Animals
- Aesthetics
- Recreation
- Commercial fishing
- Cultural resources
- Tribal resources
- Public services

Fire or Explosion Prevention

Rail operations are required to meet national and state regulations for safe operation and maintenance, which are intended to prevent fires and explosions related to rail transport.

Fire or Explosion Response

PHMSA provides guidance for a fire or explosion from a train carrying crude oil (Pipeline and Hazardous Materials Safety Administration 2014), which states that,

> in the event of an incident that may involve the release of thousands of gallons of product and ignition of tank cars of crude oil in a unit train, most emergency response organizations will not have the available resources, capabilities, or trained personnel to safely and effectively extinguish a fire or contain a spill of this magnitude (e.g., sufficient firefighting foam concentrate, appliances, equipment, water supplies). Response to unit train derailments of crude oil will require specialized outside resources that may not arrive at the scene for hours; therefore it is critical that responders coordinate their activities with the involved railroad and initiate requests for specialized resources as soon as possible.

As with oil spills, first responders from the local jurisdictions or the railroad emergency response team would provide an initial investigation. The first responders are expected to enact defensive operations until appropriate and adequate resources are on scene. The on-scene coordinator would contact the company responsible for the product for technical support related to an emergency with the oil or chemical (49 CFR 172.604). Rail carriers provide emergency response resources. These may include air monitoring and environment management capabilities, technical specialists, and contractors to assist in managing the consequences of a crude oil train derailment (49 CFR 130.31). Final rules updating the requirements are pending.

Capabilities at the local level differ between fire departments. The local fire departments along the PS&P rail line do not have technical hazardous material teams.

The Aberdeen Fire Department's comment letter (Hubbard and Malizia pers. comm.) states,

> According to the US Department of Transportation's Commodity Preparedness and Incident Management Reference Sheet (PHMSA Petroleum Crude Oil Reference 09/2014), a single tank car containing 30,000 gallons of crude oil involved in a spill with fire would require a minimum of 216 gallons of 3% Class B foam for the INITIAL 15 minutes of operations. They add that reapplication of foam will be necessary to maintain an adequate foam blanket. That quantity of Class B foam is well beyond the current capability of the Aberdeen Fire Department to carry or apply effectively. … A mutual aid response agreement with the Hoquiam Fire Department does provide access to a flatbed truck (HFD 7319) that carries four (4) 265 gallon AR-AFFF foam totes and a 300 gallon Purple K dry extinguisher. This apparatus does not have pumping capability and must be paired with a fire engine to pump and provide the foam. This resource is not staffed on a daily basis by the Hoquiam Fire Department and its response and deployment timeframe has not been tested within the City of Aberdeen under emergent conditions.

Air monitoring capabilities vary based on the equipment and personnel trained. Currently, the fire departments do not have sufficient air monitoring capabilities for a fire or explosion. Supporting resources may be available from surrounding jurisdictions. Under RCW 43.43.961, the Fire Service Resource Mobilization Plan provides personnel, equipment, and other logistical resources from around the state when a fire or other emergency, like a hazardous material release, exceeds the firefighting and hazardous material capacity of local jurisdictions (Washington State Patrol Office of the State Fire Marshal 2014:5). State agencies that share responsibility as primary agencies for a hazardous material response are Ecology and the Washington State Patrol (Washington State Emergency Management Division 2011). If a fire or hazardous material response incident escalates beyond the limits of local resources, additional state and federal assets can be requested for an incident.

Typical emergency actions for responding to a crude oil train derailment resulting in an explosion or fire are as described in Section 4.5.2.1, *Oil Spills, Oil Spill Response.* Similar actions would be taken for all products proposed to be transported. Based on Guide #128 of the PHMSA Emergency Response Guide, the initial evacuation distance for fires in railcars from crude oil is 0.5 mile (Hubbard pers. comm.).

Emergency response actions would follow the protocols and procedures set forth in Section 4.2.3, *What framework provides responses to an incident?* The potential impact of the proposed action on local emergency service providers are addressed in Section 4.7, *Impacts on Resources*.

4.5.3 What mitigation measures would reduce impacts related to rail transport?

This section describes the voluntary measures and design features, applicant mitigation, and other measures that would reduce impacts on environmental health and safety impacts from rail transport related to the proposed action. These mitigation measures are in addition to regulatory compliance and best practices discussed above.

4.5.3.1 Voluntary Measures and Design Features

The applicant has committed to the following voluntary measures to address risks related to rail transport of crude oil to the project site.

- To reduce potential risk from tank car punctures and spills identified with use of DOT-111 tank cars for transport of Bakken crude oil, the applicant will not accept crude oil by rail unless the following actions occur.
  - The rail cars meet or exceed the new U.S. Department of Transportation specification 117 design or performance criteria.
  - Existing tank cars are retrofitted in accordance with the U.S. Department of Transportation-prescribed retrofit design or performance standard (80 FR 26643).
- Supply three totes of AR-AFFF at the project site for use by local fire departments.

4.5.3.2 Applicant Mitigation

The applicant will implement the following mitigation.

- To improve preparedness for incidents, including oils spills, explosions, and fires, the applicant will ensure an emergency preparedness workshop is conducted prior to beginning project operations. The applicant will coordinate the workshop with Ecology. The workshop will be no more than 1 day in length. It will be held prior to beginning operations and thereafter will become part of the facility drill program. The initial workshop will focus on familiarizing local emergency responders, tribes, and communities with the contents of the Northwest Area Contingency Plan, the Grays Harbor and Chehalis Geographic Response Plans, other local response plans, the facility response plan, and the measures that are in place for a rapid and effective spill response.
- To improve the safe transport of crude oils with different volatilities and sinking tendencies, the applicant will not accept crude oil by rail unless the applicant has received verification that a sample of the oil has been tested and properly classified and characterized.
- To reduce risks of a spill due to a rail incident, the applicant will not accept crude oil unit trains by rail unless the train has in place a functioning two-way end-of-train device or distributed power for operations on the PS&P rail line to the local yard.
- Due to sensitivity of the local environment, tribal resource concerns, and the potential presence of special-status species, to improve coordination and response capabilities in the event of a rail incident, the applicant will not accept crude oil by rail unless PS&P prepares, submits to Ecology for approval, and implements a contingency plan meeting the requirements identified below. This requirement will remain in place until state contingency plan requirements for railroads

are implemented by Ecology pursuant to ESHB 1449, Section 5, or WAC 173-186, and/or amendments to the federal oil spill response plan rule (49 CFR 130) are adopted.

  - Disclose full details of the method of response to spills of various sizes.
  - Define a worst-case spill planning volume.
  - Identify response notification and coordination procedures.
  - Identify personnel assigned to implement the plan.
  - Reference applicable Washington State geographic response plans.
  - Describe a training and exercise program for personnel and equipment.
  - Identify prepositioned spill containment and cleanup equipment and trained personnel.
  - Identify arrangement for enlisting qualified and trained cleanup personnel to implement the plan.
  - Describe how plan relates to other relevant contingency plans, such as facility plans, other rail plans, including federal oil spill response plans, and regional plans.
  - Ensure equipment identified that is necessary for determining air quality conditions but not available through local agencies or fire departments will be made available to local fire departments.

- To increase the timeliness of responses to spills and incidents involving trains and to maximize coordination of responses along the PS&P rail line, the applicant will not accept crude oil by rail unless the following measures are completed.
  - PS&P participates with the local fire districts in a public safety drill at least once every 2 years.
  - PS&P tests one geographic response plan strategy annually and invites Ecology to participate. This requirement will remain in place until state contingency plan requirements for railroads are implemented by Ecology pursuant to ESHB 1449, Section 5.
  - PS&P participates in testing the applicant's oil spill contingency plan with a rail scenario at least once every 3 years. This drill will be designed with Ecology and scheduled on the regional drill calendar.
- To improve response capability for spills that may occur on the Chehalis River, the applicant will coordinate with Ecology to advertise and extend registration of Vessels of Opportunity to the Chehalis River and to tribal boat owners prior to beginning operations. Applicants for the Vessel of Opportunity Program should be directed to www.oilspills101.wa.gov for information and registration.
- To improve capability to respond to potential incidents involving trains transporting crude oil to the project site, the applicant will not accept crude oil until a foam truck has been provided to the Elma Fire Department. The foam truck will provide fire-fighting capability along the PS&P rail line. The foam truck must be available and operational prior to beginning operations. The applicant will consult with Ecology and the local fire department to determine the capacity of the foam truck.
- To improve response times to reduce the initial impacts of an oil spill, the applicant will ensure that two trailers containing the spill response equipment listed below are available prior to beginning crude oil operations for use by initial local and emergency responders along the PS&P

rail line. This equipment will be offered to fire departments along the PS&P rail line and the Chehalis Indian Tribe. The trailer and equipment will be maintained by the applicant and inspected annually. The equipment will only be provided to fire departments and Chehalis Tribe if they agree to store the equipment in a secure location and ensure the equipment used by appropriately trained personnel. The applicant will work with Ecology and local emergency officials to update the Western Region Response List website (www.wrrl.us), any applicable spills response plans to address the emergency equipment caches and to document notification protocols, necessary training, use of personal protective equipment, and equipment deployment procedures.

Mobile trailers of a specific size to hold the below equipment:

- 3,000 feet of river boom
- 5,000 feet of sausage sorbent boom
- 30 anchoring systems (anchors, lines, floats)
- 20 shoreside anchoring systems
- 1 towing bridle
- 4 heaving lines
- 1 machete (or other vegetation cutting tool)
- 1 pair of bolt cutters
- 50 sandbags
- 1 roll plastic sheeting
- 4 each plywood sheets (4 feet by 8 feet)
- 500 feet 3/8-inch poly line
- PPE: coveralls or Tyvek ® disposable suits, gloves, outer (chemical-resistant and disposable) boots, safety glasses or chemical splash goggles, hard hats sufficient for 5 people

- To reduce the risks of derailments and impacts on rail infrastructure due to increased rail traffic and the weight of crude oil trains, the applicant will not accept crude oil by rail until PS&P verifies track integrity based on an evaluation of load limits. The evaluation will be completed prior to beginning operations.
- To improve local emergency planning and response, the applicant will fund development of a geographic information system (GIS) layer that identifies critical facilities near the facility and along the PS&P line. The facilities will include schools, hospitals, community centers, and parks within 0.5 mile of the rail line. The GIS layer will be provided to the Local Emergency Planning Commission, local fire departments, and Ecology. The study will be submitted prior to beginning operations.
- To improve response capability and protect human health, the applicant will contract with an experienced air-monitoring consultant to respond with equipment and personnel for incidents. The contract will be incorporated into the facility's contingency plan and will be approved by Ecology. The contract will be in place prior to beginning operations.
- To reduce risks related to an oil spill, the applicant will not accept crude oil by rail until PS&P meets with local emergency management officials to identify training needs for local responders

who will respond to an emergency on the PS&P rail line. This effort will include development and execution of a training program for these responders to increase level of awareness and understanding of the hazards associated with an oil train incident. The training will include identification of notification protocols, use of personal protective equipment, and equipment deployment procedures. This training will be completed before the applicant begins receiving oil trains and will be offered at least annually.

- To improve response capability on the Confederated Tribes of the Chehalis Reservation lands in the case of an oil spill, the applicant will ensure that an annual 1-day hazard awareness oil spill training for identified Chehalis tribal members is provided, including conducting and inviting tribal members to participate in drills.
- To improve response capability in the Grays Harbor area in the case of an oil spill, the applicant will ensure an annual 1-day hazard awareness oil spill training is provided for identified Quinault Indian Nation tribal members, including conducting and inviting tribal members to participate in drills.
- To increase the timeliness and maximize the coordination of responses to spills and incidents involving crude oil trains along the PS&P rail line, the applicant will ensure the Grays Harbor Local Emergency Planning Committee's emergency response plan is updated to address the applicant's operations. This information must be included prior to beginning operations. To improve oil recovery in the case of a spill, equipment required at hour 6 under WAC 173-182-355 must be resident in Grays Harbor. Additionally, the facility must purchase and stage in Grays Harbor:
    - An additional 200 feet of boom and temporary storage of at least 196 barrels with the ability to collect, contain, and separate collected oil from water. The additional boom should be capable of encountering oil at advancing speed of at least 2 knots in waves. This boom shall be of a type appropriate for the operating environment.
    - An additional 1,000 feet of shore seal boom.
- To improve oil recovery in the case of a spill of crude oil that weathers, sinks, or submerges, the applicant will ensure access through agreements or contracts to provide the following equipment. The equipment will be capable of being on scene within 12 hours of spill notification and the means of access will be documented in the applicant's contingency plan and available prior to beginning operations.
    - Sonar, sampling equipment or other methods to locate the oil on the bottom or suspended in the water column.
    - Containment boom, sorbent boom, silt curtains, or other methods to contain the oil that may remain floating on the surface or to reduce spreading on the bottom.
    - Dredges, pumps, or other equipment necessary to recover oil from the bottom and shoreline.
    - Equipment necessary to assess the impact of such discharges.
    - Other appropriate equipment necessary to respond to a discharge involving the type of oil handled, stored, or transported.
- To improve the capability of local emergency responders to respond to spills, fires, or explosions at or near the project site, the applicant will contribute a fair share of the total cost to replace the City Hoquiam Fire Department's fire apparatus to ensure it is able to handle crude oil fires.

Equipment must be available and operational prior to beginning operations. The applicant will consult with the local fire departments to determine specifications for the equipment. The total applicant contribution will be determined by the City and applicant through negotiation at the time of the equipment purchase.

4.5.3.3 Other Measures to Be Considered

Potential impacts associated with the proposed action resulting from increased likelihood of a rail incidents occurring could be further reduced by implementing the following measures.

- To verify track safety, PS&P should conduct a walking inspection once a week of all curves to inspect for track, fastener, or bolt issues.
- To verify track safety, PS&P should use a gauge restraint measurement system to check for wide gauge issues quarterly.
- To verify bridge safety, PS&P should implement the following measures.
  - Make inventory and inspection records available to the public process for all 52 bridges.
  - Demonstrate that a qualified inspector has verified that all 52 bridges have the load capacity to safely handle a unit train of 120 loaded tank cars.
  - Describe its bridge inspection program that includes annual inspections by a qualified inspector.
  - Describe in detail which bridges are scheduled for upgrade, the nature of the upgrade, and approximate start date and completion date
- To increase the timeliness of responses to spills and incidents involving trains and maximize coordination of response along the PS&P rail line, PS&P should attend meetings and discuss incidents and near misses with the Grays Harbor Local Emergency Planning Committee at least once annually. PS&P should discuss with the Washington Utilities and Transportation Commission the feasibility of creating a railroad safety committee based on the model of the Grays Harbor Safety Committee.
- To improve response capability on the Chehalis Reservation in the case of an oil spill, the Confederated Tribes of the Chehalis Reservation should identify members who could respond to oil spills and provide this information to PS&P and the Grays Harbor Local Emergency Planning Committee.
- To improve response capability in Grays Harbor in the case of an oil spill, the Quinault Indian Nation should identify members who could respond to oil spills and provide this information to PS&P and the Grays Harbor Local Emergency Planning Committee.
- To improve local response capability in the case of an oil spill, the Grays Harbor, Thurston, and Lewis Local Emergency Planning Committee and Fire Departments along the PS&P rail line should support the attendance of local emergency response personnel at the Security and Emergency Response Training Center in Pueblo, Colorado, to enhance their skills in response to releases from train incidents.
- To reduce the risk of an incident on the PS&P rail line, PS&P should work with local officials to collaborate and initiate a comprehensive community awareness campaign to educate and inform the public of the dangers of trespassing into the railway and trying to beat a train. This campaign will include communication of new train frequency, publishing ads in local

newspapers, and continuing to support the existing Operation Lifesaver program with visits to schools, community centers, civic clubs, and town hall meetings.

- To improve response effectiveness, PS&P should add spill response equipment to the Western Response Resource List (WRRL) online.
- To improve safety and reduce the potential for incidents, the City of Aberdeen should consider opting in to the Washington Utilities and Transportation Commission railroad crossing safety inspection program. The commission can provide technical assistance on grade crossing safety, maintenance, and modifications as agreed between the city and the commission.

4.5.4 Would the proposed action result in unavoidable and significant adverse environmental impacts related to rail transport?

Regulatory requirements for prevention of, preparedness for, and response to incidents involving the release of crude oil and mitigation measures to reduce impacts are detailed above. However, no mitigation measures would completely eliminate the possibility of a spill, fire, or explosion, nor would they completely eliminate the adverse consequences of a spill, fire, or explosion. Depending on the location of the incident, amount spilled, type of crude oil, and environmental conditions, such as the time of year, water flows, and weather conditions, the potential environmental impacts could be significant.

The following resources could experience significant impacts as described in Section 4.7, *Impacts on Resources*.

- Water
- Plants
- Animals
- Aesthetics
- Recreation
- Commercial fishing
- Cultural resources
- Tribal resources
- Public services
- Air
- Human health

4.5.5 Who would pay for the response and cleanup of a rail transport spill?

The liability for rail transport spills is the same as described for onsite spills (Section 4.4.5, *Who would pay for the response and cleanup of an onsite spill?*) when there is the potential for waters of the United States to be affected. The polluter pays for costs and damages associated with oil spills. Response and cleanup of spills from rail cars that threaten the navigable waters or adjoining

shorelines are the responsibility of the owner or operator (also referred to as the *shipper*) of the rail cars carrying the crude oil (RCW 88.40, Transport of Petroleum Products—Financial Responsibility). The federal government has established high limits on that liability. Washington State places no limits on liability of polluters to third parties, allowing recovery of cleanup costs and natural resource damages beyond the federal limit. To cover removal costs above the federal limits of liability, the U.S. Congress established a 1-billion-dollar Oil Spill Liability Trust Fund to pay for expeditious oil removal and uncompensated damages.

If the spill from a train car does not reach or threaten navigable waters, the federal Resource Conservation and Recovery Act (42 U.S.C. 6901) as well as the Federal Comprehensive Environmental Response, Compensation, and Liability Act (42 U.S.C. 9607), and the Natural Resource Damage Act (43 CFR Part 11) provide mechanisms for Washington State to obtain compensation from the responsible party for cleanup and environmental restoration, and liability provisions for criminal and civil penalties.

WAC 480-62 requires the railroad company carry insurance that covers any losses resulting from a reasonable worst-case spill. The reasonable worst-case spill for the PS&P rail line is 17.75 cars.

4.6 Environmental Health Risks—Vessel Transport

This section addresses the potential environmental health risks (specifically, the likelihood of spills, fires, or explosions of various sizes) associated with offsite vessel transport in Grays Harbor. This section first describes the environmental health risks that would exist under the no-action alternative to provide context for how risks would change with the addition of the proposed action. It then describes the potential risks related to oil spills, fires, or explosions associated with vessel transport under the proposed action. This section then describes the existing planning, preparedness, and response framework in place that is intended to address risks related to vessel transport and identifies additional applicant mitigation measures. The section concludes with a discussion of unavoidable and significant adverse impacts of the proposed action and an explanation of financial responsibility for emergency response and cleanup activities if an incident occurred during vessel transport.

4.6.1 What are the existing risks?

Under the no-action alternative, the environmental health and safety risks during vessel transport would include the potential for vessel incidents that could harm people or the natural environment, particularly if the incidents resulted in spills of hazardous materials. These risks would be similar to existing conditions at least initially but could increase over time because of projected increases in vessel traffic over the analysis period unrelated to the proposed action (Chapter 3, Section 3.17, *Vessel Traffic*).

4.6.1.1 Oil Spills

From 2008 to 2014, several vessel incidents occurred in Grays Harbor, including one methanol spill from a vessel. Five incidents were caused by loss or reduction in propulsion. One of these resulted in a vessel grounding with no damage or spill and one resulted in an allision with a buoy with no damage or spill. In 2011, a ship spilled 200 gallons of methanol to water because of human error in connecting a hose to a flange for a transfer.

Under existing conditions, large commercial vessel traffic in Grays Harbor consists primarily of dry-cargo vessels that carry grain and wood products and vessels carrying cars, referred to collectively in this document as *cargo vessels*. In addition, there are tank vessels[1] carrying bulk liquids, including methanol related to existing operations. Under the no-action alternative, this vessel traffic is expected to continue and to increase over time as described in Chapter 3, Section 3.17, *Vessel Traffic*.

Because it is not possible to predict the timing or exact magnitude of an incident, a set of large spill scenarios were considered to provide an understanding of the range of risks under the no-action alternative. For additional details about the analysis of risks under the no-action alternative, see Appendix M, *Risk Assessment Technical Report*.

[1] *Tank vessels* include *tankers* (self-propelled ships) and *tank barges* (barges propelled by tugs). While these are cargo vessels as well, they are referred to separately for the purposes of this document. Tank vessels and cargo vessels are referred to collectively in this document as *large commercial vessels*.

Because the potential impacts for exposure to spills would vary depending on the specific circumstances present at the time of the incident, the potential environmental impacts are addressed in general terms in Chapter 3, Section 3.14, *Hazardous Materials*.

- The **large vessel collision spill scenario** (up to 105,000 gallons [2,500 barrels]) could occur once in 920 years. This scenario considers the potential for vessel collision with another vessel.
- The **large vessel grounding spill scenario** (up to 1.2 million gallons [29,000 barrels]) could occur once in 3,500 years. This scenario considers a vessel running aground.
- The **large vessel allision spill scenario** (15.1 million gallons [360,000 barrels]) could occur once in 2,600 years. This scenario considers a vessel striking a fixed structure, such as the jetty entrance to Grays Harbor.

4.6.1.2 Fires or Explosions

One explosion on a tank vessel has been recorded in Washington State. In November 1993, the tanker *Sea River Philadelphia* suffered an explosion in an inert gas compartment while moored in Anacortes. No one was injured and no oil was spilled. The cause of the explosion was inadequate maintenance procedures (Washington State Department of Ecology 2015: 44). Other tank vessel explosions in the United States between 1993 and 2013 were caused by human error or improper procedures or a combination of both (Table 4.6-1).

Table 4.6-1. Tank Vessel Explosions in the United States, 1993 to 2013[a]

Date	Name of vessel	Location	Cause
April 24, 2013	Kirby barges 28182 and 28194 and Towing Vessel *Safety Runner*	Mobile, Alabama	High concentration of tank vapors from tank cleaning operations resulting in explosions on towing vessel and barges.
January 19, 2005	Tank Barge EMC 423	Chicago Sanitary and Ship Canal	Heating of a cargo pump with a propane torch accidentally ignited vapors escaping through the standpipe.
October 9, 1993	OMI Charger	Galveston, Texas	Ignition of an explosive atmosphere with a welder's arc.

Sources: National Transportation Safety Board 2014; U.S. Coast Guard 1997, 2010

[a] The tank vessels in this table were not carrying crude oil. The OMI Charger was a single-skin tank ship that carried gasoline; the EMC 423 was a single- skin tank barge that was carrying clarified slurry oil; the Kirby barges (28182 and 28194) were being cleaned and had about 11 barrels of residual natural gasoline (a liquid, flammable, first distillation of crude oil).

Under the no-action alternative, there would continue to be the possibility of fires or explosions related to the ongoing vessel traffic in Grays Harbor, including methanol transport related to existing operations. While the materials transported do not include crude oil, the existing vessel movements still involve flammable materials, which might ignite if spilled and ignited. The chance of a fire or an explosion is dependent on the material involved and the exact conditions of the accident.

4.6.1.3 Response

As noted in Sections 4.4.1.3, *Response*, and 4.5.1.3, *Response*, there are several municipal fire departments and the Grays Harbor Fire Protection Districts near and around Grays Harbor that are

available to provide personnel and fire apparatus in the event of an emergency. Several of these have mutual aid agreements that enable them to share resources. Brusco Tug & Barge has one harbor tug with a fire monitor with tank to carry foam.

Capabilities at the local level differ between fire departments. Refer to Section 4.4.1, *What are the existing risks?* and Section 4.5.1 *What are the existing risks?* for additional information. Many of the local fire departments around Grays Harbor do not have designated hazardous material response teams. Air monitoring capabilities vary based on the equipment and personnel trained. Supporting resources may be available from surrounding jurisdictions. Under RCW 43.43.961, the Fire Service Resource Mobilization Plan provides personnel, equipment, and other logistical resources from around the state when a fire or other emergency, like a hazardous material release, exceeds the firefighting and hazardous material capacity of local jurisdictions (Washington State Patrol Office of the State Fire Marshal 2014:5). State agencies that share responsibility as primary agencies for a hazardous material response are Washington State Department of Ecology (Ecology) and the Washington State Patrol (Washington State Emergency Management Division 2011). If a fire or hazardous material response incident escalates beyond the limits of state resources, additional federal assets can be requested for an incident.

4.6.2 What are the potential risks?

Under the proposed action, the environmental health and safety risks in the harbor would include the possibility of vessel incidents that could harm people or the natural environment, particularly if larger spills of oil occurred. These risks would be greater with implementation of the proposed action compared to the no-action alternative. The risks would be greater because there would be more vessels operating in the harbor, which would generally increase the potential for an incident. There would also be new environmental health risks related to the potential exposure of people and the natural environment to crude oil.

This section describes factors influencing the potential increase in risks in the harbor. It identifies the change in the likelihood of a spill occurring under the proposed action, identifies mitigating factors currently in place to reduce the impacts of a spill, and describes the potential extent of a spill and the response actions that would occur. This section also describes the risks of fires or explosions related to the proposed action and the response actions that would occur in the event of a fire or explosion during vessel transport.

As noted in Chapter 3, Section 3.17, *Vessel Traffic*, operation of the proposed action would result in increased vessel traffic in the study area. The vessels would consist primarily of tug barges but could include the use of tankers. The actual mix of vessel type and size would be determined by the owner of the oil who contracts for ships to provide transport to or from the terminal. The decision is based on the distance of transport, fuel needs of the vessel, and the constraints of the receiving harbors and ports where the oil would be delivered. Under the proposed action, up to an additional 238 vessels trips[2] would operate annually in Grays Harbor. These are assumed to be tank barges, although tankers could be used, which, because they can carry more product, would reduce the number of vessel trips.

[2] A vessel trip represents a one-way trip; in other words, an inbound trip and an outbound trip count as two trips.

4.6.2.1 Oil Spills

Oil Spill Risk

Typically, spills from vessels occur from operations (transferring fuel internally or transferring fuel to or from the vessel) or because of an incident such as a collision, grounding, or allision. Incidents can result from situations such as a loss or reduction of propulsion, loss of steering, or other equipment failure, as well as human errors.

Grays Harbor has navigational challenges, including a bar at the entrance to the harbor, a constrained navigation channel for deep-draft vessels, and sharp turns in the channel. The substrate of the channel is generally sand and mud, which, in addition to the requirement for vessels to be double-hulled, reduces the potential of spill due to groundings.

In 1988, the barge *Nestucca* spilled 231,000 gallons (5,500 barrels) of heavy fuel oil along Washington State's outer coast, offshore of the entrance to Grays Harbor. The barge was being towed and the line broke after crossing the Grays Harbor bar. The tug collided with the barge and ripped a gash in the hull, causing a spill. The oil spill affected beaches as far south as Oregon and north to Vancouver, British Columbia. Because of the spill, the Washington State Department of Ecology Spills Program and the Pacific State–British Columbia Oil Spill Task Force were established. Since that incident, Washington State laws and federal laws for oil spill prevention, preparedness, and response were implemented, including requirements for double-hulled vessels and natural resource damages.

The report, *Oil Spill Risk in Industry Sectors Regulated by Washington State Department of Ecology Spills Program for Oil Spill Prevention and Preparedness* (Washington State Department of Ecology 2009) noted 14 oil spills from tankers from 1995 to 2008, with 13,709 gallons (326 barrels) of oil spilled. The report also found 14 oils spills from tank barges with 7,002 gallons (167 barrels) spilled. Both of these data points indicate that most spills are far less than a full discharge of contents. Another recent study (Glosten 2014) developed release probabilities that indicated 13 to 22% of incidents actually resulted in a spill. In the remaining 78 to 87% of the cases, there was no loss of cargo resulting from the incident.

A risk assessment (Appendix M, *Risk Assessment Technical Report*) determined the potential frequency of spills of different sizes based on planning requirements applicable to vessel transport. A tank vessel can suffer structural damage and a resulting spill of cargo as the result of a collision with another vessel, an allision with a fixed structure such as a jetty or pier, or a grounding. The evaluation of vessel transport risks considers all three events. The risk assessment considered accident rates for each of these types of events combined with the probability of release in an incident with the number of vessels anticipated for the proposed action to derive the likelihood of each scenario. Appendix M provides a discussion of the risk scenarios and the methods used to determine spill frequencies.

Because of the increased number of vessel trips to and from the project site, the proposed action would result in the potential for more frequent spills of bulk liquids relative to the no-action alternative, although the orders of magnitude for large spills are similar. Additionally, the proposed action would introduce bulk handling and storage of crude oil, which is not currently present in the study area. The likelihood of very large releases would remain low.

As noted previously, it is not possible to predict the timing or exact magnitude of an incident; therefore, the following spill scenarios were considered to provide an understanding of range of risks under the proposed action. The likelihoods of each spill scenario related to vessel transport associated with the proposed action and related consequences are summarized below.

- The **large vessel collision spill scenario** (up to 105,000 gallons [2,500 barrels]) could occur once in 120 years.
- The **large vessel grounding spill scenario** (up to one vessel compartment of 1.2 million gallons [29,000 barrels]) could occur once in 470 years.
- The **large vessel allision spill scenario** (up to 15.1 million gallons [360,000 barrels]) could occur once in 360 years.

If such an incident occurred, by definition, the event would be associated with the potential for a larger spill. However, as discussed further in this section and in Section 4.2, *Applicable Regulations,* requirements are in place, including vessel design standards, which are intended to limit the size of a release if an incident occurs. As noted in Appendix M, *Risk Assessment Technical Report,* and Appendix N, *Oil Spill Modeling,* mitigating factors such as response measures were not factored into the release volumes or consequence modeling associated with the release scenarios. This approach was taken to provide for a measure of conservativism in characterizing the potential impacts.

To provide additional information about the potential spread and movement of spills from a vessel. Appendix N, *Oil Spill Modeling,* demonstrates the movement of spilled oil in the harbor and shows that it can vary dramatically, depending on the amount spilled, the location of the spill, material spilled, weather conditions, and flow conditions. Depending on the specific conditions, it is possible for spilled oil to reach the far shores of the estuary and even the Pacific Ocean from a vessel at the facility within 24 hours, or it may remain near the spill. In general, the modeling shows that under summer conditions, most of the oil is pushed into the South Bay of the harbor. Under winter conditions, oil is more likely to move more quickly outside of the harbor into the ocean, depositing oil along beaches near the mouth. Oiling along the outer coast occurred during the *Nestucca* spill in 1988. Models and historical data indicate an oil spill originating from a vessel just outside of Grays Harbor could oil shorelines within Grays Harbor and along the outer coast. The oil, if uncontained, could travel as far north as Canada and south to Oregon depending on spill quantity and weather conditions at the time of the spill.

Because the potential impacts of exposure to spills on human health and the environment would vary depending on the specific size and circumstances of the spill, impacts on the following resources are addressed in general terms in Section 4.7, *Impacts on Resources*.

- Water
- Plants
- Animals
- Aesthetics
- Recreation
- Commercial fishing
- Cultural resources
- Tribal resources

- Air
- Human health
- Public services

Bunkering and Refueling

The applicant has stated that no bunkering (refueling) operations would occur at Terminal 1. The Harbor Safety Plan for Grays Harbor (Grays Harbor Safety Committee 2014) currently states that no bunkering is done in Grays Harbor, including at docks or anchorages. Bunkering operations in Washington State waters are subject to both U.S. Coast Guard regulations, 33 CFR 155–156, 46 CFR Sections 12, 15 and 35, and Washington State regulations addressing bunkering, oil transfer operations, and prebooming requirements in WAC 317-40 and WAC 173-184. If bunkering were to begin in Grays Harbor, the mitigation proposed in Section 4.6.3, *What mitigation measures would reduce impacts related to vessel transport?* would minimize oil spill risks from bunkering.

Oil Spill Prevention

As discussed in Section 4.2, *Applicable Regulations*, vessels transporting oil as cargo have construction design features (protective double bottoms and sides) and mechanical measures (oil discharge monitoring systems and emergency shutdown devices for the oil transfer system) to prevent spills. Vessel operators are required to develop and implement safety and contingency plans to ensure that appropriate protocols, equipment, and training are in place to reduce the chances and extent of damage related to spills. Additionally, vessels use navigational equipment (depth sounders and electronic position fixing devices) to verify position and prevent collisions or groundings that all contribute to the prevention of oil discharges into the marine environment.

Containment Standards

Containment is required around each loading manifold, overfill pipe, and oil transfer connection point on the vessel. The containment is designed according to the size of the transfer hose to capture small spills and prevent the spill from reaching the water.

Double-Hull Construction Standards

Double hulls provide a measure of protection by creating a space between the outside of the vessel and oil tank areas. Both the tug barges and the crude oil tankers that would transport liquids for the proposed action would have double hulls. Yip et al. (2011) concluded that a double-hull design reduces the size of oil spills in incidents by 62% for tankers and 20% for tank barges.

Pollution Prevention Equipment and Requirements

Oil tankers and barges with an overall length of 400 feet or more are required to carry equipment for the containment and removal of on-deck oil spills of at least 12 barrels (33 CFR 155.205). The following materials must be carried.

- Sorbents
- Nonsparking hand scoops, shovels, and buckets
- Containers suitable for holding recovered waste
- Emulsifiers for deck cleaning

- Protective clothing
- A minimum of one nonsparking portable pump with hoses
- Scupper plugs

Oil Transfer Procedure Requirements

Formalized oil transfer procedures describe the roles and responsibilities of any personnel involved in oil transfers and the actions that should occur in the case of a spill. The transfer procedures required by 33 CFR 155.720 are as follows.

- Designate the person-in-charge who has the appropriate license, training, and familiarity with vessel equipment for the transfer operations.
- Have oil discharge removal equipment and supplies available.
- Describe the transfer procedures using the specific equipment on the ship.

Oil Spill Response

Spill response actions would follow the protocols and procedures set forth in Section 4.2.3, *What framework provides responses to an incident?* As noted, in Section 4.2.3, the local emergency service providers described under Section 4.6.1, *What are the existing risks?* would likely be the first responders to an oil spill in Grays Harbor.

For first responders from the local jurisdictions, the posture for an oil spill is the same—defensive and protective. The local responders will do what is necessary to evaluate and report on the situation, keep themselves and the public safe, and monitor response and cleanup operations for compliance with local ordinances and permits. The potential impact of the proposed action on local emergency service providers are addressed in Section 4.7, *Impacts on Resources*.

Depending on the severity of the incident, when considering impacts on public health and the environment, the U.S. Coast Guard, and Ecology may take a more aggressive role in the initial response operations to ensure that the responsible party is taking appropriate and timely action to mitigate damages to the environment.

Vessel Contingency Planning

The site plan required for the proposed action would provide specific oil spill response actions and would include information on the specific equipment, valves, pipelines, and loading arms related to contingency planning for dockside spills. Typical actions for responding to a spill are as follows.

- Notify companies and agencies that are responsible for the cleanup effort.
- Stop the flow of oil, if possible, and prevent ignition.
- Ensure the safety of all response personnel and the public.
- Get trained personnel and equipment to the site quickly.
- Define the size, position, and content of the spill; its direction and speed of movement; and its likelihood of affecting sensitive habitats. Contain the spill to a limited area.
- Remove and dispose of the oil properly.

The owner or operator of the vessel must notify the National Response Center as required by federal law. The center will notify federal agencies, including the U.S. Coast Guard. State laws and regulations RCW 90.56 and WAC 173-182-262, Oil Spill Contingency Plan also requires the owner or operator to notify the Washington Emergency Management Division of a discharge or substantial threat of a discharge. The division will notify other state and local agencies, including Ecology. Notification must be made immediately upon the discharge or substantial threat of a discharge, or as soon as is feasible without further endangering the vessel or personnel.

The owner or operator activates the vessel contingency plan by making notifications and coordinates with Ecology and the U.S. Coast Guard to take any necessary actions to protect the public health, welfare, and natural resources of the state.

Geographic Response

The Grays Harbor and the Chehalis River Geographic Response Plans (GRP) contain specific response strategies in the event of an oil spill (from any source) into or threatening waters and related environmental resources in the study area. For example, the Grays Harbor GRP contains response strategies relevant to an oil spill that could affect the lower Chehalis River (including response strategies related to tributaries or wetlands that connect to the river), the North and South Bays, and Bowerman Basin (near Grays Harbor airport). The Chehalis River GRP geographically covers the river from Cosmopolis, picking up where the Grays Harbor GRP ends, and follows the river southeast to Centralia, concluding at Pe Ell.

The GRPs describe response strategies such as placing boom to close off access of spilled oil into environmentally sensitive sites (such as Grass Creek in North Bay or Newskah Creek just to the south of Rennie Island). The boom also would deflect oil moving on the river or in the harbor into a containment area for collection (with vacuum trucks and sorbent materials), or divert oil away from areas that are sensitive or hard to clean. The GRPs also proposed culvert blocks or underflow dams to aid in shoreline protection and oil collection. The GRPs contain supplemental information related to the response strategies that support their implementation. For example, the Grays Harbor GRP includes a table with recommended boom lengths, appropriate boom deflection angles, and the number of required anchors to support boom placement for a range of different current speeds. Predesignated staging area locations (for equipment and personnel) and relevant logistics for their use are clearly described.

The response strategies are prioritized in the GRPs to reflect the sensitivity of threatened environmental resources or potential public health concerns (as in the case of spill proximity to populated areas or water intakes). In some cases, economic considerations may dictate response priorities (for example preventing oil from affecting shellfish harvest areas or a marina). These priorities are discussed prior to a spill and reflected accordingly in the GRPs to prevent a delay in the allocation of potentially scarce response assets during an active spill response.

Each GRP identifies potential spill origin points. There is no attribution in the GRPs for the cause of the spill at the spill origin points. Each spill origin point has a multitude of associated response strategies within the GRPs due to the inevitable likelihood that spilled oil will spread on and flow with water until it is contained and removed. For example, the Grays Harbor GRP contains over 24 strategies to combat the spread of spilled oil from spill origin point designation GH-B, located near the mouth of the Chehalis River, in the lower southeast quadrant of Grays Harbor.

In addition to the site-specific information contained in the GRPs, there is relevant information in other sections of the larger Northwest Area Contingency Plan (Section 4.2.2.2, *Northwest Area Contingency Plan*) that supplement the site-specific strategies that would also address potential risks related to the proposed action (Region 10 Regional Response Team 2016). For example, *Chapter 3000–Operations* contains a section titled *Operational Safety Issues Associated with Bakken Crude Oil*. Section 9420 of the Northwest Area Contingency Plan, titled *Northwest Area Shoreline Countermeasures Manual and Matrices*, contains an in-depth description of 10 shoreline types (ranging from fine- to medium-grained sand beaches to salt and fresh water marshes) and appropriate cleanup considerations for each type.

4.6.2.2 Fires or Explosions

Fire or Explosion Risk

As noted in Section 3.14, *Hazardous Materials,* crude oil is flammable. Crude oil and refined oils are carried in bulk by oil tankers and oil barges. A spill could cause fire or explosion if there is an ignition source and combustible gases are present in a quantity that could ignite.[3]

Fires or explosions can result from spills that occur as the result of collisions or allisions, and less typically from groundings. A fire or explosion would be less likely to occur than a spill (i.e., in only a fraction of the spills). Some collisions and allisions might involve enough energy and sparking to cause ignition and possibly an explosion if the vapors are sufficiently confined. In an even smaller fraction of incidents and spills, fires or explosions could involve other vessel compartments.

Additional information regarding the risks of fire and explosions during vessel transport is provided in Appendix M, *Risk Assessment Technical Report*.

Because the potential impacts of exposure to fires or explosions on human health and the environment would vary depending on the specific size and circumstances of the spill, impacts affecting the following resources are addressed in general terms in Section 4.7, *Impacts on Resources*.

- Air
- Human health
- Plants
- Animals
- Aesthetics
- Recreation
- Commercial fishing
- Cultural resources
- Tribal resources

[3] The term *flammable liquid* means any liquid that gives off flammable vapors at or below 80°F. In general, crude oil is considered highly flammable. The term combustible liquid means any liquid having a flashpoint above 80°F. The regulations discussed in this section are applicable to either hazard.

- Public services

Fire or Explosion Prevention

Regulating agencies have developed structural, mechanical, and procedural requirements to reduce the threat of a fire or explosion on tank vessels and barges. U.S. Coast Guard vessel inspectors have the authority to inspect any tank vessel in U.S. waters for compliance with U.S. laws and international treaties and issue the certificates that represent this compliance for U.S. tank vessels. Ecology also conducts vessel inspections. Vessel classification societies also regularly survey vessels to ensure compliance. The following types of features prevent fires and explosions on tank vessels.

- Structural
  - Cargo piping must not pass through machinery spaces (a source of ignition).
  - Cargo pumps must be isolated and away from machinery spaces.
  - A venting system that prevents tanks from being over-pressurized while they are being loaded or if the product expands while being transported. Vapors are released high above the deck at the end of vent risers, away from potential ignition sources.
- Mechanical and electrical
  - Tankers use an inert gas system, which replaces air with an inert (nonflammable) gas in oil tanks. This system is used when offloading oil to remove potentially flammable gases and to provide an atmosphere that is not explosive.[4] Loading usually requires no additional inert gas if the tank is already inert: the incoming cargo will displace the inert gas in the tank, which is then vented. Monitoring equipment is required to verify the status of tank atmospheres during loading, unloading and transit.
  - Emergency steering system.
  - Remote manual shutdowns for cargo pump systems to shut down transfers quickly from multiple locations.
- Procedural
  - Crew training on proper oil transfer procedures and firefighting.
  - Prohibits any work that could provide an ignition source (e.g., welding).
  - Smoking prohibitions.

Fire or Explosion Response

Should a spill occur, the emergency response plan would address the roles, responsibilities, and actions to take, depending on how much was spilled, and where and whether ignition has already occurred. Typical responses to an explosion are as follows.

- Activate the marine firefighting and oil spill contingency plan.
- Make notifications.
- Account for all personnel and initiate search and rescue operations if necessary.

[4] This requirement assumes that oxygen levels under 8% are not sufficient to support combustion.

- Ensure the safety of all response personnel and the public.
- Conduct hazard assessment and risk evaluation and institute measures to protect the public if necessary (from airborne hazards caused by fire or additional, potential, explosion hazards).
- Conduct continuous air monitoring, as appropriate.
- Conduct fire suppression operations, as appropriate.
- Initiate oil spill response activities, as appropriate.

The Aberdeen and Hoquiam Fire Departments are not equipped or trained to mitigate a ship fire involving flammable liquids. The fire departments do not have access to a fireboat or the expertise or personnel to adequately and safely manage these incidents. As described in Chapter 3, Section 3.17.4.2, *Tug Services*, waterside firefighting capabilities require coordination among the assets of Grays Harbor County, the U.S. Coast Guard, and private interests. Tugs in Grays Harbor may have waterside firefighting capability, including foam application, and could be contracted by the responsible party to aid local agency firefighting efforts in Grays Harbor. Section 4.6.3, *Applicant Mitigation*, includes a mitigation measure for the applicant to ensure that marine firefighting equipment that can be installed in a boat owned by the Grays Harbor Sheriff is made available.

Emergency response actions would follow the protocols and procedures set forth in Section 4.2.3, *What framework provides responses to an incident?* As noted, in Section 4.2.3, the local emergency service providers described under Section 4.6.1, *What are the existing risks?* would likely be first responders to a fire or explosion in Grays Harbor.

The potential impacts of the proposed action on local emergency service providers are addressed in Section 4.7, *Impacts on Resources*.

4.6.3 What mitigation measures would reduce impacts related to vessel transport?

This section describes the applicant mitigation and other measures that would reduce impacts on environmental health and safety from vessel transportation related to the proposed action. These mitigation measures are in addition to regulatory compliance and best practices discussed above.

4.6.3.1 Voluntary Measures and Design Features

The applicant has committed to the following voluntary measure to address risks related to crude oil operations at the project site.

- Supply three totes of alcohol-resistant aqueous film-forming foam (AR-AFFF) at the project site for use by local fire departments.

4.6.3.2 Applicant Mitigation

The applicant will implement the following mitigation.

- Due to sensitivity of the local environment, tribal resource concerns, and the potential presence of sensitive species, to reduce the risk of incident from loss of propulsion, loss of steering, grounding, or severe weather, the applicant will not receive or load crude oil to tankers or tank barges unless the vessels have tug escorts through Grays Harbor as described below. This

requirement will remain in place until rules are implemented pursuant to ESHB 1449, Section 12, at which time the rules will apply to the proposed action.

  - At least one tug must accompany a laden tanker or tank barge carrying oil between the Hoquiam River and Grays Harbor entrance, and two tugs (one escort tug and one assist tug) must assist the vessel during mooring procedures.
  - For laden tankers, the escort tug must be appropriately tethered while transiting Grays Harbor.
  - Escort tugs must have an aggregate shaft horsepower equivalent to at least 5% of the deadweight tons of the escorted oil tanker or tank barge.
  - Escort tugs must have sufficient mechanical capabilities to provide for safe escort.

- To ensure adequate safety for tug operations and thereby reduce the risk of an incident, the applicant will not receive or load crude oil to tankers or tank barges unless the vessels supply Grays Harbor pilots and tug companies with bollard pull capacities of the vessels prior to entering Grays Harbor.
- To reduce potential risk of incident of vessel collision or allision in Grays Harbor, the applicant will provide funding for and work with the U.S. Coast Guard, Ecology, Port of Grays Harbor, and Grays Harbor Safety Committee to propose, develop, and implement a formalized vessel management system. The vessel management system will include the ability to schedule, track, and monitor vessel movements in the harbor and off the entrance to the harbor. The vessel management system will be active prior to the applicant beginning the proposed operations. If a rule is adopted under RCW 88.16, Pilotage Act, prior to beginning operations, the requirements of the new rule would be followed.

  To reduce potential risk of vessel collision while in Grays Harbor, the vessel management system should act as follows.

  - Ensure vessel traffic is limited while a laden tank vessel is in the navigation channel.
  - Ensure that no other deep-draft vessels are in the navigation channel when a laden tank vessel is transiting the channel.
  - Include real-time Automatic Identification System tracking and monitoring.
- To reduce the risk of a fire or explosion from tank barges, the applicant will not receive or supply Bakken crude oil to tank barges unless the tank barges are able to inert their tanks when carrying Bakken crude oil.
- To reduce the risk of an incident, the applicant will coordinate with the Port of Grays Harbor and, as a member of the Grays Harbor Safety Committee, work to develop and implement specific procedures for escorting, tethering, and emergency maneuvering to control laden tank vessels. The procedures must be drafted prior to the proposed operations beginning. These procedures should be included in the Grays Harbor Safety Plan. At a minimum, these procedures must include the following elements.

  - Escort configurations and maneuvering characteristics of escorted tankers and tank barges.
  - Specific emergency connection and tethering procedures for connection of tugs to tankers and tank barges.

  - Specific maneuvers necessary for the tug to maintain control of the tanker while transiting Grays Harbor waters specifically during incidents of loss of propulsion or steering.
  - Appropriate safe speed of transit in Grays Harbor when tugs are tethered.
  - Guidelines for tanker or tank barge bridge team to rapidly recognize and respond to a loss of power or steering. By improving recognition and reaction time, the tug can more effectively steer the vessel through the navigation channel upon incident.
  - Requirement for a pretransit conference.
  - Refueling operations.
- To reduce the risk of an incident during vessel refueling, the applicant will ensure that any tank barges loaded with fuel for purposes of refueling vessels at the project site follow the navigation and safety mitigation measures for crude oil tank barges described in this section.
- To improve marine firefighting capabilities in Grays Harbor, the applicant will ensure that marine firefighting equipment (i.e., nozzle and pump) is available to and can be installed in a boat owned by the Grays Harbor Sheriff. The equipment will be available before operations. Specifications will be determined through discussions with the Grays Harbor Sheriff.
- To reduce the potential for a spill from a vessel incident, the applicant will allow only tankers with independent propulsion fuel tanks (i.e., not located next to the hull) at the dock.
- To improve response times and increase coordination of responses, the applicant will develop and implement a program approved by Ecology to educate its tankers and tank barge customers on the reporting requirements for vessel incidents resulting in a threat of a spill under RCW 88.46.100, Notification of Vessel Emergencies Resulting in Discharge of Oil, prior to beginning the proposed operations.
- To improve response times and communication in the event of an incident that could affect commercial or recreational fishing, the applicant will develop a method to provide information on potential incidents to commercial and recreational fishing boats and will describe this measure in the oil spill contingency plan prior to beginning operations.
- To improve oil recovery in the case of a spill, equipment required at hour 6 under WAC 173-182–355 must be resident in Grays Harbor. Additionally, the facility must purchase and stage the following equipment in Grays Harbor:
  - An additional 200 feet of boom and temporary storage of at least 196 barrels with the ability to collect, contain, and separate collected oil from water. The additional boom should be capable of encountering oil at advancing speeds of at least 2 knots in waves. This boom will be of a type appropriate for the operating environment.
  - An additional 1,000 feet of shore seal boom.
- To improve oil recovery in the case of a spill of crude oil that weathers, sinks, or submerges, the applicant will ensure access through agreements or contracts to have the following equipment available. The equipment will be capable of being on scene within 12 hours of spill notification and the means of access will be documented in the applicant's contingency plan and available prior to beginning operations.

- Sonar, sampling equipment or other methods to locate the oil on the bottom or suspended in the water column.
- Containment boom, sorbent boom, silt curtains, or other methods to contain the oil that may remain floating on the surface or to reduce spreading on the bottom.
- Dredges, pumps, or other equipment necessary to recover oil from the bottom and shoreline.
- Equipment necessary to assess the impact of such discharges.
- Other appropriate equipment necessary to respond to a discharge involving the type of oil handled, stored, or transported.

4.6.3.3 Other Measures to Be Considered

Potential impacts associated with the proposed action could be further reduced by implementing the following measures.

- To reduce the risk of an incident, the Grays Harbor pilots, Port of Grays Harbor, and tug company operating under contract with the Port of Grays Harbor should conduct the following training.
  - Regular training between the pilots and tug crews to ensure that the tugs will be able to meet the pilot's expectations during an emergency.
  - Exercises or drills to demonstrate appropriate emergency connection and tethering.
- To reduce potential risk of incident or vessel collision or allision in Grays Harbor, the Port of Grays Harbor, Grays Harbor Safety Committee, and the U.S Coast Guard should research the need for vessel traffic service for Grays Harbor and, if needed, implement a vessel traffic service.
- To reduce potential risk of incident of vessel collision while in Grays Harbor, the Port of Grays Harbor and USCG should research the need for a one-way channel transit along the inner harbor for laden tank vessels and, if needed, revise regulations.
- To improve safety during high traffic or bad weather conditions or in the case of an incident, the Grays Harbor Safety Committee should work with USCG to designate an anchorage in Grays Harbor with specific requirements for tank vessels as described in 33 CFR 109.07.
- To reduce the potential risk of vessel incidents due to lack of knowledge of local conditions, the Port of Grays Harbor should require all tankers and tugs escorting tank barges to take a Grays Harbor pilot while transiting Grays Harbor waters.
- To improve safety in Grays Harbor, the Port of Grays Harbor should conduct annual assessments on pilot availability and capacity to meet projected increases in vessel traffic.

4.6.4 Would the proposed action result in unavoidable and significant adverse environmental impacts related to vessel transport?

Regulatory requirements for prevention of, preparedness for, and response to incidents involving the release of crude oil and mitigation measures to reduce impacts are detailed above. However, no mitigation measures would completely eliminate the possibility of a spill, fire, or explosion, nor

would they completely eliminate the adverse consequences of a spill, fire, or explosion. Depending on the location of the incident, amount spilled, type of crude oil, and environmental conditions, such as the time of year, water flows, and weather conditions, the potential environmental impacts could be significant.

The following resources could experience significant impacts as described in Section 4.7, *Impacts on Resources*:

- Water
- Plants
- Animals
- Aesthetics
- Recreational resources
- Commercial fishing
- Cultural resources
- Tribal resources
- Public services
- Air
- Human health

4.6.5 Who would pay for the response and cleanup of a vessel transport spill?

Washington State law requires the operators of tankers and tank barges transporting hazardous substances to provide evidence of financial responsibility. Under RCW 88.40.020, Evidence of Financial Responsibility, tank vessels that transport oil in bulk as cargo must demonstrate financial responsibility to pay at least 1 billion dollars. With a few limited exceptions, federal law requires vessel operators (all types of vessels) to have a Certificate of Financial Responsibility for vessels over 300 gross tons using the navigable waters of the United States (33 CFR 138.15). The certificate is evidence to the U.S. Coast Guard that the vessel owner or operator can meet their oil spill removal obligations under the Oil Pollution Act should they spill oil into the navigable waters of the United States.

Washington State places no limits on liability of third parties, allowing the state to recover cleanup costs and natural resource damages beyond the federal limit. The federal limits of liability for oil spill removal costs related to tank vessels are summarized in Table 4.6-2.

Table 4.6-2. Limits of Liability for Tank Vessels

Reference	Applicability	Limits of Liability
33 CFR 138.230(a)(2)	Tank vessels greater than 3,000 gross tons	The greater of $2,000 per gross ton or $17,088,000
33 CFR 138.230(a)(4)	Tank vessels equal to or less than 3,000 gross tons	The greater of $2,000 per gross ton or $4,272,000

CFR = Code of Federal Regulations

4.7 Impacts on Resources

Implementation of the regulatory requirements identified in Section 4.2, *Applicable Regulations*, and the mitigation measures described for environmental health risks at the terminal (onsite), related to rail transport, and related to vessel transport (Sections 4.4.3, 4.5.3, and 4.6.3, respectively), would reduce the likelihood of a spill occurring and would improve emergency response in the event that a spill did occur. However, some risks would remain and it is possible that oil could still enter the environment.

Because the potential impacts of an incident would vary based on the material spilled, weather, water flows, location and other factors, this section describes the types of impacts that could be expected in general terms. The resources that are addressed in this section include water, plants, animals, aesthetics, recreational resources, commercial fishing, cultural resources, tribal resources, air, human health, and public services. While this section acknowledges resources that could be adversely affected in the event of an oil spill, fire, or explosion, Chapter 3, *Affected Environment, Impacts, and Mitigation*, contains a detailed discussion of the resources at risk and the existing conditions for each resource in the study area. Because of the sensitivity of natural and human resources in the study area, depending on the extent of the environmental damage, the potential impacts on the sensitive resources identified below could be significant.

4.7.1 What would be the environmental impacts of a spill?

The impacts of a spill would be most affected by the magnitude of the spill (small, slow leak in a contained area or a large, uncontained amount), the type of liquid, the location (on land or in water). The greatest potential for environmental harm could occur when larger releases enter or directly occur in waterways. In water, spilled materials can spread quickly, depending on the weather and geography. As discussed previously, cleanup and recovery actions would vary based on the spill and resources affected.

4.7.1.1 Water

In the event of a spill, the specific impacts on water resources would depend on various factors, including the location of the spill, the amount and type of oil spilled, the weather, tidal conditions if the spill were to reach water, and the timing and type of response actions employed. The types of impacts on water that could occur are described below in general terms. More information about water resources in the study area is presented in Chapter 3, Section 3.3, *Water*.

Surface Waters

Spills into adjacent surface waters or onto the ground at the project site, along the PS&P line, or in the harbor could contaminate marine and inland waters, associated wetlands, and underlying groundwater. The spilled material could expose aquatic and terrestrial plants and animals, aquatic habitats, shorelines, sediments, and humans to contamination.

The type, duration, and extent of water resource impacts caused by releases of these potential contaminants depend on numerous factors. These include the type and quantity of the spilled material, location of the release, physical and biological features of the affected environment,

sensitivity of various species to the hazardous material, and the material that is encountered (International Tanker Owners Pollution Federation Limited 2011a).

Groundwater

Spills could enter groundwater by infiltration (percolating through the soil column to the water table). This could contaminate municipal and private drinking water wells and other types of wells (e.g., irrigation, industrial supply). Contaminants dissolved in groundwater can also be transported into down-gradient surface waters that are fed by groundwater discharge, degrading surface water quality and potentially affecting aquatic life in those resources (Heath 1989: 66–67).

In the study area, the highest risk of groundwater contamination from spilled crude oil would be along the PS&P rail line, which runs through several areas underlain by largely unconfined surficial[1] aquifers. These aquifers are known to interact with surficial water features (e.g., rivers, streams), generally receiving discharge from these features during the winter when river stages are high and discharging to rivers and streams during the summer when river stages are low (Gendaszek 2011: 10). Several wells within 0.25 mile of the PS&P rail line provide drinking water for private residences and municipalities, as well as water for irrigation and industrial uses (Washington State Department of Ecology 2015). The PS&P rail line also crosses through a mapped Critical Aquifer Recharge Area[2] around the Black River and Scatter Creek in Thurston County (Thurston County Washington 2010).

4.7.1.2 Plants

In the event of a spill, the specific impacts on plants would depend on various factors, including the location of the spill, the amount and type of oil spilled, the weather, tidal conditions if the spill were to reach water, and the timing and type of response actions employed. The types of impacts on plants that could occur are described below in general terms. More information about plants in the study area is presented in Chapter 3, Section 3.4, *Plants*.

The primary impacts on plants from exposure to oil would occur through direct physical and chemical mechanisms as well as through chronic or more persistent mechanisms if a prolonged exposure occurred. These mechanisms are summarized in Table 4.7-1.

The nature and duration of these effects would depend on factors such as the type and quantity of the material released, location of the release (e.g., land or in water), the potential for ignition, physical and biological features of the affected environment (e.g., topography), sensitivity of various species to pollution, and the form of the material that is encountered. In addition to the effects of exposure to released materials, organisms can be damaged by physical and chemical aspects of spill response and cleanup efforts.

If a plant comes into direct contact with crude oil, constituent compounds (e.g., polycyclic aromatic hydrocarbons) can cause acute toxicity, resulting in tissue necrosis and loss of photosynthetic ability.

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[1] Surficial aquifers are defined as the uppermost saturated zone, typically an unconfined aquifer, or mappable extreme (Washington State Department of Ecology 1998: v). Surficial aquifers in the Chehalis River watershed typically lie only a few feet below land surface and extend to a depth no more than 100 feet.

[2] The Washington State Growth Management Act defines critical aquifer recharge areas as areas that have a critical recharging effect on aquifers used as drinking water sources where the aquifer is vulnerable to contamination that could affect the potability of the water (WAC 365-190-030[3]).

Depending on the amount of a plant's surface that is coated, crude oils and heavy refined oils can destroy plant tissues through direct toxicity and can reduce photosynthesis, oxygen transfer to the roots, and respiration to the point where the aboveground portion of the plant dies. Regrowth from below ground roots and rhizomes is possible within one to two growing seasons, although 3 to 5 years is a typical recovery period for salt marshes such as are present along the shores of Grays Harbor and the lower Chehalis River (International Tanker Owners Pollution Federation Limited 2011a: 4; Michel and Rutherford 2013: 2–21). Subacute effects on plants can also include reductions in growth or reproductive success, and reduced resistance to environmental stressors.

The specific impacts in the study area would also depend on the time of year and would vary by plant species. In the Grays Harbor area, perennial marsh and shoreline vegetation species begin resprouting from underground roots and rhizomes in early spring and continue to grow through summer, reaching maximum biomass in early autumn. Coating on stems and leaves and reductions in photosynthetic ability in the beginning of the growing season can affect perennial species more than would otherwise occur during the dormant winter season. Recovery of marsh vegetation is more rapid if a release were to occur during the nongrowing season (Michel and Rutherford 2013: 2–15). Annual species (which grow each year from seed) are generally more vulnerable than perennial species, but also are typically the first species to recolonize heavily damaged areas (Michel and Rutherford 2013: 2–16). If the roots or rhizomes die due to contact with spilled oils, the plant would die, and recovery would depend on the spread and regrowth of plants from outside the affected area.

Dispersed oil in the water column can also affect floating plants (phytoplankton), nonfloating kelp, and primary consumers (zooplankton) typically through direct toxicity. This affects, at least temporarily, the base of the estuarine and marine food web, which, depending on the extent (in size and duration) of the damage, can result in broader ecological damage.

Persistence in the environment and prolonged impacts on vegetation would also depend on the location of the release. Crude oil that reaches the shoreline could coat the physical substrates of the intertidal zone and shoreline. Rocky substrates (e.g., jetties at the mouth of Grays Harbor), once coated, can be cleaned by the mechanical action of waves. In contrast, pebble and sand beaches, such as line the Pacific shoreline north and south of the mouth of Grays Harbor, the substrates that support nonfloating kelp areas, and the mudflats and tidal marshes that are the dominant intertidal habitat in Grays Harbor, are at a higher risk of contamination from persistent effects in the event of a larger-scale release. If such an event were to happen, oil could seep into pore spaces and reach plant stem and root channels and benthic invertebrate burrows. Once oil enters these small pores, it can be very difficult to access and clean up contaminated areas. Heavier and more viscous oils, such as bitumen, may be more likely to remain trapped in pore spaces and thus be more difficult to remove (International Tanker Owners Pollution Federation Limited 2011a: 6). High viscosity oils can also form "asphalt pavements"—the oil oxidizes in small pore spaces into hard pavement that can persist for decades (International Tanker Owners Pollution Federation Limited 2011b: 7).

Sensitive Areas in the Study Area

If a release were to occur in Grays Harbor or the Chehalis River, the various species of tidal salt marsh plants that fringe the shoreline of Grays Harbor, as well as wetland plant communities that characterize the Chehalis River Surge Plain Natural Area Preserve, Bowerman Basin, Johns River Wildlife Area, Oyhut Wildlife Recreation Area, and other sensitive areas shown in Figure 3.4-2, could

be affected. Depending on the circumstances, these sensitive areas could be affected through the specific mechanisms discussed above.

Crude oil reaching the shoreline of Grays Harbor could affect macroalgae, nonfloating kelp, tidal marsh plants, aquatic plants, and shoreline/riparian plants directly through coating (as described for floating oil), as well as through acute contact with toxic components of the hazardous materials and sub-acute effects described above.

Tidal marshes and mudflats in the study area are particularly vulnerable to coating and retention of oil in sediments and to secondary effects related to increased erosion resulting in changes to the dynamics of the tidal zone that can affect plant species diversity. Depending on the circumstances, releases can be swiftly transported deep into tidal marshes and mudflats by tidal channels. Once trapped in low-energy, sheltered areas, contaminants can permeate the fine-grained mud and sand sediments and can persist in buried layers for long periods (International Tanker Owners Pollution Federation Limited 2011b:6–7; 2011a:7). If extensive areas of tidal marsh are affected, such as might occur in the case of a catastrophic spill, the plants stems and roots could cease to collect and hold sediments, which can lead to increased erosion of the marsh surface. Through this secondary mechanism of sediment loss, catastrophic hazardous materials releases can indirectly result in broader losses of marsh area that persist over time; this phenomenon has been observed in *Spartina* marshes in Louisiana oiled during the British Petroleum Deepwater Horizon crude oil spill (Silliman et al. 2012). Because tidal marsh species dominance and diversity in Grays Harbor (and other Pacific Northwest estuaries) is partially driven by elevation of the tidal zone, changes in erosion and sedimentation could also alter the amount and configuration of high marsh and low marsh plant communities.

Recovery time of tidal marshes is generally fastest in warmer climates, when the released materials are less persistent (e.g., lighter to medium crude oils), and when primarily sediments and not plants are coated. Recovery of tidal marshes is generally the longest in colder climates, when releases occur near sheltered settings, and when the released materials are more persistent (e.g., light refined products with heavy crude oils) (Michel and Rutherford 2013:2-21).

Vegetation along the PS&P Rail Line

If a larger-scale spill occurred along the PS&P rail line, contaminants could enter waterways at numerous crossings and drain to the Chehalis River, and eventually into Grays Harbor. Although it is not possible to know where a release might occur, the environmental outcome of such an event would be worse if it occurred in areas that supported unique or sensitive plant populations or agricultural operations. For example, if a spill occurred along the north side of the PS&P rail line near Rochester and to the east of Scatter Creek, it could affect populations of the white-topped aster (U.S. Fish and Wildlife Species of Concern, Washington Natural Heritage Program Sensitive Species), previously recorded in two locations adjacent to the rail line. Similarly, a spill near the Centralia PS&P rail yard or along the rail line near US Route 12 (US 12) and Prairie Creek could affect multiple recently documented occurrences of the small-flowered trillium (Washington Natural Heritage Program Sensitive Species). Depending on the circumstances, there is a potential for spilled oil to affect agricultural areas located along the rail line.

As discussed in Sections, 4.4, *Environmental Health Risks—Terminal (Onsite),* 4.5, *Environmental Health Risks—Rail Transport*, and 4.6, *Environmental Health Risks—Vessel Transport*, numerous measures and protocols are in place to prevent and minimize the extent of a spill once it occurs. These measures aimed at minimizing the frequency of a potential spill and the extent of the spill

would reduce the potential for adverse impacts on plants. However, no mitigation measures can be implemented that will completely eliminate the possibility of a spill, nor are there any mitigation measures that will completely eliminate the adverse consequences of a spill.

4.7.1.3 Animals

In the event of a spill, the specific impacts on animals would depend on various factors, including the location of the spill, the amount and type of oil spilled, the weather, tidal conditions if the spill were to reach water, and the timing and type of response actions employed. The types of impacts on animals that could occur are described below in general terms. More information about animals in the study area is presented in Chapter 3, Section 3.4, *Animals*.

Spills can affect animals because of both physical surface oiling or smothering and toxic effects of constituents in oil. Animals can also be injured by physical and chemical aspects of response and cleanup efforts. Depending on the extent and nature of the impacts, there is the potential for more widespread harm to larger populations of animals. Recovery of individual animals or groups of animals would depend on numerous factors, including the type, location, and extent of the impact and the number and life stage of the individuals affected. The potential impacts on animals are discussed in the context of floating spills, contact in the water column, contact along the shoreline, and contact on land. The mechanisms of impact are summarized in Table 4.7-1.

Marine Animals

Impacts from Oil at the Water Surface

Animals that would most likely be affected by floating oil in the study area include common diving birds that frequent Grays Harbor, such as double-crested cormorants, pied-billed grebe, belted kingfisher, Caspian tern, and common mergansers (Grays Harbor Audubon Society 2008), as well as common marine mammals such as harbor seals, California sea lions, porpoises, and dolphins. Federally listed species such as killer whales, humpback whales, and sea turtles, such as leatherback and green sea turtles, might visit Grays Harbor (although rarely) and can be seasonally present in the study area. Gray whales are well documented in Grays Harbor and are known to regularly use the harbor during seasonal migrations along the Washington coast. Because whales and sea turtles must come to the surface to breath, they could suffer the affects by breathing in or ingesting the toxic constituents of floating oil, and adults could suffer mucous membrane inflammation (increasing susceptibility to infection) from the oil or its fumes (International Tanker Owners Pollution Federation Limited 2011b: 6). Similarly, pelagic bird species commonly found off the coastline of Grays Harbor, such as pink-footed shearwater, black footed albatross, and northern fulmar (Grays Harbor Audubon Society 2008), would most likely be affected by floating oil in Pacific coastal waters. Semiaquatic mammals present in the Chehalis River such as beavers and river otters are examples of fur-covered animals that feed by diving through the water's surface and would most likely be affected by floating oil through loss of insulation, oil ingestion, or inhalation of toxic fumes of constituent chemicals (Crosby et al. 2013:79).

Oil floating on the water surface would pose the greatest risk to animals that are completely dependent on the marine or estuarine environment (such as seabirds and aquatic species, including marine mammals) and that come to the water surface to breath or dive through the surface to forage for food. Aquatic animals that breach the water surface or birds that land on water in an area with floating oil could ingest oil, inhale oil, or inhale its vapors and become physically coated with oil.

Constituent compounds within oil (e.g., polycyclic aromatic hydrocarbons) can be acutely toxic to animals and cause death by contact or ingestion. Many birds and mammals, including harbor seals, California sea lions, and possibly killer whales and humpback whales could ingest oil in their efforts to clean themselves or as they are feeding, which could result in rapid mortality or organ damage and subsequent death. Ingestion of crude oils and other petroleum products also can suppress the immune system of animals and cause skin irritation or ulceration, adrenal system damage, and behavioral changes, which could ultimately lead to death (U.S. Fish and Wildlife Service 2004, 2010). Physical coating (oiling) of an animal with floating oil can cause animals to suffocate if it coats or enters the respiratory tract. Oil coating can also cause a loss of thermoregulatory ability, ultimately leading to hypothermia, as well as loss of buoyancy and lift, which can drown animals or prevent them from flying or feeding successfully (Cedre 2008: 49–50; Crosby et al. 2013: 79–80). Other aquatic animals and birds that have not been directly exposed to a floating oil spill, such as scavengers (e.g., bald eagles), can be exposed to oil by feeding on injured or dead aquatic animals (e.g., fish) that have been in contact with and contaminated by oil floating on the water surface.

Impacts from Oil in the Water Column

Animals that feed or respire directly in the water (below the surface) are most at risk from impacts of submerged oil dispersed in the water column, particularly if natural or chemical dispersion causes the oil to persist in the water column for multiple days. The animals in the study area that would be most affected by submerged oil include marine mammals, invertebrates, and fish, as described in Chapter 3, Section 3.5, *Animals*.

Constituent compounds within oil can be acutely toxic to animals in the water column and cause death by contact with gills or ingestion. Submerged and dispersed oil that comes into contact with animals can clog and destroy sensitive tissues such as gills and mucous membranes necessary for respiration (e.g., fish and marine mammals) and filtering organs necessary for feeding (e.g., sessile organisms like barnacles, clams, and mussels) (Cedre 2008: 50). Other potential effects of oil on fish include reduced growth, enlarged livers, changes in heart and respiration rates, fin erosion, and impaired reproduction and development (U.S. Fish and Wildlife Service 2004, 2010). Recent field and laboratory studies of Gulf killifish that reside in the Gulf of Mexico showed a variety of sublethal responses to oiled sediments. These responses include developmental abnormalities in larval and adult fish, cardiovascular defects in embryonic fish, and delayed hatching and smaller size at hatching of juveniles (Michel and Rutherford 2013: 2–18). Those effects, in turn, increase the chances of direct mortality or capture by predators. Photo-enhanced toxicity, a mechanism in which polycyclic aromatic hydrocarbons or other oil components are activated by ultraviolet radiation, has also been shown to increase the toxicity of oil on aquatic organisms, especially early life stages of fish (Incardona et al. 2011; Alloy et al. 2016).

Potential oil effects on invertebrates include physical smothering, altering metabolic and feeding rates, and altering shell formation (U.S. Fish and Wildlife Service 2004). In addition, oil can contaminate plankton (microscopic floating organisms), which includes algae, fish eggs, and the larvae of various invertebrates; fish that feed on these organisms can subsequently become contaminated (U.S. Fish and Wildlife Service 2004).

Oil spilled into Grays Harbor or the Chehalis River or tributaries that cross the PS&P rail line could affect the survival of eggs and larvae, including salmonids protected under the Endangered Species Act. Fish mortalities have been associated with spills that result in localized concentrations of oil in the water column, large quantities of highly toxic components of light oils into breaking surf along a

shoreline, and spills in rivers (International Tanker Owners Pollution Federation Limited 2011b:5). Salmon eggs and larvae are highly sensitive to oil toxins, which could result in reduced spawning success (U.S. Fish and Wildlife Service 2004, 2010). Subacute effects on animals can include reduced feeding, increased larval or juvenile mortality, delayed or reduced reproduction, or increased risk of predation due to behavioral changes.

Impacts from Oil along Shoreline and Intertidal Habitats

Oil spilled close to shorelines and intertidal habitats or floating oil that reaches these areas can affect animals that inhabit or transit shoreline and intertidal habitats (e.g., shorebirds, river otters, seals). Oils along the shorelines can also affect invertebrates (e.g., shellfish) that live in the sand on rocks, in mudflats and transitional wetland areas. The toxic and smothering effects on animals described above from compounds on the water surface and in the water column would generally be the same for animals along the shoreline and intertidal environment that could be exposed to these compounds.

Common benthic invertebrates in Grays Harbor marshes and intertidal mudflats include various species of clams and snails, as well as intertidal crabs (e.g., red rock crabs and Dungeness crabs), which burrow in the substrates of these habitats. Oil that sinks and binds with sediments in these habitats can become trapped, resulting in smothering or exposure to toxic constituent chemicals in benthic invertebrates. High rates of intertidal crab mortality have been documented following oil spills the reached salt marshes in Massachusetts, New York, New Jersey, and Nigeria (Michel and Rutherford 2013: 2-17). Potential oil effects on invertebrates can include mortality or injury from physical smothering, altering metabolic and feeding rates, and altering shell formation (U.S. Fish and Wildlife Service 2004). Birds that forage for benthic invertebrates along beaches, shorelines, and mudflats would also be exposed to oil and contaminated invertebrates; common bird species in Grays Harbor that feed on invertebrates on the beach and mudflats include shorebirds such as western sandpiper, dunlin, and sanderling (Grays Harbor Audubon Society 2008). Common diving ducks such as bufflehead and common goldeneye also feed on invertebrates several feet under water (Grays Harbor Audubon Society 2008).

Oil spills could pose a higher risk to migrating or nesting birds in the study area because populations may concentrate in one area (e.g., migratory flocks of shorebirds). A much wider range and larger number of species would potentially be affected if an oil spill were to occur along the shoreline beyond Grays Harbor and intertidal habitats during the nesting season and the spring and fall migrations. Salt marsh, mudflat, and beaches of Grays Harbor and the Grays Harbor National Wildlife Refuge support a seasonal concentration of hundreds of thousands of shorebirds migrating north between late April and early May each year (U.S. Fish and Wildlife Service 2014). Birds that forage along the shoreline and intertidal environment could be exposed to oil and could suffer the same effects as birds that encounter oil on the surface of the water, although they might be less likely to be fully coated by oil. Birds foraging on invertebrates in these areas would ingest oils along with contaminated prey, resulting in the same toxic effects (e.g., immunosuppression, skin irritation or ulceration, adrenal system damage, and behavioral changes, which could ultimately lead to death [U.S. Fish and Wildlife Service 2004, 2010]) from exposure to constituent toxic chemicals. Other animals and birds that have not been directly exposed to an oil spill, such as scavengers, can be exposed to oil by feeding on injured or dead birds that have been in contact with and contaminated by oil along the shoreline environment.

Animals that transit shoreline and intertidal habitats in the study area, such as harbor seals and river otters, also could be exposed to an oil spill along these habitats. These animals could ingest oil, inhale oil or its vapors, and physically be coated with oil. These mammals could suffer the same toxic effects as described above for marine mammals and birds (e.g., acute mortality and sub-lethal effects such as immunosuppression and behavioral changes, which could ultimately lead to death). Harbor seals could accumulate some of the oil constituents (e.g., polycyclic aromatic hydrocarbons) in their blubber and pass them along to their pups in maternal milkfats. Physical coating of river otters could cause hypothermia. Ingestion of oils and constituent chemicals during self-grooming or consumption of contaminated prey could lead to similar toxic effects, as noted for birds and other mammals.

Persistent effects of oil retained in sediments along shoreline and intertidal habitats, such as marsh plant death and consequent sediment loss, can concurrently change the diversity and abundance of animal species that use these habitats. Changes or loss of plant community structure can alter the ecological services of those communities, such as nursery areas for fish, until such time as the original or similar community structure can redevelop (International Tanker Owners Pollution Federation Limited 2011b: 3–4). Persistent or chronic effects on animal life also can result when oil strongly affects key animals that create physical habitat structure (e.g., mussels). This can lead to changes in the structure and functioning of both plant and animal communities. For example, high mortality of ribbed mussels was noted in several spills along the east coast in Spartina marshes, including the 1969 spill of almost 200,000 gallons of No. 2 fuel oil from the fuel barge Florida in Buzzards Bay Massachusetts. The mussels bind the root mat of east coast Spartina marshes together, and heavy mortality can accelerate local marsh erosion; persistent oil was still present in the soil 30 years after the spill and continued to affect ribbed mussel, fiddler crab, and marsh vegetation (Michel and Rutherford 2013: 2–18, A-1).

Terrestrial Animals

Oil spills in the vegetated terrestrial environment could occur during rail transport and could affect terrestrial animals and their habitats. Similar to species that depend on the aquatic environment, oil spills can affect terrestrial animals because of both physical smothering and toxic effects from constituent chemicals. Animals that contact oil could be physically coated, inhale its vapors, or ingest oil when foraging or grooming. Effects similar to those described above for aquatic and semiaquatic animals could occur. Common terrestrial animal species that could be affected by an oil spill along the PS&P rail line are described in Chapter 3, Section 3.5, *Animals.* In addition, any degradation of habitat from oil could displace animals by forcing them to abandon the area in search of more suitable habitat. This could result in significant impairment of normal behavioral patterns, and could reduce reproduction and survival, as individuals would expend energy looking for other habitat and attempting to insert into areas already defended by other animals of the same species.

An oil spill to land, however, is likely to cover a much smaller geographic area than a spill of the same quantity of oil to surface waters. Thus, a smaller proportion of local terrestrial animal populations might be impacted, possibly without long-term obvious impacts on local populations of birds or mammals. Frogs and other amphibians, however, might suffer localized mortality and reduced reproductive success if oil spills to land reach freshwater pools and ponds used for breeding.

Sensitive Areas in the Study Area

Sensitive areas within the study area where there would be concern for oil spills include areas identified as having important habitat characteristics that support sensitive species or refuge and preserve areas designated by a state or federal agency that support a high diversity of animals. The U.S. Fish and Wildlife Service designated critical habitat in several areas along the PS&P rail line for the federally listed bull trout (fish) and marbled murrelet (bird), and has proposed critical habitat for the Oregon spotted frog.

The PS&P rail line crosses three streams designated as critical habitat for bull trout: the Wishkah, Satsop, and Wynoochee Rivers. In addition, the PS&P rail line runs adjacent to the Chehalis River (also designated as critical habitat for bull trout), and is particularly close to the river between Oakville to just south of Elma. In the study area, all four rivers provide important foraging, migration, and overwintering critical habitats for bull trout.

The PS&P rail line is also adjacent to three areas of marbled murrelet critical habitat around the Oakville area and is adjacent to proposed critical habitat for Oregon spotted frog near the Black River crossing. An oil spill from a train that reached one or more of these critical habitats could cause adverse effects on survival and reproduction that could further compromise the existing populations.

The Washington State Department of Natural Resources' Chehalis River Surge Plain Natural Area and the U.S. Fish and Wildlife Service's Grays Harbor National Wildlife Refuge are higher quality ecosystems in the study area that support a variety of animals, including several sensitive species. The PS&P rail line runs along the northern boundary of the Chehalis River Surge Plain Natural Area, and the Grays Harbor National Wildlife Refuge is part of Grays Harbor. An oil spill from a train along this area that would be exposed to animals could result in physical smothering and toxic effects from constituent chemicals; the resulting impacts would be the same as what has already been described above. In addition, any degradation of habitat in this area from oil could displace uncontaminated animals, possibly causing reduced survival and reproduction as described above. Similar impacts would be expected if a vessel were to spill oil in Grays Harbor that would reach the Grays Harbor National Wildlife Refuge.

The U.S. Fish and Wildlife Service has designated critical habitat for the federally listed bull trout and the National Marine Fisheries Service has designated critical habitat for the federally listed green sturgeon in Grays Harbor. An oil spill from a vessel that would be exposed to these species in Grays Harbor could result in physical smothering and toxic effects from constituent chemicals, with increased mortality and reduced reproduction for affected animals as described above. As noted in Chapter 3, Section 3.5, *Animals*, Grays Harbor estuary is located along the Pacific Flyway, a migratory flight corridor between Alaska and South America. It is one of four major staging areas for migrating shorebirds in North America, with shorebirds congregating in the mudflats to feed and rest during spring and fall migrations. Approximately 24 species of shorebirds use the Grays Harbor National Wildlife Refuge during migrations, which begin in late April and continue through mid-May. The applicant has committed to cease all vessel-loading operations for a 2-week period each year during the Grays Harbor Shorebird Festival (Section 3.10.7.1, *Applicant Mitigation*). The applicant's primary intent in committing to this voluntary measure is to recognize the importance of the annual Grays Harbor Shorebird Festival to the community and those attending the festival; however, the measure also would reduce the potential risks of affecting shorebirds during this key migratory period.

Numerous measures and protocols are in place to prevent and minimize the extent of a spill once it occurs. These measures aimed at minimizing the frequency of a potential spill and the extent of the spill would reduce the potential for adverse impacts on animals. However, no mitigation measures can be implemented that will completely eliminate the possibility of a spill, nor are there any mitigation measures that will completely eliminate the adverse consequences of a spill.

4.7.1.1 Aesthetics

In the event of a spill, the specific impacts on aesthetic resources would depend on various factors, including the location of the spill, the amount and type of oil spilled, the weather, tidal conditions if the spill were to reach water, and the timing and type of response actions employed. The types of impacts on aesthetics that could occur are described below in general terms. More information about aesthetic resources in the study area is presented in Chapter 3, Section 3.9, *Aesthetics, Light, and Glare*.

The aesthetic value of an area is based on the visual character and quality of its natural and human-made features. The aesthetic value of the study area varies from low to moderate visual quality at the project site (due to greater extent of industrial uses) to high visual quality in areas with fewer encroaching features (industrial facilities) and increased views of natural landscapes. The areas of high visual quality would be more susceptible to effects from spills.

Table 4.7-1. Physical Properties and Mechanisms of Impact on Plants and Animals

Crude Oil Type	Density	Properties and Potential Release Behavior	General Types of Acute Physical and Chemical Impacts		Potential Persistent/Chronic Impacts	
			Plants	Animals	Plants	Animals
Bakken	Specific gravity 0.8–0.86; API 45	Typically floats on water; higher gas content, higher vapor pressure, lower flash point and boiling point, and higher degree of volatility than most other crude oils; increased ignitability and flammability; constituent chemicals can be toxic	• Physical smothering of leaves and soil (loss of photosynthesis and respiration) • Photosynthetic reduction and reduced carbohydrate storage in roots • Leaf/stem/root necrosis and death due to toxicity of constituent chemicals	• Smothering/ drowning • Lost insulation and hypothermia • Inhalation, ingestion, and exposure to constituent chemicals can cause health complications (e.g., organ damage, skin ulcerations) and death	• Increased marsh and shoreline erosion due to plant death/reduced stem density • Changes in sediment elevation and community structure (e.g. high marsh, low marsh) • Changes in sediment grain size and turbidity (e.g. suitability for eelgrass) • Plant death and physical disturbance changes dominant plant species and community structure	• Long-term toxicity from constituent chemicals retained in sediments • Behavioral changes and increased predation risk • Reduced growth • Genetic changes and reproductive impairment
Diluted bitumen	Specific gravity 0.92; API 23	Low evaporation and dissolution; Floats, submerges, and/or sinks depending on temperature, time spent in the environment (weathering process), and specific gravity/API value of the particular oil shipment and type of diluent added; diluent typically volatile and acutely toxic	Similar mechanisms of effect as Bakken crude oil	Similar mechanisms of effect as Bakken crude oil	• Similar to Bakken in potential chronic mechanisms • Possibly higher potential to penetrate into sediments • If sinks and binds to sediments, residue can persist for longer	• Similar mechanisms of effect as Bakken crude oil

Sources: Onwurah et al. 2007; Edema 2012; U.S. Environmental Protection Agency 1999; Lee 2015: Appendix C

A spill could degrade the visual quality of surrounding landscapes including both terrain and waterways. The degree of impact depends on factors including location of the spill, spill size, type of material spilled, weather and water current conditions, vegetation sensitivity, and effectiveness of spill response (containment and cleanup efforts). The greatest potential for impacts on the viewshed would involve a large spill of crude or other heavy oils in areas where the spill could be easily viewed from the land- and water-based vantages. The presence of this type of oil on the terrain and water would substantially alter the existing viewscapes, as described below.

A spill of crude or other oils could negatively alter the viewshed by initially coating or covering topographical features in oil that can later result in broader ecological damage. The appearance of an oil spill on natural landscapes is unsightly with thick oily sludge (a sticky, gooey, or tarry substance) enveloping widespread areas over relatively long periods. As noted above, ecological impacts related to vegetation could also occur from direct contact with toxic constituent chemicals in the oil that could result in smothering of leaves and soil and cause acute toxicity to plants. This would alter the existing visual landscape until vegetation regrew.

A spill directly to water would have greater potential for extensive environmental exposure than a spill on land since oil could be transported via the waterway to a much wider geographic area. Visible effects of this type of spill can occur on the water surface, shorelines, beaches, and sensitive ecological areas including wetlands, marshes, and mudflats. The presence of crude or other heavy oils in the water could temporarily change the color and textural appearance of the water's surface to a brownish or blackish covering or sheen. Along the shorelines, beaches, and wetlands, dark oil slicks and sludges can accumulate over widespread areas resulting in a negative impression of the viewshed for relatively long periods.

Removal of oil and cleanup efforts on land and water is difficult and time-sensitive, and residual visual effects (e.g., leftover oil slicks or sheens, increased erosion from void of vegetation) may remain after cleanup operations. Additionally, the labor and equipment involved in cleanup itself could also affect the visual quality of the landscape.

Numerous measures and protocols are in place to prevent and minimize the extent of a spill once it occurs. These measures aimed at minimizing the frequency of a potential spill and the extent of the spill would reduce the potential for adverse impacts on aesthetics. However, no mitigation measures can be implemented that will completely eliminate the possibility of a spill, nor are there any mitigation measures that will completely eliminate the adverse consequences of a spill.

4.7.1.2 Recreation

In the event of a spill, the specific impacts on recreational resources would depend on various factors, including the location of the spill, the amount and type of oil spilled, the weather, tidal conditions if the spill were to reach water, and the timing and type of response actions employed. The types of impacts on recreation that could occur are described below in general terms. More information about recreational resources in the study area is presented in Chapter 3, Section 3.10, *Recreation*.

A number of recreational resources (i.e., city and state parks and natural areas) offering a variety of recreational opportunities (e.g., fishing, birdwatching, boating) are available throughout the study area. Impacts from a spill would occur if the event results in conflicts with the existing recreational use or access to recreational areas. The degree of impact would be influenced by a number of factors

(e.g., location of the spill, spill size, type of material spilled, topography, ecological sensitivity, effectiveness of spill response). The greatest potential for impacts on recreation resources could occur in the event of a large spill near a park or natural area, particularly in or near a waterway. Potential impacts on recreation in the event of a spill are explained below.

An oil spill could degrade the environment and preclude the use of recreational resources from the site of the release to throughout the extent of the spill. Affected recreational areas would be prohibited to the public during oil spill response and cleanup efforts until the affected areas are no longer impaired. Recreational activities could be restricted from the affected area for months, and in some cases years. In the case of the grounding of the *New Carissa*,[3] recreation radically declined as beaches and other recreational areas were closed for months resulting in an estimated reduction of 30,000 recreational trips in the affected areas (U.S. Fish and Wildlife Service 2012).

In addition to the closure of recreational areas due to spill recovery efforts, other effects of an oil spill, such as impacts on natural resources, views, and wildlife, may conflict with the existing usage of the affected recreational area and deter recreational activities. In the case of the *Exxon Valdez* oil spill,[4] recreation and tourism in the spill area dramatically declined as damage to natural resources limited access to hunting and fishing areas and beaches that harbored oil could not be visited. Recreational activities have increased since the spill; however, complete recreational use is still recovering as some beaches, localized areas, and natural resources are still impaired (Exxon Valdez Oil Spill Trustee Council 2015).

Recreational activities could be affected if the impacts of a spill on aesthetic and wildlife resources disrupt recreational use associated with these resources. Regarding aesthetic resources, the study area includes several areas of high visual quality where many recreationalists visit to enjoy views of the natural landscapes and wildlife. If these resources are affected, activities could be discouraged due to the altered condition of the affected area from the spill's negative visual effect on the landscape. An oil spill's impact on wildlife resources could also result in a decline of recreational activities. A majority of the study area's recreational activities are reliant on wildlife resources that provide opportunities to fish, shellfish, hunt, and watch wildlife. A large spill event could severely affect these resources, which could halt fishing, hunting, and wildlife viewing until fish and wildlife have recovered. In some cases, such as the *Exxon Valdez* oil spill, recovery of these resources could take years. Recreational attendance would return over time, and how quickly depends on the effectiveness of recovery efforts and period of impairment.

A subsequent effect on recreational resources resulting from limited use and access of affected recreational areas could include increased use of recreational areas in the study area that were not affected by the oil spill. Although there are numerous and large recreational areas provided in and around the study area, it should be noted that changes in recreational use in response to a spill could occur since areas that were not affected become more heavily used as activities are displaced from the affected areas.

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[3] "On February 4, 1999, the 640-foot freighter *New Carissa* ran aground on the Oregon coast during a major winter storm. The vessel was carrying nearly 400,000 gallons of fuel oil and diesel onboard. After 4 days in the heavy surf, the *New Carissa* began leaking oil. On 11 February, the *New Carissa* broke in half, releasing an estimated 70,000-140,000 gallons of fuel into the marine environment (U.S. Fish and Wildlife Service 2012).

[4] On March 24, 1989, the 986-foot vessel *Exxon Valdez* ran aground on Bligh Reef in Prince William Sound, Alaska spilling approximately 11 million gallons of crude oil that covered 1,300 miles of coastline and 11,000 square miles of ocean (Exxon Valdez Oil Spill Trustee Council 2015).

As proven by past oil spill recovery and cleanup efforts (*Exxon Valdez* and *New Carissa*), removal of oil and cleanup efforts on land and water are difficult and can take months to years to complete. Additionally, the labor and equipment involved in cleanup itself could also affect the recovery period of natural resources.

Numerous measures and protocols are in place to prevent and minimize the extent of a spill once it occurs. These measures aimed at minimizing the frequency of a potential spill and the extent of the spill would reduce the potential for adverse impacts on recreation. However, no mitigation measures can be implemented that will completely eliminate the possibility of a spill, nor are there any mitigation measures that will completely eliminate the adverse consequences of a spill.

4.7.1.3 Commercial Fishing

In the event of a spill, the specific impacts on commercial fishing would depend on various factors, including the location of the spill, the amount and type of oil spilled, the weather, tidal conditions if the spill were to reach water, and the timing and type of response actions employed. The types of impacts on commercial fishing that could occur are described below in general terms. More information about commercial fishing in the study area is presented in Chapter 3, Section 3.17, *Vessel Traffic*.

The impacts of an oil spill on survival of juvenile and adult shellfish and fish, including salmonids, described in Section 4.7.1.3, *Animals*, would affect the number of fish and shellfish available for harvest by commercial fishers in future years. This impact could last several years from residual amounts of oil persisting in the environment. Fisheries could be restricted or closed to protect a species. Moreover, an oil spill in Grays Harbor or the Chehalis River could result in the temporary closures of fisheries during an event response. Because the consumption of contaminated shellfish and fish is a significant concern following an oil spill (National Oceanic and Atmospheric Administration 2002), extended fishery closures or restrictions could be in place to protect the general public from consumption of contaminated shellfish and fish.

4.7.1.4 Cultural Resources

In the event of a spill, the specific impacts on cultural resources would depend on various factors, including the location of the spill, the amount and type of oil spilled, the weather, tidal conditions if the spill were to reach water, and the timing and type of response actions employed. The types of impacts on cultural resources that could occur are described below in general terms. More information about cultural resources in the study area is presented in Chapter 3, Section 3.11, *Historic and Cultural Preservation*.

A spill could result in a variety of impacts to cultural resources in the study area. These impacts might include the fouling of historic resources (such as buildings and structures), oil seepage into soils containing archaeological sites, the contamination of historic landscapes or culturally significant properties, and the potential for secondary impacts caused by incident response or cleanup activities. The nature and duration of these impacts would depend on a variety of factors, including the type and quantity of material released, location of the release, and physical and biological features in the affected environment.

Oil that comes in contact with historic resources could potentially require the cleaning, repair, or replacement of features. The manner in which these activities were undertaken could adversely

affect a historic resource by physically affecting those character-defining features that convey its historical significance.

Archaeological resources would likely not be directly affected by an oil spill but could be affected by any excavation or other ground disturbing activities that would occur because of cleanup or site remediation activities.

Historic landscapes or culturally significant properties could also be affected in this manner. In addition, the defining characteristics of a historic landscape or culturally significant property could be directly affected by an oil spill, causing physical damage or contaminating features or characteristics deemed significant. These features or characteristics could include vegetation or wildlife, the traditional use of a location, or aspects of the resource's location and setting.

Numerous measures and protocols are in place to prevent and minimize the extent of a spill once it occurs. These measures aimed at minimizing the frequency of a potential spill and the extent of the spill would reduce the potential for adverse impacts on cultural resources. However, no mitigation measures can be implemented that will completely eliminate the possibility of a spill, nor are there any mitigation measures that will completely eliminate the adverse consequences of a spill.

4.7.1.5 Tribal Resources

In the event of a spill, the specific impacts on tribal resources would depend on various factors, including the location of the spill, the amount and type of oil spilled, the weather, tidal conditions if the spill were to reach water, and the timing and type of response actions employed. The types of impacts on tribal resources that could occur are described below in general terms. More information about tribal resources in the study area is presented in Chapter 3, Section 3.12, *Tribal Resources*.

As discussed in Chapter 3, Section 3.12, *Tribal Resources*, tribal resources include the traditional areas used for gathering of plants and fishing for economic, subsistence and ceremonial purposes. Traditional areas and the natural resources therein provide for spiritual and physical sustenance of tribal members. Treaty-reserved fishing and gathering rights provide a means for economic self-sufficiency and income (commercial harvest), dietary sustenance (subsistence harvest), and cultural practices (ceremonial harvest).

Tribal fishing resources include the associated catch in fresh water, Grays Harbor, and ocean fisheries. Quinault Indian Nation members fish in Grays Harbor for salmon, steelhead, sturgeon, and Dungeness crab. Resource Dimensions (2015:68) summarized the number of fishers reported by the Quinault Indian Nation that participate in the various treaty-right fisheries. The Quinault Indian Nation provided additional information on the number of active fishers in the Grays Harbor gillnet fisheries and number of fishers by area. Resource Dimensions (2015:68) reported 123 fishers in the Grays Harbor gillnet fishery. The Quinault Indian Nation (2015:4) reported 70 authorized Quinault Indian Nation gillnet fishers in Grays Harbor. The Quinault Indian Nation limit the number of fishers in the Chehalis River portion of Grays Harbor, fishing areas 2D, 2A, 2A1, and the lower Chehalis River up to Wynoochee River, to 50 fishers (Figure 3.12-1). Another 10 fishers are authorized to fish in the Humptulips River and another 10 are authorized to fish in the North Bay area (fishing area 2C). Ocean fisheries adjacent to Grays Harbor are fished for Dungeness crab, halibut, sablefish, groundfish, Chinook and coho salmon. Areas fished by Quinault Indian Nation fishers are coastal waters from Destruction Island just north of the Quinault Reservation boundary to Grays Harbor (50 CFR 660.50). Grays Harbor is home port for fishing vessels in ocean fisheries and is where fishers offload catch for these fisheries. On average, five Quinault Indian Nation fishers participate in

the ocean salmon fisheries, approximately 22 in the Dungeness crab fishery and approximately 13 in the halibut, sablefish, and groundfish fishery. The Quinault Indian Nation also manage razor clams for commercial and subsistence harvest on beaches on and off the reservation adjacent to Grays Harbor, and gather plant materials (such as sweetgrass and cattail stems) for production of woven materials. Members of the Confederated Tribe of the Chehalis Reservation harvest salmon and steelhead from the Chehalis River within the reservation boundaries and use tidal lands in Grays Harbor for shellfish harvest.

Potential impacts from a spill on plants in the study area including in shoreline habitats, the Chehalis River Surge Plain Natural Area, and Bowerman Basin are described in Section 4.7.1.2, *Plants*. A spill could have an impact on the gathering of plant material by Quinault Indian Nation and Confederated Tribe of the Chehalis Reservation members by making areas unusable because of contaminants or by affecting the reproduction and growth of plant species important to the tribes' cultures.

A spill in Grays Harbor or the Chehalis River could affect the various species of tidal salt marsh plants that fringe the shoreline of Grays Harbor and the tidal surge plain wetland plant communities that characterize the Chehalis River Surge Plain Natural Area Preserve (Figure 3.4-2). Freshwater, Grays Harbor, and ocean fisheries could be affected. Constituent compounds in oil can be acutely toxic to animals resulting in mortality, reduced growth and vigor, or impaired reproduction and development (Sections 4.7.1.2, *Plants*, and 4.7.1.3, *Animals*).

The nature and duration of these impacts would depend on a variety of factors, including the type and quantity of the material released, location of the release (e.g., land or in water), the potential for ignition, physical and biological features of the affected environment, sensitivity of various species to pollution, and the form of the material that is released. In addition to the effects of exposure to released materials, organisms can also be damaged by physical and chemical aspects of spill response and cleanup efforts.

Potential impacts of an oil spill on animals in the study area, including fish, shellfish, and invertebrates, are described in Section 4.7.1.3, *Animals*. A spill in Grays Harbor or the Chehalis River in or adjacent to waterfowl habitat would reduce access to hunting areas used by Quinault Indian Nation. A spill could affect waterfowl habitat, species survival, or use of Grays Harbor by migratory waterfowl. These long-term effects could last several years and would affect the number of waterfowl available to tribal hunters in future years.

An oil spill in Grays Harbor or the Chehalis River would affect survival of juvenile and adult shellfish and fish, including salmonids, thereby reducing the number available for harvest in the treaty-reserved Quinault Indian Nation fisheries and the on-reservation salmon fishery of the Confederated Tribe of the Chehalis Reservation. Short-term impacts of an oil spill on survival could occur from direct contact with oil by shellfish and fish. Long-term impacts on survival could occur from residual amounts of oil persisting in the environment. The long-term persistence of oil in the environment could reduce survival of shellfish and fish through chronic exposure to toxic constituent chemicals. Indirect impacts on shellfish and fish survival could result from impacts on the food chain and reduced prey available to shellfish and fish. These long-term impacts could last several years and would affect the number of harvestable shellfish and fish available to tribal fishers in future years. Fisheries could be restricted or closed entirely to protect an affected species or population.

White sturgeon caught in Grays Harbor by Quinault Indian Nation fishers are from river systems outside of Grays Harbor. White sturgeon and green sturgeon use the Grays Harbor estuary for

foraging. The harvest of white sturgeon in Grays Harbor by Quinault Indian Nation fishers could be affected if an oil spill were to affect sturgeon use of Grays Harbor for foraging.

An oil spill in Grays Harbor or the Chehalis River could result in the exclusion of tribal members from gathering traditional plant material or fishing traditional areas during the incident response. The consumption of contaminated shellfish and fish is a significant concern following an oil spill (National Oceanic and Atmospheric Administration 2002). An oil spill could result in extended fishery closures or restrictions to protect tribal members and the public (i.e., fish sold to the public) from consumption of contaminated shellfish and fish.

The nature and duration of these impacts would depend on a variety of factors, including the type and quantity of material released, location of the release, and physical and biological features in the affected environment. Numerous measures and protocols are in place to prevent and minimize the extent of a spill once it occurs. These measures aimed at minimizing the frequency of a potential spill and the extent of the spill would reduce the potential for adverse impacts on tribal resources. However, no mitigation measures can be implemented that will completely eliminate the possibility of a spill, nor are there any mitigation measures that will completely eliminate the adverse consequences of a spill.

4.7.1.6 Air

In the event of a spill, the specific impacts on air resources would depend on various factors, including the location of the spill, the amount and type of oil spilled, the weather, tidal conditions if the spill were to reach water, and the timing and type of response actions employed. The types of impacts on air that could occur are described below in general terms. More information about air conditions in the study area is presented in Chapter 3, Section 3.2, *Air.*

As noted in Section 4.3, *Risk Considerations*, volatile vapors released from a spill may create flammable atmospheres or inhalation hazards. The toxicity of crude oil and the potential to adversely affect air quality depend on the volatility of the constituents: benzene, toluene, ethylbenzene, xylene, hydrogen sulfide, naphthalene, generic alkanes, and polycyclic aromatic hydrocarbons. These constituents represent the most toxic of the components of crude oil. These are generally found in lower percentages than in refined petroleum products such as gasoline and diesel.

The compounds with the potential for acute exposure health effects are hydrogen sulfide and benzene. The sulfur and benzene content of these products depends on the crude oil from which they are refined but are generally within the following ranges. Bakken crude oil generally has a sulfur content of less than 0.3% by weight and a benzene content ranging from 0.1 to 1.0% by volume (Congressional Research Service 2014). Diluted bitumen generally has a sulfur content of 3.75% by weight (National Research Council 2013) and a benzene content of 0.23% by weight (Polaris 2013).

Human health impacts related to inhalation exposure are discussed in Section 4.7.1.7, *Human Health*.

4.7.1.7 Human Health

Similar to the impacts that could occur on the natural environment, spills of crude oil could adversely affect human health. People with the potential to be affected include first responders, nearby residents or workers, people that use resources affected by a spill, and many others. The

Pipeline and Hazardous Materials Safety Administration's 2016 *Emergency Response Guidebook 128* for flammable liquids recommends considering an initial downwind evacuation for at least 1,000 feet for a large spill. Humans can be affected by inhaling hazardous air pollutants; ingesting oil (either directly or if drinking water is affected); consuming fish, shellfish, or animals that were exposed to oil; or from direct exposure to the skin from contaminated surface water or groundwater. The human exposure symptoms related to the Kalamazoo, Michigan dilbit spill concluded that exposure symptoms to diluted bitumen were comparable to crude oil (Stanbury et al. 2010). Human health effects include short-term effects and long-term (chronic) effects. Depending on the scale of the incident, the impacts could be severe and have long-lasting physical and emotional impacts on affected individuals and their families.

Inhalation Hazards

Inhalation is the most likely exposure for first responders and people present near the site of a spill. As noted in Section 4.7.1.9, *Air*, hazardous air pollutants that are harmful to human health may be released in a spill.

If a release occurred in a populated area, the following adverse impacts could occur. Inhalation of vapors resulting from exposure to a fresh release can cause irritation of the respiratory system. This can cause eye and skin irritation, dizziness, rapid heart rate, headaches, confusion, nausea, and/or vomiting. Inhalation hazards from weathered materials are much less of a concern because the toxic volatile hydrocarbons are at much lower concentration following weathering.

The compounds with the greatest potential for exposure health effects are hydrogen sulfide and benzene. Hydrogen sulfide is a colorless gas with a pungent, rotten egg odor smell. The odor threshold varies in individuals but is generally detectable by most people at 0.008 parts per million (ppm) (Amoore and Hautala 1983). Starting at about 50 ppm, olfactory fatigue sets in and the odor is no longer detectible (Office of Environmental Health Hazard Assessment 2008). Human health risk from exposure to elevated levels of hydrogen sulfide depends on the concentration of the gas and length of exposure. Exposure to 10 ppm for more than 10 minutes causes eye and throat injuries. Exposure to between 20 ppm and 350 ppm could pose short-term health risks (shortness of breath) to first responders or others at the spill site. Exposure to 500 ppm for 3 to 5 minutes results in unconsciousness. The toxicity of volatile organic compounds in crude oil is lower than that of hydrogen sulfide, although Bakken crude is typically low in hydrogen sulfide compared to other crude oil (API 2011). Chronic effects can result in headaches and impaired memory or motor function.

An oil spill trajectory and fate model assessed the potential exposure from a 10,000-barrel medium crude oil spill in typical southern waters (air 80°F and water 70ºF) under worst-case wind and current speeds (calm winds, 1-knot currents) (Thayer and Tell 1999). Results showed that modeled concentrations (well in excess of 10 ppm) could be immediately dangerous to workers due to respiratory paralysis. However, modeled hydrogen sulfide concentrations drop below toxic levels in less than 4 minutes. The volatility of hydrogen sulfide is temperature-dependent and would be released at rate of about 20% lower (Yongsiri et al. 2004) and over a longer duration in the colder air and water temperatures found in Grays Harbor (Appendix D, *Air Data).* The maximum area affected was less than 1,300 feet from the spill. Thus, hydrogen sulfide concentrations are not expected to pose a health concern to first responders after a very short period. However, air monitoring should be conducted to determine the appropriate actions to take.

Benzene is a colorless liquid at room temperatures, with a slightly sweet smell. The odor threshold is 0.875 ppm (Haley 1977); at levels between 700 and 3,000 ppm, benzene can cause drowsiness, dizziness, rapid heart rate, headaches, tremors, confusion, and unconsciousness. Central nervous system symptoms of toxicity are apparent immediately after inhalation of high concentrations of benzene (3,000 ppm for 5 minutes). The Occupational Safety and Health Administration set permissible exposure levels for workers at 1 ppm for 8-hour daily exposure. Because benzene is less volatile than hydrogen sulfide, its release from spilled oil occurs over a longer period and may pose a greater risk of exposure to high concentrations as the result of an oil spill.

The Thayer and Tell (1999) study also examined exposure to the potential concentration levels for benzene with a benzene content of 0.2% by weight. Results showed that the initial concentration can be well over 1 ppm but decreases rapidly within 1 hour and a distance of approximately 1,150 feet from the spill. Over the course of 6 hours, the concentration dropped below 1 ppm everywhere, even under calm wind conditions. Again, dissipation would likely occur over a slightly longer duration in the Grays Harbor area because of colder air and water temperatures, but benzene would be at lower concentrations. Benzene concentrations are unlikely to pose a health concern to first responders, especially after 1 hour after the spill, unless there is a continuous spill of crude oil. However, air monitoring should be conducted to determine the appropriate actions to take.

Additional human health impacts can occur as the result of inhalation exposure to other constituent chemicals. The general types of human health impacts from exposure to crude oil are shown in Table 4.7-2.

Table 4.7-2. Human Health Effects from Inhalation Exposure to Crude Oil

Chemical	Human Health Effects
Hydrogen sulfide	Eye and throat injury/irritation, dizziness, nausea, heart rate, headaches, confusion, nausea, and/or vomiting. Inhalation of high levels can result in unconsciousness and death.
Benzene	Drowsiness, dizziness, rapid heart rate, headaches, tremors, confusion, and unconsciousness. Long-term exposure to high levels can cause blood disorders, reproductive effects, in women, adverse effects on the developing fetus, and increased incidence of leukemia.
Toluene	Irritation to eyes, skin, and the respiratory system. Can cause tiredness, confusion, impaired memory, nausea, loss of appetite, and loss of hearing. Exposure to high levels can result in unconsciousness and death. Long-term exposure can affect the nervous system or kidneys.
Xylene	Irritation to eyes, skin, and respiratory system; can cause headaches, lack of coordination, dizziness, confusion and impaired balance. Exposure to high levels can result in unconsciousness and death. Long-term exposure can adversely affect the central nervous system and change liver and kidney function.
Generic alkanes (octane, hexane, nonane)	Inhalation of high levels of n-hexane can cause numbness in the feet and hands, weakness in feet and lower legs, asphyxiation.
Naphthalene	Inhalation of high levels can cause nausea, diarrhea, and blood in urine. Exposure to extremely high levels can be fatal. Long-term exposure has been associated with red blood cell effects, resulting in fatigue and lack of appetite.
Polycyclic aromatic hydrocarbons	Irritation to eyes and skin cancer, possible reproductive and immune system effects. Several are known to be human carcinogens.

Those most susceptible include response and cleanup workers and those that live or work near the spill site. Effects on pulmonary function have been observed in workers exposed to crude oil during

spill cleanup (Meo et al. 2008). Interviews of subjects involved in oil cleanup identified significantly higher rates of health complaints associated with cough, runny nose, eye irritation or redness, sore threat, headache, nausea, and general illness compared to controls (Meo et al. 2009). One study of health surveillance information related to a pipeline spill in Michigan, including health care provider reporting, community surveys, calls to the Poison Control Center, and data submitted to the state's surveillance system, found the predominant symptoms reported by exposed individuals included headaches, nausea, and respiratory system effects, consistent with effects identified with exposure to crude oil in the literature (Stanbury et al. 2010). Another study of residents living near a marine spill reported symptoms relating to eyes, skin, and the nervous and respiratory systems with the effects correlated to the distance from the spill site (Janjua et al. 2006).

Levy and Nassetta (2011) conducted a review of studies documenting adverse health effects related to oil spills. Chronic effects reported include psychological disorders, respiratory disorders, genotoxic effects, and endocrine abnormalities. The Prestige spill cleanup in Spain involved a large number of people in the cleanup. Studies of these populations showed evidence of cytogenetic damage in exposed individuals. The chemicals present in the Prestige oil induced alterations in hormonal status, and may be considered an endocrine disrupter. The study's conclusions emphasize the importance of response worker protection in preventing effects related to exposure (Pérez-Cadahia et al. 2007).

To provide guidance to help limit exposure to dangerous levels, The National Institute for Occupational Safety and Health and the Occupational Health and Safety Administration have issued recommend exposure levels to crude oil (National Institute for Occupational Safety and Health 2016). This includes recommended and permissible exposure levels as well as lower and upper explosive limits.

Ingestion Hazards

Human health effects can also occur as the result of ingestion of crude oil. Ingestion of crude oil can occur either directly or from consuming highly contaminated water or food. Depending on the circumstances of a spill, ground and surface water used for drinking or irrigation can become contaminated. Risks of contamination of food sources can also occur when spills affect commercial or tribal fisheries. The effects of contaminated food sources can persist within the environment after cleanup is complete from the bioaccumulation of chemicals in the food chain.

Depending on the chemical constituents and the amount ingested, symptoms vary but are generally similar to those listed in Table 4.7-2. In general, symptoms include nausea, vomiting, diarrhea, dizziness, confusion, convulsions, and death. Vomiting can also lead to the aspiration of hydrocarbons that can result in significant lung injury or chemical pneumonia. Long-term exposure to ingested contaminants can also cause anemia and leukemia.

After a spill, state and federal agencies monitor areas that have been adversely affected and may close areas to fishing and shellfish harvesting or issue advisories that drinking water is not safe to consume. The Food and Drug Administration along with the National Oceanic and Atmospheric Administration have developed specific criteria for closing and eventual reopening affected areas, such as was the case with the Deepwater Horizon Oil Spill event (U.S. Food and Drug Administration 2016). They have also developed specific safe consumption levels for different food sources. Levels of concern and other factors for any subsequent oil spill event would be independently developed.

Exposure Hazards

In addition to the inhalation and ingestion hazards described above, human health effects can also occur as the result of direct exposure. Direct exposure most often occurs through contact with contaminated surface or groundwater. More severe symptoms generally arise from repeated or prolonged exposure although sensitive individuals may experience more pronounced effects from shorter-term exposure. Symptoms typically include skin and eye irritation with the effects ranging from a slight skin reddening to burning, swelling, pain, and permanent skin damage. Chronic exposure can also result in the skin becoming drier and thicker over time and in many of the same types of impacts related to inhalation and ingestion in Table 4.7-2.

Numerous measures and protocols are in place to prevent and minimize the extent of a spill once it occurs. These measures aimed at minimizing the frequency of a potential spill and the extent of the spill would reduce the potential for adverse impacts on human health. However, no mitigation measures can be implemented that will completely eliminate the possibility of a spill, nor are there any mitigation measures that will completely eliminate the adverse consequences of a spill.

4.7.1.8 Public Services

In the event of a spill, the specific impacts on public services would depend on various factors, including the location of the spill, the amount and type of oil spilled, the weather, tidal conditions if the spill were to reach water, and the timing and type of response actions employed. The types of impacts that could occur are described below in general terms. More information about public services in the study area is presented in Chapter 3, Section 3.13, *Public Services*.

Depending on the specific circumstances of an incident, public services near the incident could be disrupted. For example, it may be necessary to evacuate people and reallocate public resources to emergency response activities. Potential impacts could range from relatively minor, short-term disturbance to longer, more significant disruptions.

Spill response actions would follow the protocols and procedures set forth in Section 4.2.3, *What framework provides responses to an incident?* As noted in that section, the local emergency service providers described under Section 4.5.1, *What are the existing risks?* would likely be the first responders to an oil spill.

For first responders from the local jurisdictions or the railroad emergency response team, the posture for an oil or hazardous material spill on the rail line is the same—defensive and protective. The local responders do what is necessary to evaluate and report on the situation, keep themselves and the public safe, and monitor response and cleanup operations for compliance with local ordinances and permits. Depending on the severity of the incident, when considering impacts on public health and the environment, the U.S. Environmental Protection Agency, U.S. Coast Guard, and Washington State Department of Ecology may take a more aggressive role in the initial response operations to ensure that the responsible party is taking appropriate and timely action to mitigate damage to the environment.

As noted in Sections 4.4.1, 4.5.1, and 4.6.1, local emergency service providers in the study area are not equipped to respond to incidents that could occur under existing conditions. Applicant measures listed in Sections 4.4.3, 4.5.3, and 4.6.3 are intended to reduce risks and improve local response capabilities; however, the proposed action would result in a demand for services that exceeds current capabilities.

4.7.2 What would be the environmental impacts of a fire or explosion?

The proposed action would result in the potential for more frequent spills relative to the no-action alternative and the potential for impacts specific to crude oil, such as increased risks of fires or explosions. A fire with or without an explosion could result from a spill, although the chance of a fire or explosion is lower than the overall chance of a spill, as only a fraction of spills are expected to ignite. In general, a fire or explosion will only occur as the result of some, not all, oil spills. Heavier oils more commonly pool and do not generate many flammable vapors. Lighter materials, like diesel and gasoline, produce more flammable vapors that present a greater risk for a fire or explosion and are handled with precautions to prevent ignition. This is part of the reason that there are now restrictions on the vapor pressure of Bakken crude oil, to make it behave more like heavier crude oil and less like more flammable materials. The potential impacts associated with a fire or explosion resulting from a facility, train, or vessel spill is described in the following sections. The potential extent and the nature of the environmental damage can be quite varied. Because of these variables, the impacts of a fire or explosion on resource areas are described here in general terms.

4.7.2.1 Recent Fires and Explosions Involving Crude Oil Trains

Fires or explosions of crude oil are most likely to occur during transport when higher speeds provide enough energy to generate a spark. Recent incidents involving rail transport provide information about the potential impacts on human health when spills result in fires and in some cases, explosions. Typically, evacuations protect nearby residents from adverse health impacts. Many of these incidents involved trains traveling at speeds greater than speeds allowed on the PS&P rail line (25 miles per hour).

- On June 3, 2016, a 96-car Union Pacific train hauling Bakken crude oil derailed, released oil, and ignited along the Columbia River Gorge. The accident occurred near the town of Mosier, about 70 miles east of Portland, Oregon. Sixteen of the cars derailed, and approximately four of them caught fire. The cause of the accident appeared to be metal fasteners. There were no injuries. A small sheen of oil was sighted on the Columbia River, although no evidence of the spill reaching the river was originally found. The fire burned for part of a day, and there was no explosion. The vapor pressure of the Bakken crude oil was below the lower cap established by Oregon regulation.
- On November 8, 2015, in Watertown Wisconsin, 15 cars derailed releasing 1,000 gallons (23.8 barrels) with 102 people evacuated.
- On July 16, 2015, an incident involving at least three train cars were leaking crude oil after 21 cars derailed near Culbertson, Montana. There were no reports of injuries or fires although some residents were evacuated. An estimated 35,000 gallons (830 barrels) of oil were spilled.
- On May 6, 2015, a 109-car crude oil train derailed near Heimdal, North Dakota. Six cars exploded and an estimated 60,000 gallons (1,430 barrels) of oil spilled. Due to the resulting fire, 27 people were evacuated.
- On March 10, 2015, 21 cars of a 105-car-long crude oil train derailed about 3 miles outside of Galena, Illinois. No one was injured; however, several fires erupted lasting several days.
- On March 7, 2015, 39 cars of a crude oil train derailed about 3 miles outside of Gogama, Ontario. The resulting fire destroyed a bridge.

- On February 16, 2015, a crude oil train derailed and caught fire near Mount Carbon, West Virginia, leaking oil into the Kanawha River tributary and burning one home. The resulting fire lasted for almost one week and resulted in the evacuation of hundreds of families and the closure of two water treatment plants.
- On February 14, 2015, 29 cars of a 100-car train hauling crude oil and petroleum distillates derailed in a remote part of Ontario, Canada, causing a fire but no reported injuries. Over 360,000 gallons (8,571 barrels) were spilled.
- On January 20, 2014, seven cars derailed, with six containing Bakken oil on a bridge over the Schuylkill River in Philadelphia. No oil was spilled and no one was injured.
- On January 7th, 2014, an 8,400-foot freight train traveling at a speed of 47 miles per hour. Seventeen cars and one locomotive were derailed near Plaster Rock, New Brunswick. Of the 17 cars derailed, five were carrying crude oil, another five were carrying butane, and one was carrying ethanol. Other cars were not carrying hydrocarbons. The train had 122 cars, of which 66 were loaded and 56 were empty. About 60,900 gallons (1,450 barrels) of crude oil were spilled from two tank cars and caught fire, but without explosions. Approximately 150 residents were evacuated within a 1-mile radius. There were no injuries or deaths.
- On May 9, 2014, in LaSalle, Colorado, five cars derailed releasing 7,900 gallons (188 barrels), requiring 350 evacuations.
- On April 30, 2014, an incident occurred in Lynchburg, Virginia, where 17 oil cars derailed. One car failed, leading to a fire. Three of the derailed cars ended up in the James River, spilling up to 30,000 gallons (714 barrels) of crude oil into the river. Later clarification noted that the fire involved a CPC-1232 rail car.
- On February 13, 2014, in North Vandergrift, Pennsylvania, 21 cars derailed releasing 9,800 gallons (233 barrels).
- On January 31, 2014, in New Augusta, Mississippi, 11 cars derailed releasing 476,400 gallons (11,343 barrels).
- On December 30, 2013, an accident involving a westbound grain train and an eastbound crude oil train occurred near Casselton, North Dakota.[5] Twenty tank cars carrying crude oil derailed when the crude oil train hit a derailed grain car going approximately 42 miles per hour. Eighteen of the tank cars were punctured spilling an estimated 400,000 gallons (9,520 barrels) of crude oil. The crude oil from the ruptured tank cars was ignited with multiple explosions. A voluntary evacuation of about 1,400 people followed the accident. No injuries or deaths were reported.
- November 8, 2013, an oil train traveling 38 miles per hour derailed near Aliceville, Alabama, resulting in 26 cars derailing and spilling approximately 455,520 gallons (17,830 barrels), contaminating some wetlands.
- On April 3, 2013, a freight train traveling at 35 miles per hour near White River, Ontario experienced an emergency brake application, resulting in the derailment of 22 cars (19 loaded and three empty). Seven of the cars contained petroleum crude oil. During the derailment, a number of cars rolled down an embankment. Two of the crude oil tank cars released about 31,000 gallons (740 barrels) of crude oil and 4,800 gallons (114 barrels) of canola oil were

[5] The PS&P rail line is a single-track railroad and would not include risks associated with double-track railroads.

spilled. A fire was reported, but no explosions. There were no injuries or deaths because of the accident.

- On July 6, 2013, in an accident in Lac-Mégantic, Quebec, a train transporting crude oil had a runaway tank car. The runaway car gained speed and derailed at 65 miles per hour in the town of Lac-Mégantic, Quebec. As a result, 47 people were killed and 40 buildings were damaged when 63 tank cars spilled approximately 1.6 million gallons (38,100 barrels) of crude oil and ignited.
- On March 27, 2013, in Parkers Prairie, Minnesota, 14 cars derailed releasing 10,000 gallons. No evaluation was required.

4.7.2.2 Air

In the event of a fire or explosion, the specific impacts on air resources would depend on various factors, including the location of the spill, the amount and type of oil spilled, the weather, tidal conditions if the spill were to reach water, and the timing and type of response actions employed. The information below is provided to demonstrate the types of impacts on air that could occur in general. More information about air conditions in the study area is presented in Chapter 3, Section 3.2, *Air.*

Most information about the air and related health impacts associated with burning crude oil come from peer-reviewed conference proceedings where the level of air pollutants are measured during a controlled burn using air monitoring equipment. Many studies have been conducted to identify what hazardous air pollutants are emitted when oil burns, mainly to assess if burning crude oil is a viable method for reducing the environmental impacts of an oil spill.

One of the most extensive studies was the Newfoundland Offshore Burn Experiment (Fingas et al. 1994; Campagna and Humphrey 1992; Fingas 2014; National Oceanic and Atmospheric Administration 1995), which found that particulate concentrations in the smoke plume remained the chief air pollutant of concern with levels remaining above background more than a mile or two downwind of the incident. The smoke emitted from burning oil contains gases and particulates that may have toxic effects on human health, much like exhaust emissions from motor vehicles or smoke from wood stoves (National Oceanic and Atmospheric Administration 1995). The actual health risks depend on the actual exposure (concentration level and the duration of exposure) to the air contaminant. In most cases, exposure to smoke particulate would occur when the smoke plume occurs relatively close to the ground level.

Particulates in the smoke plume are considered by most health professionals to be the main combustion product to investigate and monitor (National Oceanic and Atmospheric Administration 1995). During burning, elemental carbon (soot) and hydrocarbons are emitted, and because these particulates absorb light to a high degree, the smoke plume from crude oil burning is usually black. The most recent compendium of results (Fingas 2014) has further expanded the compounds assessed and the concentration levels observed based on additional experiments. These studies continue to support the finding that particulate matter remains the pollutant of chief concern, but would not be expected to exceed levels of public health concern within 1,000 yards of the fire unless a strong temperature inversion was present at the time of the incident.

While the majority of the burned oil would be converted to carbon dioxide and water, particulates, mostly soot, typically account for 10 to 15% of the emissions. In addition, small amounts of polynuclear aromatic hydrocarbons are emitted from the fire, mostly as residues attached to the

particulates. Some polynuclear aromatic hydrocarbons are known or suspected carcinogens. Exposure of the skin (from chronic skin contact with oils) or the lungs from inhalation of these chemicals can be harmful. Based on data from the Newfoundland Offshore Burn Experiment, most polynuclear aromatic hydrocarbons are burned in the fire, and their concentration in the oil residue is higher than in the air emissions (Fingas et al. 1994).

In other studies that examined air impacts of burns that occurred over longer periods, concentrations of polynuclear aromatic hydrocarbons were found to be barely detectable in air emissions (Campagna and Humphrey 1992). Low levels have also been detected in experimental oil burns (Fingas et al. 1994).

4.7.2.3 Human Health

Potential human health risks from a fire or explosion include death, injury, and exposure to contaminants through inhalation or ingestion. As noted in Section 4.7.2.2, *Air*, when crude oil burns, depending on the specific properties of the oil and the circumstances of the incident, toxic air pollutants may be released. The primary air pollutants of concern are carbon monoxide, lead, nitrogen dioxide, particulate matter, sulfur dioxide, and polycyclic aromatic hydrocarbons. Table 4.7-3 lists the general symptoms associated with exposure to these compounds.

Table 4.7-3. Human Health Effects from Inhalation Exposure to Crude Oil Fires

Chemical	Human Health Effects
Carbon monoxide	Headaches, dizziness, nausea, impaired mental function, declined lung function. More prolonged exposure can lead to immune system suppression and susceptibility to respiratory system complications. Severe inhalation can lead to death.
Lead	High blood pressure, abdominal pain, constipation, joint and muscle pain, impaired mental function, pain or numbness in the extremities, headaches, reproductive complications.
Nitrogen dioxide	Severe irritation and burning of eyes, skin, mucous membranes, and other exposed tissue. Lung damage and difficulty breathing. Severe inhalation can lead to death. Decreased immune response and dental erosion, increased fatigue.
Particulate matter	Respiratory and cardiovascular complications and disease, asthma, and cancer.
Sulfur dioxide	Eye irritation and damage, psychic alterations, breathing difficulty, heart failure, pulmonary edema, circulatory collapse.
Polycyclic aromatic hydrocarbons	Irritation to eyes, skin cancer, possible reproductive and immune system effects. Several are also known to be human carcinogens.

As noted in Section 4.7.2.1, *Recent Fires and Explosions Involving Crude Oil Trains*, people could be injured or killed in the event of a fire or explosion. Human health effects can also occur as the result of direct exposure to extreme heat or fire or to explosive materials. Depending on the severity, this can lead to injury or death. Operations at the project site and during vessel transport could also result in fires or explosions that could harm or kill workers or other people nearby at the time of the incident. Depending on the scale of the incident, the impacts could be severe and have long-lasting physical and emotional impacts on affected individuals and their families.

In a fire or explosion, evacuations could be used to protect nearby residents. Emergency responders would determine if evacuations are needed. The Pipeline and Hazardous Materials Safety

Administration's *2016 Emergency Response Guidebook 128* for flammable liquids recommends isolating and evacuating for 0.5 mile for a fire involving a tank or rail car. Numerous measures and protocols are in place to prevent spills and minimize the extent of a spill once it occurs. These measures aimed at minimizing potential spills and the extent of spills would reduce the potential for a fire or explosion and adverse impacts on human health. However, no mitigation measures can be implemented that will completely eliminate the possibility of a spill or fire or explosion, nor are there any mitigation measures that will completely eliminate the adverse consequences of a spill, fire, or explosion.

4.7.2.4 Plants

In the event of a fire or explosion, the specific impacts on plants would depend on various factors, including the location of the spill, the amount and type of oil spilled, the weather, tidal conditions if the spill were to reach water, and the timing and type of response actions employed. The types of impacts on plants that could occur are described below in general terms. More information about plants in the study area is presented in Chapter 3, Section 3.4, *Plants.*

Impacts of a fire or explosion would depend on the conditions as well as the characteristics of the vegetation species and communities exposed. The likelihood of a plant being killed by fire depends on a combination of time and temperature. High, sustained temperatures are most likely to result in plant mortality, especially when several different parts of the plant have been injured. The aboveground portions of herbaceous plants, shrubs, and trees are the most likely to be destroyed. Trees may survive as long as the fire does not spread into the canopy. However, trees that survive the fire may later succumb to disease, fungus, or insects due to their decreased resistance caused by injuries sustained in the fire. Belowground roots and rhizomes may survive depending on the intensity, duration, and extent of the fire and its effect on the soil. The effect of fire on soil is related to the amount of heat transferred into the ground due to the severity of the fire.

High intensity fire can sterilize the soil and delay vegetation recovery, affecting community structure and function. Reduced vegetation cover after a fire can accelerate soil erosion and sedimentation.

Numerous measures and protocols are in place to prevent and minimize the extent of a spill once it occurs. These measures aimed at minimizing the frequency of a potential spill and the extent of the spill would reduce the potential for a fire or explosion and adverse impacts on plants. However, no mitigation measures can be implemented that will completely eliminate the possibility of a spill, fire, or explosion, nor are there any mitigation measures that will completely eliminate the adverse consequences of a spill, fire, or explosion.

4.7.2.5 Animals

In the event of a fire or explosion, the specific impacts on animals would depend on various factors, including the location of the spill, the amount and type of oil spilled, the weather, tidal conditions if the spill were to reach water, and the timing and type of response actions employed. The types of impacts on animals that could occur are described below in general terms. More information about animals in the study area is presented in Chapter 3, Section 3.4, *Animals.*

Animals' immediate responses to fire are influenced by intensity, severity, rate of spread, uniformity, and size of the fire. Responses may include injury, mortality, immigration, or emigration. Animals with limited mobility, such as young, are more vulnerable to injury and mortality than

mature animals. Many animal-fire studies depict a reorganization of animal communities in response to fire, with increases in some species accompanied by decreases in others.

Numerous measures and protocols are in place to prevent and minimize the extent of a spill once it occurs. These measures aimed at minimizing the frequency of a potential spill and the extent of the spill would reduce the potential for explosion and adverse impacts on animals. However, no mitigation measures can be implemented that will completely eliminate the possibility of a spill, fire, or explosion, nor are there any mitigation measures that will completely eliminate the adverse consequences of a spill, fire, or explosion.

4.7.2.6 Aesthetics

In the event of a fire or explosion, the specific impacts on aesthetic resources would depend on various factors, including the location of the spill, the amount and type of oil spilled, the weather, tidal conditions if the spill were to reach water, and the timing and type of response actions employed. The types of impacts on aesthetics that could occur are described below in general terms. More information about aesthetic resources in the study area is presented in Chapter 3, Section 3.9, *Aesthetics, Light, and Glare*.

A fire or explosion from an oil spill could substantially degrade the visual quality of surrounding landscapes. The degree of impact is contingent on the size and location of the fire or explosion with the greatest potential for impacts on the viewshed in areas where the effects could be easily viewed from the land- and water-based vantages. Visual effects of a fire or explosion can include areas with extensive burn damage to structures, facilities, property, or natural features such as forests, vegetation, wildlife habitats. This type of physical damage would substantially alter and degrade the visual quality of the study area's existing viewsheds until the landscape is restored.

Numerous measures and protocols are in place to prevent and minimize the extent of a spill once it occurs. These measures aimed at minimizing the frequency of a potential spill and the extent of the spill would reduce the potential for a fire or explosion and adverse impacts on aesthetics. However, no mitigation measures can be implemented that will completely eliminate the possibility of a spill, fire, or explosion, nor are there any mitigation measures that will completely eliminate the adverse consequences of a spill, fire, or explosion.

4.7.2.7 Recreation

In the event of a fire or explosion, the specific impacts on recreational resources would depend on various factors, including the location of the spill, the amount and type of oil spilled, the weather, tidal conditions if the spill were to reach water, and the timing and type of response actions employed. The types of impacts on recreation that could occur are described below in general terms. More information about recreational resources in the study area is presented in Chapter 3, Section 3.10, *Recreation.*

A fire or explosion from an oil spill could substantially degrade the environment and preclude the use of recreational resources in affected areas. The degree of impact would be influenced by the location and magnitude of the fire or explosion. The greatest potential for impacts would occur if the fire or explosion was within or close to a recreational facility (e.g., boating facilities, campgrounds, trails), park, or natural area. Impacts on recreational resources would include the destruction or physical damage by the fire or explosion to the resource itself. Recreational visitation and activities would dramatically decline if recreational resources such as viewsheds and wildlife resources were

substantially damaged by fire or explosion. Visitation could also be reduced as access to recreational sites could be destroyed or interrupted during fire related closures. Some areas could be affected by the presence of fire camps during suppression of the fire or explosion.

A subsequent impact on recreational resources resulting from limited use and access of affected recreational areas could be increased use of recreational areas in the study area that were not affected by the fire or explosion. Although there are numerous and large recreational areas in and around the study area, changes in recreational use in response to a fire or explosion could occur since areas that were not affected become more heavily used as activities are displaced from the affected areas.

Numerous measures and protocols are in place to prevent and minimize the extent of a spill once it occurs. These measures aimed at minimizing the frequency of a potential spill and the extent of the spill would reduce the potential for a fire or explosion and adverse impacts on recreation. However, no mitigation measures can be implemented that will completely eliminate the possibility of a spill, fire, or explosion, nor are there any mitigation measures that will completely eliminate the adverse consequences of a spill, fire, or explosion.

4.7.2.8 Cultural Resources

In the event of a fire or explosion, the specific impacts on cultural resources would depend on various factors, including the location of the spill, the amount and type of oil spilled, the weather, tidal conditions if the spill were to reach water, and the timing and type of response actions employed. The types of impacts on cultural resources that could occur are described below in general terms. More information about cultural resources in the study area is presented in Chapter 3, Section 3.11, *Historic and Cultural Preservation*.

A fire or explosion from an oil spill could result in the partial or complete destruction of historic resources and culturally significant properties adjacent to or near the study area. The severity of the impacts would depend on the proximity of such resources to the study area, the extent and severity of the fire or explosion, and measures taken during the incident response and cleanup activities. Such events would not be expected to affect archaeological resources unless the fire, explosion, incident response, or cleanup activities resulted in the disturbance or excavation of soils within or near an archaeological site.

Numerous measures and protocols are in place to prevent and minimize the extent of a spill once it occurs. These measures, aimed at minimizing the frequency of a potential spill and the extent of the spill, would reduce the potential for a fire or explosion and adverse impacts on cultural resources. However, no mitigation measures can be implemented that will completely eliminate the possibility of a spill, fire, or explosion, nor are there any mitigation measures that will completely eliminate the adverse consequences of a spill, fire, or explosion.

4.7.2.9 Tribal Resources

In the event of a fire or explosion, the specific impacts on tribal resources would depend on various factors, including the location of the spill, the amount and type of oil spilled, the weather, tidal conditions if the spill were to reach water, and the timing and type of response actions employed. The types of impacts on tribal resources that could occur are described below in general terms. More information about tribal resources in the study area is presented in Chapter 3, Section 3.12, *Tribal Resources*.

An explosion or fire from a spill could affect tribal resources such as plants and animals, as described above. It could also result in the exclusion of tribal members from traditional areas during incident response. The duration of these impacts would depend on the severity of the fire and duration of the incident response and cleanup activities. The greatest potential for impacts would occur if the explosion or fire was at or near traditional fishing grounds in Grays Harbor and the lower Chehalis River. Such events could exclude Quinault Indian Nation fishers from harvesting fish used for commercial, subsistence, and ceremonial purposes. An explosion or fire in Grays Harbor or the Chehalis River adjacent to waterfowl habitat could affect access to hunting areas used by Quinault Indian Nation tribal members. The degree of impact would be influenced by the location, magnitude, and time of year of the explosion or fire.

Numerous measures and protocols are in place to prevent and minimize the extent of a spill once it occurs. These measures aimed at minimizing the frequency of a potential spill and the extent of the spill would reduce the potential for a fire or explosion and adverse impacts on tribal resources. However, no mitigation measures can be implemented that will completely eliminate the possibility of a spill, fire, or explosion, nor are there any mitigation measures that will completely eliminate the adverse consequences of a spill, fire, or explosion.

4.7.2.10 Public Services

In the event of a fire or explosion, the specific impacts on public services would depend on various factors, including the location of the spill, the amount and type of oil spilled, the weather, tidal conditions if the spill were to reach water, and the timing and type of response actions employed. The types of impacts that could occur are described below in general terms. More information about public services in the study area is presented in Chapter 3, Section 3.13, *Public Services*.

Depending on the specific circumstances of an incident, public services near the incident could be disrupted. For example, it may be necessary to evacuate people and reallocate public resources to emergency response activities. Potential impacts could range from relatively minor, short-term disturbance to longer, more significant disruptions.

Spill response actions would follow the protocols and procedures set forth in Section 4.2.3, *What framework provides responses to an incident?* As noted in Section 4.2.3, the local emergency service providers described under Section 4.5.1, *What are the existing risks?* would likely be the first responders to an oil spill at the project site.

For first responders from the local jurisdictions or the railroad emergency response team, the posture for an oil or hazardous material spill on the rail is the same—defensive and protective. The local responders do what is necessary to evaluate and report on the situation, keep themselves and the public safe, and monitor response and cleanup operations for compliance with local ordinances and permits. Depending on the severity of the incident, when considering impacts on public health and the environment, the U.S. Environmental Protection Agency, U.S. Coast Guard, and Washington State Department of Ecology may take a more aggressive role in the initial response operations to ensure that the responsible party is taking appropriate and timely action to mitigate damages to the environment.

As noted in Sections 4.4.1, 4.5.1, and 4.6.1, local emergency service providers in the study area are generally not equipped to respond to an incident under existing conditions. Applicant measures listed in Sections 4.4.3, 4.5.3, and 4.6.3 are intended to reduce risks and improve local response

capabilities; however, the proposed action would result in a demand for services that exceeds current capabilities.

Chapter 5
Extended Rail and Vessel Transport

Under the proposed action, crude oil would be transported to and from the project site by rail and vessel, respectively. Chapter 3, *Affected Environment, Impacts, and Mitigation*, and Chapter 4, *Environmental Health and Safety*, present analyses of potential impacts from onsite operation of the proposed action; transport of crude oil by rail along the Puget Sound & Pacific Railroad (PS&P) rail line between Centralia, Washington, and the project site; and transport of crude oil by vessel from the project site along the Grays Harbor Navigation Channel, out 3 nautical miles from the mouth of the harbor. This chapter addresses the transport of crude oil beyond these points, from the most likely source of crude oil to the likely destinations.

This chapter describes the following information.

- Extended study area.
- Likely sources and destinations for crude oil that would be transloaded and stored at the proposed facility, potential for the proposed action to affect (or induce) crude oil production at these sources, and likely effect of the lifting of the U.S. crude oil export ban.
- Routes, conditions, commodities, and existing and projected (where available) traffic volumes along the transportation routes in the extended study area.
- Potential impacts of routine transport and risk of oil spills, fires, and explosions under the no-action alternative and proposed action, considering existing and proposed emergency preparedness and response planning.
- Potential significant and unavoidable impacts.

5.1 What is the extended study area for rail and vessel transport?

The extended study area consists of specific rail and vessel transportation corridors that could be affected by the transport of crude oil to and from the project site. The rail corridor consists of the area along the BNSF Railway Company (BNSF) main line from the Williston Basin in North Dakota[1] to Centralia, Washington, with a focus on Washington State. The vessel corridor consists of the vessel routes along the U.S. West Coast to the most likely destinations north to Puget Sound refineries and south to California refineries. Section 5.3, *What are the likely sources and destinations of crude oil?* describes the basis for these end points.

[1] The Williston Basin rail terminals are primarily in North Dakota but extend into Montana, South Dakota, and Saskatchewan, Canada.

5.2 How were impacts evaluated in the extended study area?

5.2.1 Information Sources

The following sources of information were used to define the existing conditions relevant to rail and vessel transportation and identify the potential impacts of the no-action alternative and the proposed action in the extended study area.

- Washington State 2014 Marine & Rail Oil Transportation Study (Washington State Department of Ecology 2015).
- Washington State Freight Mobility Plan (Washington State Department of Transportation 2014a).
- Washington State Rail Plan, Integrated Freight and Passenger Rail Plan, 2013–2015 (Washington State Department of Transportation 2014b).
- North Dakota State Rail Plan (North Dakota Department of Transportation 2007).
- 2010 Montana State Rail Plan (Montana Department of Transportation 2010).
- Idaho Statewide Rail Plan (Idaho Department of Transportation 2013).
- Vessel Entries and Transits for Washington Waters—VEAT 2015 (Washington State Department of Ecology 2016)
- Vessel Calls in U.S. Ports, Selected Terminals and Lightering Areas (U.S. Maritime Administration 2015).
- West Coast Offshore Vessel Traffic Risk Management Project Final Project Report and Recommendations (Pacific States/British Columbia Oil Spill Task Force 2002).

5.2.2 Impact Analysis

Rail transport was considered along the mainline BNSF routes between the likely source, Williston Basin, and Centralia, Washington (Section 5.3.1, *Sources of Crude Oil*). The routes considered are based on existing BNSF operations for loaded and unloaded crude oil trains. Infrastructure and operating information for these routes was based on the respective state rail plans identified above. No rail capacity or traffic projections were available between Williston Basin and the Washington state line. Rail capacity and existing and projected rail traffic for the BNSF mainline routes in Washington State are based on the Washington State rail plan (Washington State Department of Transportation 2014b). The rail plan provides estimates for 2010 and 2035. The 2010 estimates were extrapolated to 2015 to provide a 20-year interval between existing and projected conditions consistent with the rail analysis in the study area in Chapter 3, Section 3.15, *Rail Traffic*. Potential impacts on rail traffic are discussed based on comparing the unit train trips under the proposed action, 458 trips per year, to existing and projected rail trips along the assumed routes in Washington State.

Vessel transport was considered along the West Coast of the United States, north to the Puget Sound and south to California ports (Section 5.3.2, *Destinations of Crude Oil*). Existing vessel traffic was based on the information sources described above. Because no vessel traffic projections were

available, future vessel traffic was discussed qualitatively. Impacts on vessel traffic are discussed based on comparing the tank vessel trips under the proposed action, 238 trips per year, to existing trips of vessels of more than 1,000 gross tons that called at select West Coast destinations in 2015.

5.3 What are the likely sources and destinations of crude oil?

As described in Chapter 2, *Proposed Action and Alternatives*, crude oil would arrive at the proposed facility by unit train. It is expected to be Bakken crude oil from the Williston Basin, but could be diluted bitumen derived from oil sands in Alberta, Canada. The crude oil would be transported from the project site via tank vessel likely to West Coast refineries. This section explains the crude oil market driving these likely sources and destinations, the effect of recent policy changes related to the export of U.S. crude oil, other potential sources of crude oil, and the potential for the proposed action to induce crude oil production. Refer to Appendix Q, *Crude Oil Market Analysis*, for more information.

5.3.1 Sources of Crude Oil

U.S. crude oil reserves are estimated at more than 36 billion barrels (U.S. Energy Administration 2013). U.S. crude oil production increased by 85% between 2006 and 2015 (U.S. Energy Administration 2015). This increase can be attributed primarily to the extraction of shale oil in Texas and crude oil from the Bakken formation. Extraction of Bakken crude oil increased by more than 11 times between 2003 and 2013—from 3.4 to 37.8 million gallons per day (Washington State Department of Ecology 2015). This increased production has led to increased shipments of these oils to refineries in Washington State, California, Illinois, Texas, Louisiana, and New Jersey via rail and vessel.

Current crude oil production from the Williston Basin is approximately 1.03 million barrels per day (North Dakota State Industrial Commission 2016).[2] The capacity to move crude oil out of the basin via rail, pipelines, and trucks, referred to as *takeaway capacity*, is 1.83 million barrels per day, well above current production levels. Despite recent slowing of production due to the decline in oil prices that began in 2014, additional takeaway capacity has been planned for the coming years. Based on the analysis presented in Appendix Q, *Crude Oil Market Analysis*, because takeaway capacity is not constrained out of Williston Basin, the proposed action would not result in additional drilling or production of Bakken crude oil solely due to construction of the proposed facility.

Canadian crude oil production has increased by almost 75% over the past 10 years from 2.6 billion barrels per day in 2006 to 3.9 billion barrels per day in 2015 (National Energy Board of Canada 2016). It is reasonably likely that production will continue to grow slowly, but the rate of growth would depend on oil prices. Based on the analysis in Appendix Q, *Crude Oil Market Analysis*, Canadian production growth may be more constrained by takeaway capacity than Bakken growth. Therefore, if the proposed facility were to receive diluted bitumen, the proposed action could slightly increase Canadian production. However, transloading of diluted bitumen at the proposed facility would depend on several factors. If the proposed facility is transshipping Bakken crude oil, capacity may be insufficient to handle Canadian crude oil. Moreover, to handle the heavy, viscous

[2] For comparison, the capacity of the proposed action would be approximately 49,000 barrels per day on average.

diluted bitumen, additional investment in storage tanks and other equipment would be required. Lastly, rail transport to the West Coast would need to be more economically favorable than rail transport to the Gulf Coast.

Therefore, the extended study area for rail transport focuses on the route between the Williston Basin and Centralia, Washington. Refer to Appendix Q, *Crude Oil Market Analysis*, for more information.

5.3.2 Destinations of Crude Oil

Vessels transporting crude oil from the project site would likely be bound for West Coast refineries in the Puget Sound or California markets. As described in Appendix Q, while crude oil could be exported with the recent lifting of the ban of exports of U.S. crude oil, the economics make this unlikely. Asian refineries, primarily Korean, Japanese, or Chinese, would be the likely foreign markets for crude oil transported from the project site. However, freight costs to Asian refineries can be high, especially for the smaller vessels that are likely to call at the proposed facility. Even on the largest possible vessels considered (Panamax), exports would incur very high transportation costs. Bakken crude oil producers would have to discount the price of oil at the well significantly to overcome the high transportation costs to Asia.

5.4 What rail and vessel transport occurs in the extended study area?

This section provides a discussion of recent changes related to the transport of oil, including crude oil, in and out of Washington State. It then describes existing conditions related to the rail and vessel transportation along the likely routes in the extended study area.

5.4.1 Movement of Crude Oil

Nationwide, domestic transport of crude oil by rail increased dramatically between 2010 and 2014, from 20 million barrels to 385 million barrels per year (U.S. Energy Administration 2016a). In 2015, the number of barrels transported by rail dropped to 323 million barrels per year. The decline in crude-by-rail volume is attributed to a global shift in foreign and domestic crude oil prices between foreign and domestic crudes. Reductions in domestic production due to lower global oil prices and new and expanded oil pipeline capacity are also contributing factors (U.S. Energy Administration 2016b). The majority of crude oil transported by rail in the United States originates in the North Dakota and Montana regions of the Bakken formation. West Coast ports and refineries are the second largest recipient of Bakken crude oil after the East Coast. Mirroring national trends, there was a sharp rise in the volume of Bakken crude oil transported by rail to the West Coast, from 453,000 barrels in 2010 to 52 million barrels in 2014, followed by a slight decline in 2015 to 50 million barrels (U.S. Energy Administration 2016c).

Multiple sources of crude oil have been transported into Washington State over the years. Because the capacity of Washington's refineries has not substantially changed over the last decade, the amount of crude oil transported into the state has been steady at about 8.5 billion gallons annually. The primary source of crude oil has been tanker delivery from Alaska's North Slope; however, the region's oil production has been declining since 1988 (U.S. Energy Information Administration).

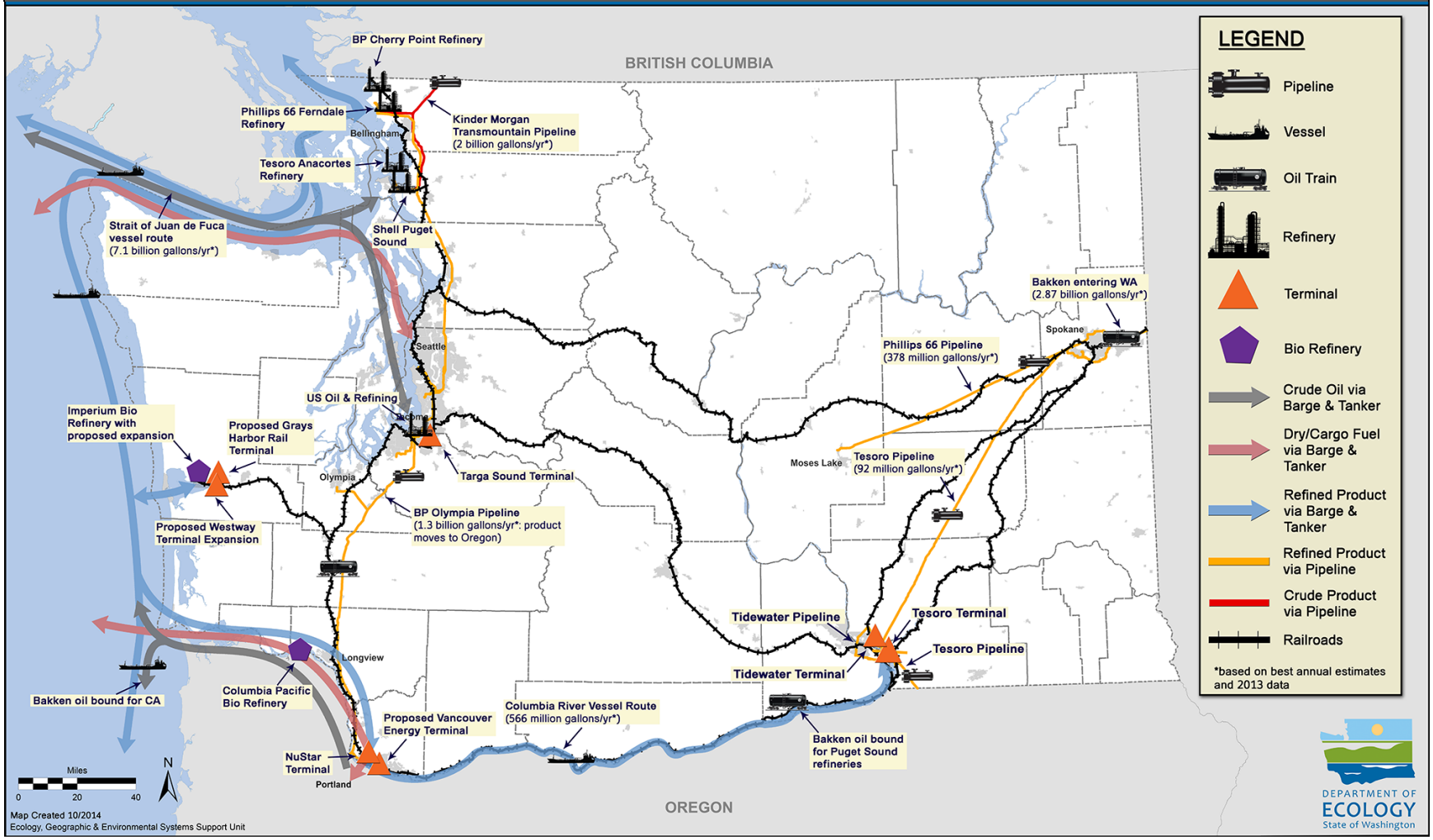
With this decline, tanker delivery of crude oil has shifted to pipeline and more recently to rail tank car (Figure 5-1).

Washington State oil refineries exported about 2.6 billion gallons of refined products in 2011, an increase of 17% from 2008. In addition, in 2011, 487.2 million gallons of bunker (vessel) fuel were loaded onto tank vessels and exported from Washington State refineries (Washington State Department of Ecology 2015).

Oil, including diluted bitumen from Canada, is transported by pipeline to refineries in northern Puget Sound. Puget Sound refineries transfer refined products to the Olympic Pipeline, tank vessels, and trucks for transport. Diluted bitumen and Bakken crude oil are also transported by rail through Spokane to a facility on the Columbia River and refineries in Puget Sound. Most crude oil shipped by rail in Washington transits through the Columbia River Gorge but could transit over other rail routes.

Nineteen loaded crude oil unit trains pass through Washington State weekly, or approximately 988 per year, destined either for the storage facilities and refineries described above, or for facilities in Oregon and California. Additionally, crude oil tank cars are transported on mixed commodity unit trains; data on these tank car movements are unknown. Table 5-1 and Figure 5-2 illustrate how the mode of crude oil transport to Washington State has changed from 2003 to 2013.

Figure 5-1. Movement of Oil In and Out of Washington State



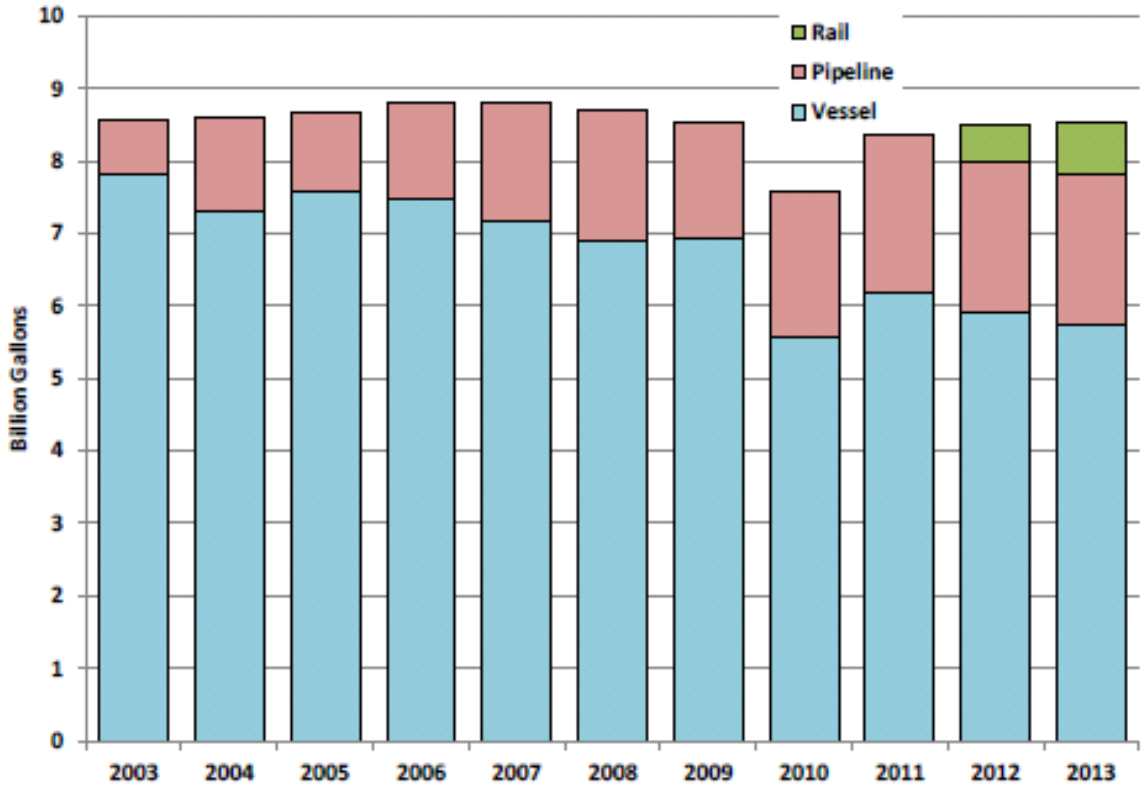
Source: Washington State Department of Ecology 2015

Table 5-1. Estimated Annual Oil Imports by Mode of Transportation into Washington State

	Billion Gallons				Total (%)		
Year	**Vessel**	**Pipeline**	**Rail**	**Total**	**Vessel**	**Pipeline**	**Rail**
2003	7.8030	0.7753	0.0000	8.5783	91.0	9.0	0.0
2004	7.3171	1.2929	0.0000	8.6100	85.0	15.0	0.0
2005	7.5884	1.0919	0.0000	8.6803	87.4	12.6	0.0
2006	7.4826	1.3079	0.0000	8.7905	85.1	14.9	0.0
2007	7.1744	1.6338	0.0000	8.8083	81.5	18.5	0.0
2008	6.9090	1.7784	0.0000	8.6875	79.5	20.5	0.0
2009	6.9398	1.5992	0.0000	8.5390	81.3	18.7	0.0
2010	5.5713	2.0129	0.0000	7.5842	73.5	26.5	0.0
2011	6.1756	2.1769	0.0000	8.3525	73.9	26.1	0.0
2012	5.9210	2.0756	0.5092	8.5057	69.6	24.4	6.0
2013	5.7480	2.0652	0.7128	8.5260	67.4	24.2	8.4
Total	**74.6302**	**17.8100**	**1.2220**	**93.6621**	**79.7**	**19.0**	**1.3**

Source: Washington State Department of Ecology 2015:32

Figure 5-2. Crude Oil Imports into Washington State by Mode (2003–2013)



Source: Washington State Department of Ecology 2015

5.4.2 Rail

This section describes the mainline routes that would likely be used to transport crude oil under the proposed action in the extended study area. It provides a general description of the route from Williston Basin to the Washington state line, with more detailed information about rail traffic, operations and maintenance, and risks related to existing operations in the state.

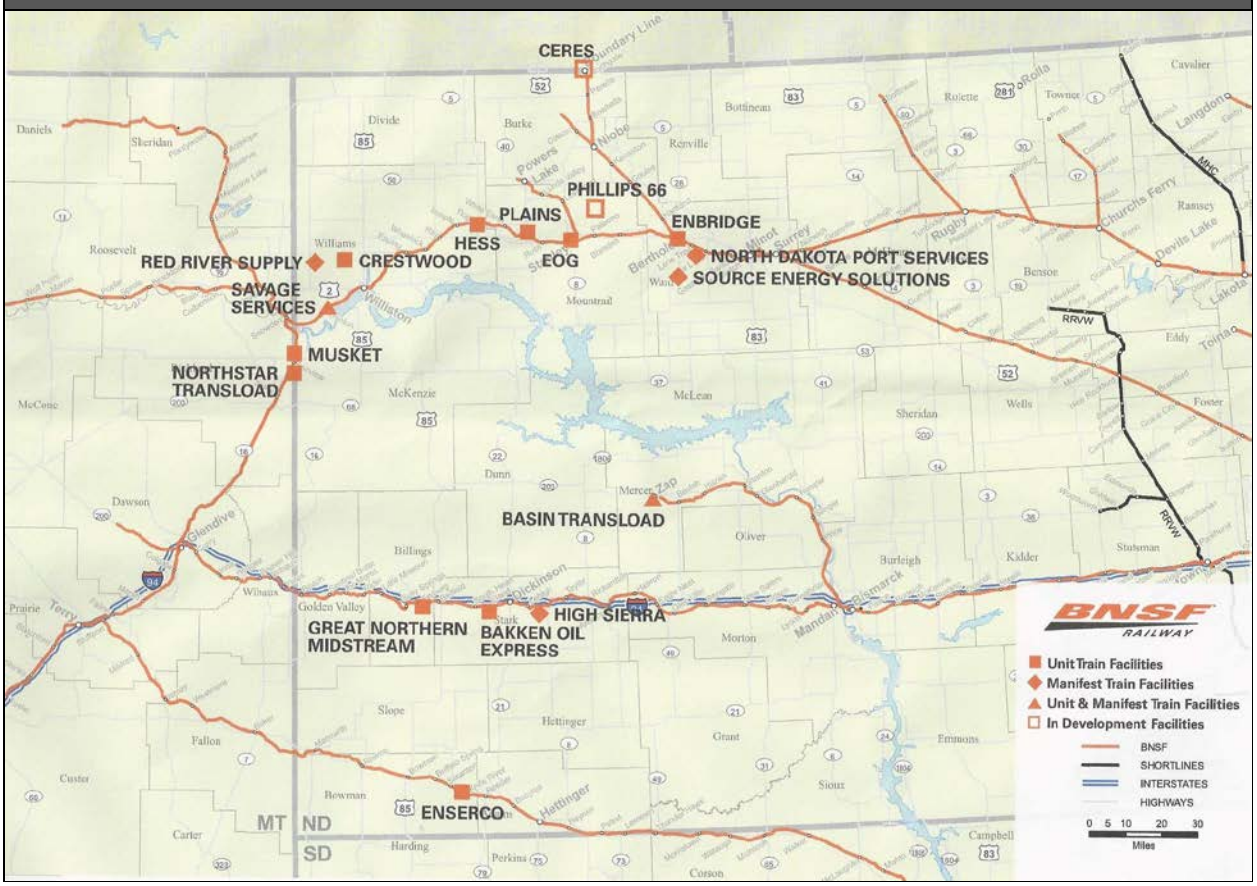
5.4.2.1 Mainline Routes, Traffic, and Commodities

This section describes the routes that are assumed for transport of crude oil related to the proposed action.

Williston Basin to Washington/Idaho State Line

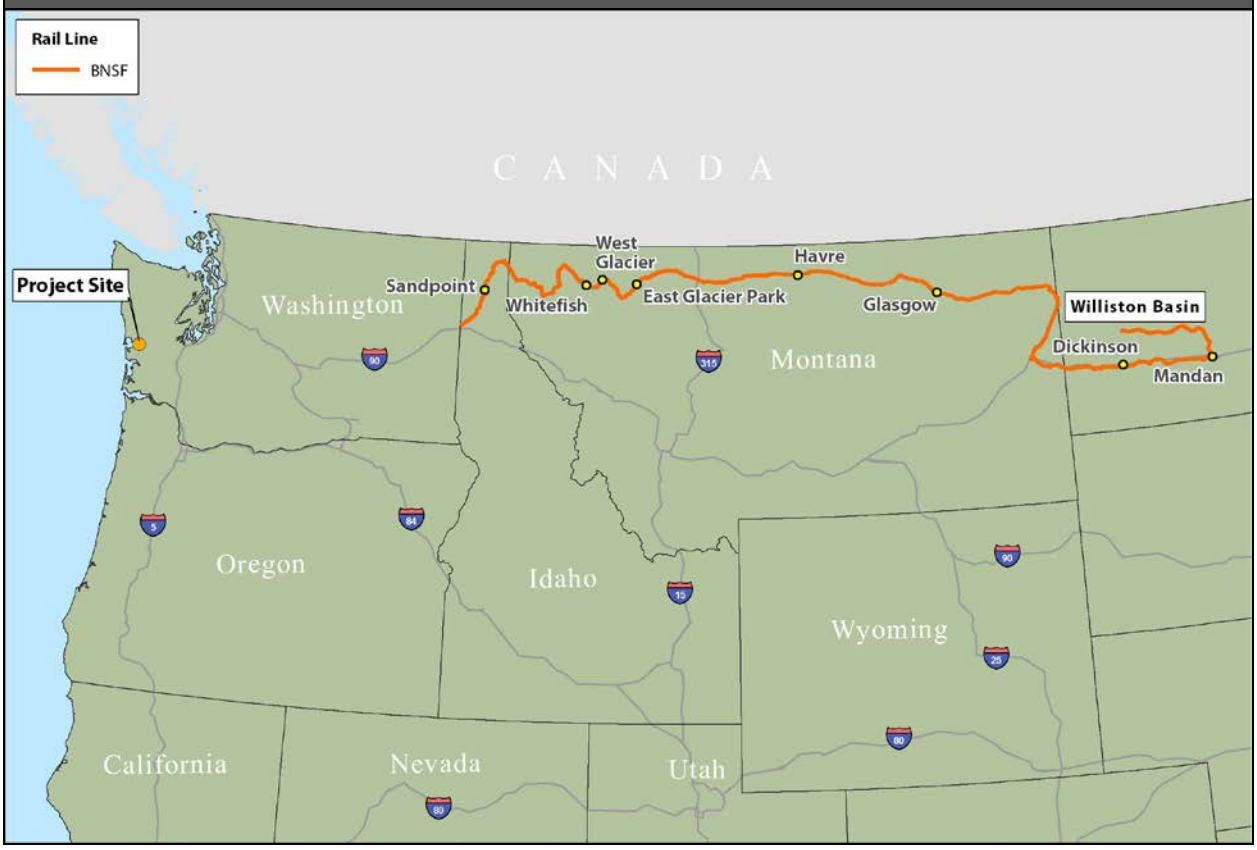
BNSF serves 10 originating terminals in the Williston Basin. BNSF main lines connect to 16 of the top 19 oil-producing counties in central and western North Dakota, and five of the six oil-producing counties in eastern Montana (Figure 5-3). BNSF transports more than half of the oil produced in the North Dakota and Montana regions of the Bakken formation.

Figure 5-3. Williston Basin Originating Crude Oil by Rail Terminals



From Williston Basin, loaded unit trains would travel along the most northerly BNSF route through western North Dakota, Montana, and Idaho to the Washington/Idaho state line. Figure 5-4 illustrates a likely route that would be used to transport crude oil under the proposed action, although other routes could be used.

Figure 5-4. Route from Williston Basin to Washington State



Infrastructure and operating information for this route are described below by state.

- **North Dakota.** The route from Williston Basin, North Dakota, to the North Dakota/Montana state line consists of parts of two BNSF subdivisions (North Dakota Department of Transportation 2007).
  - **Zap Subdivision.** This subdivision is a BNSF rail line that runs 80.5 miles from the Zap Station to Mandan, North Dakota, and operates with a maximum speed of 25 miles per hour and a maximum carload of 143 tons.
  - **Dickinson Subdivision.** The North Dakota portion of this subdivision is a BNSF rail line that runs 174.2 miles from Mandan, North Dakota, to the North Dakota/Montana state line and operates with a maximum speed of 60 miles per hour and a maximum carload of 143 tons.

  Combined, these segments cover 254.7 miles. Rail traffic on these segments transports grain, oil, coal, and other commodities. Rail tonnage in North Dakota increased by approximately 50%

between 2000 and 2011, from 20 million tons per year to 30 million tons per year. By 2014, the tonnage increased to more than 65 million associated with a rise in Bakken oil shale activity. In 2015, tonnage originating in North Dakota dipped to less than 60 million tons per year, of which 28 million tons were crude oil (North Dakota Department of Transportation 2016).

- **Montana.** The route through Montana consists of parts of BNSF subdivisions and Yellowstone Valley Railroad (Montana Department of Transportation 2010).
  - **Dickinson Subdivision**. The Montana portion of this subdivision is a BNSF rail line that runs 39.1 miles from North Dakota/Montana State Line to Glendive, Montana, and operates with a maximum speed of 50 miles per hour and maximum carload of 143 tons.
  - **Glendive to Snowden Segment.** This segment is the Yellowstone Valley Railroad System rail line that runs 78.7 miles from Glendive to Bainville, Montana, and operates with a maximum speed of 45 miles per hour and maximum carload of 143 tons.
  - **Glasgow Subdivision.** This subdivision is a BNSF rail line that runs 130.3 miles from Bainville to Glasgow, Montana. The Glasgow Subdivision serves Amtrak passenger service as well as freight operations. Freight trains operate with a maximum speed between 50 and 60 miles per hour and maximum gross car weight of 143 tons.
  - **Milk River Subdivision**. This subdivision is a BNSF rail line that runs 155.8 miles from Glasgow to Pacific Junction, Montana. The Milk River Subdivision serves Amtrak passenger service as well as freight operations. Freight trains operate with a maximum speed of 60 miles per hour and maximum gross car weight of 143 tons.
  - **Hi Line Subdivision.** This subdivision is a BNSF rail line that runs 253.5 miles from Pacific Junction to Whitefish, Montana. The Hi Line Subdivision serves Amtrak passenger service as well as freight operations. Freight trains operate with a maximum speed between 30 and 55 miles per hour and a maximum gross car weight of 143 tons.
  - **Kootenai River Subdivision.** This subdivision is a BNSF rail line that runs 133.2 miles from Whitefish, Montana to the Montana/Idaho state line. The Kootenai River Subdivision serves Amtrak passenger service as well as freight operations. Freight trains operate with a maximum speed between 20 and 60 miles per hour and a maximum gross car weight of 143 tons.

  Combined, the segments cover 790.6 miles. Rail traffic along these segments transports coal, farm products, lumber and wood products, crude oil, and other commodities.

- **Idaho.** The route through Idaho consists of part of one BNSF subdivision (Idaho Department of Transportation 2013):
  - **Kootenai River Subdivision.** The Idaho portion of this subdivision runs 101.1 miles from the Montana/Idaho state line to the Idaho/Washington state line and operates with a maximum speed of 60 miles per hour.

  Rail traffic on this segment transports cereal grain, coal, agricultural products, wood products, chemicals and fertilizers, and crude oil. On average, 28 to 48 trains pass through the corridor daily.

Washington State

Washington State is served by two Class 1 railroads: BNSF and the Union Pacific Railroad (Figure 5-1). Except for two small segments of Union Pacific–owned track, Union Pacific operates in Washington State on BNSF tracks. In Washington State, crude oil is currently transported only along BNSF main lines (Washington State Department of Ecology 2015).

BNSF operates more than 1,604 miles of rail line in Washington State, which represent almost 10% of their total system. BNSF is the largest rail operator in Washington, handling 1.367 million carloads in 2011 (Washington State Department of Transportation 2014b:37).

Although BNSF has not specified a route for crude oil unit trains in Washington, based on current BNSF train operations (Washington State Department of Transportation 2014b), unit trains transporting crude oil to the project site and returning empty trains are expected to use the routes described below (Figure 5-5).[3]

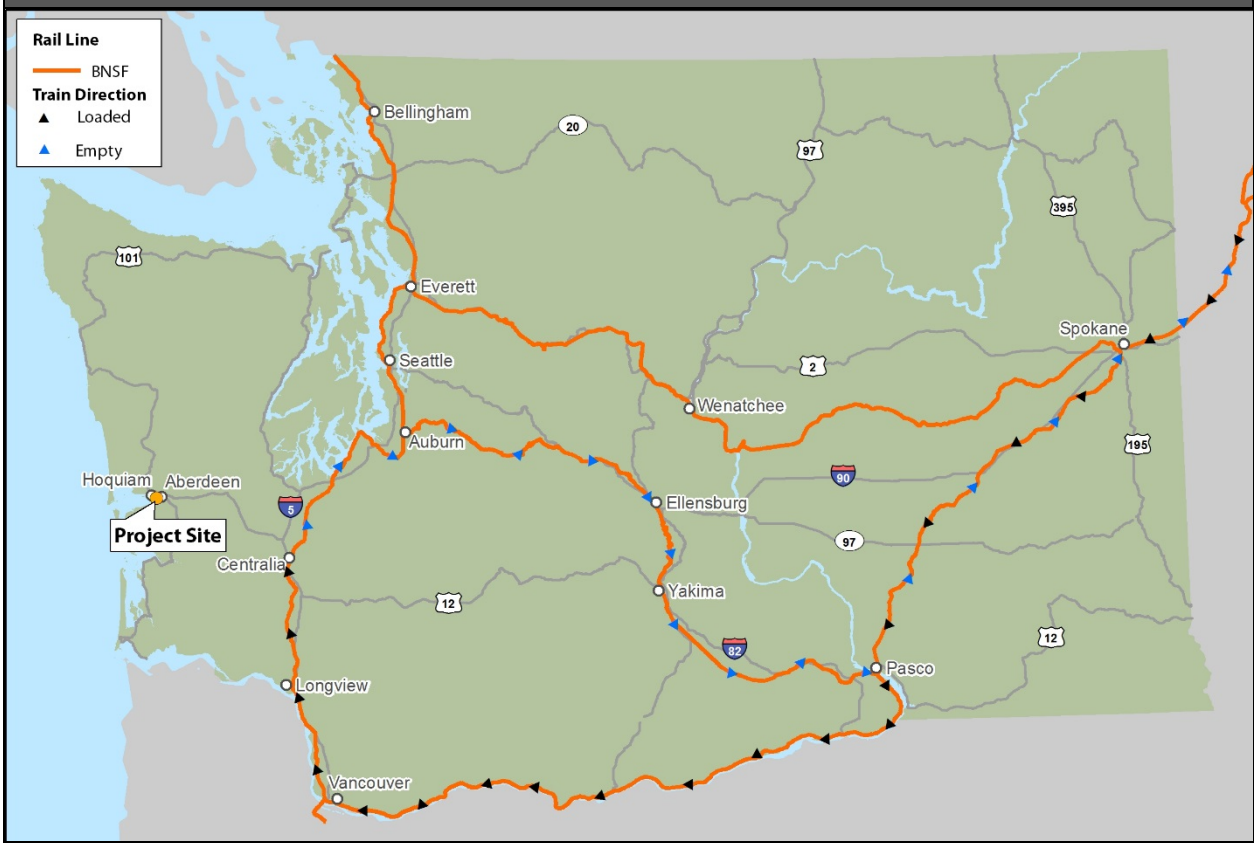
- Loaded trains:
  - West from the state line to Spokane
  - Southwest through Pasco then west along the Columbia River Gorge to Vancouver
  - North to Centralia
- Empty trains:
  - North from Centralia to Auburn
  - East over Stampede Pass to Pasco
  - Northeast to Spokane

Infrastructure and traffic data for these route segments are described below and summarized in Table 5-2.

- **Idaho/Washington State Line to Spokane.** This segment covers 18.6 miles and is part of BNSF's Kootenai River Subdivision. It is a double track with centralized traffic control (CTC).[4] Capacity is approximately 76 trains per day and current volume is approximately 70 trains per day. All BNSF trains between the eastern part of BNSF's system and points in Washington State move over this segment. Train traffic includes intermodal, grain, coal, and general manifest[5] trains. Amtrak's Empire Builder passenger service between Chicago, Illinois; Seattle, Washington; and Portland, Oregon, also uses this segment.

[3] BNSF could choose alternative routes. As volume increases on any one-line segment, BNSF may revise operations to distribute traffic over existing infrastructure or expand infrastructure. In addition to the existing routes in Washington, Union Pacific routes in Oregon bordering the Columbia to the south also operate crude oil trains.
[4] With CTC, electrical circuits monitor the location of trains, allowing dispatchers to control train movements from a remote location, usually a central dispatching office. The signal system prevents trains from being authorized to enter sections of track occupied by other trains moving in the opposite direction.
[5] A manifest train is freight train with a mixture of car types and cargoes, also known as a mixed freight train.

Figure 5-5. BNSF Mainline Crude Oil Routes in Washington State



- **Spokane to Pasco.** This segment covers 145.5 miles and is part of BNSF's Lakeside Subdivision. This line is mostly single track with CTC. Capacity is approximately 37 trains per day and current volume is approximately 39 trains per day, which exceeds capacity. Train traffic on this segment includes intermodal, grain, coal, and general manifest trains. The Portland section of Amtrak's Empire Builder passenger service uses this segment. BNSF is currently making upgrades to increase capacity on this segment, including adding a second main line in some areas.
- **Pasco to Vancouver.**[6] This segment covers 221.4 miles and is BNSF's Fallbridge Subdivision, also known as the Columbia River Gorge route. It is mostly single track with CTC. Capacity is approximately 40 trains per day and current volume is approximately 34 trains per day. Train traffic on this route includes intermodal, grain, coal, and mixed freight. The Portland section of Amtrak's Empire Builder passenger service also uses this route. BNSF uses directional operations on this segment, which increases capacity by running westbound loaded unit trains on this segment and eastbound empty unit trains via Stampede Pass.

[6] The Union Pacific rail line runs parallel to the south side of the Columbia River in Oregon but is not expected to be used by trains related to the proposed action.

- **Vancouver to Centralia.** This segment covers 85.5 miles and is part of BNSF's Seattle Subdivision. It is double track with CTC. Capacity is approximately 78 trains per day and current volume is approximately 50 trains per day. This line also carries all Union Pacific trains between Portland, Oregon and Tacoma. Traffic includes intermodal, grain, coal and other unit trains along with manifest trains. This section of the BNSF line is also a key route for passenger trains. Amtrak's Coast Starlight trains to and from California and Amtrak Cascades trains between Eugene, Oregon and Seattle, Washington use this segment. Scheduled to be completed by 2017, the Washington State Department of Transportation is constructing 3.7 miles of a third main track on the BNSF Seattle Subdivision main line in the Longview-Kelso area. The purpose of the third main track is to enable two trains to pass while a train is simultaneously moving into or out of the Longview Junction yard. This would reduce the potential for delays to passenger and freight trains running through the area.
- **Centralia to Auburn.** This segment covers 72.5 miles and is part of BNSF's Seattle Subdivision. There are two main tracks and traffic control is CTC. Capacity is approximately 78 trains per day and current volume is approximately 50 trains per day. Traffic on this line includes intermodal, empty coal, and grain trains returning to the east, as well as manifest trains. This segment is also a key section for passenger trains. Amtrak's Coast Starlight trains to and from California and Amtrak Cascades trains use this route, as do Sound Transit Sounder commuter trains on the section between Tacoma and Auburn.
- **Auburn to Yakima.** This segment covers 139.6 miles and is part of BNSF's Stampede Subdivision. It is mostly single track and traffic control is mostly traffic warrant control (TWC)[7] with some segments of CTC. Capacity is approximately 39 trains per day and current volume is approximately seven trains per day. Traffic volume consists largely of empty coal and grain trains. BNSF uses directional operations on this segment, which increases capacity by running empty eastbound unit trains on this segment and westbound loaded unit trains via the Columbia River Gorge.
- **Yakima to Pasco.** This segment covers 89.4 miles and comprises BNSF's Yakima Valley Subdivision. It is mostly single track and traffic control is mostly TWC with some segments of CTC. Capacity is approximately 39 trains per day and current volume is approximately seven trains per day. Traffic volume consists largely of empty coal and grain trains returning to the east and some manifest trains.

Table 5-2 summarizes existing infrastructure and 2015 traffic data for the BNSF route segments in Washington State expected to be used by crude oil trains under the proposed action. The far right column presents estimated utilization, expressed as estimated traffic as a percentage of estimated capacity.

[7] Under this control system, train crews obtain authority to occupy and move on a main track from the dispatcher in the form of a completed track warrant form. Usually the track warrant information is transmitted to the train crew by phone, radio, or electronic transmission to the locomotive.

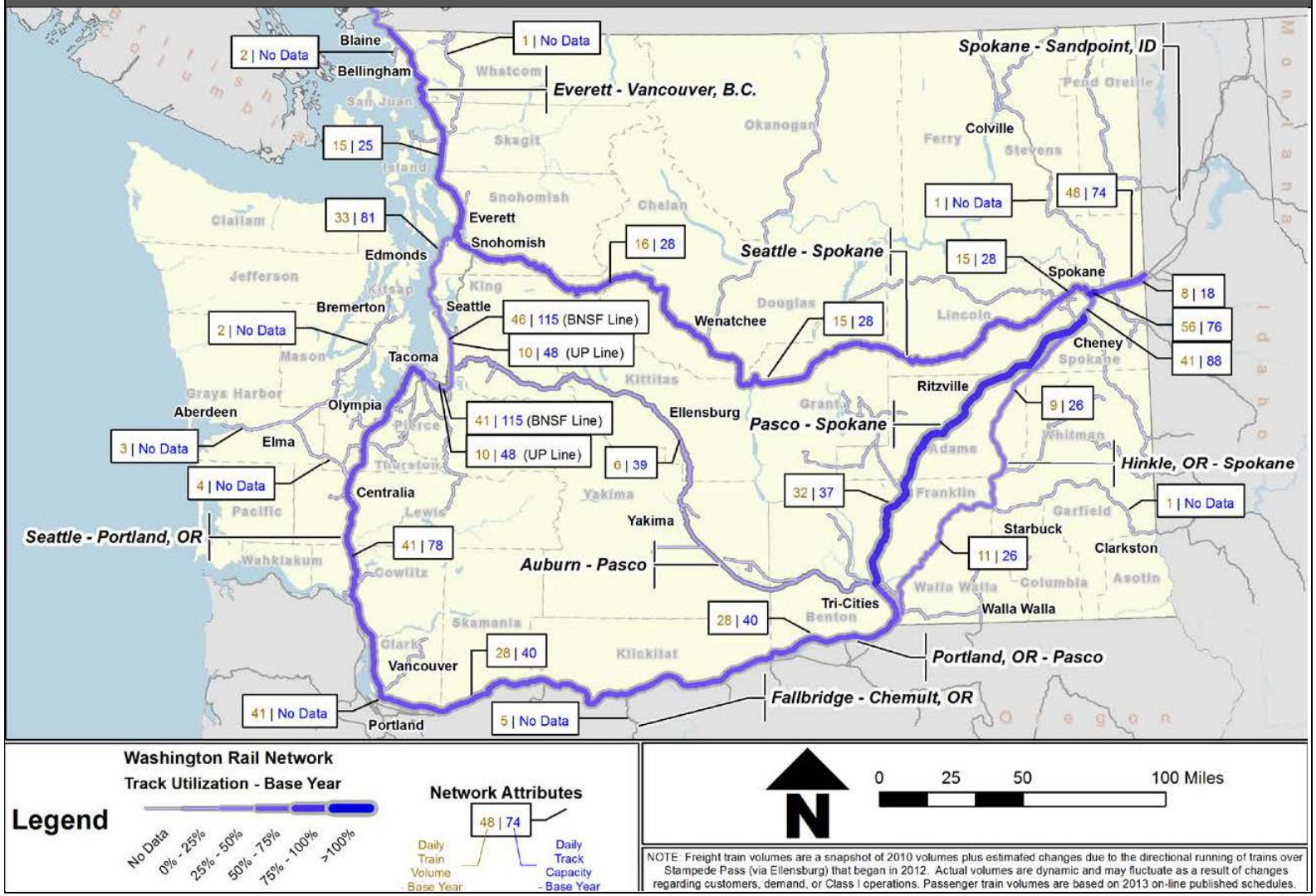
Table 5-2. Rail Traffic and Infrastructure along Anticipated Crude Oil Mainline Routes in Washington State—2015[a]

Route Segment	Subdivision	Existing Traffic Control System[a]	Existing Main Tracks [a]	Estimated Traffic (Trips per Day)[a]	Estimated Capacity (Trips per day)	Estimated Utilization
Idaho/Washington State Line–Spokane	Spokane	CTC	2	70	76	92%
Spokane–Pasco	Lakeside	CTC	1	39	37	105%
Pasco–Vancouver	Fallbridge	CTC	1	34	40	85%
Vancouver–Centralia	Seattle	CTC	2	50	78	64%
Centralia–Auburn	Seattle	CTC	2	50	78	64%
Auburn–Yakima	Stampede	TWC	1	7	39	18%
Yakima–Pasco	Yakima Valley	TWC	1	7	39	18%

[a] Source: Washington State Department of Transportation 2014b, extrapolated to 2015.
CTC = Centralized Traffic Control; TWC = Traffic Warrant Control

Figure 5-6 presents 2010 traffic volume and capacity information by segment of BNSF subdivisions in Washington State.

Figure 5-6. BNSF Mainline Daily Traffic and Utilization—2010



Source: Washington State Department of Transportation 2014b:41

5.4.2.2 Operating Characteristics

The BNSF mainline routes vary with respect to operating characteristics, as summarized below.

- **Track class.** The Federal Railroad Administration sets track classes from 1 to 9 based on the quality of the track. Track class determines speed limits and maximum train car weight. It also determines whether the rail line can accommodate passenger trains. The BNSF mainline routes in Washington State are maintained at Class 4 specifications.
- **Control system.** The train control system ensures safety by managing rail traffic through signaling systems.
- **Speed.** The Federal Railroad Administration sets the speed limit based on track class, although some large communities may establish permanent speed restrictions. While unloaded unit bulk trains can operate at maximum track speed, unit trains carrying crude oil are restricted to a maximum speed of 45 miles per hour.[8] Lesser volumes of oil and hazardous materials, however, may be transported in manifest trains. These trains can operate at the maximum speed allowed for class track and freight trains.

The U.S. Department of Transportation Pipeline And Hazardous Materials Safety Administration's final rule on Hazardous Materials: Enhanced Tank Car Standards and Operational Controls for High-Hazard Flammable Trains (May 2015) places several restrictions and requirements on the high-hazard flammable unit trains.[9] These controls relate to speed restrictions, braking systems, and routing, as follows.

- **Speed.** All trains that include 20 or more tank cars carrying a Class 3 flammable liquid in a continuous block or 35 such tank cars throughout the entire train are designated as high-hazard flammable trains and are restricted to 50 miles per hour in all areas. If such trains include tank cars that do not meet the new enhanced standards, they are restricted to 40 miles per hour in high-threat urban areas. If such trains include tank cars that do not meet the new enhanced standards, they are restricted to 40 miles per hour in high-threat urban areas. High-threat areas in Washington State include Portland to Vancouver and a 10-mile buffer extending from the border of the combined area, and Seattle to Bellevue and a 10-mile buffer extending from the border of the combined area (49 Code of Federal Regulations [CFR] 1580, Appendix A).
- **Braking.** High-hazard flammable trains must have a functioning two-way end-of-train device or a distributed power braking system in place. In addition, high-hazard flammable unit trains must be operated with an electronically controlled pneumatic braking system. This system must be implemented by January 1, 2021, if the train is transporting one or more tank cars loaded with a Packing Group I flammable liquid and by May 1, 2023, if it is transporting one or more tank cars loaded with a Packing Group II or III flammable liquid.[10]

[8] Exceedance is determined by the total weight of the train (cars and commodity without the weight of the locomotives) divided by the number of cars in the train with operable brakes.
[9] A high-hazard flammable unit train is one that travels at speeds greater than 30 miles per hour and includes 70 or more tank cars loaded with Class 3 flammable liquids. Crude oil and ethanol are Class 3 flammable liquids.
[10] The packing groups set requirements based on the degree of danger presented by the material (I: high, II: medium, or III: low), which reflects the boiling point and flashpoint for the material carried.

- **Routing.** Railroads must select their route based on a routing analysis that addresses at least 27 specified safety and security factors. They must also provide an appropriate point of contact to state and/or regional fusion centers and other state, local, and tribal officials who contact the railroad to discuss routing decisions. This is in addition to the requirements to notify State Emergency Response Commissions set forth in a May 2014 Emergency Order, per a recent clarification from the U.S. Department of Transportation.

5.4.2.3 Maintenance and Inspections

The Federal Railroad Administration requires that railroads conduct track inspections as well as maintain and upgrade track. Crews monitor track condition and maintain or upgrade ties, rail, and ballast, as necessary. This maintenance program relies on continual inspection of the track and grade crossings. As noted in Section 4.2, *Applicable Regulations*, the National Transportation Safety Board has issued recommendations that railroads take into account, at a minimum, accumulated tonnage, track geometry, rail surface conditions, railhead wear, rail steel specifications, track support, residual stresses in the rail, rail defect growth rates, and temperature differentials.

BNSF's maintenance program in Washington included 1,011 miles of track surfacing and undercutting work, and the replacement of nearly 50 miles of rail and close to 203,000 ties, as well as signal upgrades for federally mandated positive train control (BNSF Railway Company 2015).

Track Inspection

Federal law requires BNSF corridors be inspected four times a week, and BNSF says many heavily traveled routes are inspected daily. The BNSF inspectors would review the conditions of tracks and rights-of-way as well as whistle posts, crossbucks, and active warning devices.

Grade Crossings

BNSF is responsible for maintenance of active warning devices. BNSF staff members inspect each active warning device monthly, reviewing the functionality of gates and lights and of battery power sources (BNSF Railway Company 2013).

Wayside Detector System

Wayside detectors monitor the condition of passing trains and alert rail car operators to potential defects. Locations of wayside detectors along the BNSF main line in Washington State are presented in Table 5-3. The detectors include dragging equipment detection, rail car journal integrity exception reporting, wheel impact detectors, and slide fence detectors.

Table 5-3. Location of Wayside Detectors by Subdivision

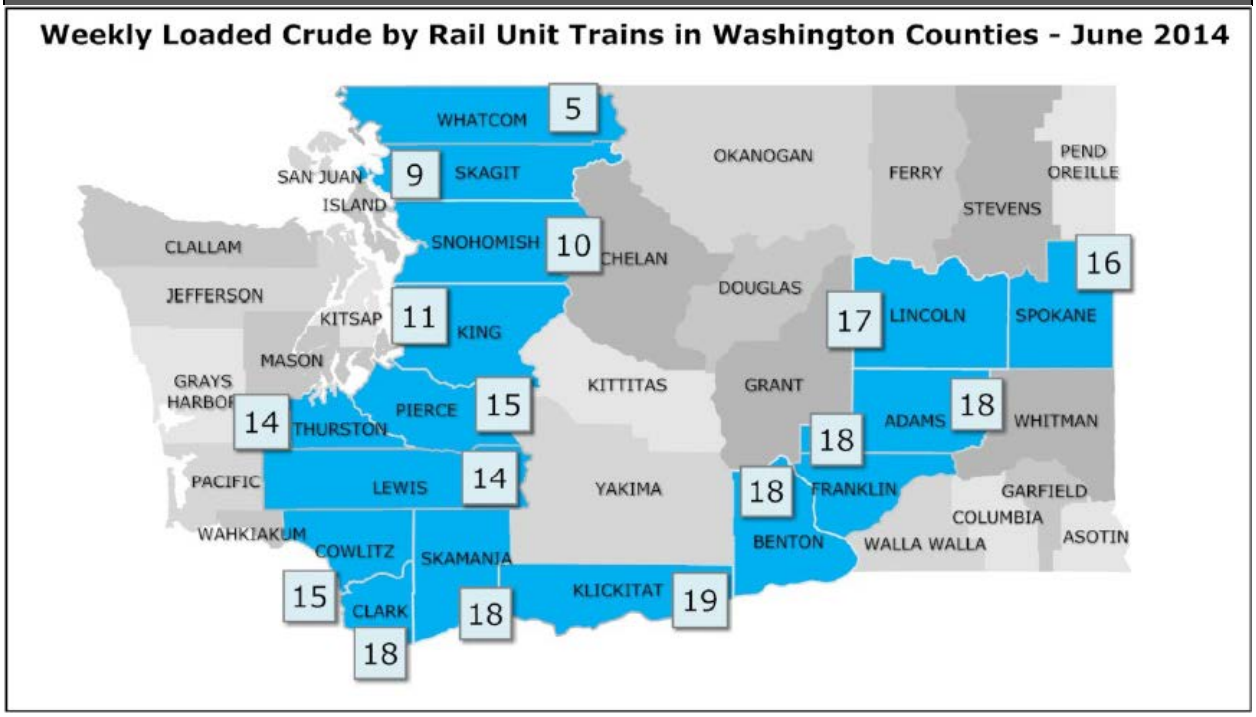
Main Line	Route	Mileposts (MP)	Route Miles	Number of Wayside Detectors	Average Miles between Detectors
Columbia River Gorge	Sandpoint, ID to Spokane, WA	3.0–71.5	68.5	14	4.89
	Spokane to Pasco	1.1–147.5	146.4	28	5.23
	Pasco to Vancouver, WA	229.7–9.9	219.8	28	7.85
North-South	Vancouver, WA to Seattle	136.5–0.3	136.2	12	11.35
	Seattle to Everett	0.0–32.2	32.2	4	8.05
	Everett to Blaine	0.0–119.3	119.3	9	13.26
Stevens Pass	Everett to Wenatchee	1784.7– 1650.2	134.5	22	6.11
	Wenatchee to Spokane	1650.2– 1481.6	168.6	11	15.33
Stampede Pass	Auburn to Ellensburg	0.0–102.6	102.6	18	5.7
	Ellensburg to Pasco	1.9–127.0	125.1	12	10.43

Source: Washington State Department of Ecology 2015

5.4.2.4 Existing Risks along the Rail Routes

Under existing conditions, rail incidents, including collisions and derailments, can occur in the extended study area. Regardless of the cargo, such an incident can result in injury and death, as well as damage to the natural and built environment. As described in Section 5.4.2.1, *Mainline Routes, Traffic, and Commodities*, trains currently transport a broad range of flammable and toxic materials in this extended study area, including crude oil. Figure 5-7 illustrates the number of loaded crude oil trains along mainline routes in Washington State in 2014. Because of these existing transport commodities, potential consequences of a rail incident under existing conditions also include release of hazardous materials, fires, explosions, and toxic vapor clouds.

Figure 5-7. Current Weekly Loaded Crude Oil by Rail in Washington Counties (June 2014)



Source: Washington State Department of Ecology 2015

The Federal Railroad Administration released a preliminary investigation report on the derailment of a crude oil train on a Union Pacific line that resulted in an explosion and fire in Mosier, Oregon in June 2016. The agency determined that the Union Pacific derailment was caused by broken lag bolts that caused the track gauge to widen. Multiple lag bolts in this section of Union Pacific track were broken and sheared, causing the tie plates to loosen from ties. The loosened tie plates allowed the rails to be pushed outward as trains moved across them, eventually widening the track gauge, leading to the derailment. Broken and sheared lag bolts, while difficult to detect by high-rail inspection, are more detectable by walking inspection combined with indications of movement in the rail or track structure and/or uneven rail wear.

The Transportation Safety Board of Canada has also released reports on incidents caused by track infrastructure problems that resulted in derailments of crude oil trains. The reports have found that track infrastructure failures may have played a role in two incidents near Gogama, Ontario and a third incident that involved a mixed manifest train on the Ruel Subdivision near Minnipuka, Ontario on March 5, 2015. The report states that crude oil unit trains transporting heavily loaded tank cars will tend to impart higher than usual forces to the track infrastructure during their operation. These higher forces expose any weaknesses in the track structure, making the track more susceptible to failure. The Transportation Safety Board has issued a Safety Advisory Letter for risk assessments to assess track infrastructure conditions and determine whether additional risk control measures are required. As noted previously, the U.S. National Transportation Safety Board has also issued a recommendation that railroads take into account, at a minimum, accumulated tonnage, track

geometry, rail surface conditions, rail head wear, rail steel specifications, track support, residual stresses in the rail, rail defect growth rates, and temperature differentials.

Depending on the specific location of a rail incident (e.g., proximity to population centers and sensitive resources), the type of material released, the volume of the release, and the potential for ignition (e.g., fire, explosion), impacts could be significant. Chapter 4, Section 4.7.2.1, *Recent Fires and Explosions Involving Crude Oil Trains,* and Chapter 7, Section 7.3.4.2, *Potential Costs Related to Environmental Health and Safety Concerns*, provide information about recent incidents involving the transport of crude oil.

As discussed in Chapter 4, Section 4.2.2, *What framework prepares for an incident?* the National Contingency Plan provides for geographic response plans (GRPs) to prepare for potential incidents involving the release of oil. GRPs have two main objectives: to identify sensitive resources at risk of injury from oil spills and to direct response actions to protect these sensitive resources during the initial hours of a response.[11] These plans help coordinate response efforts by the responsible party and federal and state agencies. Strategies in the plan are deployed by responders after the immediate concern of controlling and containing the source of a spill has been addressed. GRPs contain maps and descriptions of natural, cultural, and economic resources and identify strategies to reduce harm to those resources. They also prioritize which response strategies should be implemented based on the location of the spill.

Twenty-seven GRPs in Washington State have been completed (Washington State Department of Ecology 2016a). In 2016, four existing GRPs will be updated and four new GRPs will be developed. The new areas are the Lower Skagit River, Nooksack River, Samish River, and (Lower) Yakima River. Not all GRPs address responses for submerged or sinking oils (Washington State Department of Ecology 2015).

Even with preparedness planning, the equipment necessary for oil spill containment, responder health and safety monitoring, and fire suppression capabilities during a crude oil emergency are currently insufficient across much of Washington (Washington State Department of Ecology 2015). As noted in Chapter 4, Section 4.2.3*, What framework responds to an incident?* local fire departments currently lack the funding necessary to plan, train, and equip their communities for crude oil incidents. In 2006, the Washington State Department of Ecology (Ecology) administered a grant program that provided specialized oil spill response equipment and training to local first responders and tribes across Washington and trained over 1,000 first responders on how to safely and effectively deploy the equipment. Additional ongoing training is needed, including specialized training to address the needs of first responders who now face the additional risk of highly flammable crude oils currently being shipped by rail (Washington State Department of Ecology 2015).

The regulatory framework provides mechanisms for facilities and vessel operators to contribute funds in the forms of fees and taxes to support Ecology's Spill Prevention, Preparedness, and Response Program. With the shift of crude oil imports away from tankers to rail and pipeline, where similar funding mechanisms are not as well developed, a vital funding source supporting Ecology's program and other state entities has decreased. The additional costs for prevention, preparedness,

[11] Geographic response plans are available on the Washington State Department of Ecology's website at http://www.ecy.wa.gov/programs/spills/preparedness/GRP/index.html

and response activities are not sustainable with current funding mechanisms (Washington State Department of Ecology 2015). New final rules described in Section 4.2, *Applicable Regulations*, are intended to partially address this issue.

5.4.3 Vessel

As described in Section 5.3, *What are the likely sources and destinations of crude oil?* West Coast refineries are the most likely destinations of crude oil that would be transported from the project site.

5.4.3.1 Routes

Outside of state waters (3 nautical miles from the mouth of Grays Harbor), empty vessels travelling to the project site or laden vessels transporting crude oil from the project site would travel north to Puget Sound refineries or south to California refineries. Vessels transporting oil/bulk liquids as part of the proposed action are not expected to transit the Columbia River.

Under recommendations from the Pacific States/British Columbia Oil Spill Task Force, loaded tank vessels typically transit along routes 50 nautical miles from the coast and freight vessels transit 25 nautical miles from the coast.

Table 5-4 presents the number of vessels of more than 1,000 gross tons that called at selected West Coast ports in 2015.

Table 5-4. Number of Vessels of more than 1,000 Gross Tons Calling at Selected West Coast Ports—2015

Port Location	Number of Calls
Washington	
Puget Sound	
Anacortes	*205*
Cherry Point	*259*
Everett	*118*
Port Angeles	*244*
Seattle	*643*
Tacoma	*1,062*
Kalama	274
Vancouver	344
California	
Bay Area	
Benicia	*536*
Martinez	*29*
Oakland	*1,406*
Pittsburg	*86*
Richmond	*636*
Stockton	*234*
San Francisco	*41*
Long Beach	1,835
Los Angeles	1,853
San Diego	385
Source: U.S. Maritime Administration 2015	

Puget Sound Destinations

Several large crude oil refineries are located in Puget Sound, including the BP and Phillips 66 refineries in Ferndale and the Tesoro and Shell refineries in Anacortes. Vessels transporting crude oil from the project site to Puget Sound refineries would travel north along the coast, past the Olympic Coast National Marine Sanctuary to the northwestern tip of Washington State, and enter the Strait of Juan de Fuca, which separates Vancouver Island to the north from the Olympic Peninsula to the south (Figure 5-8).

Large commercial vessels operating in Puget Sound typically call at ports in Port Angeles, Seattle, Tacoma, Olympia, or Vancouver, British Columbia. In 2015, large commercial vessels made approximately 5,196 trips to and from Washington ports in Puget Sound; approximately 3,400 of these trips were via the Strait of Juan de Fuca. There were an additional 5,990 large commercial vessel trips along the Strait of Juan de Fuca to access Canadian ports (Washington State Department of Ecology 2016b).

Figure 5-8. Puget Sound

Route

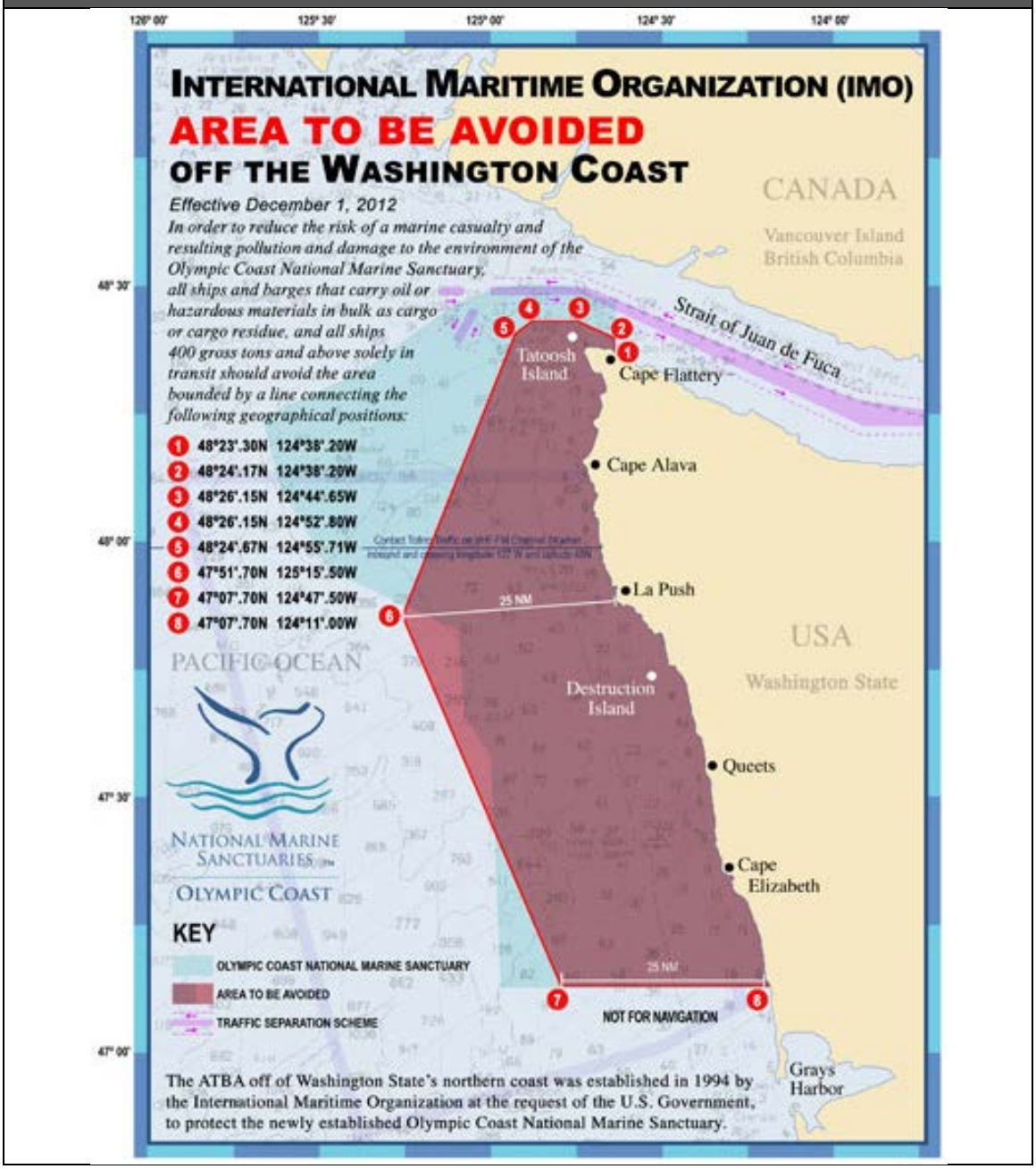
Olympic Coast National Marine Sanctuary

Vessels traveling from the project site to Puget Sound would pass the Olympic Coast National Marine Sanctuary, which comprises approximately 2,408 square nautical miles of coastal and ocean waters and the submerged lands off the central and northern coast of Washington State (Figure 5-8). The sanctuary, which is connected to both the Big Eddy Ecosystem and the California Current Large Marine Ecosystem, is one of North America's most productive marine regions and undeveloped shorelines. The northern edge of the sanctuary begins just north of Cape Flattery, Washington, and the southern boundary is located approximately 12 nautical miles north of the entrance to Grays Harbor.

The sanctuary includes an area designated as an *Area to Be Avoided* by the International Maritime Organization in 1994 at the request of the U.S. government (Figure 5-9). The designation is intended to protect the sanctuary by limiting vessel transits off the coast of Washington to reduce the risk of marine casualties such as oil spills and the resulting environmental damage to the sanctuary. The designation applies to all ships 400 gross tons and greater and to any ships and barges that carry oil or hazardous materials as cargo or tanks containing residual oil. Complying with the Area to Be

Avoided is voluntary, but in 2012 the compliance rate for all vessels over 400 gross tons was 98% (National Oceanic and Atmospheric Administration 2013).

Figure 5-9. Areas to Be Avoided off the Washington Coast



Strait of Juan de Fuca

The Strait of Juan de Fuca, accessible from the Pacific Ocean, and its approaches provide access to Port Angeles, Puget Sound, and the San Juan Island Archipelago (Figure 5-8). To the north and

connected by Haro Strait and Boundary Pass is the Strait of Georgia. Deep-draft vessels entering the Strait of Juan de Fuca use the harbors at Port Angeles, Anacortes, Seattle, Tacoma, Olympia, and Bellingham, Washington, and Vancouver, British Columbia. The Strait of Juan de Fuca separates the south shore of Vancouver Island, Canada, from the north coast of Washington State. Commerce in this region is extensive. Vessels entering the Strait of Juan de Fuca for commerce may be foreign-flagged or U.S.-flagged.

From the Pacific Ocean, proposed action vessels would travel through the Strait of Juan de Fuca. The strait is about 11 miles wide for approximately 50 miles to Race Rocks and then widens to about 16 miles for 30 miles east to Whidbey Island, its eastern boundary (National Oceanic and Atmospheric Administration 2015). The waters are typically deep until near the shore with few outlying dangers, most of which are in the eastern part. The navigation of these waters is relatively simple in clear weather. In thick weather, because of strong and irregular currents, extreme caution and vigilance must be exercised.

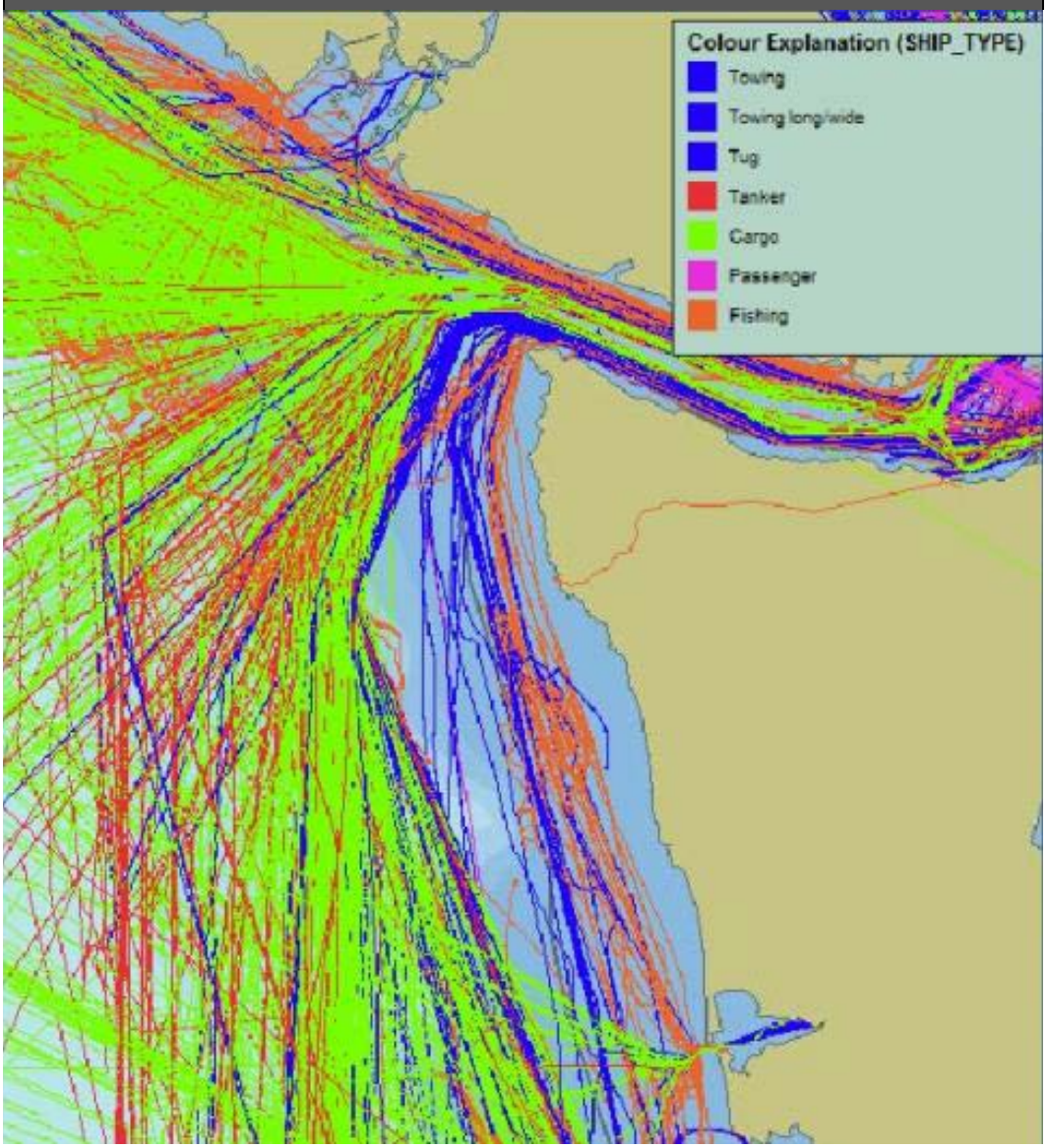
Vessel Traffic Management

The U.S. Coast Guard commands a vessel traffic service system in Puget Sound to facilitate the safe and efficient transit of vessel traffic and to prevent collisions or groundings. This system conducts real-time reporting, monitoring, and management of vessel traffic and anchorage usage and provides instant information and advice 24 hours a day as needed. It also enforces navigation rules and special safety and security restrictions. It may adjust certain rules or restrictions for safety reasons.

Vessels are tracked using automated identification systems required on all large commercial vessels. The Marine Exchange of Puget Sound tracks vessels in Puget Sound, Grays Harbor, and off the Washington coast for 150 miles. The Merchants Exchange of Portland tracks vessels in the Lower Columbia River and off the Washington and Oregon coasts. An example of the large commercial vessel transits tracked along the coast of the Olympic Peninsula of Washington State is shown in Figure 5-10.

An International Maritime Organization-approved traffic separation scheme governs vessel traffic in Puget Sound and its approaches. This area is actively managed by a joint U.S.–Canadian Cooperative Vessel Traffic Service. The separation scheme consists of five sets of traffic lanes: the western approach and the southwestern approach from the ocean; the western lanes in the strait; the southern lanes to Port Angeles; the northern lanes to Victoria, British Columbia; and two precautionary areas, one west-northwest of Cape Flattery and the other north of Port Angeles. Each set of lanes consists of inbound and outbound traffic lanes with separation zones (National Oceanic and Atmospheric Administration 2015). Tank vessels are not required to meet the Rosario Strait one-way traffic rules in 33 CFR 161.55. Tug vessels are monitored by the U.S.–Canadian Cooperative Vessel Traffic Service during transit though Rosario Strait and Puget Sound.

Figure 5-10. Vessel Traffic along the Olympic Peninsula Coastline—December 2012–January 2013



Operations

Tankers over 125,000 deadweight tons[12] bound for a U.S. port are prohibited from operating in Puget Sound (33 CFR 165.1303). All oil tankers (as defined in 33 CFR 168) and vessels of 40,000 deadweight tons or more must have tug escorts (Revised Code of Washington [RCW] 88.16.190). All escorts must be nearby to ensure timely and effective response, taking into consideration the sea and weather conditions, ship characteristics, and nearby traffic.

[12] *Deadweight ton* refers to the ship's weight-bearing capacity: it is the sum of all cargo, provisions, and crew, but not the weight of the ship itself.

The Puget Sound Harbor Safety Committee has implemented a harbor safety plan with standards of care for bunkering (fueling), anchoring, and actions for incidents, towing vessels, and tanker escorts.

Emergency Response

To help protect Washington's shorelines and waterways, the Washington State maritime industry has permanently stationed an emergency response towing vessel in Neah Bay. The tug is an important safety net to prevent disabled ships and barges from grounding off Washington's outer coast or in the western Strait of Juan de Fuca. Tank vessels transiting to or from a Washington port through the Strait of Juan de Fuca (except for transits extending no further west than Race Rocks Light) must include the emergency response towing vessel stationed at Neah Bay in their oil spill contingency plans (RCW 88.46.130).

Bunkering and Refueling

Vessels transiting to Puget Sound may refuel (or bunker) while at dock or at anchor. Bunkering operations regularly occur in Puget Sound. Bunkering operations in Washington waters are subject to both U.S. Coast Guard regulations (33 CFR 155–156, 46 CFR Sections 12, 15, and 35) and Washington State regulations (WAC 317-40 and WAC 173-184) addressing bunkering, oil transfer operations and prebooming requirements. The Puget Sound Harbor Safety Plan includes standards of care for refueling operations.

California Destinations

California operates 11 public ports, including three megaports (Los Angeles, Long Beach, and Oakland); eight smaller niche ports (Hueneme, Humboldt Bay, Redwood City, Richmond, West Sacramento, San Diego, San Francisco, and Stockton); and one private port (Benicia). The Ports of Los Angeles and Long Beach form the largest port complex in the United States, handling 25% of all container cargo traffic in the United States. California has a large oil refining capacity—over 2 million barrels per day of crude oil, with the majority of this capacity in the Los Angeles region and San Francisco Bay Area. Bunkering Operations in California waters are subject to U.S. Coast Guard regulations, 33 CFR 155–156, and 14 California Code of Regulations, Chapter 3, Subchapter 6.

5.4.3.2 Existing Risks along the Vessel Routes

Under existing condition, vessel incidents such as collisions and groundings can occur in the extended study area. Regardless of the cargo, such an incident can result in injury, death, or an oil spill that could cause damage to the natural and built environment. Because vessels transport a broad range of flammable and toxic materials in the extended study area, potential consequences also include exposure to spilled materials, and fires, explosions, and toxic vapor clouds.

Depending on the specific location of a vessel incident (e.g., proximity to population centers or sensitive resources), the type of material released, the volume of the release, and the potential for ignition (e.g., fire, explosion), impacts could be significant. Chapter 7, Section 7.3.4.2, *Potential Costs Related to Environmental Health and Safety Concerns*, provides additional information about recent incidents involving the transport of crude oil.

As discussed in Chapter 4, Section 4.2.2, *What framework prepares for an incident?* the National Contingency Plan provides for GRPs to prepare for potential incidents involving the release of oil.

GRPs have two main objectives: to identify sensitive resources at risk of injury from oil spills and to direct response actions to protect these sensitive resources during the initial hours of a response.[13] These plans help coordinate response efforts by the responsible party and federal and state agencies. Strategies in the plan are deployed by responders after the immediate concern of controlling and containing the source of a spill has been addressed. GRPs contain maps and descriptions of natural, cultural, and economic resources and identify strategies to reduce harm to those resources. They also prioritize which response strategies should be implemented based on the location of the spill. The GRP response strategies are designed for use with persistent heavy oils that float on water and may not be suitable for other petroleum products or hazardous substances. Twenty-seven GRPs in Washington State have been completed (Washington State Department of Ecology 2016a).

Even with preparedness planning, the equipment necessary for oil spill containment, responder health and safety monitoring, and fire suppression capabilities during a crude oil emergency are currently insufficient across much of Washington (Washington State Department of Ecology 2015). As noted in Section 4.2.3*, What framework responds to an incident?* many local fire departments currently lack the funding necessary to plan, train, and equip their communities for crude oil incidents. In 2006, Ecology administered a grant program that provided specialized oil spill response equipment and training to local first responders and tribes across Washington and trained over 1,000 first responders on how to safely and effectively deploy the equipment. Additional ongoing training is needed, including specialized training to address the needs of first responders who now face the additional risk of highly flammable or heavier crude oils currently or potentially being shipped by vessel (Washington State Department of Ecology 2015).

5.5 What are the potential impacts related to rail and vessel transport in the extended study area?

This section describes the potential impacts of rail and vessel transport in the extended study area under the no-action alternative and the proposed action.

5.5.1 No-Action Alternative

Under the no-action alternative, the proposed action would not occur and the applicant would continue to operate its existing facility as described in Chapter 2, Section 2.1.3.2, *Existing Operations.* It is assumed that growth in the extended study area would continue under the no-action alternative. Projected rail and vessel traffic under the no-action alternative and potential impacts are described below.

5.5.1.1 Rail Transport

This section describes projected rail traffic, planned capacity enhancements and maintenance, and potential impacts in the extended study area under the no-action alternative.

[13] Geographic response plans are available on the Washington State Department of Ecology's website at http://www.ecy.wa.gov/programs/spills/preparedness/GRP/index.html

Traffic

Growth in rail traffic along the main line between Williston Basin and Washington through 2035 is expected to follow national trends. As described in Section 5.4.2.1, *Mainline Routes, Traffic, and Commodities*, a diverse range of freight is transported along the main line, including agricultural products, chemicals, forest products, farm and food products, coal, and petroleum products. While the volume of coal and petroleum products transported by rail nationwide has decreased slightly since 2014, the volume of other products such as grain and chemicals has increased (Association of American Railroads 2016). Transport of crude oil by rail, although currently on a downward trend since oil prices began to fall in 2014 and domestic crude became less economical to produce and transport, saw explosive growth from 2010 to 2014 (U.S. Energy Administration 2016a). The U.S. Energy Information Administration (2016d, 2016e) forecasts domestic production of crude oil to return to the recent peak in 2015 of 9.4 million barrels per day, the highest levels of domestic production since the 1970s, by 2025. A rebound in the domestic production of crude oil is expected to increase crude by rail transport, although some of the increase is likely to be offset by new pipeline capacity.

Estimates from before the recent drop in commodity prices suggest a long-term increase in rail traffic along the BNSF main line as more freight transits through Midwestern states to coastal ports and population centers. The Idaho Department of Transportation (2013) estimates that daily traffic on the Idaho portion of the BNSF Kootenai River Subdivision, which spans from Whitefish, Montana, to Spokane, Washington, will increase from 28 trips per day in 2012 to 70 trips per day in 2040, an increase of 133%. In Montana, the volume of freight shipped by rail is expected to increase from 54.1 million tons in 2002 to 79.3 million tons in 2035, an increase of 47% (Montana Department of Transportation 2010).

Washington's rail system is expected to handle more than 260 million tons of cargo by 2035—more than double the volume carried on the system in 2010 (Washington State Department of Transportation 2014b). This represents a compounded annual growth rate of 3.4% for commodities carried on the BNSF main lines.

Table 5-5 presents projected rail traffic in the state along the segments expected to be used by unit trains related to the proposed action, as described in Section 5.4.2.1, *Mainline Routes, Traffic, and Commodities.* The rail traffic projections in are based on data collected between 2010 and 2013 (Washington State Department of Transportation 2014b). Rail traffic is highly dynamic and fluctuates because of changing demand. The 2035 rail traffic estimates are intended to provide a "snapshot" of estimated rail traffic volumes; the rail traffic estimates do not represent actual volumes for 2035. The estimates do not include crude oil trains or rail traffic related to coal export terminals proposed in Washington State. The far right column presents estimated utilization, expressed as estimated traffic as a percentage of estimated capacity, assuming no improvements or operational changes.

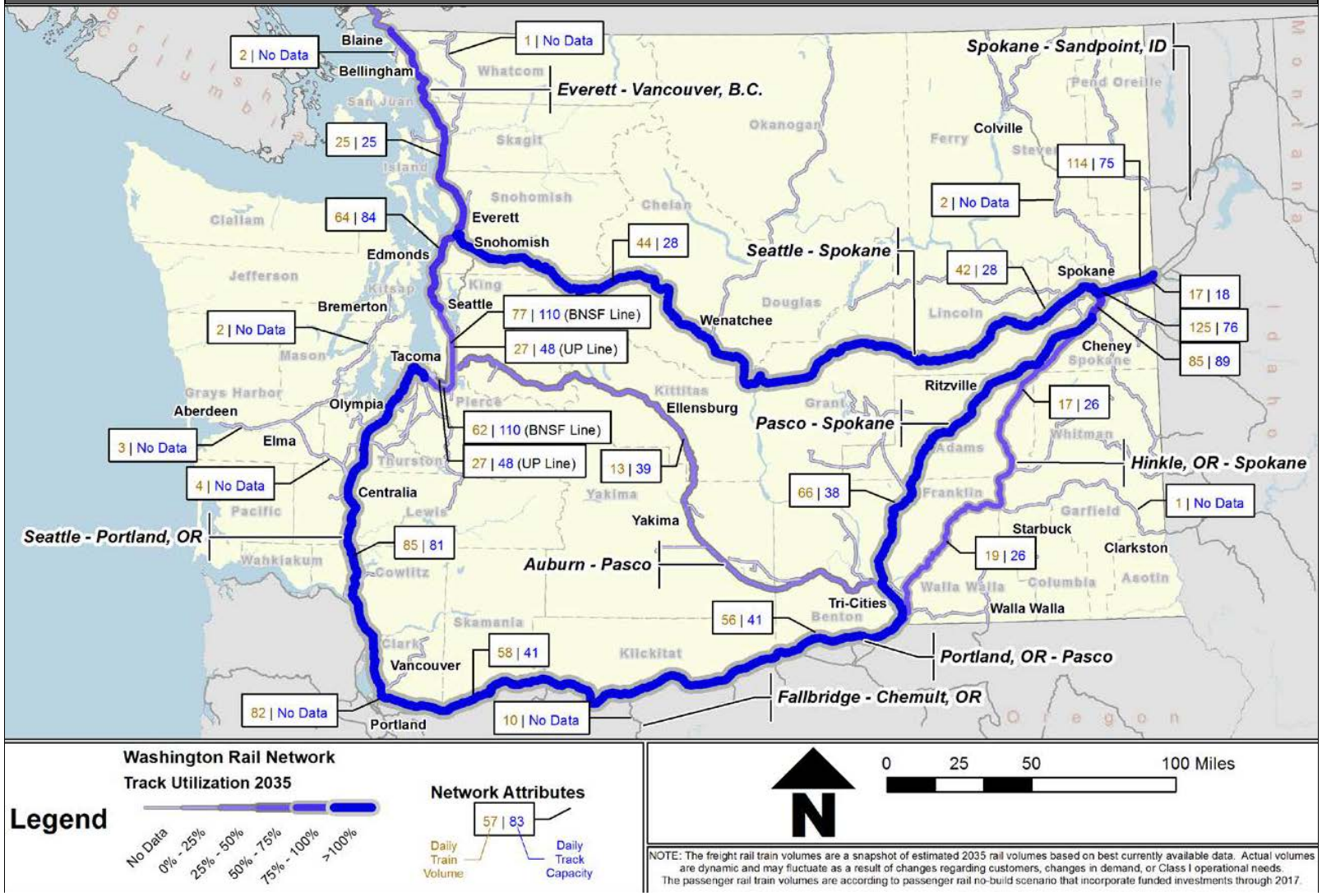
Table 5-5. Rail Traffic along Anticipated Crude Oil Mainline Routes in Washington State in 2015 and 2035

		Estimated 2015[a]			Projected 2035	
Route Segment	**Subdivision**	**Traffic Volume (trips per day)**	**Capacity (trips per day)**	**Utilization**	**Traffic Volumes[b] (trips per day)**	**Utilization[c]**
Idaho/Washington State Line–Spokane	Spokane	70	76	92%	125	164%
Spokane–Pasco	Lakeside	39	37	105%	66	178%
Pasco–Vancouver	Fallbridge	34	40	85%	56	140%
Vancouver–Centralia	Seattle	50	78	64%	85	109%
Centralia-Auburn	Seattle	50	78	64%	85	109%
Auburn–Yakima	Stampede	7	39	18%	13	33%
Yakima–Pasco	Yakima Valley	7	39	18%	13	33%

[a] Extrapolated to 2015.
[b] Numbers do not include crude oil unit trains or rail traffic related to coal export terminal proposals in Washington State.
[c] Without improvements or operational changes.
Source: Washington State Department of Transportation 2014b.

Figure 5-11 presents 2010 traffic volume and capacity information by segment of the subdivisions.

Figure 5-11. BNSF Mainline Daily Traffic and Utilization—2035



Source: Washington State Department of Transportation 2014b:41

Table 5-6 presents proposed and operating facilities moving crude oil by rail in the extended study area in Washington State (Washington State Department of Ecology 2015).

Table 5-6. Proposed and Operating Facilities Moving Crude Oil by Rail

Owner or Proponent	Location	Daily Trains (Empty and loaded)
BP Refinery	Cherry Point	2
NuStar Terminal	Vancouver	0.6
Phillips66 Refinery	Ferndale	1
Shell Refinery	Anacortes	2
Targa Sound Terminal	Tacoma	2
Tesoro Refinery	Anacortes	2
U.S. Oil Refinery	Tacoma	1
Vancouver Energy Terminal	Vancouver	8

Planned Capacity Enhancements

BNSF initiated the following capital project on the assumed rail routes in Washington State in 2015.

- Replacement of the Washougal River Bridge in Camas began in late 2014 and is expected to continue through 2016.

In addition, the following projects to improve reliability and on-time performance for passenger trains would have benefits for freight rail traffic (Washington State Department of Transportation 2014b).

- A third main line between Kelso and Longview is under construction and planned for completion in fall 2017.
- A new siding near Kalama—the Kelso Martin's Bluff New Siding Project—is under construction and planned for completion in fall 2017.
- A BNSF unit train staging yard could be constructed near Woodland, which would increase the efficiency of BNSF routes through the Columbia River Gorge and along the Interstate 5 corridor. BNSF currently stages unit grain trains in Pasco for movement to export terminals on the lower Columbia River, Puget Sound, and Grays Harbor. The distance between the Pasco staging yard and the export terminals increases the potential for train delays. A staging yard in Woodland would reduce the distance to the export terminals. This project would also benefit passenger trains by reducing conflicts with slower-moving freight trains. This project is currently in the discussion phase.

Potential Impacts

Increased rail traffic along the BNSF main lines in the extended study area could affect rail capacity if BNSF does not take actions to address this growth. It is expected that BNSF will make the necessary investments or operating changes to accommodate the growth in rail traffic, but the timing of these actions is unknown.

In addition to potential impacts on rail capacity, routine operations related to increased rail transport along the BNSF main lines would incrementally increase currently occurring impacts on the natural and built environment, summarized as follows.

- Emission of ambient air pollutants and air toxics from train engine exhaust.
- Incidental leaks and spills from engines and defective tank cars.
- Train noise, including wayside noise from passing trains and horn noise at grade crossings.
- Vehicle delay at at-grade crossings, including disruption to emergency vehicle response times.
- Impacts on tribal resources.

The types of impacts would be similar to those described in the respective sections of Chapter 3, *Affected Environment, Impacts, and Mitigation*. While the actual impacts described in Chapter 3 are specific to rail transport along the PS&P rail line, they would also result from rail transport in the extended study area. However, the potential for impacts and their relative magnitude would depend on the existing conditions at specific locations and other factors.

Increased rail transport along the BNSF main lines in Washington State would also increase the likelihood of rail incidents, including collisions and derailments. Moreover, the increase in transport of crude oil and other hazardous materials by rail would increase the likelihood that a rail incident would result in consequences such as oil spills, fires, or explosions. Although rail incidents and related consequences could occur more frequently with increased rail traffic generally and increased transport of crude oil and other hazardous materials specifically, if the types of materials transported do not change significantly, the potential consequences associated with a rail incident would remain similar in nature and magnitude to those that could occur under existing conditions.

Chapter 4, Section 4.7, *Impacts on Resources,* describes the impacts that could result from an oil spill, fire, or explosion. These impacts are not specific to a particular size event or a specific location; therefore, they can be generally applied to a potential event in the extended study area.

Depending on the specific location of a rail incident (e.g., proximity to population centers and sensitive resources), the type of material released, the volume of the release, and the potential for ignition (e.g., fire, explosion), impacts could be significant.

As noted in Section 5.4.2.4, *Existing Risks along the Rail Routes*, there are existing preparedness and response gaps with respect to transport of crude oil by rail. While new final rules described in Chapter 4, Section 4.2.2, *What framework prepares for an incident?* are intended to partially address these gaps, the need for updated and consistent geographic response planning and additional training and equipment for local emergency service responders would continue to be an issue of concern under the no-action alternative.

5.5.1.2 Vessel Transport

This section describes projected vessel traffic and potential impacts in the extended study area under the no-action alternative.

Traffic

The outlook for vessel traffic along the U.S. West Coast is influenced by numerous global, national, and regional factors. An increase in large vessel traffic depends in large part on the health of the global economy and U.S. trade with Asian nations, which are a major source of ship traffic to West Coast ports. The Washington Public Ports Association and Washington State Department of Transportation sponsored a marine cargo forecast for Washington in 2011. This forecast estimates continued, steady growth through 2030 of all types of cargo transported by vessel, with from 0.2% increase in liquid bulk products such as petroleum to 6.8% increase in dry bulk products such as mineral ore (BST Associates 2011). With the recent drop in commodity prices, including crude oil, it is reasonable to assume that the near-term outlook for waterborne trade would be lower than these projections, but an increase in global trade in the long-term would likely result in an expansion of West Coast vessel traffic.

The volume of petroleum products transported by vessel along the West Coast is subject to global supply and demand as well as regional constraints. Domestic maritime trade (the transport by vessel from one U.S. port to another U.S. port, also referred to as coastwise trade) is required by law to be on U.S.-registered vessels. The Magnuson Amendment (33 United States Code [U.S.C.] 476) places limits on increasing the capacity of Washington's Puget Sound. Given these limitations, continued growth in petroleum trade along the western region of the United States will depend on new infrastructure development and shipping capacity. Alternative means of transporting oil, including rail and pipeline, may also affect the volume of crude oil transported by vessel.

Because of the challenges and limitations of forecasting vessel traffic, projections of vessel traffic cannot be quantified for the extended study area. The following subsections describe general impacts associated with an increase in vessel traffic over existing conditions. A larger increase in vessel traffic would result in greater impacts and a smaller increase or decrease in vessel traffic would result in lesser impacts.

Potential Impacts

Increased vessel traffic along West Coast vessel routes and at Puget Sound and California ports would incrementally increase currently occurring impacts on the natural and built environment summarized as follows.

- Emission of ambient air pollutants and air toxics from vessel engine exhaust.
- Water quality impacts from incidental leaks.
- Introduction of invasive species through ballast water exchanges.
- Impacts on aquatic species from increased underwater noise and vibration, vessel strikes, and increased wake and propeller wash.
- Impacts on tribal resources.

The types of impacts would be similar to those described in the respective sections of Chapter 3, *Affected Environment, Impacts, and Mitigation.* While the actual impacts described in Chapter 3 are specific to the study area (Grays Harbor and the marine nearshore environment), they can be generally applied to the extended study area. However, the potential for impacts and their relative magnitude would depend on the existing conditions at specific locations and other factors.

Increased vessel transport in the extended study area would also increase the likelihood of vessel incidents. Moreover, the increase in transport of crude oil and other hazardous materials by vessel would increase the likelihood that a vessel incident would result in consequences such as oil spills, fires, or explosions. Although vessel incidents and related consequences could occur more frequently with increased vessel traffic generally and increased transport of crude oil and other hazardous materials specifically, if the types of materials transported do not change significantly, the potential consequences associated with a vessel incident would remain similar in nature and magnitude to those that could occur under existing conditions.

Chapter 4, Section 4.7, *Impacts on Resources,* describes the impacts that could result from an oil spill, fire, or explosion. These impacts are described in general terms, not specific to a particular size event at a specific location; therefore, they can be generally applied to a potential event in the extended study area. Depending on the specific location of a vessel incident (e.g., proximity to population centers and sensitive resources), the type of material released, the volume of the release, and the potential for ignition (e.g., fire, explosion), impacts could be significant.

As noted in Section 5.4.3.2, *Existing Risks along the Vessel Routes*, there are existing preparedness and response gaps with respect to transport of crude oil by vessel. The need for updated and consistent geographic response planning and additional training and equipment for local emergency service responders would continue to be an issue of concern under the no-action alternative.

5.5.2 Proposed Action

This section describes the impacts that could occur in the extended study area as a result of the transport of crude oil by rail and vessel related to the proposed action.

5.5.2.1 Rail Transport

Traffic

The proposed action would result in 458 unit train trips[14] per year (1.25 trips per day on average) at maximum throughput. Half of these trips would be loaded trains and half would be returning empties. Table 5-7 present these trips as a percentage of 2015 traffic estimates and 2035 traffic projections. As shown in the table, trips related to the proposed action represent between 1.3 and 8.9% of 2015 traffic estimates along the assumed routes; along the routes assumed for loaded trains, proposed action trips represent between 1.3 and 3.2% of 2015 estimates. Proposed action trips represent between 0.7 and 4.8% of 2035 projections along the assumed routes; along the assumed routes for loaded trains, proposed action trips represent between 0.7 and 1.9% of 2035 estimates.

[14] A trip represents one-way travel; in other words an inbound loaded train trip and outbound empty train trip are counted as two trips.

Table 5-7. Proposed Action Rail Trips as Percentage of Existing and Projected Rail Trips in the Extended Study Area under the No-Action Alternative

Route Segment	Subdivision	Estimated 2015 Trips Per Day[a]	Proposed Action Trips as a Percentage	Projected 2035 Trips per Day[b]	Proposed Action Trips as a Percentage
Idaho/Washington State Line–Spokane	Spokane	70	1.8%	125	1.0%
Spokane–Pasco	Lakeside	39	3.2%	66	1.9%
Pasco-Vancouver[c]	Fallbridge	34	1.8%	56	1.1%
Vancouver–Centralia[c]	Seattle	50	1.3%	85	0.7%
Centralia–Auburn[d]	Seattle	50	1.3%	85	0.7%
Auburn–Yakima[d]	Stampede	7	8.9%	13	4.8%
Yakima–Pasco[d]	Yakima Valley	7	8.9%	13	4.8%

[a] Extrapolated to 2015.
[b] Numbers do not include crude oil unit trains or rail traffic related to coal export terminal proposals in Washington State.
[c] Assumes loaded proposed action trains only.
[d] Assumes empty proposed action trains only.
Source: Washington State Department of Transportation 2014b.

Potential Impacts

The proposed action could result in an increase in rail traffic along the BNSF main lines in the extended study area, which could affect rail capacity if BNSF does not take actions to address this growth. It is expected that BNSF will make the necessary investments or operating changes to accommodate the growth in rail traffic, but the timing of these actions is unknown.

In addition to potential impacts on rail capacity, routine rail transport along the BNSF main lines related to the proposed action could result in an incremental increase in the following impacts on the natural and built environment similar to existing conditions and the no-action alternative.

- Emission of ambient air pollutants and air toxics from train engine exhaust.
- Incidental leaks and spills from engines and defective tank cars.
- Train noise, including wayside noise from passing trains and horn noise at grade crossings.
- Vehicle delay at at-grade crossings, including disruption to emergency vehicle response times.
- Impacts on tribal resources.

The types of impacts would be similar to those described in the respective sections of Chapter 3, *Affected Environment, Impacts, and Mitigation*. While the actual impacts described in Chapter 3 are specific to rail transport along the PS&P rail line, they can be generally applied to rail transport in the extended study area. However, the potential for impacts and their relative magnitude would depend on the existing conditions at specific locations and other factors.

In addition, crude oil rail transport along the BNSF main lines in Washington State under the proposed action could increase the likelihood of rail incidents and related consequences (i.e., oil

spills, fires, and explosions). However, the potential consequences would remain similar in nature and magnitude to those that could occur under existing conditions and the no-action alternative.

Chapter 4, Section 4.7, *Impacts on Resources,* describes the impacts that could result from an oil spill, fire, or explosion. These impacts described in general terms, not specific to a particular size event or a specific location; therefore, they can be generally applied to the extended study area. Depending on the specific location of a rail incident (e.g., proximity to population centers, sensitive resources), the type of material released, the volume of the release, and the potential for ignition (e.g., fire, explosion), impacts could be significant.

As noted in Section 5.4.2.4, *Existing Risks along the Rail Routes*, there are existing preparedness and response gaps with respect to transport of crude oil by rail. While new final rules described in Chapter 4, Section 4.2.2, *What framework prepares for an incident?* are intended to partially address these gaps, the need for updated and consistent geographic response planning and additional training and equipment for local emergency service responders would continue to be an issue of concern similar to the no-action alternative.

5.5.2.2 Vessel Transport

Traffic

The proposed action would result in 238 tank vessel trips per year (0.7 trip per day on average) at maximum throughput. As described in Section 5.5.1.2, *Vessel Transport*, projections of vessel traffic cannot be quantified for the extended study area and, therefore, proposed action vessel trips are compared to existing conditions.

Table 5-8 presents proposed action tank vessel trips as a percentage of existing large commercial vessel trips to and from selected West Coast destinations in the extended study area where proposed action vessel trips may occur. As shown in the table, proposed action vessel trips at maximum throughput operation (238 trips per year) would represent 4.5% of existing large commercial vessel traffic in Puget Sound, 4.0% of such traffic at larger ports accessed via San Francisco Bay, and 3.2% at Los Angeles area ports.[15]

[15] The Ports of Los Angeles and Long Beach, which are adjacent to each other.

Table 5-8. Proposed Action Vessel Trips as a Percentage of Existing Vessel Trips Related to Select West Coast Destinations

Selected West Coast Destinations	Estimated Annual Trips 2015[a]	Proposed Action Trips as a Percentage
Washington		
Puget Sound	5,196	4.5%
California		
San Francisco Bay Area Ports	5,936	4.0%
Los Angeles–Long Beach Ports	7,376	3.2%

[a] Based on number of calls of vessels over 1,000 gross tons; a call is assumed to equal two trips (one inbound and one outbound).

Source: U.S. Maritime Administration 2015 (California ports); Washington State Department of Ecology 2016b (Puget Sound).

Potential Impacts

Vessel traffic related to the proposed action is anticipated to have a negligible impact on vessel traffic in the extended study area. However, it could result in an incremental increase in the following impacts on the natural and built environment similar to existing conditions and the no-action alternative.

- Emission of ambient air pollutants and air toxics from vessel engine exhaust.
- Water quality impacts from incidental leaks.
- Introduction of invasive species through ballast water exchanges.
- Impacts on aquatic species from increased underwater noise and vibration, vessel strikes, and increased wake and propeller wash.
- Impacts on tribal resources.

The types of impacts would be similar to those described in the respective sections of Chapter 3, *Affected Environment, Impacts, and Mitigation.* While the actual impacts described in Chapter 3 are specific to the study area (Grays Harbor and the marine nearshore environment), they can be generally applied to the extended study area. However, the potential for impacts and their relative magnitude would depend on the existing conditions at specific locations and other factors.

Crude oil vessel transport in the extended study area could result in an increased likelihood of a vessel incidents and related consequences (i.e., oil spills, fires, and explosions). However, the potential consequences would remain similar in nature and magnitude to those that could occur under existing conditions and the no-action alternative.

Chapter 4, Section 4.7, *Impacts on Resources,* describes the impacts that could result from an oil spill, fire, or explosion. These impacts are described in general terms, not specific to a particular size event or a specific location; therefore, they can be generally applied to the extended study area. Depending on the specific location of a vessel incident (e.g., proximity to population centers, sensitive resources), the type of material released, the volume of the release, and the potential for ignition (e.g., fire, explosion), impacts could be significant.

As noted in Section 5.4.3.2, *Existing Risks along the Vessel Routes*, there are existing preparedness and response gaps with respect to transport of crude oil by vessel. The need for updated and consistent geographic response planning and additional training and equipment for local emergency service responders would continue to be an issue of concern similar to the no-action alternative.

5.6 Would the proposed action have unavoidable and significant adverse impacts on rail and vessel transport in the extended study area?

Regulatory requirements for prevention of, preparedness for, and response to incidents involving the release of crude oil, and mitigation measures to reduce impacts are described in Chapter 4, *Environmental Health and Safety*. However, no mitigation measures would completely eliminate the possibility of a spill, fire, or explosion, nor would they completely eliminate the adverse consequences of a spill, fire, or explosion. Depending on the location of the incident, amount spilled, type of crude oil, and environmental conditions, such as the time of year, water flows, and weather conditions, the potential adverse environmental impacts could be significant.

The following resources could experience significant impacts as described in Chapter 4, Section 4.7, *Impacts on Resources*.

- Water
- Plants
- Animals
- Aesthetics
- Recreation
- Commercial fishing
- Cultural resources
- Tribal resources
- Public services
- Air
- Human health

Chapter 6
Cumulative Impacts

6.1 What are cumulative impacts?

Cumulative impacts are impacts that would result from the incremental addition of the proposed action to impacts from past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor, but collectively significant, actions that occur over time. The purpose of the cumulative impacts analysis is to ensure that decision-makers consider the full range of consequences for the proposed action, including the proposed action's incremental contribution to cumulative impacts on the environment.

This chapter describes the approach to conducting the cumulative impacts analysis, including what past, present, and reasonably foreseeable future projects are considered, and identifies the resource areas that are addressed in the analysis. It then describes cumulative impacts that could result from construction and operation of the proposed action, including potential risks associated with the handling, storage, and transport of crude oil. Lastly, this chapter presents any measures identified to mitigate the cumulative impacts of the proposed action and identifies any unavoidable and significant adverse cumulative impacts.

6.2 What is the study area and what resources were considered for the cumulative impacts analysis?

As discussed in the preceding chapters of this EIS, the potential for impacts related to the proposed action are considered in terms of the potential to affect resources in the study area, which generally includes the project site, Puget Sound & Pacific Railroad (PS&P) rail line, and Grays Harbor. The extended study area includes the area that could be affected by increased rail traffic from the source of crude oil to Centralia, Washington, and the areas that could be affected by increased vessel traffic from the mouth of Grays Harbor to the point of final delivery.

In general, the scope of the cumulative impacts analysis is limited to those resources where the proposed action could have significant impacts in combination with other past, present, and reasonably foreseeable and similar future actions. Based on the analyses in Chapter 3, *Affected Environment, Impacts, and Mitigation*, and Chapter 4, *Environmental Health and Safety*, the proposed action would affect the following resources in each study area and could contribute to cumulative impacts. The potential for cumulative impacts in the extended study area is addressed in Section 6.5.8, *Extended Study Area*.

- Section 6.5.1, *Air*
- Section 6.5.2, *Noise and Vibration*
- Section 6.5.3, *Tribal Resources*
- Section 6.5.4, *Rail Traffic*

- Section 6.5.5, *Vehicle Traffic and Safety*
- Section 6.5.6, *Vessel Traffic*
- Section 6.5.7, *Environmental Health and Safety* (related to incidents of oil spills, fires, and explosions)

6.3 What are the relevant regulations for the cumulative impacts analysis?

This cumulative impacts analysis is prepared in accordance with the Washington State Environmental Policy Act (SEPA) (Chapter 43.21C Revised Code of Washington [RCW]), the SEPA Rules (Chapter 197-11-060 Washington Administrative Code [WAC]), and the SEPA Handbook.

Additional guidance developed by the Council on Environmental Quality (CEQ) in the handbook entitled *Considering Cumulative Effects under the National Environmental Policy Act* (1997) was also considered where SEPA requirements are consistent with requirements of the National Environmental Policy Act (NEPA).

6.4 What methods were used to analyze cumulative impacts?

The resource-specific methods and assumptions described in the respective resource sections of Chapter 3*, Affected Environment, Impacts, and Mitigation*, Chapter 4*, Environmental Health and Safety,* and Chapter 5, *Extended Rail and Vessel Transport,* were used for the cumulative impacts analysis*.* The cumulative impact analysis took the following approach.

- Addressed the resources with the potential to be affected by the proposed action as discussed in Chapter 3, *Affected Environment, Impacts, and Mitigation*; Chapter 4, *Environmental Health and Safety*; and Chapter 5, *Extended Rail and Vessel Transport*.
- Considered other actions in relation to the geographic scope of the proposed action.
- Considered other actions in relation to the temporal period of the proposed action.
- Relied on the best available data at the time of the analysis.
- Reached conclusions based on known regulations at the time of the analysis.

The boundaries for the cumulative impacts analysis were based on the geographic location of the proposed action and are described for each resource area. The analysis considered regional influences and activities, and the projected lifespan of the proposed project activities. The geographic extent of the cumulative impacts analysis area is described for each resource in Section 6.5, *What cumulative impacts were identified?*

Where impacts were quantitatively evaluated, potential cumulative impacts were considered in 2017—the anticipated first year of operation—and in 2037 to account for future growth and development. The impacts identified in these years would apply to the lifetime of the proposed

action, and proposed mitigation measures are intended to apply for the lifetime of the proposed action.

This analysis considers the impacts on the environment resulting from the incremental impacts of the proposed action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal, state, local) or person (private citizen, nongovernment organization, corporation) undertakes the other actions. This analysis considers other actions that could affect the human or natural environment similar to the proposed action and that could add to the impacts of the proposed action.

6.4.1 Past and Present Actions

The following past and present actions have contributed to the existing condition of resources in at the project site, in Grays Harbor, and along the PS&P rail line.

- **Prior industrial development at the Port of Grays Harbor (Port) and ongoing terminal operations.** The Port owns four deepwater marine terminal facilities and provides services including pilotage, ship assistance, line handling and terminal stevedoring, and onsite cargo storage. The Port's terminals are supported by large, paved, secured cargo yards, the Port's own on-dock rail system, and more than 104,000 square feet of on-dock covered storage. The marine terminal rail system includes more than 50,000 feet of rail looping through the marina terminal complex (WorleyParsons 2014). A network of local roads with some collector and arterial roads provides access to the Port's terminal facilities.
- **Prior development of transportation infrastructure (roadways and rail lines) and ongoing maintenance of that infrastructure.** The terminal rail system connects to the PS&P main line, owned by Genesee and Wyoming, Inc. The PS&P short line, Class III railroad, connects to the BNSF Railway Company (BNSF) main line, a Class I railroad, in Centralia. The PS&P rail line can also connect to the Union Pacific main line in Centralia (WorleyParsons 2014). The PS&P rail line was constructed between 1889 and 1896. It currently moves products and materials for 30 industries.
- **Prior development of infrastructure for harbor navigation and ongoing maintenance of that infrastructure**. Grays Harbor is a tidal estuary with jetties at the entrance. The two jetties were originally constructed from 1889 to 1913 for harbor navigation. Other aids to navigation include a deepwater navigation channel (Grays Harbor Navigation Channel), turning basins, and anchorage areas for shallow and deep-draft vessels (WorleyParsons 2014). The navigation channel, anchorage areas, and turning basins are maintained by the U.S. Army Corps of Engineers (USACE) through periodic maintenance dredging.

6.4.2 Ongoing and Reasonably Foreseeable Future Actions

Requests for information on any planned infrastructure or construction projects scheduled to occur between 2017 and 2037 were sent to the Cities of Oakville, McCleary, Elma, Montesano, Hoquiam, and Aberdeen. In addition, Thurston County, Lewis County, Grays Harbor County, including the Grays Harbor Council of Governments, Cowlitz-Wahkiakum Council of Governments, PS&P, the Port, the Quinault Indian Nation, and the Confederated Tribes of the Chehalis Reservation were also contacted. The following plans and elements were reviewed for this analysis.

- Cowlitz-Wahkiakum Council of Governments Metropolitan and Regional Transportation Improvement Programs 2015–2018 (August 2014)
- Grays Harbor Council of Governments 2013 Annual Report
- Cowlitz-Wahkiakum Council of Governments Fiscal Year 2013 Annual Report (July 1, 2012 to June 30, 2013); Southwest Washington Regional Transportation Planning Organization
- Washington State 2010–2013 Freight Rail Plan (December 2009)
- Cowlitz-Wahkiakum Council of Governments Metropolitan and Regional Transportation Plan 2009–2029 (November 2009)
- City of Hoquiam Comprehensive Land Use Plan (February 2009)
- Grays Harbor Council of Governments US 101 Regional Circulation Project – Final Report (January 2007)

Based on information gathered from the sources above, Table 6-1 lists future actions that could contribute to cumulative impacts on resources analyzed for the proposed action. The locations of these projects are show in Figure 6-1.

Figure 6-1. Cumulative Projects

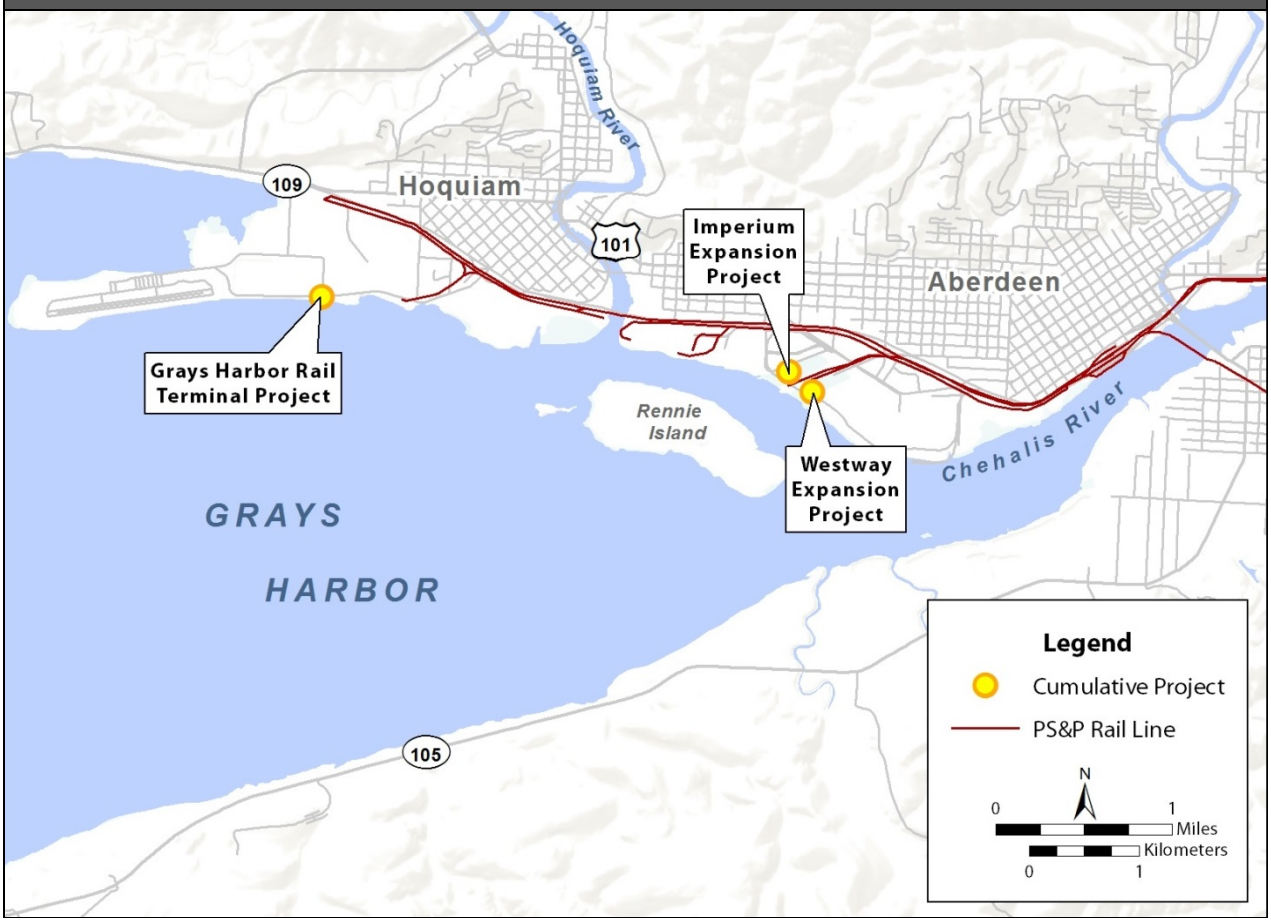


Table 6-1. Reasonably Foreseeable Future Actions Contributing to Cumulative Impacts

Project	Proponent	Location	Description	Contributing Activity	Schedule
Westway Expansion Project (proposed action)	Westway Terminal Company LLC	Port of Grays Harbor, Terminal 1	Westway Terminal Company LLC is proposing to expand the existing bulk liquids terminal to handle and store crude oil. The project would involve constructing additional storage tanks and expanding rail unloading capacity and vessel loading capacity on the site.	Proposed action would increase PS&P rail line traffic by 458 (loaded and unloaded) trips per year and vessel traffic in Grays Harbor by approximately 238 vessel trips per year.	Construction is anticipated to start in 2016 if permits are issued.
REG (formerly Imperium Terminal Services) Expansion Project	REG (formerly Imperium Terminal Services LLC)	Port of Grays Harbor, Terminal 1	REG is proposing[a] to expand the existing bulk liquids terminal to handle and store crude oil, ethanol, naphtha, gasoline, vacuum gas oil, jet fuel, no. 2 fuel oil, no. 6 fuel oil, kerosene, renewable jet fuel, renewable diesel, used cooking oil, and animal fat, in addition to currently permitted liquids, including biodiesel, petroleum diesel, vegetable oil, and methanol. The project would involve constructing additional storage tanks and expanding rail unloading capacity and vessel loading capacity on the site.	Proposed action would increase PS&P rail line traffic by 730 rail trips (loaded and unloaded) per year and vessel traffic in Grays Harbor by approximately 400 vessel trips per year.	Construction is anticipated to start in 2016 if permits are issued.
Grays Harbor Rail Terminal Project	USD Group LLC	Port of Grays Harbor, Terminal 3	USD Group LLC is proposing[c] to construct a new bulk liquids terminal to handle and store crude oil. The project would involve constructing additional storage tanks and expanding rail unloading capacity and vessel loading capacity on the site.	Proposed action would increase PS&P rail line traffic by 365 rail trips (loaded and unloaded) per year and vessel traffic in Grays Harbor by approximately 120 vessel trips per year.	Construction is anticipated to begin within the next 2 years if permits are issued.
Grays Harbor Navigation Improve-ment Project[a]	U.S. Army Corps of Engineers	Grays Harbor Navigation Channel	The project would deepen the navigation channel to 38 feet mean lower low water between the South reach and Cows Point reach.	Upon completion of channel deepening, the limiting design depth for the transit of large commercial vessels between the Bar Reach and Port terminals would be 38 feet mean lower low water.	Dredging for channel deepening is currently proposed to occur between 2016 and 2017.

Project	Proponent	Location	Description	Contributing Activity	Schedule

[a] Vessel traffic projections for the baseline and no-action alternative evaluated in this EIS assume the implementation of the Grays Harbor Navigation Improvement Project. Moreover, the channel capacity analysis in Chapter 3, Section 3.17, *Vessel Traffic*, and in Section 6.5.6, *Vessel Traffic*, considers the project's proposed increase in channel depth.

[b] The specifics of the REG Expansion Project are changing and have not been finalized. Therefore, the analysis of cumulative impacts retains the original proposed action considered in the Draft EIS. Based on information available at this time, the commodity types and volumes are anticipated to be less than assumed in the analysis.

[c] The proposal for the Grays Harbor Rail Terminal Project is no longer active; however, industrial growth is anticipated at this site between 2017 and 2037. Therefore, the analysis of cumulative impacts retains the original proposal considered in the Draft EIS. Future development would not include crude oil due to the revised zoning code.

Vessel traffic projections for the baseline and no-action alternative evaluated in this EIS assume the implementation of the Grays Harbor Navigation Improvement Project. Moreover, the channel capacity analysis in Chapter 3, Section 3.17, *Vessel Traffic*, and in Section 6.5.6, *Vessel Traffic*, considers the project's proposed increase in channel depth. For these reasons, the analysis of cumulative impacts focuses on those associated with construction and operation of the three projects proposed for development at the Port: the proposed action, the REG (formerly Imperium Terminal Services) Expansion Project (REG project), and Grays Harbor Rail Terminal Project. These three projects are referred to as the cumulative projects.[1]

Tables 6-2 and 6-3 summarize the rail and vessel traffic associated with the reasonably foreseeable future actions contributing to cumulative impacts of the cumulative projects.

Table 6-2. Rail Traffic for Reasonably Foreseeable Future Actions

	Rail Trips		
Project	**Daily**	**Weekly**	**Annual**
Proposed action	1.25	8.75	458
REG project	2	14	730
Grays Harbor Rail Terminal Project	1	7	365
Total Rail Trips	**4.25**	**29.75**	**1,553**

Table 6-3. Vessel Traffic for Reasonably Foreseeable Future Actions

	Vessel Calls			Vessel Trips		
Project	**Daily**	**Weekly**	**Annual**	**Daily**	**Weekly**	**Annual**
Proposed action	0.3	2.3	119	0.7	4.6	238
REG project	0.5	3.8	200	1.1	7.7	400
Grays Harbor Rail Terminal Project	0.2	1.2	60	0.3	2.3	120
Total Vessel Trips	**1.0**	**7.3**	**379**	**2.1**	**14.6**	**758**

6.5 What cumulative impacts were identified?

This section addresses the cumulative impacts on air, noise and vibration, tribal resources, rail traffic, vehicle traffic and safety, vessel traffic, and environmental health and safety that could result from the cumulative projects. This section also addresses potential cumulative impacts in the extended study area.

6.5.1 Air

This section discusses potential cumulative impacts on air that would result from construction and operation of the cumulative projects.

[1] As noted in Table 6-1, although the specifics of the REG project and Grays Harbor Rail Project are changing, growth at these properties between 2017 and 2037 is anticipated. Therefore, the analysis of cumulative impacts retains the original proposals considered in the Draft EIS. Based on information available at this time, the commodity types and volumes proposed by REG are anticipated to be less than assumed in the analysis.

6.5.1.1 Study Area

The cumulative impacts study area for air includes Grays Harbor County where emissions from onsite operations would occur and where the majority of emissions related to offsite rail transport on the PS&P rail line and vessel transport in Grays Harbor would occur. Possible greenhouse gas (GHG) emissions associated with operations, rail and vessel transport, and combustion are considered.

6.5.1.2 Cumulative Impacts

The following section describes the criteria pollutants, toxic air pollutants, and GHG emissions that could result from the construction and routine operation of the cumulative projects.

Criteria Pollutants

As presented in Chapter 3, Section 3.2, *Air*, air pollutants resulting from the proposed action are not anticipated to approach levels defined by the National Ambient Air Quality Standards (NAAQS). Although increased nitrogen oxide (NO_X) emissions during onsite operations of the proposed action would not exceed the NAAQS, the emissions are analyzed under a scenario where all cumulative projects perform activities at the same time.

The maximum cumulative nitrogen dioxide (NO_2) concentrations would occur if the following actions occurred simultaneously.

- The applicant is loading a vessel at the terminal while operating the vapor combustion unit at maximum capacity.
- REG is unloading crude oil from a unit train.
- USD Group LLC is loading crude oil at Terminal 3 and unloading a unit train.

Under these circumstances, the highest concentration of 1-hour NO_2 could occur resulting in an increase of NO_2 concentration that would slightly exceed the 1-hour NO_2 standard.[2] The 1-hour NO_2 standard is 188 micrograms per cubic meter of air (μg/m^3), and the total NO_2 concentration based on the above scenario is 190 μg/m^3 of air. A violation of the NO_2 standard would not likely occur for the following reasons.

- The standard requires that the 3-year average of NO_2 be exceeded.[3]
- The analysis conservatively assumed a high percentage of NO_2 converted.[4]

[2] The maximum 1-hour NO_2 modeled concentration from the combined total of all three facilities would be about 145 micrograms per cubic meter of air (μg/m^3) (81 μg/m^3 for the proposed action, 14 μg/m^3 for the REG project, and 50 μg/m^3 for the Grays Harbor Rail Terminal Project). Adding the maximum ambient 1-hour NO_2 background concentrations of 45 μg/m^3, the total concentration would be 190 μg/m^3. The 1-hour NO_2 standard under NAAQS is 188 μg/m^3.

[3] The standard requires that the 3-year average of the 98th percentile of the daily 1-hour maximum not be exceeded.

[4] The modeling conservatively assumed that 80% of the emitted NO_X is converted to NO_2. It is unlikely that this high percentage of emitted NO_X is converted to NO_2 over the short travel distances where the maximum concentration is predicted to occur.

- All of the mobile source activity as previously described would have to occur simultaneously during meteorological conditions that have the poorest dispersion conditions (i.e., very low wind speeds and a strong temperature inversion).
- The maximum 1-hour background concentration would need to occur simultaneously.

Additionally, incorporation of the mitigation described in Chapter 3, Section 3.2, *Air*, and Section 6.5.1.3, *Mitigation Measures*, would further reduce the risks of exceeding applicable air quality standards.

Toxic Air Pollutants

Air dispersion modeling of diesel particulate matter (DPM) was conducted using the U.S. Environmental Protection Agency (EPA) AERMOD dispersion model[5] for rail activities between Poynor Yard and the three project sites.

Figures 6-2 and 6-3 show the average increased inhalation cancer risk from DPM in 2017 and 2037[6] under cumulative conditions by illustrating the 10-per-million and 1-per-million risk levels. The air quality sensitive receptors[7] within these risk levels are also shown.

Under WAC 173-460, Controls of New Sources of Toxic Air Pollutants, Washington State Department of Ecology (Ecology) may recommend approval for a stationary source project that is likely to cause an exceedance of acceptable source impact levels for one or more toxic air pollutants if it is demonstrated that the increase in emissions of toxic air pollutants (such as DPM) would not likely result in an increased cancer risk of more than 10 in 1 million. However, this regulation only applies to stationary sources, not mobile sources such as rail locomotives. There are no local or state regulations for DPM emissions from mobile sources. For this reason, the 10-per-1-million risk level is not a threshold to determine significance of the impact. However, to provide context of the average increased inhalation cancer risk from DPM, the 10-per-million risk level is shown in Figures 6-2 and 6-3. For project-level impacts, EPA would typically urge action to mitigate the increased risk of exposure at the 100-per-million risk level. The maximum potential increase in risk from the project is well below this level of increase as shown in Figures 6-2 and 6-3.

The analysis indicates that if all cumulative projects are operating at maximum throughput, the 10-per-million-and-above risk level from rail operations would be limited to the project sites in 2017.

In 2017, the 1-per-million risk level from rail operations would extend from east of Poynor Yard to west of the REG project site. As shown in Figure 6-2, some residential land uses are within the 1-per-million risk level west and north of the PS&P rail line. Three sensitive receptors (West End Playfield, 28th Street Landing, and Viewing Tower) (Chapter 3, Section 3.2, *Air*) are also located within the 1-per-million risk level.

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[5] AERMOD is a dispersion model recommended by EPA for estimating the impact of industrial sources of emissions on ambient air quality.

[6] Years 2017 and 2037 were modeled to assess the risk from DPM emissions over time because locomotives that emit less DPM than in 2017 will be in operation by 2037. The analysis assumes maximum throughput capacity in 2017 and 2037.

[7] A facility or land use that houses or attracts members of the population who are particularly sensitive to the effects of air pollutants, such as children, the elderly, and people with illnesses.

By 2037, no 10-per-million risk levels are predicted (Figure 6-3). No residential areas would be above 1-per-million risk and the 28th Street Landing and Viewing Tower would be just below the 1-per-million risk level. The risks would be less compared to 2017 because the analysis considers that newer locomotives with improved control technologies would be used nearly exclusively by this time.

Figure 6-2. Average Cumulative Diesel Particulate Matter Inhalation Cancer Risk (2017)

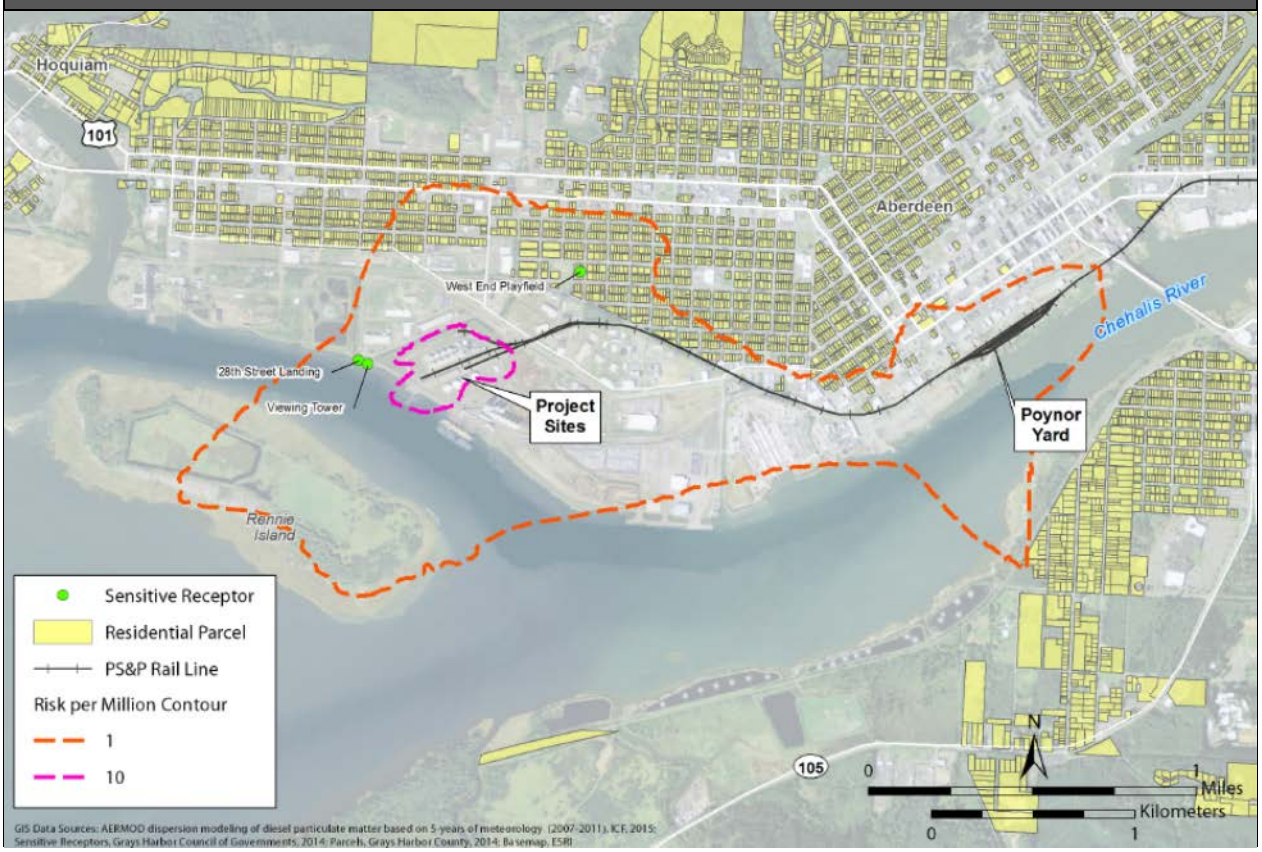
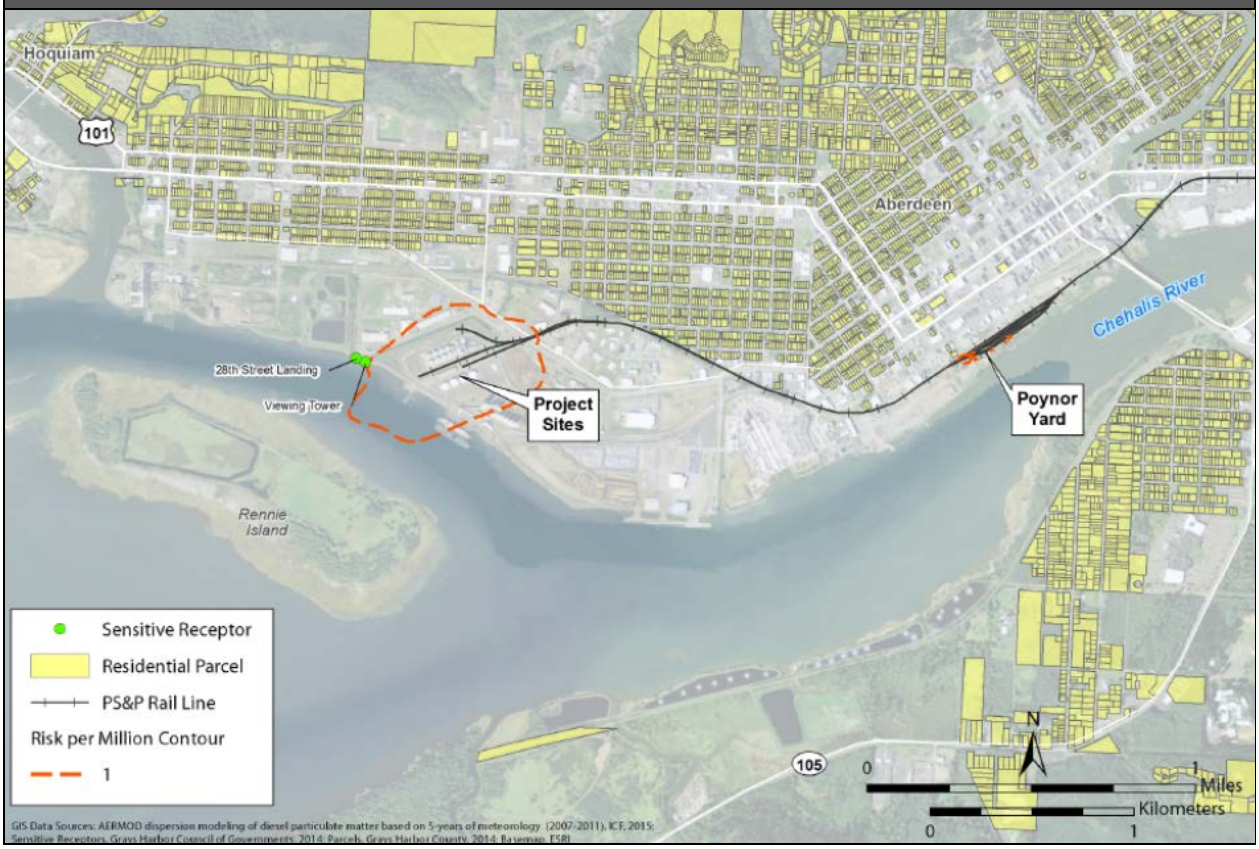


Figure 6-3. Average Cumulative Diesel Particulate Matter Inhalation Cancer Risk (2037)



Greenhouse Gas Emissions

Emission of GHGs would result from onsite operation of the cumulative projects. Other sources of GHG emissions that could be attributed to the cumulative projects are those from the extraction of crude oil, transport of the crude oil to and from the project site, and end use of the crude oil (e.g., combustion). These sources of GHG emissions are discussed below.

Crude Oil Production

Crude oil production (drilling) results in the emission of GHGs. If the cumulative projects were to induce production of crude oil or other bulk liquids,[8] GHG gas emissions for this activity could be deemed attributable to the proposed action. Based on the analysis presented in Appendix Q, *Crude Oil Market Analysis,* the proposed action would not likely affect oil production. Therefore, GHG emissions related to extraction activities are not quantified for the cumulative projects.

Onsite Operations and Offsite Transport

Onsite operation of the cumulative projects at maximum throughput would result in the emission of approximately 21,272 metric tons of carbon dioxide equivalent (CO_2e) each year from stationary sources (Table 6-4).

[8] The REG project proposes handling a variety of bulk liquids; however, for the purposes of the GHG analysis, it is assumed that maximum throughput is solely for crude oil.

Rail and vessel transport related to the cumulative projects would also result in GHG emissions. Based on the analysis presented in Appendix Q, *Crude Oil Market Analysis,* crude oil transloaded at the proposed facility is expected to be shipped to West Coast refineries. It is anticipated that much of this crude oil would replace crude oil that was previously transported to these refineries by other means. The *Washington Marine and Rail Oil Transportation Study* states the following (Washington State Department of Ecology 2014b):

> …historically, 90% of crude oil bound for Washington's refineries was delivered here by tank ship from Alaska or from other international sources of oil. Today pipeline and rail delivery of crude oil make up more than 30% of our imports, while vessel delivery is reduced to less than 70%. Crude oil transportation is rapidly shifting to delivery by rail and pipeline.

Table 6-4 presents estimates of GHG emissions from rail transport from the likely source, Williston Basin,[9] and vessel transport to the farthest likely destination, Port of Long Beach, California,[10] of maximum throughput of crude oil related to the cumulative projects.

Table 6-4. Annual Average Greenhouse Gas Emissions from Operations of the Cumulative Projects ($MTCO_2e$/year)

Source Type	Proposed Action	REG Project	Grays Harbor Rail Terminal Project	Total
Rail (Washington State)[a]	28,173	43,343	21,205	92,721
Rail (beyond Washington State)[b]	51,219	81,619	40,842	173,680
Marine vessels (Washington State)[c]	643	1,417	2,394	4,454
Marine vessels (beyond Washington State)[d]	39,161	65,817	36,025	141,003
Industrial sources (project site)	4,052[e]	6,634[f]	10,586[g]	21,272
Total	**123,248**	**198,830**	**111,052**	**433,130**

[a] Includes onsite rail emissions.
[b] Includes emissions from roundtrip rail transport between Washington State border and Enbridge, North Dakota.
[c] Includes emissions from vessels at the Terminal 1 dock.
[d] Includes emissions from vessel transport via from 3 nautical miles off the Washington coast to the Port of Long Beach, California.
[e] Trinity Consultants 2015a
[f] Trinity Consultants 2015b
[g] HDR Engineering, Inc. 2014
$MTCO_2e$ = metric tons of carbon dioxide equivalent

Table 6-5 presents estimates of GHG emissions related to transport of the equivalent volume of Alaska North Slope crude oil, which is expected to be offset by any crude oil transloaded under the cumulative projects. The emission estimates related to transport of Alaskan crude do not include emissions related to loading and movement of crude oil from the North Slope to Valdez; therefore, they are understated and conservative for the purposes of calculating offset emissions. Moreover, if crude oil transloaded through the proposed facility were to be transported to California refineries, it could replace crude oil from international sources.

[9] Enbridge, North Dakota, was used as the source point.
[10] Refer to Appendix Q, *Crude Oil Market Analysis,* for a discussion of why West Coast refineries are considered the most likely destination of crude oil transloaded through the proposed facility, despite the lifting of the ban on exports of U.S. crude oil.

Table 6-5. Estimated Annual Greenhouse Gas Emissions Related to Offset Vessel Transport of Alaskan Crude Oil (metric tons of CO_2e per year)

Vessel Transit[a]	Emissions
Proposed action	47,049
REG project	79,135
Grays Harbor Rail Terminal Project	43,326
Total	169,510

[a] Assumes 17 Suezmax vessels (195,000 deadweight tons). Loaded vessels traveling from Valdez, Alaska, to Long Beach, California, and returning empty. Does not include emissions from loaded vessels and movement of crude oil from North Slope to Valdez, Alaska.

Statewide GHG emissions related to the cumulative projects from onsite operations and offsite transport within the state would be 118,447 metric tons of CO_2e per year (Table 6-4). These statewide GHG emissions represent a 0.13% increase in 2011 related statewide GHG emissions[11] (Washington State Department of Ecology 2014a). The largest contribution of statewide GHG emissions would result from rail transport, which represents an increase of approximately 9.3% in the 2011 statewide GHG emissions from rail transport[12] (Washington State Department of Ecology 2014a). Future improvements in the efficiency of locomotives may decrease the total GHG emissions resulting from the cumulative projects.

RCW 70.235.020 sets the following GHG statutory reduction levels.

- By 2020, reductions to 1990 emission levels.
- By 2035, reductions to 25% below 1990 levels.
- By 2050, reductions to 50% below 1990 levels or 70% below Washington State's expected emissions that year.

In order to meet these reductions, Washington State must reduce emissions to 88.4 million metric tons per year by 2020, 66.3 million metric tons by 2035, and approximately 44.2 million metric tons by 2050. The statewide GHG emissions from the cumulative projects would represent approximately 0.26% of Washington State's statutory reductions of 44.2 million metric tons of CO_2e (half of the 1990 level) by 2050.

Adding emissions from rail and vessel transport related to the cumulative projects beyond Washington State (rail transport from the Williston Basin, North Dakota, to the state line, and vessel transport from state waters to Long Beach, California) would result in an additional 314,683 metric tons of CO_2e per year (Table 6-4). Onsite operations plus offsite transport of maximum throughput from crude oil source to refinery would total 433,130 metric tons of CO_2e per year. Considering offset emissions of 169,510 metric tons of CO_2e per year related to Alaskan crude oil, estimated net GHG emissions from the cumulative projects would be 263,620 metric tons of CO_2e per year.

In 2011, global emissions were estimated to be 43,372 million metric tons of CO_2e and U.S. emissions were estimated to be 6,550 million metric tons of CO_2e (World Resources Institute

[11] 2011 statewide GHG emissions from stationary industrial sources and rail and vessel transport were 91.7 million metric tons of CO_2e per year.
[12] 2011 statewide GHG emissions from stationary industrial sources and rail and vessel transport were 1 million metric tons of CO_2e per year.

2014). The estimated average annual net GHG emissions from the cumulative projects would represent approximately 0.0006 and 0.004% of these estimates, respectively.

In November 2014, the United States entered into a nonbinding agreement with China to reduce emissions 26 to 28% below 2005 levels (White House 2014). This national goal translates to annual emissions between 4,628 and 4,756 million metric tons by 2025. The estimated average annual net GHG emissions from the cumulative projects represents approximately 0.006% of these national targets.

According to the International Panel on Climate Change, cumulative GHG emissions should be limited to 1 trillion metric tons (total) by 2050 or the planet will exceed the 2°C warming threshold. Currently, GHGs emitted worldwide since the Industrial Age are estimated to be 592 billion metric tons (Oxford E-Research Center 2015). Cumulative worldwide emissions must be limited to 408 billion metric tons to meet the 2050 target. The estimated average annual net GHG emissions from the cumulative projects represent approximately 0.00006% of this limit.

Combustion

In addition to GHG emissions from onsite operations and offsite rail and vessel transport, the combustion of crude oil would also result in GHG emissions. To the extent that crude oil transloaded through the proposed facility would replace oil shipped to West Coast refineries by other means and from other sources (e.g., Alaska or international ports), combustion emissions would not be entirely additive. Crude oil may be refined into multiple other products that may or may not have substantial GHG emissions (e.g., asphalt is not combusted and is a crude oil product) and the end use would vary based on the product and market. Because crude oil can be broken down into a variety of products and their end use varies, the end-use combustion calculation, which assumes that all of the oil will be combusted, is conservative and likely overstates total GHG emissions. For purposes of disclosure, GHG emissions from the combustion of the maximum throughput of crude oil per year related to the cumulative projects were quantified using the emissions factors presented in Table 6-6.

Using EPA's average heat content of crude oil of 5.80 million British thermal units (Btu) per barrel (U.S. Environmental Protection Agency 2013) and the highest emissions factor[13] for the product likely to be handled by the facilities[14] listed in Table 6-6, the maximum amount of CO_2 emissions from end use of products shipped through the proposed facility in a given year is 28.1 million metric tons of CO_2 per year (proposed action is 7.8 million metric tons of CO_2 per year, REG project is 13.1 million metric tons of CO_2 per year, and Grays Harbor Rail Terminal Project is 7.2 million metric tons CO_2 per year).

[13] The emissions factor represents the number of kilograms of CO_2 that would be emitted for each million Btu of a given product.
[14] Kerosene has the highest emission factor but crude oil is expected to be the main product handled by all three facilities.

Table 6-6. Estimated CO_2 Emissions Factors for Oil Combustion

State or Condition	Products	CO_2 Emissions Factors (kg CO_2 per million Btu)
Refined	Gasoline	70.22
	Kerosene	75.20
	Naptha	68.02
	Jet fuels	72.22
	No. 2 fuel oil (diesel oil)	73.96
	No. 6 fuel oil (bunker oil)	75.10
	Vacuum gas oil	73.00 (Estimate)
Unrefined	Bakken crude oil[a]	73.96
	Diluted bitumen[b]	75.10
Non-Petroleum Fuels		
Pure (unblended)	Ethanol	68.44
Can be composed of 20–80% of plant-based fuel	Renewable jet fuel	72.22 (Estimate)
Can be composed of 20–80% of plant-based fuel	Renewable diesel	73.84
Variable composition	Used cooking oil/animal fat	71.06

Source: U.S. Environmental Protection Agency 2013.
[a] Emissions factor for no. 2 fuel oil was used for Bakken crude oil.
[b] Emissions factor for no. 6 residual fuel oil was used for diluted bitumen.
kg CO_2 per million Btu = kilograms of carbon dioxide per million British thermal units.

Regardless of the end-use emissions scenario, the cumulative projects would represent a very small segment of the crude oil market in the United States. In 2013, 7.45 million barrels of crude oil were produced in the United States, and 7.72 million barrels of crude oil were imported every day. Together, this equals 15.17 million barrels of crude oil supplied to the United States every day (U.S. Energy Information Administration 2015). The total amount of oil transported by the cumulative projects would be 176,110 barrels per day (Table 6-7) or 1.2% of the U.S. daily crude oil supply. Because of this small volume, the cumulative projects would not likely affect the crude oil market.

Table 6-7. Proposed Daily Throughput Compared to National Average—Cumulative Projects

Proposed Project	Daily throughput (barrels per day)	Daily US Crude Oil Supply (percent [%] of 15.17 million barrels per day)
Proposed action	48,918	0.3%
REG project (for all tanks)	82,192	0.5%
Grays Harbor Rail Terminal Project	45,000	0.3%
Total	**176,110**	**1.2%**

Climate Change

GHG emissions from the cumulative projects would contribute to global GHG emissions, which contribute to climate change. This section describes the projected impacts of climate change in the Pacific Northwest.

Earth's climate is primarily controlled by the balance of incoming energy from the sun and reflected energy from the Earth's surface. Heat and light from the sun is either reflected or absorbed by the Earth's surface and its atmosphere. GHGs (carbon dioxide, methane, nitrous oxide, water vapor, ozone, and hydrofluorocarbons) can trap outbound radiation in the Earth's atmosphere. GHGs are released through natural sources, such as CO_2 emitted from aerobic respiration or organic decomposition. GHGs are also released because of human activities, such as the combustion of fossil fuels, industrial processes, land use change, deforestation, agricultural production, solvent use, and waste management.

The *Intergovernmental Panel on Climate Change Fifth Assessment Report* states the warming of the global climate system is unequivocal, and each of the last three decades has been successively warmer at the Earth's surface than any preceding decade since 1850. Additionally, from 1880 to 2012, the globally averaged, combined land and ocean surface temperature data show a warming of 0.85°C, or 1.5°F (Intergovernmental Panel on Climate Change 2013). This warming has coincided with increased concentrations of GHGs in the Earth's atmosphere.

The Intergovernmental Panel on Climate Change, the National Research Council, and the U.S. Global Change Research Program have concluded that it is extremely likely (a 95 to 100% chance) that global increases in atmospheric GHG concentrations and global temperatures are caused by human activities. Washington State's Climate Impacts Group has researched the potential impacts of climate change in the Pacific Northwest and concluded that there will be substantial impacts by the middle of the 21st century (Climate Impacts Group 2015). Changes to temperature, precipitation, and sea level are predicted (Mote et al. 2014). Observed and projected increases in temperatures, shifts in precipitation, and changes in flood patterns reflect regional patterns across Idaho, Oregon, and Washington. Changes in sea-level rise are localized to the Oregon and Washington coasts.

An increase in the overall temperature of the Earth causes large-scale changes throughout the Earth's climate system, including higher sea levels, changes in precipitation, and altered weather patterns (e.g., an increase in more extreme weather events). These changes affect the natural and built environment and humans.

Sea level rise can cause higher tides and storm surges, which result in early flooding in more low-lying areas. Stronger storms with heavier precipitation and higher wave conditions will increase the frequency and extent of flooding in many communities. Stronger storms combined with higher sea levels will result in higher coastal erosion rates and more damage to property and infrastructure in coastal communities (Washington State Department of Ecology 2016a).

Ocean acidification is also a result of increasing levels of CO_2. The Earth's oceans absorb excess CO_2 from the atmosphere, making seawater more acidic. More acidic waters threaten Washington State's shellfish industry and tribal resources and could affect the marine food web. Ocean acidity is increasing at a faster rate than predicted, and this increase may reduce the ability of oysters and other species to form shells (Washington State Blue Ribbon Panel on Ocean Acidification 2012).

Sea level rise can also lead to contaminated groundwater supplies as sea-water penetrates coastal aquifers and wells in low-lying communities (Washington State Department of Ecology 2016a).

Temperatures across the region increased by 1.3°F during the 1895 to 2011 period (Kunkel et al. 2013 in Mote et al. 2014). Temperatures are projected to continue increasing with average annual temperatures increasing 3.3 to 9.7°F[15] by the end of the century compared to the 1970 to 1999 period (Mote et al. 2014).

From 1895 to 2011, there has not been a statistically significant change in annual precipitation across the Northwest. However, the variability of annual precipitation has increased since 1976 compared to the previous 75 years (Kunkel et al. 2013 in Mote et al. 2014). Similarly, projected changes in precipitation are less certain with climate and various emissions futures resulting in a range of wetter and drier future conditions. Plausible futures range from an 11% decrease to a 12% increase in annual average precipitation by mid-century (Mote et al. 2014).[16] Seasonal shifts, such as a wetter spring and dryer summer, could be obscured by annual averages. An increase in heavy downpours may result in an increase in flood risk in rain-snow and rain-dominant basins (Mote et al. 2014), which could lead to greater flooding from the Chehalis, Humptulips, Wynoochee, and Wishkah Rivers because they originate in primarily rain-dominant basins.

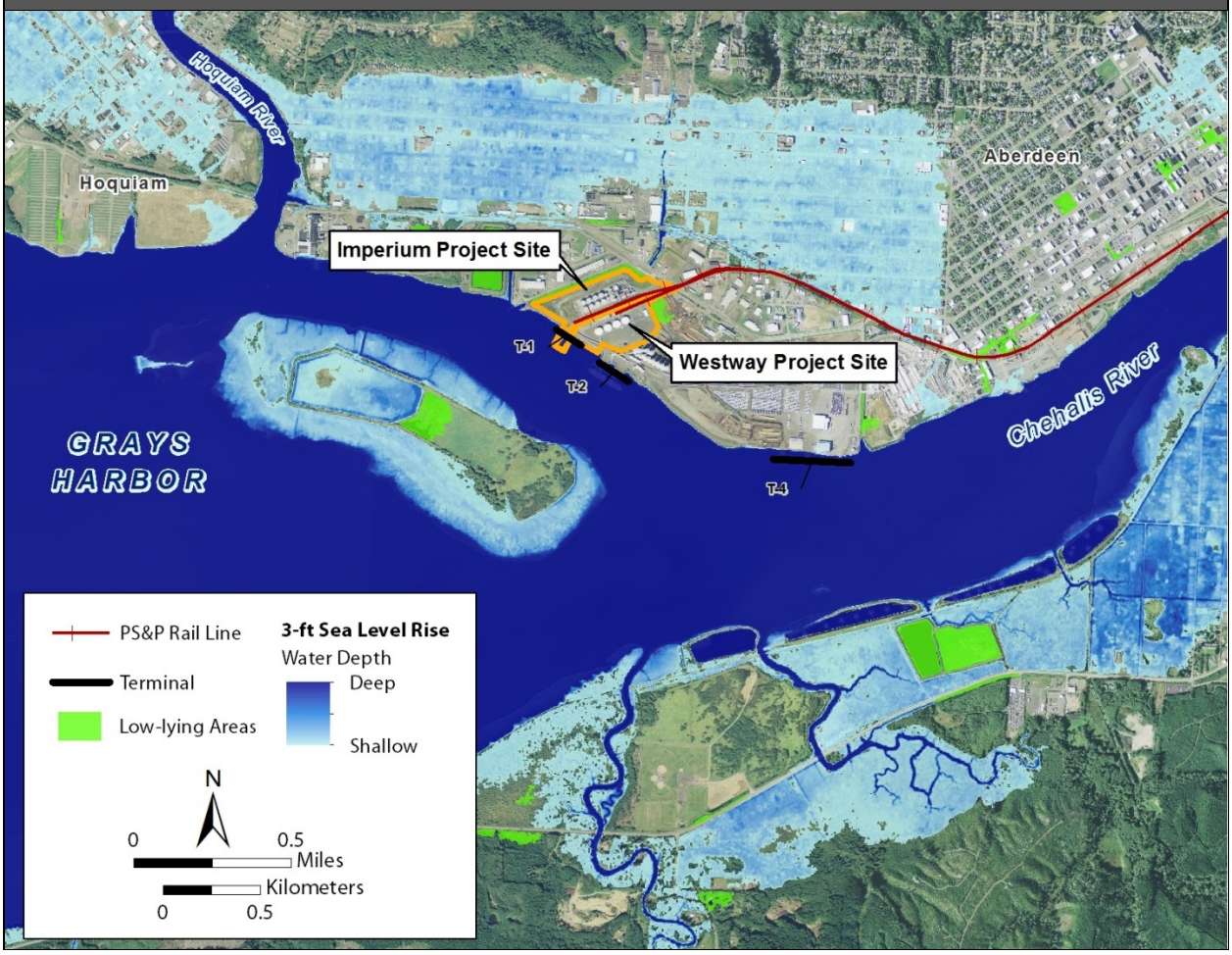
As global temperatures rise, the oceans warm and expand, and ice caps and glaciers melt. This causes sea levels to rise. Global sea level has risen about 7 inches during the 20th century and is projected to rise at a higher rate in the future (National Research Council 2012).

Sea level in the project vicinity in 2050 is expected to rise up to 48 centimeters (1.57 feet) (National Research Council 2012).[17] Adding 1.57 feet to the current mean sea level tide (4.51 feet), the high water from tides projected in 2050 would be up to 6.1 feet above mean sea level. Accounting for this increase in sea level, the project site, which has an average elevation of approximately 11 feet above mean sea level, would remain approximately 5 feet higher than the projected high tide level of 6.1 feet above mean sea level in 2050.

Intensifying coastal storms could increase the likelihood of more severe coastal flooding and erosion (Dalton et al. 2013). Based on the Sea Level Rise Viewer (National Oceanic and Atmospheric Administration 2015), a mapping tool that shows community-level impacts from coastal flooding or sea level rise at up to 6 feet above average high tides, flooding would not occur at the project site even at 3 feet of sea-level rise, which is nearly twice the amount predicted for 2050 (Figure 6-4).

[15] The range reflects changes projected under the lower (B1) and higher (A2) emissions scenarios, as defined by the Intergovernmental Panel on Climate Change *Special Report on Emissions Scenarios (SRES)*.
[16] Increase is relative to the 1970 to 1999 average and based on an ensemble of projections from 21 climate models and the low (B1) and high (A2) emissions scenarios.
[17] The National Research Council 2012 report provides a projection (a single estimate) and a range (high and low estimate) of projections for 2030, 2050, and 2100.

Figure 6-4. Flooding in the Study Area Based on 3 Feet of Sea-Level Rise



Source: National Ocean and Atmospheric Administration 2015

6.5.1.3 Mitigation Measures

Implementation of the applicant mitigation measure identified below would address potential exceedance of NO_X related to the cumulative impacts. Implementation of the applicant mitigation measures identified in Chapter 3, Section 3.2, *Air*, would also address cumulative impacts.

- In order to identify NO_X emissions if the proposed action, REG project, and Grays Harbor Rail Terminal Projects are approved, Westway, REG, and Grays Harbor Rail Terminal will ensure air-monitoring stations are installed to monitor the NO_2 emissions at or near the facility prior to the third proposed facility beginning operations. Air monitoring reports will be submitted to Olympic Region Clean Air Agency annually. If levels are observed to be approaching the NAAQS, then additional measures could be required in the agency's air permit.

6.5.1.4 Unavoidable and Significant Adverse Environmental Impacts

The cumulative projects would result in increased air emissions, most notably of NO_2 and DPM. Compliance with the applicable regulations along with implementation of the proposed mitigation measures described in Chapter 3, Section 3.2, *Air*, and above would reduce cumulative impacts on air quality. There would be no unavoidable and significant adverse cumulative

impacts. Cumulative impacts related to increased risk of incidents and related consequences are addressed in Section 6.5.7, *Environmental Health and Safety*.

6.5.2 Noise and Vibration

This section discusses potential cumulative impacts on noise that would result from construction and operation of the cumulative projects.

Based on the analysis in Chapter 3, Section 3.7, *Noise and Vibration*, the proposed action would have negligible onsite noise and vibration impacts from construction or routine operations at the project site and during vessel transport and vibration impacts from rail transport. The noise and vibration would be similar to levels generated by other industrial activities in the Port. For this reason, only the potential cumulative impacts on noise from rail operations are discussed in this section.

6.5.2.1 Study Area

The cumulative impacts study area for noise includes areas that could be affected by increased noise related to rail transport on the PS&P rail line.

6.5.2.2 Cumulative Impacts

The following section describes the noise impacts that could result from the routine operation of the cumulative projects.

The cumulative projects would increase train traffic on the PS&P rail line by 4.25 trips per day. Based on the Federal Railroad Administration (FRA)/Federal Transit Administration (FTA) guidance manual (FRA/FTA Manual) methods described in Chapter 3, Section 3.7, *Noise and Vibration*, the addition of proposed action trains to cumulative rail traffic would increase the average noise level along the PS&P rail line. Average noise level, or day-night sound level (L_{dn})[18] measures the average sound level over a 24-hour period (not single train passbys). Based on the FRA/FTA criteria, train noise with the cumulative projects would affect people farther from the rail line than under existing conditions.

Table 6-8 presents the number and general location of noise-sensitive receptors along the PS&P rail line that would be exposed to increased rail traffic noise (wayside and horn noise) from the cumulative projects. Approximately 78 receptors would be exposed to wayside noise increases that meet the FRA/FTA criteria for moderate impacts,[19] primarily in the Elma-Satsop area and the area between Montesano and Aberdeen. Approximately 10 receptors would be exposed to wayside noise increases that meet the FRA/FTA criteria for severe impacts,[20] all at PS&P rail line grade crossings[21] in Elma (North 11th Street, North 13th Street, and North 17th Street).

[18] This is a 24-hour average noise level (in A-weighted decibels [dBA]) with a 10-decibel upward adjustment of noise levels occurring at night. This adjustment is made to account for most individuals' increased sensitivity to noise at night.
[19] The change in the noise level would be noticeable to most people but may not be enough to cause strong adverse community reactions. For more information, see Section 3.7, *Noise and Vibration*.
[20] A significant percentage of people would be highly annoyed by the noise (Chapter 3, Section 3.7, *Noise and Vibration*).
[21] Throughout this chapter, *grade crossings* refer to at-grade crossings on the PS&P rail line.

Table 6-8. Estimated Counts of Sensitive Receptors Exposed to Increased Noise on the PS&P Rail Line—Cumulative Projects

Analysis Segment	Location	Grade Crossings[a]	Number of Grade Crossings	General Land Use Characteristics	Horn		Wayside	
					Moderate Impact[b]	Severe Impact[b]	Moderate Impact[b]	Severe Impact[b]
A	Centralia	1–8	8	Higher-density single family residential and commercial	143	0	0	0
B	Unincorporated Centralia, Rochester (south of US 12)	9–20	12	Single-family residential and commercial	47	15	1	0
C	Rochester (between US 12 and Littlerock Road SW)	21–24	4	Single-family residential and commercial	18	4	3	0
D	Rochester (west of Littlerock Road SW)	25–30	6	Single-family residential and commercial	23	5	0	0
E	Oakville	31–42	12	Lower-density single-family residential and commercial	41	3	0	0
F	Malone-Porter	43–54	12	Lower-density single-family residential	81	26	8	0
G	Elma-Satsop	55–72	18	Medium-density single-family residential	268	148	32	10
H	Montesano	73–84	12	Medium-density single-family residential	44	16	0	0
I	West of Montesano/east of Aberdeen	85–92	8	Medium-density single-family residential	45	27	34	0
J	Aberdeen	93–103	11	Single-family residential and commercial	46	9	0	0
Total					**756**	**253**	**78**	**10**

[a] See Chapter 3, Figure 3.7-2, for the location of grade crossings.
[b] As defined by FRA/FTA criteria (Chapter 3, Section 3.7, *Noise and Vibration*).

Increased noise would result from locomotive train horns sounding at grade crossings for public safety. Based on the analysis, noise exposure would occur near grade crossings along the PS&P rail line with the highest increases in the Elma-Satsop area. Approximately 756 receptors along the PS&P rail line would be exposed to increased noise from locomotive train horns that would meet the FRA/FTA criteria for moderate impacts at 83 grade crossings. These include the eight grade crossings in Centralia that have high levels of existing surface transportation noise exposure. Rail traffic noise from the cumulative projects would add to the existing high levels of noise exposure.

Approximately 253 additional receptors would be exposed to increased noise that would meet the FRA/FTA criteria for severe impacts. These receptors are near 51 grade crossings along the rail line, with a majority (approximately 148 receptors) in the Elma-Satsop area.

Table 6-9 illustrates the grade crossings exposed to the highest noise increases from train horn noise. For information on noise increases at all grade crossings, see Appendix G, *Noise Data*.

Table 6-9. Grade Crossings with the Most Sensitive Receptors Exposed to the Highest Noise Levels from Train Horns[a]

Grade Crossing[a]	Grade Crossing Description[b]	Location	Number of Receptors
55	North 2nd Streets	Elma	32
61	North 11th Street	Elma	24
62	North 13th Street	Elma	20
91	Private Crossing	Central Park	14
58	North 6th Street	Elma	14
85	Country Farm Road	Montesano	12
63	North 17th Street	Elma	10
65	Hurd Road	Satsop	10
60	North 10th Street	Elma	8
73	Old Monte Brady Road	Brady	6
45	Private Crossing	Malone-Porter	6
59	North 9th Street	Elma	6
57	North 5th Street	Elma	6

[a] Between one and four sensitive receptors would be exposed to the highest increase in train horn noise at 38 other grade crossings.
[b] See Chapter 3, Figure 3.7-2, for the location of grade crossings.

As described in Chapter 3, Section 3.7, *Noise and Vibration*, the relative impacts from exposure to increased noise would depend on the existing noise level. As the existing level of noise exposure increases, the additional noise exposure needed to cause a greater impact decreases. Potentially affected receptors would generally experience an average increase in noise exposure over the course of any given day. However, it is not possible to predict when trains would be traveling along the PS&P rail line. All trains would travel at the same speed as existing trains, and would continue to sound horns consistent with existing practices. Sensitive receptors along the PS&P rail line would experience train horn soundings more frequently from the additional 4.25 trips related to the cumulative projects.

6.5.2.3 Mitigation Measures

Implementation of the proposed mitigation measures identified in Chapter 3, Section 3.7, *Noise and Vibration* would also reduce cumulative impacts.

6.5.2.4 Unavoidable and Significant Adverse Environmental Impacts

The cumulative projects would result in increased noise along the PS&P rail line. This increased noise could result in impacts considered severe under FRA/FTA criteria. These impacts would occur at 55 crossings, affecting approximately 263 total receptors with up to approximately 32 receptors affected at any one grade crossing. Most of these impacts (253 of the 263 receptors affected) would result from train horn noise that is required for public safety; the other impacts would result from train wayside noise.

Local communities have the opportunity to work with FRA to apply for a quiet zone to limit train horn sounding. Mitigation identified in Chapter 3, Section 3.7, *Noise and Vibration*, would also reduce cumulative noise impacts. However, as long as train horns continue to sound for safety at the grade crossings listed in Table 6-9, the potential for exposure to severe impacts at these crossings would remain.

6.5.3 Tribal Resources

This section discusses potential cumulative impacts on tribal resources that would result from construction and operation of the cumulative projects.

6.5.3.1 Study Area

The cumulative impacts study area for tribal resources consists of tribal resources near the project sites that could be affected by construction and routine operations of the cumulative projects. The cumulative study area also includes tribal resources that could be affected during routine rail transport along the PS&P rail line and routine vessel transport through the Grays Harbor Navigation Channel.

6.5.3.2 Cumulative Impacts

The following sections describe the potential impacts on tribal resources that could result from the construction and routine operation of the cumulative projects. The potential for increased risks of larger spills and related environmental consequences are addressed in Chapter 4, *Environmental Health and Safety*.

Construction

As noted in Section Chapter 3, Section 3.12, *Tribal Resources*, the proposed action would be required to comply with water and air quality standards consistent with the permits described in Section 3.12. Therefore, construction of the proposed action would not likely result in the cumulatively substantial degradation of tribal resources.

Onsite Operations

As noted in Chapter 3, Section 3.12, *Tribal Resources*, the proposed action could affect tribal resources, including plants, wildlife, and fisheries, if operations were to degrade or limit access to resources used by the tribes.

As described in Chapter 3, *Affected Environment, Impacts, and Mitigation*, impacts on water, plants, and animals from routine operation of the proposed action are expected to remain low for the reasons noted in Sections 3.3, *Water*, 3.4, *Plants*, and 3.5, *Animals,* respectively. Specifically, required containment structures, stormwater treatment, and best management practices would minimize the potential for contaminated stormwater runoff to affect these resources. Because these factors would similarly apply to the cumulative projects, although the potential increase of small leaks and spills would be slightly greater than under the no-action alternative, the potential cumulative impacts on plants, wildlife, or fisheries from contaminated stormwater runoff are expected to remain low. Cumulative impacts from increased risk of oil spills, fires, and explosions that could affect tribal resources are addressed Section 6.5.7, *Environmental Health and Safety.*

As described in Chapter 3, Sections 3.3, *Water*, 3.4, *Plants*, and 3.5, *Animals*, leaks and spills of petrochemicals from routine operations and maintenance already pose risks at the existing site. The risks would increase under the cumulative projects because of increased facility operations. Although the potential increase of small leaks and spills would be slightly greater than under the no-action alternative, the potential impacts on plants, wildlife, or fisheries from contaminated stormwater runoff is expected to remain low. Cumulative impacts from increased risk of oil spills, fires, and explosions are addressed Section 6.5.7, *Environmental Health and Safety.*

As further noted in Section 3.12, *Tribal Resources*, onsite routine operations would involve vessel-loading activities that would increase the occupancy of the Terminal 1 berth, which is a usual and accustomed fishing area of the Quinault Indian Nation fishers. Currently, tribal fishers deploy gillnets and drift with the tide, taking turns sweeping through segments of Grays Harbor that typically extend as far as Cosmopolis to the Crossover Channel Reach of the navigation channel (Chapter 3, Figure 3.12-1). This area includes the portion of the navigation channel in front of the Terminal 1 berth. Depending on its size, a docked vessel would occupy approximately 20 to 25% of the width of the channel.[22] While a vessel is at berth, fishers cannot extend fishing nets as far and cannot access the areas nearest the dock structure where tribal fishers report that fish concentrate (Quinault Indian Nation 2015: Exhibit E). Lighting impacts from nighttime transfer operations may also affect fish behavior and harvest.

The most intensive fishing at the dock area is during the fall salmon management period from September to mid-November, when several fishing vessels may deploy drift gillnets near the Terminal 1 berth. Quinault Indian Nation fishers may also fish the area during other times of the year, deploying gillnets for winter steelhead, spring Chinook salmon, and white sturgeon in spring and summer.

Cumulative vessel calls to Terminal 1 at maximum throughput would occupy the berth a maximum of 363 days per year[23] (Section 6.5.6, *Vessel Traffic*). During periods of maximum catch for Chinook,

[22] The typical 550-class tank barge is approximately 600 feet long and a maximum of 78 feet wide and is assisted by a tug that is approximately 127 feet long and a maximum of 42 feet wide. A Panamax-class tanker has a maximum overall length of 950 feet and a maximum width of approximately 106 feet.
[23] Assumes all vessels are tank barges with a maximum 24-hour berth occupancy.

coho, or chum salmon, the fall fishery may be open 2 to 4 days per week. Assuming a 24-hour maximum berth occupancy and vessels evenly dispersed over the allowed harvest times, it is likely a vessel would be at the dock during a substantial portion of the fishery season. However, the potential of these vessels to affect treaty catch is dependent on how fish are distributed across the navigation channel relative to the remaining channel area available to treaty fishers.

Salmon concentrate next to the dock along Terminal 4 (Quinault Indian Nation 2015: Exhibit E); however, the navigation channel is narrower at Terminal 1 and salmon may be distributed differently at this location compared to the wider channel and adjacent shallow areas leading to the south channel at Terminal 4. Migration patterns of salmon in estuaries and rivers are complex. Hinch and Rand (2000) found evidence to suggest sockeye salmon were efficient at finding small reverse-flow vortices to increase swimming efficiencies during upstream migration. Generally upstream-migrating salmon avoid fast water by swimming near the shore and near the bottom (Quinn 2005:80). Hughes (2004) hypothesized that Chinook salmon migrate further from the bank than sockeye to avoid wave drag caused by swimming close to the surface in shallow waters. However, all species may distribute similarly in the dredged and tidally influenced navigation channel.

Depending on the specific circumstances of each interaction (e.g., chance of a vessel calling during an open tribal fishing season, time the vessel is at the dock, distribution of the fish, number of fishers on any given day), it is difficult to predict how much increased occupancy at Terminal 1 would affect the tribe's ability to meet the treaty allocation under their current practices. If vessels occupy the Terminal 1 berth up to 100% of the time during the fall fishery, Quinault Indian Nation fishers would not have the option to fish along the dock. Fishery openings in the fall are sometimes managed to harvest specific species within short windows of opportunity. Opportunities to relocate during intense fishing periods may be limited if the other areas are occupied by fishers. Additionally, gillnets used by fishers may be designed for one location and not appropriate for another location. Implementation of the mitigation described in Chapter 3, Section 3.12, *Tribal Resources,* to coordinate docking schedules and limit vessel time at the dock to avoid peak fishing openings could reduce potential impacts on treaty tribal fishing.

Docked vessels at other times of the year (i.e., winter, spring, and summer fishery openings) would likely have less impact because fewer fishers are participating in fish harvest. Fishers would, therefore, likely have more options to adjust their fishing efforts to other areas in Grays Harbor and the Chehalis River.

Rail Transport

As noted in Chapter 3, Section 3.12, *Tribal Resources*, the proposed action could affect tribal resources along the PS&P rail line if rail operations were to degrade or limit access to resources used by the tribes.

As described in Chapter 3, *Affected Environment, Impacts, and Mitigation,* impacts on water, plants, and animals from routine rail transport are expected to remain low for the reasons noted in Sections 3.3, *Water*, 3.4, *Plants*, and 3.5, *Animals.* Specifically, spills and leaks would be minimized through best management and good housekeeping practices. Any minor spills or leaks would most likely be contained within the underlying ballast rock. Because these factors would similarly apply to rail transport related to the cumulative projects, although the potential increase of small leaks and spills would be slightly greater than under the no-action alternative due to increased rail trips, the potential cumulative impacts on plants, wildlife, or fisheries from contaminated stormwater runoff

are expected to remain low. Cumulative impacts from increased risk of oil spills, fires, and explosions that could affect tribal resources are addressed Section 6.5.7, *Environmental Health and Safety.*

Increased rail traffic and the associated routine operations activities related to the cumulative projects—an additional 4.25 trips per day on average along the PS&P rail line to the baseline three trips per day—could affect animals along the PS&P rail line as the result of increased noise, potential for animal mortality (collisions with moving trains), and exposure to pollutants (spills). These impacts could, in turn, affect the number of animals available for take by hunters from the Quinault Indian Nation and Confederated Tribes of the Chehalis Reservation. These potential impacts on wildlife from increased rail traffic under the proposed action are addressed in detail in Chapter 3, Section 3.5, *Animals*.

Noise from additional trains would likely be imperceptible and would not likely affect species populations or fitness. Animals that feed on carrion, use the rail line as a movement corridor, or use habitats adjacent to the rail line could have an increased incidence of collision mortality. A potential secondary effect of animal collision mortality is the loss of any dependent offspring. While these animals may be habituated to the movement of existing trains, increased rail traffic under the cumulative projects is expected to proportionally increase animal mortality compared to the no-action alternative. This proportional increase in mortality is not likely to measurably alter species populations or fitness. Increased rail trips along the PS&P rail line related to the cumulative projects would increase average vehicle delay compared to the no-action alternative, which could affect access to tribal resources. However, as stated in Chapter 3, Section 3.12, *Tribal Resources*, for the majority of the PS&P grade crossings, the increase in crossing blockage time would not result in a substantial decline in vehicle delay compared to the no-action alternative because the potential to encounter a train at any crossing for the average vehicle would be low.

Cumulative risks of incidents are addressed in Section 6.5.7, *Environmental Health and Safety*.

Vessel Transport

As noted in Chapter 3, Section 3.12, *Tribal Resources*, the proposed action could affect tribal resources in Grays Harbor if vessel operations were to degrade or limit access to resources used by the tribes, including the plants and fisheries described in Section 3.12.

As described in Chapter 3, *Affected Environment, Impacts, and Mitigation,* impacts on water, plants, and animals from routine vessel transport are expected to remain low for the reasons noted in Sections 3.3, *Water*, 3.4, *Plants*, and 3.5, *Animals.* Specifically, spills and leaks would be minimized through best management and good housekeeping practices. Any minor spills or leaks would most likely be contained within confined areas of the vessel. Because these factors would similarly apply to vessel transport related to the cumulative projects, although the potential increase of small leaks and spills would be slightly greater than under the no-action alternative due to increased vessel trips, the potential cumulative impacts on plants, wildlife, or fisheries from contaminated stormwater runoff are expected to remain low. Cumulative impacts from increased risk of oil spills, fires, and explosions that could affect tribal resources are addressed Section 6.5.7, *Environmental Health and Safety.* As further noted in Section 3.12, vessel operations could disrupt access to usual and accustomed fishing areas if there are fishers in the navigation channel when a vessel is traveling to and from the project site. If the cumulative projects are approved, the number of vessels traveling

in the navigation channel through usual and accustomed fishing areas would increase further compared to the existing conditions.[24]

Operation of the cumulative projects at maximum throughput would result in a maximum additional 758 tank vessel trips[25] per year through the navigation channel. These vessel trips would be added to projected large commercial vessel[26] trips under the no-action alternative—between 324 and 422 trips[27] per year in 2017 and 2037, respectively, associated with ongoing operations at the Port terminals (Section 6.5.6, *Vessel Traffic*). Resulting total projected vessel trips would range from 1,082 in 2017 to 1,180 in 2037, when considering both the existing and the cumulative projects.

Because cumulative vessel traffic would be limited to the navigation channel (Chapter 3, Section 3.17, *Vessel Traffic*), impacts on tribal resources in Grays Harbor but outside the navigation channel are not expected. The cumulative projects would use Terminals 1 and 3, and would not affect drift and set-net gillnet fishers operating east of Terminal 1 and the turning basin, in the south channel near Markham, and in Area 2C (Chapter 3, Figure 3.17-5). Crab fishing grounds in Grays Harbor are outside of the navigation channel and access to those areas would not be affected by the increase in vessel traffic. Resources important to the Confederated Tribes of the Chehalis Reservation would also not be affected, because all tribal fishing occurs within the Chehalis Reservation.

Cumulative vessel trips would be most likely to conflict with tribal fishing during the fall salmon management period, when more fishers typically deploy drift gillnets in the navigation channel from the Crossover Channel Reach to the turning basin. During peak periods of the fall fishery, up to nine boats may be actively fishing this area and two to four fishers with nets deployed at one time (Quinault Indian Nation 2015:10). Increased vessel traffic would increase the chance that a vessel travelling through this area would disrupt tribal fishing.

As described in Section 3.17, *Vessel Traffic*, it takes approximately 2 hours for vessels to transit the navigation channel between the entrance buoy and Terminal 1. Favorable transit times for vessels related to the proposed action are close to high tide. Quinault Indian Nation fishers currently choose the high slack tide period for salmon drift gillnetting. Assuming the vessel is between the Crossover Channel Reach of the navigation channel and Terminal 1 for approximately half of the 2-hour transit time, including docking and undocking maneuvers, a vessel trip could disrupt fishing for a 1-hour period. The time Quinault Indian Nation fishers are not fishing to avoid a vessel would likely be longer to ensure adequate time to retrieve their nets, particularly if the nets are full of fish during peak fishing times.

Transiting vessels related to the cumulative projects would affect (limit) the timing, duration, and physical area that could be fished. Depending on the specific circumstances of the interaction, this could affect the volume of a day's catch. Depending on factors such as the time of day and number of other fishers, disruption could equate to lost fishing opportunities.

Although it is difficult to predict whether the increased vessel traffic would result in an overall inability to meet the tribe's seasonal quota, increased traffic would limit access to usual and

[24] As noted in Chapter 3, Section 3.16, *Vessel Traffic*, the analysis in this Draft EIS considers the potential growth in vessel traffic unrelated to the proposed action between 2017 and 2037. Projected traffic increases were based on growth rates used in the Grays Harbor Channel Deepening Project.
[25] A trip represents one-way travel.
[26] The term *large commercial vessel* refers collectively to tank and cargo vessels.
[27] Cumulative increase in trips does not reflect REG no-action vessels, because proposed action number is total for facility.

accustomed fishing areas with a greater potential to do so under cumulative conditions. Implementation of the mitigation described in Chapter 3, Section 3.12, *Tribal Resources*, to coordinate docking schedules and limit vessel transits during peak fishing seasons could reduce these potential impacts.

Increased vessel trips could also reduce access to the Quinault Indian Nation's ocean crab and marine fisheries by limiting the times when tribal fishers can cross the bar at the mouth of Grays Harbor and limiting access to the navigation channel, which tribal fishers prefer to use when transporting catch into the harbor. Although laden tank vessels are anticipated to transit out of the harbor during high tide, inbound vessels in ballast could transit the navigation channel at any time. To lessen the danger of hazardous conditions during incoming or outgoing tides, bar crossings are often timed during slack high or low tides. It is likely this disruption would not be substantial because smaller Quinault Indian Nation fishing vessels would be able to maneuver around and avoid the transiting tanker vessels.

Quinault Indian Nation fishers participating in the Dungeness crab fishery inside Grays Harbor would not be affected by cumulative vessel trips because they operate outside the navigation channel and monitor marine communications to avoid larger vessels when transiting to fishing grounds.

6.5.3.3 Mitigation Measures

Implementation of the applicant mitigation measures identified in Chapter 3, Section 3.12, *Tribal Resources*, would also reduce cumulative impacts.

6.5.3.4 Unavoidable and Significant Adverse Environmental Impacts

Implementation of the mitigation measures described in Chapter 3, Section 3.12 would reduce but may not completely eliminate impacts on tribal resources. Specifically, vessels related to the cumulative projects would travel through and dock in usual and accustomed fishing areas in Grays Harbor. Under current and future conditions, increased vessel activity could restrict access to tribal fishing areas in the navigation channel or at Terminal 1. This conflict is most likely during harvests of salmon, steelhead, and sturgeon. Because other factors besides vessel operations affect fishing opportunities, such as the number of fishers, fish distribution, timing, and duration of fish windows, the extent to which vessel operations related to the cumulative projects would affect tribal fishing is difficult to quantify. Cumulative impacts related to increased risk of incidents and related consequences are addressed in Section 6.5.7, *Environmental Health and Safety*.

6.5.4 Rail Traffic

This section discusses potential cumulative impacts on rail traffic that would result from construction and operation of the cumulative projects.

6.5.4.1 Study Area

The cumulative impacts study area for rail traffic consists of the PS&P rail line between Centralia and the project sites, including the PS&P junction with the BNSF main line in Centralia that could be affected during rail transport.

6.5.4.2 Cumulative Impacts

The following section describes the rail traffic, capacity, and grade-crossing occupancy impacts that could result from the routine operation of the cumulative projects. Cumulative impacts are not anticipated for construction of the cumulative projects.

Rail Traffic

Operation of the cumulative projects at maximum throughput would add 1,553 unit train trips per year (4.25 trips per day on average) along the PS&P rail line to the approximately 1,100 train trips per year (three trips per day on average) under the no-action alternative (Chapter 3, Section 3.15, *Rail Traffic*). Rail traffic from the cumulative projects at maximum throughput added to baseline rail traffic would equal approximately 7.35 trips[28] per day on the PS&P rail line. Table 6-10 summarizes the anticipated trips for the cumulative projects.

Table 6-10. Average Unit Train[a] Trips—Cumulative Projects

Project	Daily
Proposed action	1.25
REG project	2
Grays Harbor Rail Terminal Project	1
Existing traffic	3.1
Total	**7.35**

[a] Assumes 120-car unit trains (1.25 miles in length).

Capacity for Additional Trains

Based on simulation modeling (Chapter 3, Section 3.15, *Rail Traffic*), the PS&P rail line currently has the capacity to handle up to 12 trips per day, although, as with the existing traffic, delays along the rail line may occur. Current rail traffic along the PS&P rail line is approximately three trips per day. The addition of approximately 4.25 trips per day between Centralia and the project site can be accommodated without any improvements to the existing rail line.

Grade-Crossing Occupancy Times

Increased rail traffic along the PS&P rail line related to the cumulative projects would increase how often trains delay traffic at grade crossings (grade-crossing occupancy times).

The far-right column of Table 6-11 lists the average daily grade-crossing occupancy time at selected grade crossings between Centralia and east Aberdeen for all rail traffic (existing trains and trains from the cumulative projects) compared to the no-action alternative. These grade crossings are among those with the highest average daily traffic in the rail corridor (the other grade crossings are in Aberdeen).

[28] A trip represents one-way travel; in other words, an inbound trip and an outbound trip are counted as two trips.

Table 6-11. Average Daily Occupancy Time[a] for a Single Train at Selected Grade Crossings between Centralia and East Aberdeen—Cumulative Projects

Grade Crossing	Milepost	Location	No-Action Alternative	Cumulative Projects plus No-Action Alternative
Tower Street (SR 507)	0.82	Centralia	26 minutes	1 hour 8 minutes
Pearl Street (SR 507)	0.89	Centralia	26 minutes	1 hour 8 minutes
West Reynolds Street	2.14	Centralia	17 minutes	53 minutes
Old Highway 99 SW	6.07	Unincorporated Thurston County	8 minutes	30 minutes
Monte Elma Road	51.98	Satsop	7 minutes	23minutes

[a] Occupancy times rounded to the nearest minute.
SR = State Route

As described in Chapter 3, Section 3.15, *Rail Traffic*, train occupancy times are most severe in Aberdeen due to switching operations related to Poynor Yard. Table 6-12 illustrates the maximum daily occupancy times for all trains (existing trains and trains from the cumulative projects) compared to the no-action alternative at selected grade crossings in Aberdeen.

Table 6-12. Maximum Daily Occupancy Time[a] for a Single Train at Selected Grade Crossings in Aberdeen—Cumulative Projects

Grade Crossing	No-Action Alternative	Cumulative Projects plus No-Action Alternative
Fleet Street	37 minutes	45 minutes
East Heron Street	44 minutes	52 minutes
Port Industrial Road	9 minutes	58 minutes
West 1st Street	7 minutes	1 hour 7 minutes
Industrial Road	13 minutes	1 hour 17 minutes

[a] Occupancy times rounded to the nearest minute.

Unit train trips would increase the maximum train occupancy times for a single train at all grade crossings in Aberdeen. For example, the maximum train occupancy time at West 1st Street would increase by 1 hour. The increase in occupancy times at the grade crossings east of Poynor Yard would be from switching operations to build up departing trains at and east of Poynor Yard. The increase in train occupancy times at the grade crossings west of Poynor Yard would be from arriving trains and switching operations to break down trains at the west of Poynor Yard.

Unit train trips for the cumulative projects would also increase the frequency of trains occupying grade crossings in Aberdeen. Table 6-13 illustrates the average daily train occupancy time at selected grade crossing for all trains (existing trains and trains from the cumulative projects). Appendix L, *Vehicle Traffic Analysis*, provides the daily occupancy time at all grade crossings.

Table 6-13. Average Daily Train Occupancy Time[a] at Selected Grade Crossings

Grade Crossing	No-Action Alternative	Cumulative Projects plus No-Action Alternative
Fleet Street	49 minutes	2 hours 38 minutes
East Heron Street	1 hour 10 minutes	3 hours 16 minutes
Port Industrial Road	14 minutes	1 hour 58 minutes
West 1st Street	17 minutes	2 hours 19 minutes
Industrial Road	43 minutes	3 hours 23 minutes

[a] Occupancy times rounded to the nearest minute.

The additional trains from the cumulative projects would substantially increase the average daily occupancy at grade crossings in Aberdeen. For example, the East Heron Street grade crossing is currently occupied on average 1 hour and 10 minutes daily from grain, auto, and mixed carload freight trains. With existing trains and additional trains from the cumulative projects, the East Heron Street crossing would be occupied on average 3 hours and 16 minutes daily. Section 6.5.5, *Vehicle Traffic and Safety*, presents potential impacts on vehicle delay from the cumulative projects.

6.5.4.3 Mitigation Measures

Impacts on rail traffic resulting from the construction and routine operation of the cumulative projects are considered low and would not necessitate mitigation beyond the minimum requirements specified by applicable laws and regulations. Chapter 3, Section 3.16, *Vehicle Traffic and Safety*, presents mitigation measures for vehicle delay impacts at grade crossings. Chapter 4, *Environmental Health and Safety*, presents rail safety mitigation measures.

6.5.4.4 Unavoidable and Significant Adverse Environmental Impacts

The cumulative projects would result in an increase in rail traffic on the PS&P line; however, there would be sufficient capacity to accommodate this increase in rail traffic. There would be no unavoidable and significant adverse impacts on rail traffic related to the cumulative projects. Cumulative impacts on vehicle traffic and safety that could result from increased rail traffic are addressed in Section 6.5.5, *Vehicle Traffic and Safety*. Cumulative impacts related to increased risk of rail incidents and related consequences are addressed in Section 6.5.7, *Environmental Health and Safety*.

6.5.5 Vehicle Traffic and Safety

This section discusses potential cumulative impacts on vehicle traffic and safety that would result from construction and operation of the cumulative projects.

6.5.5.1 Study Area

The cumulative impacts study area for vehicle traffic and safety consists of the roadways and intersections near the project sites that could be affected by increased vehicle traffic from construction and operation of the cumulative projects. The study area also includes grade crossings between Hoquiam and Centralia that could be affected by increased rail traffic.

6.5.5.2 Cumulative Impacts

The following section describes the vehicle traffic and safety impacts that could result from the construction and routine operation of the cumulative projects.

Onsite Construction and Operations

Construction and operation of the cumulative projects would generate traffic to and from each project site during construction. The estimated daily construction vehicle trips generated for the proposed action and REG project are presented in Table 6-14. The Grays Harbor Rail Terminal project operations would also generate vehicle trips on area roadways. However, the project site is located at Terminal 3 approximately 3 miles to the west of the REG project and proposed action project sites. Any Grays Harbor Rail Terminal Project construction traffic in the Terminal 1 area including Industrial Road would have negligible impacts on vehicle delay.

Table 6-14. Estimated Daily Construction Vehicle Trips—Proposed Action and REG Project

Project	Estimated Number of Employees	Approximate Number of Vehicle Trips per Day
Proposed Action		
Phase 1	86	172
Phase 2	49	98
REG Project		
Phase 1	76	152
Phase 2	110	220

Up to approximately 196 construction workers could access the project sites (Phase 1 of the proposed action and Phase 2 of the REG project). This would generate approximately 392 construction vehicle trips each day, or approximately 7% of the average daily traffic on Industrial Road. This increase in traffic would be temporary and limited to the construction period. Construction vehicles would park at or near the project sites in the Port area and would not affect vehicle delay on Industrial Road.

After construction, approximately 160 trips would be generated daily at the project sites (approximately 100 trips with the proposed action and 60 trips with the REG project, assuming two trips per day per employee). This increase in employee vehicle trips would result in approximately 3% increase in average daily traffic on Industrial Road near the project sites. This increase is minimal compared to existing traffic conditions and would not result in a decrease to the level of service (LOS) designation on Industrial Road.

Rail

The following section describes vehicle traffic and safety impacts that could occur as a result of additional rail traffic from the cumulative projects.

Vehicle Delay

Rail traffic from the cumulative projects would increase the number of train trips on the PS&P rail line by an average of approximately 4.25 trips per day. Motorists, including emergency vehicle operators, would experience delays and an increase in vehicle delay at grade crossings.

Average Vehicle Delay

Increased rail traffic along the PS&P rail line related to the cumulative projects would increase average vehicle delay. However, for the majority of the PS&P rail line grade crossings, the increase in blockage time would not result in a decline in the LOS because the average daily traffic for a majority of grade crossings is low. Sixty of the 81 public grade crossings have average daily traffic of fewer than 900 vehicles.

The approximate total vehicle delay in 2017 in a 24-hour period for grade crossings between west of Centralia and east of Aberdeen would vary from approximately 19 to 56 minutes daily, depending on the grade crossing, compared to 7 to 17 minutes under the no-action alternative. Therefore, the total blockage time at grade crossings due to the cumulative project trains would increase by approximately 12 to 39 minutes in a 24-hour period. Even though there would be an increase in total daily vehicle delay, an increase in train trips on the PS&P rail line would not substantially increase the average vehicle delay at most PS&P rail line grade crossings compared to the no-action alternative. This is because vehicle traffic along most of the PS&P rail line is relatively low and the chance of a substantial number of vehicles encountering a train would remain relatively low. In other words, most individual drivers would not likely notice a substantial change in delay at grade crossings.

However, the total blockage time would be greater in Centralia and Aberdeen. As shown in Table 6-10 in Section 6.5.4, *Rail Traffic*, the Tower Street and Pearl Street grade crossings in Centralia would be blocked for approximately 1 hour and 8 minutes each day compared to 26 minutes under the no-action alternative. Aberdeen would also experience increases in delay as shown in Table 6-12. For example, the Port Industrial Road grade crossing would be blocked for 1 hour and 58 minutes compared to 14 minutes under the no-action alternative.

Table 6-15 summarizes the average vehicle delay in 2017 at the grade crossings with the highest average daily traffic.[29] Appendix L, *Vehicle Traffic Analysis*, provides the average vehicle delay at all grade crossings in 2017. Because these grade crossings have the highest average daily traffic, vehicles at these crossings have the highest probability to experience vehicle delay.

[29] See Chapter 3, Section 3.16, *Vehicle Traffic and Safety*, for the methods used to determine average vehicle delay and corresponding LOS.

Table 6-15. Level of Service (Average Vehicle Delay) at Selected Grade Crossings (2017)

Grade Crossing	Milepost	Location	Approximate 2017 Average Daily Traffic	No-Action Alternative	Cumulative Projects plus No-Action Alternative
Tower Street (SR 507)	0.82	Centralia	8,025	A	B
Pearl Street (SR 507)	0.89	Centralia	13,755	A	B
West Reynolds Street	2.14	Centralia	6,380	A	A
Old Highway 99 SW	6.07	Unincorporated Thurston County	10,160	A	A
Monte Elma Road	51.98	Satsop	4,770	A	A
Tyler Street	68.23	Aberdeen	4,050	B	F
South Chehalis Street	68.36	Aberdeen	4,905	C	F
Port Industrial Road	70.06	Aberdeen	17,845	A	D
West 1st Street	70.41	Aberdeen	4,625	A	E
Industrial Road	71.04	Aberdeen	5,795	B	F

SR = State Route

As shown in Table 6-15, grade crossings in Aberdeen (Olympic Gateway Plaza area and the Port of Grays Harbor area) would experience the most substantial increase in average vehicle delay with the addition of cumulative project trains on the PS&P rail line. All grade crossings that would operate at or below LOS D in 2017 are in Aberdeen. These grade crossings are in two general areas.

- **Olympic Gateway Plaza area.** As illustrated in Figure 6-5, average vehicle delay would worsen at the Olympic Gateway Plaza compared to the no-action alternative. As described in Chapter 3, Section 3.15, *Rail Traffic*, existing train-building activities at Poynor Yard require eastbound trains to extend across the Wishkah River bridge and block grade crossings in the Olympic Gateway Plaza area. The additional trains from the cumulative projects would lengthen the average vehicle delay at these grade crossings. LOS at the East Heron Street and Newell Street grade crossings, the western-most grade crossings in the Olympic Gateway Plaza area, would degrade from LOS D to LOS F. The grade crossings east of Newell Street at the Olympic Gateway Plaza area would degrade from LOS B or C to LOS E or F.
- **Port of Grays Harbor area.** As illustrated in Figure 6-6, the West 1st Street, North Maple Street, and Industrial Road grade crossings would operate at LOS E or F. These grade crossings would operate at LOS A or B under the no-action alternative. The Port Industrial Road and West 1st Street grade crossings would operate at LOS D.

Figure 6-5. 2017 Cumulative Vehicle Delay at Selected Grade Crossings East of Poynor Yard

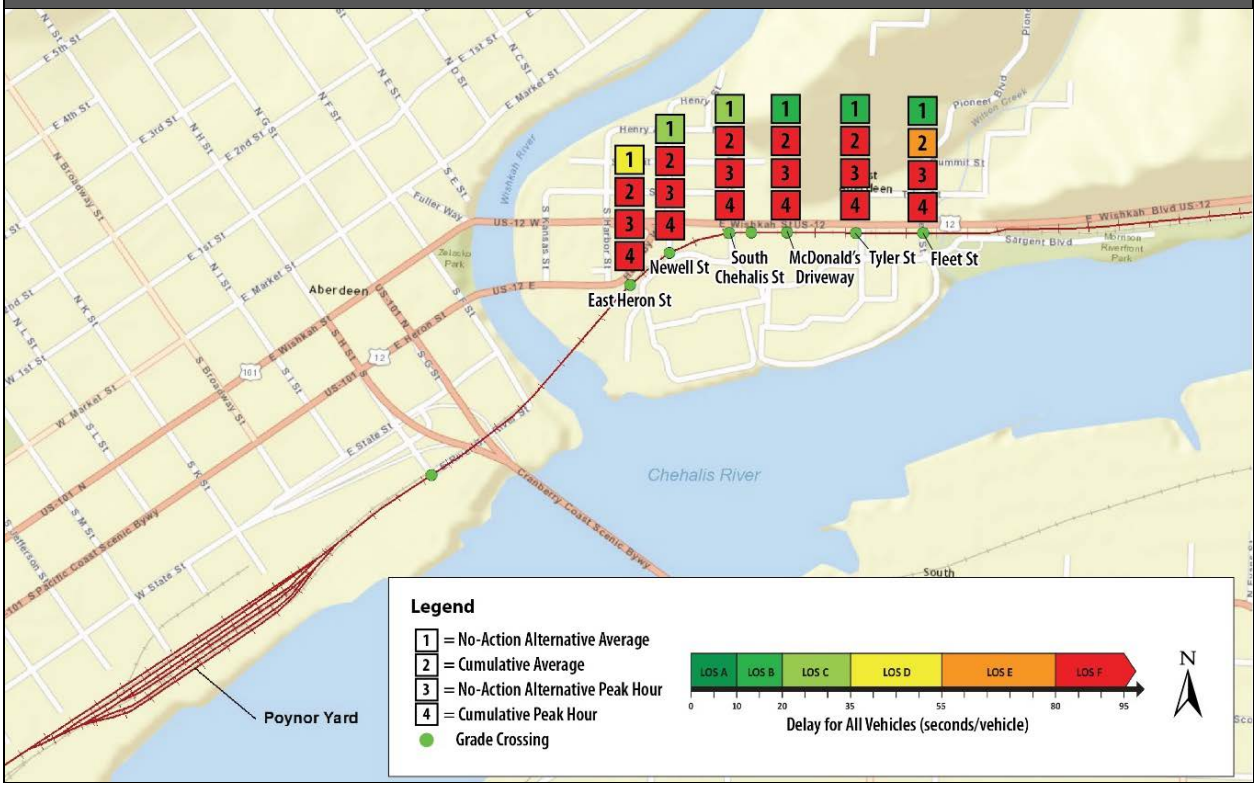
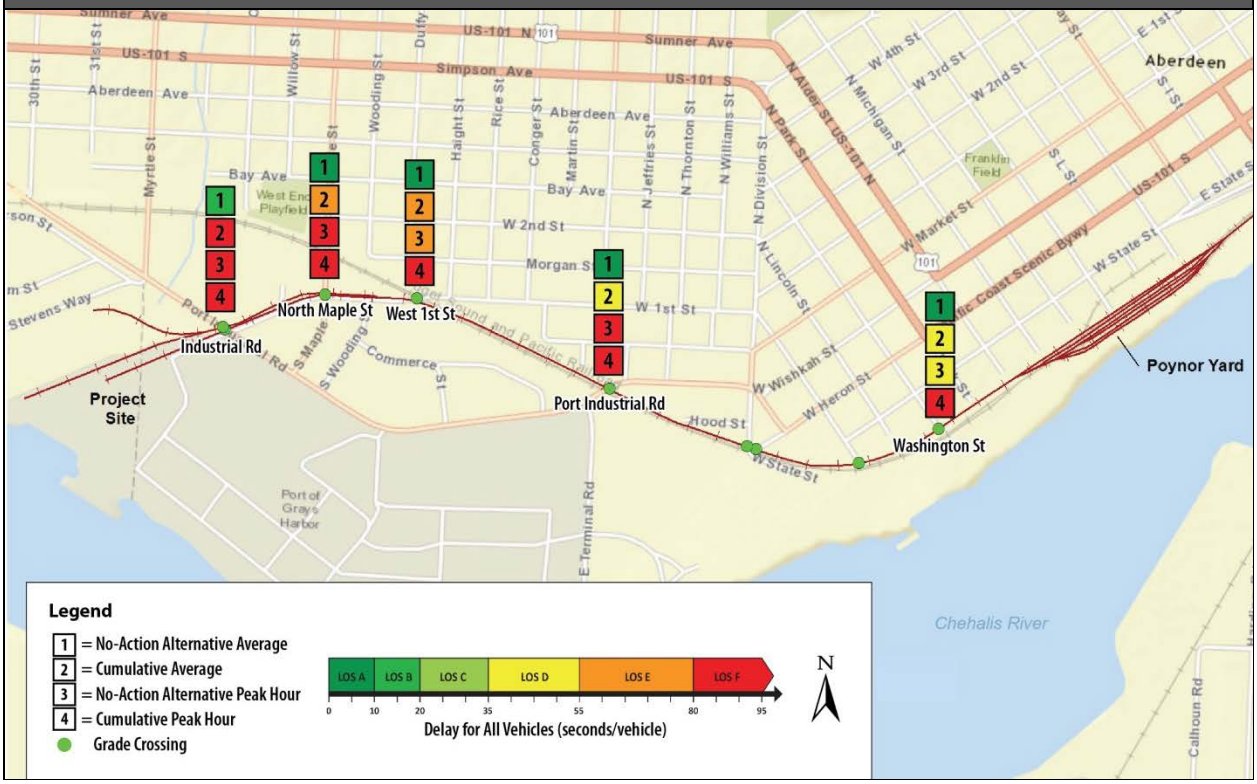


Figure 6-6. 2017 Cumulative Vehicle Delay at Selected PS&P Line Crossings West of Poynor Yard



As noted in Chapter 3, Section 3.16, *Vehicle Traffic and Safety*, this analysis represents a conservative analysis for the average vehicle in 2017 because the analysis is based on the following assumptions.

- **Maximum throughput.** The cumulative projects would begin full throughput operations of an average of 4.25 trips (maximum throughput) per day in 2017.
- **No trip diversion**. The vehicle delay analysis did not consider trip diversion (alternative routes for automobile traffic). Including trip diversion in the analysis would likely indicate shorter average vehicle delays at the Port area grade crossings because at some locations other routes would avoid crossing the PS&P rail line.
- **No planned rail infrastructure.** New infrastructure implemented in 2017 that could provide for increased train speeds (Chapter 3, Section 3.15, *Rail Traffic*) could reduce vehicle delay at grade crossings. Infrastructure improvements were not included in the analysis.
- **Most impactful switching operations for the REG project**. Switching operations for the REG project assumes that PS&P would deliver rail cars to the project site in the most cost- and time-efficient manner. This method would increase the time that REG project trains would block the grade crossing between Poynor Yard and the REG project site.

Because the population is forecasted to grow, vehicle traffic volumes at the grade crossings will increase over time. Table 6-16 summarizes the predicted average vehicle delay at the grade crossings with the highest average daily traffic in 2037. Appendix L, *Vehicle Traffic Analysis*, provides the average vehicle delay at all grade crossings in 2037. Because these grade crossings have the highest average daily traffic, vehicles at these grade crossings have the highest probability to experience vehicle delay at grade crossings.

Table 6-16. Level of Service (Average Vehicle Delay) at Selected Grade Crossings (2037)

Grade Crossing	Mile-post	Location	Approximate 2037 Average Daily Traffic	No-Action Alternative	Cumulative Projects plus No-Action Alternative
Tower Street (SR 507)	0.82	Centralia	10,375	A	B
Pearl Street (SR 507)	0.89	Centralia	17,790	A	B
West Reynolds Street	2.14	Centralia	8,250	A	A
Old Highway 99 SW	6.07	Unincorporated Thurston County	13,135	A	A
Monte Elma Road	51.98	Satsop	6,170	A	A
Tyler Street	68.23	Aberdeen	5,235	A	D
South Chehalis Street	68.36	Aberdeen	6,345	B	D
Port Industrial Road	70.06	Aberdeen	23,075	A	E
West 1st Street	70.41	Aberdeen	5,980	A	E
Industrial Road	71.04	Aberdeen	7,495	B	F

SR = State Route

Similar to 2017 conditions, all grade crossings that would operate below LOS D in 2037 along at grade crossings are in Aberdeen.

- **Olympic Gateway Plaza area.** As described in Chapter 3, Section 3.16, *Vehicle Traffic and Safety*, the average vehicle delay would decrease between 2017 and 2037 in east Aberdeen (Olympic Gateway Plaza area) because of infrastructure improvements to the Wishkah River bridge that would allow speeds to increase from 5 up to 25 miles per hour. Trains would move through grade crossings faster, thereby reducing vehicle delay at east Aberdeen grade crossings. LOS would improve at all the grade crossings between South Chehalis Street and Fleet Street grade crossings with the increase in speeds. In addition, future roadway improvements could further improve congestion and improve LOS in the Port and surrounding area. For example, possible options to alleviate congestion along US Route 12 (US 12) in Aberdeen related to the East Aberdeen Mobility Project are under consideration, including the creation of grade-separated crossings; however, because a preferred alternative has not yet been determined and funding has not been identified, this project was not considered in transportation modeling.
- **Port of Grays Harbor area.** All grade crossings between Port Industrial Road and the proposed action and REG project sites would operate at LOS E or F indicating substantial delay for the average vehicle. Port Industrial Road would degrade from LOS D to E between 2017 and 2037 due to the forecasted traffic growth.

Peak Hour Vehicle Delay

To describe the greatest impacts that could occur under cumulative conditions, an analysis of vehicle delay during the peak traffic hour was completed. The peak traffic hour is the hour of the day when the highest number of vehicles travel study area roads. The peak hour vehicle delay assumes the longest train under cumulative conditions would operate during the peak hour. Because unit trains related to the cumulative projects would have the same number of rail cars and would be longer than existing trains, the cumulative vehicle delay would be the same as the proposed action, as presented in Chapter 3, Section 3.16, *Vehicle Traffic and Safety*. Table 6-17 summarizes peak hour vehicle delay at the grade crossings with the highest average daily traffic.

Table 6-17. Level of Service (Peak Hour Vehicle Delay) at Selected Grade Crossings (2017)

Grade Crossing	Milepost	Location	No-Action Alternative	Cumulative Projects plus No-Action Alternative
Tower Street (SR 507)	0.82	Centralia	F	F
Pearl Street (SR 507)	0.89	Centralia	F	F
West Reynolds Street	2.14	Centralia	C	D
Old Highway 99 SW	6.07	Unincorporated Thurston County	C	D
Monte Elma Road	51.98	Satsop	A	B
Tyler Street	68.23	Aberdeen	F	F
South Chehalis Street	68.36	Aberdeen	F	F
Port Industrial Road	70.06	Aberdeen	F	F
West 1st Street	70.41	Aberdeen	E	F
Industrial Road	71.04	Aberdeen	F	F

SR = State Route

The peak hour vehicle delay would be most substantial in Centralia and Aberdeen. In Aberdeen, rail operations on the PS&P rail line are heavily influenced by activities related to Poynor Yard, as described in Section 6.5.4, *Rail Traffic*. Peak hour vehicle delay can be summarized as follows.

- Centralia: Similar to the no-action alternative, the Tower Street and Pearl Street grade crossings would operate at LOS F. The H Street grade crossing would operate at LOS E.
- Olympic Gateway Plaza area: Similar to the no-action alternative, all grade crossings would operate at LOS F (Figure 6-5).
- Port of Grays Harbor area: All grade crossings would operate at LOS F (Figure 6-6).

Therefore, in Aberdeen, the peak hour analysis concluded substantial vehicle delay, with all grade crossings operating at LOS F, from the eastern end of the Olympic Gateway Plaza (Fleet Street) to the Port of Grays Harbor area.

Queueing

Increases to existing traffic delays would occur with an average of 4.25 new rail trips on the PS&P rail line with the cumulative projects. Increased vehicle delay from trains blocking grade crossings would have secondary impacts on nearby intersections. As vehicles begin to queue while waiting for the grade crossing to open, increased roadway congestion can affect upstream intersections. Table 6-18 illustrates the grade crossings that would have queues exceeding available storage length in 2017, as well as the increase in the queue length in number of cars compared to the no-action alternative.

Table 6-18. Average Queue Lengths Exceeding Available Storage Capacity at Grade Crossings—Cumulative Projects (2017)

Grade Crossing	Queue Direction	Queue Location	Increase in Average Queue Length (Number of Cars)[a]
Centralia			
Tower Street (SR 507)	Northbound	SR 507 northbound couplet in central Centralia. Upstream affected intersection is 4th Street.	8
Pearl Street (SR 507)	Southbound	SR 507 southbound in central Centralia. Upstream affected intersection is 6th Street.	23
East Aberdeen/Olympic Gateway Plaza Area[b]			
Fleet Street	Northbound	Exit from Olympic Gateway Plaza at US 12.	8
Tyler Street	Northbound	Exit from Olympic Gateway Plaza at US 12.	9
Chehalis Street	Northbound	Exit from Olympic Gateway Plaza at US 12.	14
Newell Street[c]	Northbound	Exit from Olympic Gateway Plaza at US 12.	1
East Heron Street	Eastbound right-turn lane	Right-turn from US Route 12 eastbound to Olympic Gateway Plaza. Upstream affected intersection is South F Street.	15
Port of Grays Harbor Area[b]			
Port Industrial Road[c]	Eastbound and westbound	Adjacent to applicant's project site. Upstream affected intersection is South and Myrtle Street (Eastbound) and Maple Street (westbound).	25 (eastbound) 33 (westbound)
West 1st Street[c]	Eastbound and westbound	East of the project site and Port Industrial Road. Upstream affected intersection is Maple Street (eastbound) and Haight Street (westbound).	13 (eastbound) 17 (westbound)
Industrial Road[c]	Eastbound and westbound	Adjacent to applicant's project site in Port of Grays Harbor area.	35 (eastbound) 37 (westbound)

[a] Increase in average queue length compared to the no-action alternative. Assumes 20 feet per car. For example, the cumulative average queue length at Fleet Street would be 160 feet longer than the no-action alternative.
[b] Grade crossing location shown on Figures 6-5 and 6-6.
[c] Would not exceed available storage length under the no-action alternative. All other grade crossings exceed available storage length under the no-action alternative.
SR = State Route

Table 6-18 illustrates that, for average queue lengths at the Tower Street and Pearl Street grade crossings in central Centralia, five of the seven Olympic Gateway Plaza area grade crossings and three of the Port area grade crossings would be longer for cumulative conditions than for the no-action alternative. Three intersections would not exceed available storage length under the no-action alternative.

The queue lengths would be substantial at most intersections shown in Table 6-18. In the Port area, the queue lengths would result from switching operations between Poynor Yard and the proposed action and REG project sites, which would increase both the frequency and duration of blocked

grade crossings. Table 6-13 in Section 6.5.4, *Rail Traffic,* illustrates the average daily train occupancy time at selected grade crossings under cumulative conditions. This increase in the average daily train occupancy time would increase vehicle queue lengths.

In the Olympic Gateway Plaza area, queues at the grade crossings at the Olympic Gateway Plaza would extend into the plaza parking area, except at East Heron Street, where queues would extend onto US 12 eastbound. The grade crossing at East Heron Street conflicts with Olympic Gateway Plaza traffic traveling eastbound on US 12, and serves as a bottleneck. During an eastbound train event, the queue would extend past F Street (upstream intersection) on the west side of the Wishkah River. Similar to the vehicle delay analysis, the queuing analysis did not consider trip diversion. Including trip diversion in the analysis would likely indicate shorter average queue lengths at the Port area because there are other routes to avoid the grade crossings.

Average queue lengths in 2037 would increase compared to 2017 queue lengths due to the increase in traffic. Average queue lengths would also increase compared to no-action alternative conditions because of the blockage time associated with the cumulative project trains along the PS&P rail line. The grade crossings that would exceed the available storage length in 2037 would be the same as 2017 (Table 6-18). Appendix L, *Vehicle Traffic Analysis*, illustrates queue lengths at all study intersections. The following summarizes 2037 queue lengths.

- **Centralia.** Queue lengths at Pearl Street and Tower Street grade crossings in Centralia and the Port would grow by approximately 30% between 2017 and 2037.
- **Olympic Gateway Plaza area.** Queue lengths at grade crossings in the Olympic Gateway Plaza area in east Aberdeen would increase by approximately 10% between 2017 and 2037. The analysis assumed rail infrastructure improvements would improve train speeds in this area and reduce the amount of time trains occupy grade crossings in east Aberdeen by 2037.
- **Port of Grays Harbor area.** Queue lengths at the Port Industrial Road, West 1st Street, and Industrial Road grade crossings would increase by approximately 30% between 2017 and 2037.

Solutions being evaluated by ongoing regional planning efforts (such as the East Aberdeen Mobility Project) would alleviate some of the vehicle delay impacts related to the cumulative projects if such improvements are funded and implemented by 2037. Further regional efforts to evaluate the potential for additional storage capacity would also help to mitigate increased delay at those locations.

Vehicle Safety

Increased rail traffic related to the cumulative projects could increase the frequency of accidents along the PS&P rail line compared to the no-action alternative. The magnitude of the increase would be determined by the volume of train traffic and average daily traffic. The impacts on grade-crossing safety specific to each grade crossing for accidents involving trains and vehicles are summarized in Appendix L, *Vehicle Traffic Analysis.* This appendix provides the total predicted accident rate, predicted intervals between accidents, and the decrease in years between the predicted intervals in the analysis year (2017 or 2037) for all grade crossings along the PS&P rail line.

In 2017, the grade crossings that would have the shortest predicted intervals between accidents would be in Aberdeen because rail operations east of Poynor Yard (Olympic Gateway Plaza area) and west of Poynor Yard (the Port and surrounding area) would increase the frequency of train passbys at these grade crossings. As with vehicle delay, accident frequencies could improve by 2037

for some grade crossings if improvements such as grade-crossing protections are implemented. Additionally, although infrastructure improvements considered for the East Aberdeen Mobility Project were not included in the safety analysis, any improvements would likely lessen delay and improve safety at grade crossings in the Olympic Gateway Plaza area.

The *Railroad-Highway Grade Crossing Handbook–Revised Second Edition* (Federal Railroad Administration 2007) indicates that active devices with automatic gates should be considered when certain criteria are met. One criterion is if the expected accident frequency, as calculated by the U.S. Department of Transportation Accident Prediction formula, exceeds 0.075. As shown in Appendix L, *Vehicle Traffic Analysis*, no grade crossings would exceed this frequency using this formula. Therefore, using this threshold, the relative increase in the potential for accidents related to the proposed action would remain low.

Emergency Vehicle Access

As described in the vehicle delay analysis, average vehicle and peak hour delay would increase with the additional trains resulting from the cumulative projects. Because vehicle delay would increase, emergency vehicle delay would also increase at grade crossings. The following sections describe the impacts on emergency vehicle access, focused on the PS&P rail line between Centralia and Aberdeen, in Centralia, and in Aberdeen (Olympic Gateway Plaza and Port of Grays Harbor areas).

Between Centralia and Aberdeen

For the grade crossings between west Centralia and east Aberdeen, the average vehicle delay from rail traffic from the cumulative projects would increase compared to the no-action alternative. The cumulative projects would add an average of 4.25 unit train trips per day. The projected 2017 cumulative daily grade-crossing delay for all trains between west of Centralia and east of Aberdeen would be between approximately 19 and 56 minutes daily compared to between 7 and 17 minutes under the no-action alternative (Appendix L, *Vehicle Traffic Analysis*, provides daily grade crossing blockage times for all grade crossings). Therefore, the average delay at the grade crossings would increase 12 to 39 minutes in a 24-hour period from the additional trains from the cumulative projects.

These trains would affect emergency response times if an emergency vehicle were blocked at a grade crossing occupied by a train for one of the cumulative projects. The potential for the cumulative projects to affect emergency response would also depend on whether the dispatched emergency vehicle would need to cross the PS&P rail line and the availability of alternative routes if a train were to occupy the grade crossing at the time of the call. Because the frequency of train traffic on the PS&P rail line would increase, the probability of an increase in emergency response time at these grade crossings would also increase. This impact would occur when an emergency vehicle experienced a delay related to a train for the cumulative projects.

Centralia

The grade crossings in Centralia (BNSF main line to Reynolds Street crossing) are located in an urban area with a well-connected roadway network. The projected 2017 daily crossing time at grade crossings in Centralia would be 53 to 68 minutes compared to approximately 17 to 26 minutes under the no-action alternative. Because emergency response providers are located on both sides of the PS&P rail line, similar to existing conditions, emergency response calls could be dispatched to stations that would not be blocked at a grade crossing. Section3.16, *Vehicle Traffic and*

Safety, identifies proposed mitigation measures to reduce impacts on emergency response delay at grade crossings.

Aberdeen

Olympic Gateway Plaza Area (Aberdeen)

All grade crossings in the Olympic Gateway Plaza area (from East Heron Street to Fleet Street) are occupied for more than 35 minutes on average 3.9 times per week from eastbound grain and auto trains under the no-action alternative. Adding eastbound trains from the cumulative projects, these grade crossings would be occupied for more than 35 minutes on average 15.4 times per week.

Vehicle delays in the Olympic Gateway Plaza area are currently substantial because the six grade crossings at the plaza provide the only vehicular emergency access to and from the plaza and Morrison Riverfront Park, immediately east of the plaza. With all cumulative projects, emergency response vehicles would experience more frequent and longer delays to access the Olympic Gateway Plaza area because there is no alternate roadway access to the plaza. The communication and response procedures for providing emergency access to the Olympic Gateway Plaza area if a train is blocking all crossings, described in Chapter 3, Section 3.16, *Vehicle Traffic,* would also apply under the cumulative projects.

Port of Grays Harbor Area (Aberdeen)

Vehicular access west of Poynor Yard and south of the PS&P rail line would be completely blocked on the existing roadways during train transits for the cumulative projects. Emergency vehicle access blockage would be affected in two areas, described as follows.

- **Between Poynor Yard and East of Port Industrial Road.** West of Poynor Yard and east of Port Industrial Road are the Washington Street, Monroe Street, Heron Street, and Division Street grade crossings. These grade crossings would be blocked for approximately 24 minutes when a proposed action train arrives (average of 0.6 times per day), and 51 minutes when a REG project train arrives (average of 1.0 time per day), compared to between 4 and 8 minutes, depending on train type, under the no-action alternative. The alternative route described in Chapter 3, Section 3.16.5.2, *Proposed Action*, could provide access to the industrial land uses south of the PS&P rail line in this area. The proposed mitigation measures identified in Chapter 3, Section 3.16, *Vehicle Traffic and Safety*, would also reduce impacts on emergency response related to the cumulative projects.
- **Between Port Industrial Road and the project sites.** All land uses south of the PS&P rail line between the Port Industrial Road grade crossing and the proposed action project site, including Home Depot and the Port, would be blocked from lands north of the PS&P rail line for between approximately 10 minutes and 33 minutes when a proposed action train arrives (average of 0.6 times a day), and between 58 minutes and 1 hour 17 minutes when a REG project train arrives (average of 1.0 time a day). The Port Industrial Road grade crossing would be the first grade crossing that would open to provide vehicular access to this area. The Industrial Road grade crossing would the last grade crossing that would open to provide vehicular access to this area. This blockage of all grade crossings and the isolation of these land uses would substantially affect emergency response in this area. The alternative route described above could also provide access to these Port and commercial properties. The proposed mitigation measures identified in Chapter 3, Section 3.16, *Vehicle Traffic and Safety*, would also reduce impacts on emergency response related to the cumulative projects.

6.5.5.3 Mitigation Measures

Implementation of the proposed mitigation measures identified in Chapter 3, Section 3.16, *Vehicle Traffic and Safety*, would also reduce cumulative impacts.

6.5.5.4 Unavoidable and Significant Adverse Environmental Impacts

Implementation of the mitigation measures described in Section 3.16 could reduce impacts on vehicle traffic but average and peak hour vehicle delay at the following grade crossings would remain significant.

- Average hour: All six crossings in the Olympic Gateway Plaza area (Aberdeen) and three crossings (Industrial Road, North Maple Street, and West 1st Street in the Port area (Aberdeen).
- Peak hour: Washington Street in the Port area (Aberdeen).

Addressing vehicle delay at the grade crossings at the Olympic Gateway Plaza area and between Poynor Yard and the project site would require the participation of a broad group of stakeholders in coordination with ongoing regional transportation planning efforts. Ongoing regional transportation planning efforts such as the East Aberdeen Mobility Project could reduce vehicle delay impacts and improve safety conditions at the Olympic Gateway Plaza area. In addition, other regional transportation planning efforts to reduce vehicle delay (such as grade separation, early warning system, and grade-crossing protections) would also help to reduce vehicle delay.

6.5.6 Vessel Traffic

This section discusses potential cumulative impacts on vessel traffic that would result from construction and operation of the cumulative projects.

6.5.6.1 Study Area

The cumulative impacts study area for vessel traffic consists of the Terminal 1 berth and the entirety of Grays Harbor, including the navigation channel into and out of the harbor and travel corridors in state waters out to 3 nautical miles.

As described in Chapter 5, *Extended Rail and Vessel Transport,* the cumulative projects would not have a substantial impact on vessel traffic in the extended study area off the Washington coast. The impact of cumulative vessel traffic on environmental health from increased risk of incidents during vessel transport (e.g., vessel grounding or collision), and related consequences (e.g., oil spills from vessel tank ruptures) is described in Section 6.5.7, *Environmental Health and Safety.*

6.5.6.2 Cumulative Impacts

The following section describes the vessel traffic in Grays Harbor that could result from the construction and routine operation of the cumulative projects.

Construction

As noted in Chapter 3, Section 3.17, *Vessel Traffic*, construction of the proposed action is not anticipated to affect vessel operations because construction would be entirely contained on land and

not in water. This is also true of the cumulative projects. Therefore, the cumulative projects would not result in any cumulative impacts on vessel traffic.

Navigation Channel Capacity

Baseline cargo and tank vessel trips in Grays Harbor are projected to increase from 324 to 422 between 2017 and 2037 due to increased trade of commodities. The cumulative projects would add an additional 758 tank vessel trips carrying crude oil per year to baseline traffic, resulting in a forecast of 1,082 total cumulative trips in 2017 and 1,180 total cumulative trips in 2037 (Table 6-19) for all vessel types.[30]

Table 6-19. Cumulative Vessel Trips per Year—Cumulative Projects

	2017			2037		
Vessel Trips[a]	**Daily**	**Weekly**	**Annual**	**Daily**	**Weekly**	**Annual**
Baseline Conditions						
Cargo vessel	0.6	4.2	220	0.8	5.3	276
Cargo barge	0.2	1.4	72	0.3	1.8	92
Tank vessel[b]	0.1	0.6	32	0.1	1.0	54
Total Baseline Trips	0.9	6.2	324	1.2	8.1	422
Cumulative Projects						
Proposed action	0.7	4.9	238	0.7	4.6	238
REG project	1.1	7.7	400	1.1	7.7	400
Grays Harbor Rail Terminal Project	0.3	2.3	120	0.3	2.3	120
Total Cumulative Trips	2.1	14.6	758	2.1	14.6	758
Total Vessel Trips	**3.0**	**20.8**	**1,082**	**3.2**	**22.7**	**1,180**

[a] Vessel trips represent one-way trips.
[b] Numbers do not reflect REG no-action vessels, because proposed action number is total for facility.

The capacity analysis considered the number of navigable 2-hour windows available for vessels with different drafts and tidal elevations at the 2017 project depth of 38 feet mean lower low water.

Cargo barges transiting to the mouth of the Chehalis River or further inland are forecast to account for 72 trips per year (approximately 7% of total commercial vessel trips) at the Port in 2017 and 92 trips per year (8% of large commercial vessel trips) in 2037. These vessels are not considered deep-draft vessels. They have drafts between 0 and 17 feet, consistent with vessel data reported between 2008 and 2012 (Chapter 3, Section 3.17, *Vessel Traffic*).

The remaining trips under cumulative conditions would consist of tank and cargo vessels. It is anticipated that approximately half of the remaining vessel trips (either inbound or outbound trips) would be made by vessels in ballast. Vessels transiting in ballast would have a shallower draft (less than 27 feet) than when they are laden with cargo (U.S. Army Corps of Engineers 2014).

Based on these assumptions, approximately 53% of the total vessel trips (cumulative projects plus baseline) (577 in 2017 and 636 in 2037) would be made by vessels not considered to be deep draft,

[30] As noted in Chapter 3, Section 3.16, *Vessel Traffic*, projected traffic increases unrelated to the proposed action were based on growth rates used in the Grays Harbor Channel Deepening Project.

or vessels that draft less than 27 feet.[31] At the 2017 project depth of 38 feet mean lower low water, these vessels would be unconstrained by tidal elevations. The remaining 47% of all vessel trips (505 in 2017 and 544 in 2037) would be made by vessels with drafts between 27 and 39 feet.

Tank barges are most likely to call at Terminal 1 to load bulk liquids for the proposed action and REG project. The quantitative analysis in Chapter 3, Section 3.17, *Vessel Traffic*, assumes that the Crowley 550-Class articulated tug-barge or similar tank barges would be used. The analysis assumes that tank barges would be used, and thus considers the highest possible number of vessel trips. If larger-capacity tankers are used, the number of vessel trips would be reduced. For the Grays Harbor Rail Terminal Project, tankers are likely to call at Terminal 3 to load bulk liquids.

At the 2017 project depth of 38 feet mean lower low water, deep-draft vessels with drafts of 37 feet or less would have 1,627 navigable windows available each year, those with drafts of 38 feet would have 1,274 navigable windows and those with drafts of 39 feet or greater would have 904 navigable windows. Because the number of navigable windows available for transit of deep-draft vessels exceeds the total number of forecast laden vessel trips in 2017 or 2037 (505 in 2017 and 544 in 2037), the channel capacity would not be exceeded with the cumulative projects.

As described in Chapter 3, Section 3.17, *Vessel Traffic*, actual channel depths may vary considerably from project depths between maintenance dredging because sand and silt will accumulate in the channel. If the controlling depth of the navigation channel is reduced, the number of navigable windows at each tidal elevation threshold would be the same, but the maximum vessel draft possible at each tidal elevation would be reduced. Similar to current conditions, vessels with the greatest draft restriction would be given priority for transiting at the highest tidal elevations. Vessel operators may reduce the amount of cargo that is loaded to reduce the draft of the laden vessel and increase the transit opportunities. Given the flexibility of transiting at higher tidal elevations and/or reducing the cargo and draft of laden vessels, it is anticipated that vessel operators would be able to find navigable windows for the forecasted cumulative deep-draft vessel trips, even if the project depth of 38 feet mean lower low water is not maintained between dredging.

Berth Capacity at Terminal 1

As described in Chapter 3, Section 3.17, *Vessel Traffic*, assuming berth availability of 90%, the Terminal 1 berth would be available to receive vessels 328 days per year. Vessels are estimated to occupy the berth from 24 hours (tank barges) to 48 hours (tankers). The analysis assumed 100% tank barges for the cumulative projects, which results in a conservative estimate of the most days of berth occupancy. Vessel calls associated with the Grays Harbor Rail Terminal Project would call at Terminal 3 and would not affect the capacity of the Terminal 1 berth.

The cumulative tank barge calls would be 319 (119 for the proposed action and 200 for the REG project) and each would occupy the berth for 24 hours each, resulting in 319 days of berth occupancy. The baseline forecast[32] consists of 17 tankers, which would occupy the berth 34 days and 10 tank barges would occupy the berth for 10 days, for a total baseline forecast of 44 days without the cumulative projects. The total berth occupancy—baseline plus cumulative—would be 363 days per year. Although this exceeds the number of days that the Terminal 1 berth would be

[31] This percentage is slightly greater than 50% because cargo vessels have a shallower draft even when in ballast.
[32] Includes existing vessels (assumed tankers) and vessels related to projected growth between 2017 and 2037 (assumed 1 tanker and 10 barges).

available per year, it is based on conservative assumptions.[33] Moreover, if tankers replaced tank barges under the cumulative projects, berth occupancy could be as low as 318 days per year and there would be sufficient capacity.[34]

Other Capacity Constraints—Pilots and Tugs

State-Licensed Pilots

Grays Harbor is subject to compulsory Washington State pilotage for foreign vessels and U.S. vessels under enrollment and registered in foreign trade. All large commercial vessels engaged in foreign commerce would require Washington State pilots with Grays Harbor experience and knowledge (a requirement of their license and training). Domestic vessels on a coastwise voyage may enter and depart Grays Harbor under the control of a U.S. Coast Guard (federally) licensed captain.[35] However, many U.S. vessels calling at Washington State ports seek the assistance of a state-licensed pilot on a voluntary basis, or as a matter of company policy, even though it is not required by regulation.

The cumulative number of trips by large commercial vessels (cargo and tank vessels) is forecast to reach 1,082 trips in 2017 and 1,180 trips in 2037. The Port currently employs three state-licensed pilots, with two pilots to be on duty at any given time. If all cargo and tank vessels hired a state-licensed pilot to navigate to and from the Port, this would result in a maximum of 1,180 annual assignments, or approximately 393 annual assignments for each of the three state-licensed pilots currently employed by the Port.

Trips taken by state-licensed pilots in Grays Harbor are comparatively short (on average, 2 hours outbound or 2 hours inbound) and are limited to the navigation channel.[36] This would make it feasible for a pilot to take one vessel outbound and bring another inbound during a single high tide window if the volume of vessel traffic warranted this approach. Moreover, because Grays Harbor has a semidiurnal tidal cycle (with two high tides per day), there is more than one navigable window each day to pilot a vessel to or from the Port.

If needed to handle forecast growth, additional pilots could be trained. It takes approximately 9 months for a new pilot to obtain his/her first state license to handle smaller vessels and approximately 2.5 years to become fully qualified.

In accordance with WAC 363-116-065, Number of Pilots, the Puget Sound Board of Pilotage Commissioners regularly considers the number of pilots needed to optimize the operation of a safe, fully regulated, efficient, and competent pilotage service in the Grays Harbor pilotage district. The Port will continue to work with the Puget Sound Board of Pilotage Commissioners to forecast the number of vessels that would require a state-licensed pilot well in advance of anticipated increases, to allow for training and onboarding of additional pilots. If necessary, the Puget Sound Board of

[33] Maximum number of vessels (tank barges) and a full 24 hours at dock for each tank barge.
[34] A total of 86 (REG) tanker calls for 2 days each equaling 172 days added to a total of 51 (proposed action) tanker calls for 2 days each equaling 102 days added to the total baseline forecast of 44 days without the cumulative projects.
[35] Table 15.812(e)(2) in Title 46 Code of Federal Regulations requires (among other things) that the Master or Mate of a U.S. Inspected Tank Barge of 10,000 gross tons or less have 12 trips over the route to control the vessel in designated pilotage waters.
[36] In comparison, the Puget Sound pilots may spend up to 6 to 8 hours on one vessel and must debark in a completely different geographic area than where they started, adding travel time home to the assignment.

Pilotage Commissioners could support the Port by temporarily reassigning a qualified state-licensed pilot from Puget Sound to Grays Harbor (Larson pers. comm.).

Tugs

Brusco Tug & Barge has three harbor tugs stationed in Grays Harbor exclusively available for commercial vessel assistance in the harbor. During normal operations, two tugs (one at the bow and one at the stern) assist large commercial vessels (cargo and tank vessels) with docking and undocking maneuvers at the Port berths.

Tugs are also used to escort vessels through the harbor to reduce the potential for a vessel incident such as loss of steering or propulsion that could affect vessel traffic and pose a safety risk. Existing regulations do not require that vessels be accompanied by tugs through Grays Harbor. However, it is standard practice for large commercial vessels transiting Grays Harbor to use one or two tugs depending on the weather conditions and vessel-specific factors (e.g., the amount of vessel infrastructure above water, or steering or propulsion problems). With larger car carriers and big bulk cargo vessels a third tug may be used to assist with docking, undocking, or transiting when conditions warrant, such as when there are high winds (D'Angelo pers. comm.). Moreover, the Harbor Safety Plan for Grays Harbor has a *standard of care* (similar to a best management practice) that recommends tugs for all laden tank vessels carrying oil. The standards recommend the following practices, subject to pilot determination.

- At least one tug should meet an arriving laden tank vessel carrying oil at the Grays Harbor entrance and escort it to the Hoquiam River where two tugs will escort and assist the vessel during mooring procedures.
- At least one tug will accompany a departing laden tank vessel carrying oil from the terminal to the entrance of Grays Harbor.

Chapter 4, Section 4.6.3, *What mitigation measures would reduce impacts related to vessel transport?* includes proposed mitigation measures related to use of tugs through Grays Harbor to reduce potential risk of incident under the proposed action.

Including cumulative tank vessels at maximum throughput operation, large commercial vessel trips through Grays Harbor are forecast to reach 1,082 in 2017 and 1,180 in 2037, or approximately three vessel calls per day on average. A single vessel call includes an inbound and an outbound vessel transit, and it is assumed that the vessel is laden (and therefore, requires an escort) in only one direction. Based on the projected traffic levels and the fact that tugs can be moved between the Port terminals to assist with docking and undocking, the three tugs currently stationed in the harbor are adequate to support vessel operations at the Port under the cumulative projects.

Commercial (Nontreaty) Fishing

As noted in Chapter 3, Section 3.17, *Vessel Traffic*, the proposed action could result in increased disruption to commercial fishing in the navigation channel when a vessel is traveling to and from the project site or is docked at Terminal 1. This potential for disruption would increase with the cumulative projects. Vessel traffic in the navigation channel would increase from approximately one trip per day under baseline conditions to approximately three trips per day with the cumulative projects, and berth occupancy at Terminal 1 would increasing to 363 days per year. During periods of maximum catch for Chinook, coho, or chum salmon, the fall fishery may be open 2 to 4 days per week and for limited periods (e.g., 8:00 am to 12:00 noon). Approximately 15 to 20 boats participate

each year and total days the fishery is open is approximately 7 days (Scharpf pers. comm.). Commercial fisheries do not occur during other times of the year; therefore, vessel traffic at other times of the year does not affect commercial fisheries in Grays Harbor.

As noted in Chapter 3, Section 3.17, *Vessel Traffic*, assuming the vessel is traveling between the Crossover Channel Reach of the navigation channel and Terminal 1 for approximately half of the 2-hour transit time, including docking and undocking maneuvers, an individual vessel trip could disrupt fishing for a 1-hour period. When a vessel is traveling through the area, commercial fishers can either avoid the area entirely (fish elsewhere) or cut their drifts short (pull the nets in sooner) to avoid conflicts with vessels. Fishers would need to monitor radio communications for inbound and outbound vessel traffic and be prepared to retrieve fishing gear when a vessel is transiting the area.

On average, vessels related to the cumulative projects would also be at the dock more frequently, approximately 7 days per week compared to an average of 1 day per week under the no-action alternative. Depending on the specific circumstances of each interaction (e.g., chance of a vessel calling during an open fishing window, distribution of the fish, number of fishers on any given day), it is difficult to predict whether increased occupancy at Terminal 1 would substantially affect any single fisher's ability to reach their limit. If a vessel is at berth during the fall fishery, fishers would have the option to fish longer (complete more drifts) or to fish other preferred locations in Grays Harbor (such as other portions of the navigation channel, farther away from the shoreline or farther upstream), although opportunities to relocate during intense fishing periods may be limited if the other areas are occupied by fishers. Although it is difficult to predict whether the increased vessel traffic would result in an overall inability of a fisher to reach their limit, increased traffic would limit access to commercial fishing areas.

As noted in Chapter 3, Section 3.17.4.3, *Fishing and Recreational Vessels,* ocean-fishing vessels may use the navigation channel to transport their catch to the harbor. To lessen the danger of hazardous conditions during incoming or outgoing tides, bar crossings are often timed during slack high or low tides, whereas large commercial vessels tend to navigate through the channel when tidal elevations are more than 5 feet. Commercial fishers can navigate around larger vessels limited to the navigation channel to avoid potential impacts.

Implementation of the proposed mitigation measure in Chapter 3, Section 3.17, *Vessel Traffic*, to provide advance notice of arrivals and departures of vessels would also reduce cumulative impacts on commercial fishing.

6.5.6.3 Mitigation Measures

Implementation of the proposed mitigation measures in Chapter 3, Sections 3.17, *Vessel Traffic*, would also reduce cumulative impacts. Mitigation measures to address to risks related to vessel transport of crude oil in the study area are presented in Chapter 4, Section 4.6, *Environmental Health Risks—Vessel Transport*.

6.5.6.4 Unavoidable and Significant Adverse Environmental Impacts

Under existing fishing conditions, increased vessel traffic would cause a disruption when commercial fishers are in the navigation channel. This conflict is most likely during the fall harvest of salmon (Chinook, chum, and coho). Although vessel operations related to the cumulative projects are reasonably certain, it is not possible to determine how the proposed action could affect a

commercial fisher's daily catch because of other unpredictable factors (number of fishers, fish distribution, timing, and duration of fishing window on any given day of any given week).

Potential impacts related to increased risk of vessel incidents and related consequences are addressed in Section 6.5.7, *Environmental Health and Safety*.

6.5.7 Environmental Health and Safety

This section discusses potential cumulative impacts on environmental health and safety that would result from construction and operation of the cumulative projects.

6.5.7.1 Study Area

The cumulative impacts study area for environmental health and safety includes Grays Harbor, the 59 miles of PS&P rail line to the junction with the BNSF main line in Centralia, and the cumulative project sites. Within this area, the operations of interest include the storage and transfer (loading and unloading) of products for the cumulative projects and the associated rail and vessel movements, particularly for crude oil and bulk liquids.

6.5.7.2 Cumulative Impacts

This section describes the cumulative increases in risk that could result from the cumulative projects.

Risk management involves the systematic identification, evaluation, and control of impacts that may arise from uncertain future events such as oil spills, fires, explosions, toxic releases, or natural disasters. Assessing a risk to a particular resource requires identifying possible hazards, evaluating the frequency of adverse events and the magnitude of their consequences, and determining appropriate measures for prevention or mitigation. By anticipating the level of risk and the potential impacts, preventive and mitigation measures can be implemented to reduce the frequency of an event, the impacts, or both.

Because it is not possible to predict the timing or exact magnitude of an oil spill, this analysis focuses on spill scenarios, which are addressed in Appendix M, *Risk Assessment Technical Report*. Scenarios were developed for a range of potential incidents involving the terminal, unit trains, and vessels. Risks associated with the no-action alternative are discussed in Chapter 4, *Environmental Health and Safety,* Sections 4.4.1, 4.5.1, and 4.6.1, for terminal operations, rail transport, and vessel transport, respectively.

The analysis determined the likelihoods of the various scenarios for the activity levels of the cumulative projects. Scenarios included the following conditions.

- Incidents involving onsite handling and storage of crude oil and bulk materials at the cumulative project sites.
- Incidents involving trains transporting crude oil and bulk materials along the PS&P rail line.
- Incidents involving vessels transporting crude oil and bulk materials in Grays Harbor.

The scenarios considered various sizes of potential spills based on the activity (such as transport of or transferring oil) and size of tank, rail cars, and vessels. To simplify descriptions, spill scenarios are identified using the amount of material spilled (Table 6-20). Each scenario provides a

representative spill. Actual spills could be somewhat smaller or larger than the representative spill size. Additional information about each scenario is provided in Chapter 4, *Environmental Health and Safety.*

Table 6-20. Oil Spill Scenarios by Size Category

Size Category	Typical Scenario
Small	• Up to 2,100 gallons (50 barrels) spilled when transferring oil from rail cars or to vessels at the project site • Up to 1,000 gallons (24 barrels) spilled during a derailment along the PS&P rail line
Medium	• 50,400 gallons (1,200 barrels) spilled from pipeline or storage tank on site • 10,000 gallons (238 barrels) spilled when transferring oil from the facility to a vessel at the project site • 30,000 gallons (714 barrels or the contents of one full tank car) spilled during a derailment along the PS&P rail line
Large	• 8.4 million gallons (200,000 barrels or the contents of one full storage tank) spilled on site • 90,000 gallons (2,140 barrels or the contents of three full tank cars) spilled during a derailment along the PS&P rail line • 150,000 gallons (3,570 barrels or the contents of five full tank cars) spilled during a derailment along the PS&P rail line • 900,000 gallons (21,400 barrels or the contents of 30 full tank cars) spilled during a derailment along the PS&P rail line • 105,000 gallons (2,500 barrels) spilled into Grays Harbor from a vessel collision • 15.1 million gallons (360,000 barrels or the entire contents of a full tanker, including fuel) spilled into Grays Harbor during a vessel allision at harbor entrance

Using this information, the analysis first determined the likelihood that a spill would occur using the following methods. In general, the larger the spill, the less likely that the spill would occur.

- For spills at the terminals, operational information, such as the number of rail car unloadings, vessel loadings, and storage tanks in use, was combined with historical information on spills associated with these activities to determine the likelihood of spills.
- For spills along the PS&P rail line, the number of rail trips carrying crude oil was combined with historical information from the FRA on incidents on the PS&P rail line and across the country, as well as the numbers of cars derailed, the probability of spills for different types of rail cars, and the length of the rail route to determine the likelihood of spills.
- For spills during vessel transport, the number of vessel trips carrying crude oil was combined with historical information on vessel accidents and spill probabilities to determine the likelihood of spills.

The analysis looked at risks in 2017 and in 2037 for the proposed action.

Oil Spills

Onsite Risks

The cumulative projects would result in the potential for more frequent spills and the introduction of spilling crude oil, which is not handled today. The cumulative projects would result in an increase in the likelihood of a spill relative to the no-action alternative and to the proposed action alone, although the orders of magnitude are very similar. The release frequencies are summarized below.

- The **small rail-unloading spill scenario** (up to 2,100 gallons [50 barrels]) could occur once every 3 years. This amount is less than the unloading area containment that would be at least 30,000 gallons so the spill is expected to be contained on the facility.
- The **small vessel-loading spill scenario** (up to 2,100 gallons [50 barrels]) could occur once every 3 years. Much of this oil might be contained by booms and other mitigation measures.
- The **medium vessel-loading spill scenario** (represented by 10,000 gallons [238 barrels]) could occur once every 43 years. A small amount of the oil might be contained on the facility or vessel but the remaining oil could spill to water.
- The **medium pipeline or storage tank spill scenario** (represented by 50,400 gallons [1,200 barrels]) from the tanks or piping in the containment areas could occur once every 450 years. This amount is less than the containment area so the spill is expected to be contained on the facility under most circumstances.
- The **large storage tank spill scenario** (an extreme failure of any storage tank ranging between 3,360,000 to 8,400,000 gallons [80,000 to 200,000 barrels]) could occur once every 9,000 years. This could be caused by a construction or material failure, containment failure, or seismic or tsunami event. In some cases the oil would be caught in the containment area, but if there was major damage to the containment as well, the oil could spill to land or water.

Each proposed facility would operate independently, so cumulative impacts from facility operations alone are not likely. The facilities would cumulatively move and store more oil and bulk liquids increasing the potential for spills from the facilities. Spills could be from operations, during transfers, from catastrophic failure of tanks, or from piping.

Rail Risks

The increased number of rail trips related to the cumulative projects would increase the potential for more frequent spills and the possibility of spilling crude oil, as this material would be newly handled at the proposed facility. The cumulative projects would result in an increase in the likelihood of a spill relative to the no-action alternative or to the proposed action alone, although the orders of magnitude are very similar. The relative frequencies are summarized below.

- The **partial one rail car transport spill scenario** (up to 1,000 gallons [24 barrels]) could occur once in 29 years with current rail cars; with rail car improvements (80 FR 26643) this would extend to once in 31 years for 2037. Some amount of the spill would be contained in the ballast under the tracks but some amount could run out onto the ground in the immediate vicinity of the tracks. If the spill occurred over or near a waterway, some amount could spill into water.
- The **one rail car spill scenario** (roughly 30,000 gallons [714 barrels]) could occur once in 11 years with current rail cars; with rail car improvements, this would extend to once in 13 years.

- The **three rail car spill scenario** (roughly 90,000 gallons [2,140 barrels]) could occur once in 73 years with current rail cards; with rail car improvements, this would extent to once in 110 years.
- The **five rail car spill scenario** (roughly 150,000 gallons [3,570 barrels]) could occur once in 1,400 years with current rail cars; with rail car improvements, this would extend to once in 3,300 years.
- The **30 rail car spill scenario** (roughly 900,000 gallons [21,400 barrels]) could occur once in 22,000 years with current rail cars; with rail car improvements, this would extend to once in 44,000 years.

The cumulative impact of 7.5 trains per day could result in an increased potential for derailments or incidental releases of oil and hazardous substances, pollutants, and contaminants during transport or incidents. The risk of an oil spill from train operations typically relates to the risk of derailment. However, a derailment does not mean a spill will happen; a train can derail with no spill resulting.

Vessel Risks

The increased number of vessel trips related to the cumulative projects would increase the potential for more frequent spills and the possibility of spilling crude oil, compared to the other flammable materials currently handled. The cumulative projects would result in an increase in the likelihood of a spill relative to the no-action alternative and the proposed action alone, although the orders of magnitude are very similar. The relative frequencies are summarized below.

- The **large vessel collision spill scenario** (up to 105,000 gallons [2,500 barrels]) could occur once in 45 years.
- The **large vessel grounding spill scenario** (up to one vessel compartment of 1.2 million gallons [29,000 barrels]) could occur once in 128 years.
- The **large vessel allision spill scenario** (up to 15.1 million gallons [360,000 barrels]) could occur once 116 years.

Fires or Explosions

This section describes the likelihood of fires or explosions for the different release scenarios discussed in the preceding section.

Onsite Risks

A spill could cause a fire or explosion if there is an ignition source and combustible gases are present in a quantity that could ignite. The incident could cause sparking, which could ignite the spill. Many of the materials to be handled under the cumulative projects are flammable but they are generally in a liquid and not gaseous form. Typically, terminal activities resulting in a spill would have limited potential to result in ignition because terminals are designed with controls of potential ignition sources to reduce the chance of ignition. Liquid materials would pool on the ground with only limited vapor generation now that the Bakken crude oil has restrictions on its vapor pressure—particularly compared to other common materials like propane. Additional information regarding the risks of fire and explosions during rail transport is provided in Chapter 4, *Environmental Health and Safety*, and Appendix M, *Risk Assessment Technical Report*.

Rail Risks

The cumulative projects would result in an increased risk of fires or explosions compared to the no-action and proposed action alone. Explosions are most likely when a spill is ignited and the resulting fire impinges on another tank or rail car. As the material in these adjacent tanks or rail cars heat up, the pressure builds and may eventually burst the container. The extent of the damage depends on the exact configuration of the release and fire compared to the location of the other tanks or rail cars, any fire suppression capabilities, and the timing and nature of response actions. It also depends on the material: Bakken crude oil is more flammable than other heavier crude oils. The flammability of diluted bitumen varies based on the diluent (diluting agent) used.

Although fires or explosions can result from spills resulting from events like collisions and derailments, long-term historical data show that most spills do not result in fires or explosions. A fire or explosion would be less likely to occur than a spill. While there have been multiple recent derailments of trains on main lines that resulted in fires or explosions, the chance of an extreme derailment is very limited in the study area because of the slow speeds on the PS&P rail line, which are slower than typical mainline speeds. In general, large derailments from high-speed trains lead to releases from multiple rail cars. The energy involved in high-speed derailments and the resulting scatter of rail cars yield the greatest chance of a fire or explosion that affects other rail cars.

Additional information regarding the risks of fire and explosions during rail transport is provided in in Chapter 4, *Environmental Health and Safety,* and Appendix M, *Risk Assessment Technical Report*.

Vessel Risks

The cumulative projects would result in an increased risk of fires or explosions compared to the no-action and proposed action alone. Fires or explosions can occur as the result of spilled oil from vessels collisions and allisions, and less typically from groundings. A fire or explosion would be less likely to occur than a spill, i.e., in only a fraction of the spills. But some collisions and allisions might involve enough energy and sparking to cause ignition, and possibly an explosion if the vapors are sufficiently confined. In an even smaller fraction of accidents and releases, such fires/explosions could involve other compartments.

Information regarding the risks of fire and explosions during rail transport is provided in Chapter 4, *Environmental Health and Safety*, and Appendix M, *Risk Assessment Technical Report*.

Impacts on Resources

With the cumulative projects, the chance of an incident occurring would be cumulatively greater than compared to the proposed action alone. In the event of any one incident, the potential consequences are anticipated to be similar to those described in Chapter 4, *Environmental Health and Safety,* for the proposed action*.* As discussed in Chapter 4, Section 4.7, *Impacts on Resources*, the risks related to the scenarios analyzed in the risk assessment could result in adverse impacts on the following resources.

- **Water, plants, and animals.** Crude oil can degrade water quality and result in toxic exposure of plants and animals to harmful chemicals. Depending on the specific circumstances, exposure can cause tissue damage in plants and animals that can affect respiration, reproduction, and behavior. In extreme cases, exposure can result in death.
- **Tribal resources.** Harm to natural resources used by tribes for commercial, subsistence, or ceremonial purposes could result in adverse impacts on tribal resources.
- **Commercial fishing.** Impacts on fish and shellfish could affect the number available for harvest by commercial fishers in future years. This impact could last several years from residual amounts of oil persisting in the environment.
- **Aesthetics, recreation, and cultural resources.** Crude oil can cause aesthetic impacts by coating the environment and resulting in large areas of reduced vegetative growth. These impacts can disrupt recreational activities if areas affected by spills have to be closed to prevent harm of exposure to people or to conduct cleanup activities. Spilled oil can also cause damage to historic structures or other important cultural resources. Depending on the circumstances of the incident and the nature of the cleanup activities, ground disturbance during cleanup may also adversely affect archaeological resources.
- **Air.** Crude oil contains volatile vapors that, when released during a spill, may create flammable atmospheres or inhalation hazards. The toxicity of crude oil and the potential to adversely affect air quality depend mainly on the volatility of the constituents.
- **Human health.** Exposure to crude oil can adversely affect humans, primarily through exposure to harmful air pollutants. Depending on the circumstances of the incident, if people inhale crude oil vapors, they may suffer irritation to their respiratory systems, which can cause dizziness, rapid heat rate, headaches, confusion, nausea, and/or vomiting and possibly injury or death. Depending on the scale of the incident, the personal costs of these impacts could be severe and have long-lasting physical and emotional impacts on affected individuals and their families.
- **Public services.** Increased likelihood of an incident along with the new potential for spills, fires, or explosions related to crude oil handling, storage, and transport could result in the need for local emergency response services that exceed existing capacity. Disruption of local public services could also occur.

If a spill results in a fire or explosion, additional damage could occur, as listed in Chapter 4, Section 4.7, *Impacts on Resources*. The air pollutants of health concern are carbon monoxide, lead, nitrogen dioxide, particulate matter, sulfur dioxide, and polycyclic aromatic hydrocarbons. Inhalation of these byproducts can cause irritation of the respiratory system. Exposure may harm nasal passages and lungs and it may cause coughing, itching, and difficulty breathing. Depending on the circumstances of an incident, there is also the potential for injury and even death, either as a direct result of the event leading to the release or associated with emergency response and cleanup activities. The

personal costs of these impacts could be severe and have long-lasting physical and emotional impacts on affected individuals and their families.

Fires or explosions can also harm plants and animals. Depending on the extent of the damage, changes affecting community structure and function of ecosystems could occur. For example, if exposed to high, sustained temperatures, specific plant and animal communities could become more susceptible to other harm, such as increased risk of disease or predation. If individual species are adversely affected at a broader population level, the overall structure and function of the community could be altered. Harm to natural resources used by tribes for commercial, subsistence, or ceremonial purposes could also result in adverse impacts on tribal resources.

Similar to potential impacts associated with spills, damage caused by fires or explosions could adversely affect aesthetic resources, important historic structures, or recreational resources. This damage could be made worse due to cleanup activities.

6.5.7.3 Mitigation Measures

The mitigation measures listed in Chapter 4, *Environmental Health and Safety*, Sections 4.4.3, 4.5.3, and 4.6.3 would also help to reduce the proposed action's contribution to cumulative risks.

6.5.7.4 Unavoidable and Significant Adverse Environmental Impacts

Regulatory requirements for prevention of, preparedness for, and response to incidents involving the release of crude oil and mitigation measures to reduce impacts are detailed in Chapter 4, Section 4.2, *Applicable Regulations*. However, no mitigation measures would completely eliminate the possibility of a spill, fire, or explosion, nor would they completely eliminate the adverse consequences of a spill, fire, or explosion. Depending on the location of the incident, amount spilled, type of crude oil, and environmental conditions, such as the time of year, water flows, and weather conditions, the potential environmental impacts could be significant.

The following resources could experience significant impacts as described in Section 4.7, *Impacts on Resources*.

- Water
- Plants
- Animals
- Aesthetics
- Recreation
- Commercial fishing
- Cultural resources
- Tribal resources
- Public services
- Air
- Human health

6.5.8 Extended Rail and Vessel Transport

In addition to the impacts in the study area addressed in Chapters 3, *Affected Environment, Impacts, and Mitigation*, and 4, *Environmental Health and Safety*, impacts of the proposed action related to increased rail and vessel traffic in the extended study area are described in Chapter 5, *Extended Rail and Vessel Transport*. This section discusses potential cumulative impacts in the extended study area that would result from rail and vessel transport related to the cumulative projects.

6.5.8.1 Extended Study Area

The extended study area consists of specific rail and vessel transportation corridors that could be affected by the transport of crude oil to and from the project site. The rail corridor consists of the area along the BNSF main line from the Williston Basin in North Dakota[37] to Centralia, Washington, with a focus on Washington State. The vessel corridor consists of the vessel routes along the U.S. West Coast to the most likely destinations north to Puget Sound refineries and south to California refineries. Section 5.3, *What are the likely sources and destinations of crude oil?* describes the basis for these end points.

6.5.8.2 Cumulative Impacts

Rail Transport

Traffic

As described in Chapter 5, Section 5.5.1.1, *Traffic*, growth in rail traffic in the extended study area is expected to follow national trends as more freight transits through Midwestern states to coastal ports and population centers.

- Daily traffic on the BNSF Kootenai River Subdivision from Whitefish, Montana, to Spokane, Washington, is estimated to increase from 28 trips per day in 2012 to 70 trips per day in 2040, an increase of 133% (Idaho Department of Transportation 2013).
- The volume of freight shipped by rail through Montana is expected to increase from 54.1 million tons in 2002 to 79.3 million tons in 2035, an increase of 47% (Montana Department of Transportation 2010).

The cumulative projects would result in 4.25 unit train trips per day on average at maximum throughput operations. Table 6-21 present these trips as a percentage of 2015 traffic estimates and 2035 traffic projections for BNSF mainline routes expected to be used for crude oil trains in Washington State. As shown in the table, cumulative trips represent between 6.1 and 60.7% of 2015 traffic estimates along the assumed routes; along the assumed routes for loaded trains, cumulative trips represent between 6.1 and 12.5% of 2015 estimates. Cumulative trips represent between 3.4 and 32.7% of 2035 projections along the assumed routes; along the assumed routes for loaded trains, cumulative trips represent between 3.4 and 7.6% of 2035 estimates.

[37] The Williston Basin rail terminals are primarily in North Dakota but extend into Montana, South Dakota, and Saskatchewan, Canada.

Table 6-21. Proposed Action Rail Trips as Percentage of Existing and Projected Rail Trips in the Extended Study Area under the No-Action Alternative

Route Segment	Subdivision	Estimated 2015 Trips Per Day[a]	Cumulative Trips as a Percentage	Projected 2035 Trips per Day[b]	Cumulative Trips as a Percentage
Idaho/Washington State Line-Spokane	Spokane	70	6.1%	125	3.4%
Spokane-Pasco	Lakeside	39	10.9%	66	6.4%
Pasco-Vancouver	Fallbridge	34	12.5%	56	7.6%
Vancouver-Centralia	Seattle	50	8.5%	85	5.0%
Centralia-Auburnc	Seattle	50	8.5%	85	5.0%
Auburn-Yakima[c]	Stampede	7	60.7%	13	32.7%
Yakima-Pasco[c]	Yakima Valley	7	60.7%	13	32.7%

[a] Extrapolated to 2015.
[b] Numbers do not include crude oil unit trains or rail traffic related to coal export terminal proposals in Washington State.
[c] Assumed empty trains only.
Source: Washington State Department of Transportation 2014.

Potential Impacts

Continued increase in rail traffic along the BNSF main lines in the extended study area could affect rail capacity if BNSF does not take actions to address this growth. It is expected that BNSF will make the necessary investments or operating changes to accommodate the growth in rail traffic, but the timing of these actions is unknown.

In addition to potential impacts on rail capacity, increased routine rail traffic would incrementally add to currently occurring impacts on the natural and built environment, summarized as follows.

- Emission of ambient air pollutants and air toxics from train engine exhaust.
- Leaks and spills from engines and defective tank cars.
- Train noise, including wayside noise from passing trains and horn noise at grade crossings.
- Vehicle delay at at-grade crossings, including disruption to emergency vehicle response times.
- Impacts on tribal resources

The types of impacts would be similar to those described in the respective sections of Chapter 3, *Affected Environment, Impacts, and Mitigation*. While the actual impacts described in Chapter 3 are specific to rail transport along the PS&P rail line, they would also result from rail transport in the extended study area. However, the potential for impacts and their relative magnitude would depend on the existing conditions at specific locations and other factors.

When considered in combination, the cumulative projects are likely to increase the likelihood of rail incidents and related consequences (e.g., oil spills, fires, and explosions) in the extended study area compared to the no-action alternative and the proposed action alone. However, the potential consequences would remain similar in nature and magnitude to those that could occur under existing conditions and the no-action alternative. Chapter 4, Section 4.7, *Impacts on Resources,* describes the impacts that could result from an oil spill, fire, or explosion. These impacts are described in general terms, not specific to a particular size event or a specific location; therefore,

they can be generally applied to the extended study area. Depending on the specific location of a rail incident (e.g., proximity to population centers, sensitive resources), the type of material released, the volume of the release, and the potential for ignition (e.g., fire, explosion), impacts could be significant.

As discussed in Chapter 4, Section 4.2, *Applicable Regulations*, there is an extensive framework in place to prevent, prepare for, and respond to an incident involving the release of crude oil. However, as noted in Section 5.6.1.1, *Rail Transport*, there are gaps in geographic response planning within the extended study area and limited capacity exists to update and field test these plans. Additionally, there are existing gaps to plan, train, and equip local emergency service responders for crude oil incidents. Ongoing training is needed to prepare first responders who already face the risks of highly flammable crudes currently being shipped by rail (Washington State Department of Ecology 2015), such as would occur under the proposed action.

As noted in Chapter 4, Section 4.5, *Environmental Health Risks—Rail Transport*, there are ongoing broader efforts to address and improve the safety of crude oil transport by rail that would also help to offset potential increases in risk related to the cumulative projects.

Stakeholders include but are not limited to the local, tribal, and regional government agencies along the BNSF main lines, as well as the regulatory agencies, Washington State Department of Transportation, Washington Utilities and Transportation Committee, FRA, and Pipeline and Hazardous Materials Safety Administration. These stakeholders and agencies should continue coordination to identify solutions (operationally or for larger capital improvement projects) to address current and future concerns related to increased rail traffic, vehicle delay, and safety at grade crossings, and other concerns specific to each community. This could include infrastructure improvements such as grade separations, additional grade-crossing protections, grade-crossing closures, and roadway improvements.

Vessel Transport

The cumulative projects would result in 758 tank vessel trips[38] per year (approximately two trips per day on average) at maximum throughput. As described in Section 5.5.1.2, *Vessel Transport*, projections of vessel traffic cannot be quantified for the extended study area and, therefore, cumulative trips are compared to existing conditions.

Table 6-22 presents cumulative vessel trips as a percentage of existing large commercial vessel trips to selected West Coast destinations in the extended study area where cumulative vessels are likely to call. As shown in the table, cumulative vessel trips at maximum throughput operation represent 14.5% of existing large commercial vessel[39] traffic in Puget Sound, 12.8% of such traffic at larger ports accessed via San Francisco Bay, and 10.3% at Los Angeles area ports.[40]

[38] A trip represents one-way travel; in other words an inbound empty vessel trip and an outbound loaded vessel trip are counted as two trips.
[39] Based on vessels of more than 1,000 gross tons.
[40] The Ports of Los Angeles and Long Beach, which are adjacent to each other.

Table 6-22. Cumulative Vessel Trips as a Percentage of Existing Vessel Trips related to Select West Coast Destinations

Selected West Coast Destinations	Estimated Annual Trips 2015[a]	Proposed Action Trips as a Percentage
Washington		
Puget Sound	5,196	14.5%
California		
San Francisco Bay Area Ports	5,936	12.8%
Los Angeles–Long Beach Ports	7,376	10.3%

[a] Based on number of calls of vessels over 1,000 gross tons; a call is assumed to equal two trips (one inbound and one outbound).

Source: U.S. Maritime Administration 2015 (California ports); Washington State Department of Ecology 2016 (Puget Sound).

Potential Impacts

Vessel traffic related to the cumulative projects is anticipated to have a negligible impact on vessel traffic in the extended study area. However, continued growth of vessel traffic in the extended study area, as discussed in Chapter 5, Section 5.5.1.2, *No-Action Alternative*, would incrementally increase currently occurring impacts on the natural and built environment, summarized as follows.

- Emission of ambient air pollutants and air toxics from vessel engine exhaust.
- Water quality impacts from incidental leaks.
- Introduction of invasive species through ballast water exchanges.
- Impacts on aquatic species from increased underwater noise and vibration, vessel strikes, and increased wake and propeller wash.
- Impacts on tribal resources.

The types of impacts would be similar to those described in the respective sections of Chapter 3, *Affected Environment, Impacts, and Mitigation.* While the actual impacts described in Chapter 3 are specific to the study area (Grays Harbor and the marine nearshore environment), they can be generally applied to the extended study area. However, the potential for impacts and their relative magnitude would depend on the existing conditions at specific locations and other factors.

When considered in combination, the cumulative projects are likely to increase the chance of oil spills, fires, or explosions in the extended study area compared to the no-action alternative and the proposed action alone. However, the potential consequences would remain similar in nature and magnitude to those that could occur under existing conditions and the no-action alternative. Chapter 4, Section 4.7, *Impacts on Resources,* describes the impacts that could result from an oil spill, fire, or explosion. These impacts described in general terms, not specific to a particular size event or a specific location; therefore, they can be generally applied to the extended study area. Depending on the specific location of a vessel incident (e.g., proximity to population centers, sensitive resources), the type of material released, the volume of the release, and the potential for ignition (e.g., fire, explosion), impacts could be significant.

As noted in Section 5.4.3.2, *Existing Risks along the Vessel Routes*, there are existing preparedness and response gaps with respect to transport of crude oil by vessel. The need for updated and consistent geographic response planning and additional training and equipment for local emergency service responders would continue to be an issue of concern under the no-action alternative.

6.5.8.3 Unavoidable and Significant Adverse Environmental Impacts

Regulatory requirements for prevention of, preparedness for, and response to incidents involving the release of crude oil, and mitigation measures to reduce impacts are described in Chapter 4, *Environmental Health and Safety*. However, no mitigation measures would completely eliminate the possibility of a spill, fire, or explosion, nor would they completely eliminate the adverse consequences of a spill, fire, or explosion. Depending on the location of the incident, amount spilled, type of crude oil, and environmental conditions, such as the time of year, water flows, and weather conditions, the potential adverse environmental impacts could be significant.

The following resources could experience significant impacts as described in Chapter 4, Section 4.7, *Impacts on Resources*.

- Water
- Plants
- Animals
- Aesthetics
- Recreation
- Commercial fishing
- Cultural resources
- Tribal resources
- Public services
- Air
- Human health

Chapter 7

Economics, Social Policy, and Cost-Benefit Analysis

The City of Hoquiam State Environmental Policy Act (SEPA) policies and procedures (Hoquiam Municipal Code [HMC] 11.10.160) require that, in addition to the state rules adopted by reference (HMC 11.10.140), an environmental impact statement must address economic considerations, social policy implications, and the costs and benefits associated with the proposed action and the no-action alternative. As noted in HMC 11.10.160, these elements are "provided for the purpose of EIS content but do not add to the criteria for threshold determinations or perform any other function or purpose." Based on this regulatory requirement, this analysis focuses primarily on resources under the purview of the City of Hoquiam that could be affected by the proposed action alone.

This chapter is organized as follows.

- Section 7.1, *Economics,* provides the regional (statewide and countywide) economic context for the proposed action and economic impacts.
- Section 7.2, *Social Policy,* presents impacts on elements related to social elements in the study area.
- Section 7.3, *Cost-Benefit Analysis*, provides an analysis of the costs and benefits of the proposed action, relevant to the City of Hoquiam.

7.1 Economics

This section describes the regional (state- and countywide) economic conditions in the study area, as well as the economic impacts that could result under the no-action alternative or as a result of construction and routine operation[1] of the proposed action.

7.1.1 What is the study area for economics?

The study area for economics consists of the Washington State economy and the Grays Harbor County[2] economy that could be affected by construction[3] and routine operation of the proposed action. Routine operation of the proposed action encompasses onsite operations, rail transport along the Puget Sound & Pacific Railroad (PS&P)rail line,[4] and vessel transport through Grays Harbor out to 3 nautical miles from the mouth of the harbor.

[1] Chapter 4, *Environmental Health and Safety*, addresses the potential environmental impacts from increased risk of incidents (e.g., storage tank failure, train derailments, vessel collisions) and related consequences (e.g., release of crude oil).

[2] For operation of the proposed action, the economic region was defined as Grays Harbor County, because most economic activity associated with operation is expected to occur there.

[3] For the construction phase, the economic region was defined as Washington State because most construction-related purchases are likely to occur within the state, but many of them would occur outside Grays Harbor County and the adjacent counties.

[4] The PS&P rail line refers to the rail line between Centralia and the project site.

7.1.2 How were impacts on economic conditions evaluated?

This section describes the methods used to evaluate impacts.

Regional economic impacts of the proposed action were analyzed by ECONorthwest using the Impact Analysis for Planning Model (IMPLAN) as presented in Appendix O, *Economic Impact Analysis.* This analysis focused on the employment, income (including benefits), and economic output that would be generated in the region by the proposed action during construction and operation. Economic output measures the total value of economic transactions related to the proposed action. IMPLAN is a leading input-output modeling system that describes the flow of goods and services between industrial sectors in regions usually defined as a county, a group of counties, or a state. The IMPLAN databases contain county-level, inter-industry trade flows for hundreds of commodities estimated based on nationwide production functions; that is, relationships showing the average amounts of various goods and services required to produce a unit of each commodity. ECONorthwest customized the IMPLAN data based on proprietary information describing trade flows in Washington State and Grays Harbor County and on information about the proposed action provided by the applicant.

Input-output models estimate not only the employment and income generated to construct and operate a project (*direct* effects) but also the increased employment and income in industries linked to the project (*indirect* effects). The model also estimates the increased purchases that workers in the directly and indirectly affected industries make due to their increased income (*induced* effects). The sum of the direct, indirect, and induced effects is called the *total* effect, and the ratio of the total effect to the direct effect is called a *multiplier*.

7.1.3 What are the economic conditions in the study area?

This section describes the regional economic conditions that could be affected by construction and routine operation of the proposed action.

7.1.3.1 Regional Population

Between 2000 and 2012, the state population increased by 17% (Table 7-1). In 2010, Grays Harbor County ranked 17th in population out of Washington's 39 counties (U.S. Census Bureau 2014a). Although the county population increased by 6.7% between 2000 and 2012 (Table 7-1), it actually decreased by 1,105 individuals during the last 2 years of that period (U.S. Census Bureau 2014a). Table 7-1 presents regional population, labor force, income, unemployment, and poverty rates for 2000 and 2012.

Table 7-1. Population, Labor Force, Median Household Income, Unemployment Rate, and Poverty Rate for Washington and Grays Harbor County (2000 and 2012)

	Washington State			Grays Harbor County		
Statistic	**2000**	**2012**	**Percent Change**	**2000**	**2012**	**Percent Change**
Population	5,894,121	6,897,012	17.0	67,194	71,692	6.7
Labor force	2,979,824	3,556,836	19.4	30,120	31,514	4.6
Median household income ($)	45,776	57,573	25.8	34,160	42,057	23.1
Unemployment rate (%)	6.1	8.6	39.3	8.3	16.4	97.6
Poverty rate (%)	10.6	13.5	27.3	16.1	20.9	37.7

Source: U.S. Census Bureau 2014a and 2014b

7.1.3.2 Regional Income, Poverty, and Unemployment

In 2012, Washington ranked eighth in median household income among the 50 states. Its median household income exceeded that of all non-eastern-seaboard states, except Alaska (U.S. Census Bureau 2013). Although Washington is relatively affluent, its unemployment and poverty rates increased substantially between 2000 and 2012 (Table 7-1).

In 2012, Grays Harbor County ranked 34th in median household income among the state's 39 counties (Washington State Office of Financial Management 2014). Unemployment and poverty have recently become more prevalent in the county: approximately one in five county residents lived in poverty, and one in six members of the work force was unemployed in 2012 (Table 7-1). Grays Harbor County's per-capita income is substantially less than the statewide average, and it increased more slowly than in Washington between 2000 and 2012 (Table 7-2).

Table 7-2. Per-Capita Income in Washington State and Grays Harbor County (2003–2012)

Year	Washington State	Grays Harbor County
2003	34,620	24,663
2004	36,715	25,315
2005	37,651	26,150
2006	40,139	27,132
2007	42,845	28,566
2008	44,162	29,903
2009	42,112	29,391
2010	42,521	29,645
2011	44,420	30,963
2012	46,045	31,848
Percent change 2003–2012	33.3	29.1

Source: U.S. Bureau of Economic Analysis 2014
Values are not inflation-adjusted.

7.1.3.3 Regional Employment and Wages

Between 2002 and 2012, the state industries that increased fastest in statewide employment level were educational services; health care and social assistance; and professional, scientific, and technical services (Table 7-3). The industries that declined the fastest in employment in the state were mining, construction, and finance and insurance.

In Grays Harbor County, the industries that increased fastest in employment between 2002 and 2012 were management, administrative and waste management, and real estate and rental and leasing services (Table 7-3). The industries in which employment declined most rapidly were construction, military, and other services. More industries had declining employment than increasing employment.

Countywide average wages are lower than the statewide average, and they increased more slowly between 2004 and 2012 compared to statewide (Table 7-4).

Table 7-3. Employment[a] by Place of Work in Washington State and Grays Harbor County by Industry (2002 and 2012)

	Washington State			Grays Harbor County		
Sector	**2002**	**2012**	**Percent Change[b]**	**2002**	**2012**	**Percent Change[b]**
Farming	44,116	52,776	19.6	590	766	29.8
Forestry, fishing, and related activities	24,924	27,696	11.2	(D)	(D)	--
Mining	3,063	2,158	(29.6)	(D)	(D)	--
Utilities	4,524	4,913	8.6	16	(D)	--
Construction	160,441	143,496	(10.6)	1,705	1,339	(21.5)
Manufacturing	286,033	280,554	(1.9)	3,574	3,079	(13.9)
Wholesale trade	116,491	124,363	6.7	852	765	(10.2)
Retail Trade	309,158	322,363	4.3	3,969	3,425	(13.7)
Transportation and warehousing	85,295	89,301	4.7	902	(D)	--
Information	93,555	105,535	12.8	222	275	23.9
Finance and insurance	101,513	94,517	(9.3)	922	1,055	14.4
Real estate and rental and leasing services	48,565	45,918	(5.4)	841	1,128	34.1
Professional, scientific, and technical services	140,060	173,116	23.6	1,005	1,007	0.2
Management	30,286	36,318	19.9	36	92	155.5
Administrative and waste management	123,101	143,031	16.2	628	925	47.3
Educational services	41,954	52,981	26.3	112	117	4.5
Health care and social assistance	271,964	340,181	25.1	2,390	2,831	18.4
Arts, entertainment, and recreation	41,986	46,452	10.6	483	424	(12.2)
Accommodation and food services	206,171	232,890	12.9	2,432	2,317	(4.7)
Other services	145,889	146,708	0.6	2,118	1,815	(14.3)
Federal civilian	69,300	73,258	5.7	215	212	(1.4)

	Washington State			Grays Harbor County		
Sector	**2002**	**2012**	**Percent Change[b]**	**2002**	**2012**	**Percent Change[b]**
Military	75,587	81,956	8.4	288	240	(16.7)
State government	141,344	149,352	5.7	1,243	1,256	1.0
Local government	300,536	319,886	6.4	4,844	4,720	(2.6)
Total	**2,865,856**	**3,089,759**	**7.8**	**31,203**	**29,872**	**(4.3)**

Notes:
Source: U.S. Bureau of Economic Analysis 2014.
(D) Not shown to avoid disclosure of confidential information
[a] Includes full- and part-time employees and proprietors.
[b] Negative changes shown in parentheses.

Table 7-4. Average Weekly Wages for Washington and Grays Harbor County (2004 and 2012) ($)

Year	Washington State	Grays Harbor County
2004	757	574
2012	999	686
Percent Change 2004–2012	32.0	19.5

Source: U.S. Bureau of Labor Statistics 2015.
Values are not inflation adjusted.

7.1.4 What are the potential impacts on economic conditions?

This section describes impacts on economic conditions that could occur in the study area. Potential impacts of the no-action alternative are described first, followed by potential impacts of the proposed action.

7.1.4.1 No-Action Alternative

Under the no-action alternative, the applicant would continue to operate its existing facility as described in Section 2.1.3.2, *Existing Operations*. Although the proposed action would not occur, it is assumed that growth in the region would continue under the no-action alternative. This growth could lead to development of another industrial use at the project site, which could result in in impacts similar to those described for construction and routine operation of the proposed action. However, for the purposes of this analysis, it is assumed that no future development would occur at the project site.

7.1.4.2 Proposed Action

This section describes the impacts that could occur in the study area as a result of the construction and routine operation of the proposed action. First, this section describes impacts from construction of the proposed action. It then describes impacts of routine operation of the proposed action.

Construction

As described in Chapter 2, *Proposed Action and Alternatives*, construction of the proposed action would likely be completed in two phases. It is anticipated that Phase 1 could begin in 2016 and would last 10 to 12 months. The start date for Phase 2 is unknown but is anticipated to last approximately 10 months. Construction of Phase 1 is anticipated to cost $38.3 million and Phase 2 is estimated to cost an additional $20.4 million for a total construction cost of $58.7 million.

Construction of the proposed action would temporarily stimulate the economy through purchases of materials, supplies, equipment, and services; payroll to construction workers; and related indirect and induced effects. Direct purchases of goods and services used to construct the proposed facility would require the vendors providing these products to increase spending on the inputs they need to operate. For example, construction companies engaged in building industrial infrastructure would probably need to buy additional heavy equipment. Such purchases by directly affected businesses represent the *indirect effects* of the proposed action. *Induced effects* result when workers and proprietors who receive additional income from work generated by the proposed action spend that additional income on consumer goods and services within the region.

As indicated by the IMPLAN analysis (Appendix O, *Economic Impact Analysis*), approximately $10.9 million of Phase 1 total construction costs ($38.3 million) would go to labor spending (e.g., construction worker salaries and benefits) associated with the creation of approximately 82 direct construction jobs and a total of 293 jobs in the state (Table 7-5). Of the total Phase 1 construction costs, the remaining $27.4 million would go to nonlabor spending (e.g., equipment and materials purchases). Businesses classified by IMPLAN as "the construction of other new nonresidential structures industry" would receive most of the construction spending.

Of the $10.9 million to go to labor spending, approximately $10.4 million (95%) is estimated to be spent in Washington (Table 7-5). Of the $27.4 million to go to nonlabor spending, it is estimated approximately $13.2 million (48%) would be spent on construction commodities such as materials, supplies, equipment, and services in Washington. The remaining $14.2 million (52%) would be spent out of state. The relatively low share of in-state nonlabor spending reflects the need to import specialized equipment manufactured outside Washington. The estimated direct, indirect, and induced employment, income (including benefits), and output effects associated with Phase 1 construction spending that would occur in Washington State are shown in Table 7-5. Income and output levels are expressed in 2013 dollars per year.

Table 7-5. Estimated Economic Impacts from Phase 1 Construction—Proposed Action (2013 dollars)

Impact	Employment (jobs)	Labor Income and Benefits	Economic Output
Direct	82	$10,398,000	$23,570,000
Indirect	111	$6,619,000	$17,157,000
Induced	100	$4,695,000	$13,407,000
Total	293	$21,712,000	$54,134,000
Multiplier[a]	3.57	2.09	2.30

Source: Appendix O, *Economic Impact Analysis*

[a] The employment multiplier (ratio of the total effect to the direct effect) for the construction is much larger than the labor income multiplier because, although the average nonresidential construction job results in 3.57 jobs in supporting industries, the average wage in those industries is substantially lower than in the nonresidential construction industry.

In addition to these economic impacts, construction of the proposed action would result in various tax revenues accruing to state and local governments. As shown in Table 7-6, the first phase of construction was estimated to generate approximately $2.66 million in property, sales, and business and occupation tax revenues.

Table 7-6. Estimated Tax Revenues from Phase 1 Construction—Proposed Action (2013 dollars)

Property Tax	Sales Tax	Business and Occupation Tax	Total
$143,600	$2,453,700	$58,400	$2,655,700

Source: Appendix O, *Economic Impact Analysis*

As mentioned above, construction of Phase 2 is estimated to cost an additional $20.4 million. The economic impacts associated with Phase 2 construction would be similar to but slightly less than those described for Phase 1.

Operations

The annual economic output of the proposed action in Grays Harbor County was estimated at $19.9 million (Table 7-7). This includes onsite operation of the proposed action and rail and vessel operations to and from the project site. This amount does not include the value of the commodities (e.g., crude oil) that would be shipped through the Port of Grays Harbor (Port), which, for this analysis, comprise pass-through costs with no economic impacts. The annual economic output includes annual operating costs of Westway Terminal Company LLC (applicant), PS&P, and vessel operators related to the proposed action, business taxes, and net business income.

At full buildout, the proposed action would generate an estimated 36 direct jobs in Grays Harbor County associated with onsite operations (by the applicant), rail transport (by PS&P), and vessel transport (by vessel operators). The proposed action would generate an estimated 73 jobs throughout the county's economy. These jobs would account for $3.6 million in annual direct labor income and benefits and $5.1 million in total labor income and benefits throughout the county's economy (Table 7-7).

The annual operating costs of the proposed facility (by the applicant), and rail transport (by PS&P) and vessel transport (by vessel operators) related to the proposed action was estimated at $6.6 million. One-third of this spending ($2.2 million) would be attributed to the applicant, and two-thirds ($4.4 million) would be attributed to the rail and vessel transport operators. Of the total spending, $3.6 million (54.8%; Table 7-7) would be paid as income or benefits to employees and proprietors with the remainder going to non-labor expenditures.

The difference between the annual economic output and annual operating costs would consist primarily of business taxes and net business income. A substantial share of the applicant's net business income would probably be allocated to retire debt incurred during the construction phase. Essentially, all business taxes and net business income related to onsite operations and income earned by rail and vessel operators would leave Grays Harbor County and would not result in regional employment or income. The regional economic effects of operation of the proposed action are shown in Table 7-7, with income and output levels expressed in 2013 dollars per year.

Table 7-7. Estimated Economic Impacts in Grays Harbor County of Operations at Full Buildout—Proposed Action (2013 dollars)

	Employment (jobs)	Labor Income and Benefits	Economic Output
Direct	36	$3,620,000	$19,942,000
Indirect	20	$856,000	$2,961,000
Induced	17	$574,000	$1,951,000
Total	73	$5,051,000	$24,854,000
Multiplier[a]	2.58	1.40	1.25

Source: Appendix O, *Economic Impact Analysis*

[a] The multipliers for operation of the proposed action are smaller than those for construction primarily because the study area for operation is much smaller (Grays Harbor County) and the industries that would be most affected by operation are, on average, less labor-intensive and have lower wages.

In addition to these economic impacts, operation of the proposed action was estimated to generate $1.27 million in increased annual property, sales, and business and occupation tax revenues at full buildout (Table 7-8).

Table 7-8. Estimated Annual Tax Revenues Generated by Operations at Full Buildout—Proposed Action (2013 dollars)

Property Tax	Sales Tax	Business and Occupation Tax	Total
$1,083,500	$68,000	$116,300	$1,267,800

Source: Appendix O, *Economic Impact Analysis*

7.2 Social Policy

The social policy analysis considers elements of community and social structure that could be affected by the proposed action, including community cohesion, community welfare, population growth, and minority and low-income communities.

- **Community cohesion** is the ability of people to communicate and interact with each other in ways that lead to a sense of community, as reflected in a neighborhood's ability to function and be recognized as a singular unit (Washington State Department of Transportation 2014). In general, community cohesion is affected by elements that tend to divide communities, such as railroads, highways, and industrial facilities not accessible to the public.
- **Community welfare** refers to the physical health and mental well-being of individuals in a community.
- **Population growth** refers to the increase in the number of people that reside in a country, state, county, or city.
- **Minority and low-income communities** refer to those localized communities that have a higher percentage of residents in this category than the county in which they reside.

This section describes the existing conditions related to community cohesion, community welfare, population, and minority and low-income populations. It then describes impacts on these conditions that could result under the no-action alternative or as a result of the construction and operation of

the proposed action. This section also considers if impacts resulting from the proposed action could disproportionately affect minority and low-income communities.

7.2.1 What is the study area for social policy?

The study area for social policy consists of the communities surrounding the project site that could be affected by construction and operation of the proposed action. The study area also includes the communities that could be affected during rail transport along the PS&P rail line and vessel transport through Grays Harbor.

7.2.2 How were impacts on social policy evaluated?

This section describes the sources of information and methods used to evaluate impacts.

7.2.2.1 Information Sources

The analysis used information from the following sources.

- Public scoping comments
- Relevant land use plans and mapping
- U.S. Census data
- Interviews with local land use planners

7.2.2.2 Impact Analysis

Impacts of the proposed action on social policy elements were evaluated qualitatively using information from the sources described above and the analysis of impacts on the natural and built environment in Chapter 3, *Affected Environment, Impacts, and Mitigation*.

- **Community cohesion.** The evaluation of impacts on community cohesion considered how the proposed action would divide a neighborhood, isolate part of a neighborhood, or separate residents from public services by changing accessibility.
- **Community welfare.** The evaluation of impacts on community welfare considered how impacts of the proposed action described in Chapter 3 could affect human health and welfare (e.g., physical health, mental well-being, property values) in the study area.
- **Population growth.** Impacts on population growth were evaluated based on projected employment from construction and operation of the proposed action described in Section 7.1, *Economics*.
- **Minority and low-income communities.** The analysis of impacts on minority and low-income communities involved compiling minority and low-income data for the U.S. census block groups in the study area and evaluating whether the impacts would affect minority and/or low-income communities. This means considering if impacts would occur or occur in greater magnitude in areas where these populations were concentrated.

  For the purposes of this analysis, a population was considered a minority or low-income population if the percentage of minority or low-income individuals in any given census block

group was greater[5] than the percentage of that population at the county level,[6] which provides for a conservative analysis. For this analysis, *minority* populations include all racial groups other than white (defined as not Hispanic or Latino), and *low-income* populations include those living below poverty.

7.2.3 What are the existing conditions related to social policy in the study area?

This section describes the existing conditions related to community cohesion, community welfare, population growth, and minority and low-income in the study area that could be affected by construction and operation of the proposed action.

7.2.3.1 Community Cohesion

This section describes existing dividing elements, such as railroads, highways, and industrial facilities not accessible to the public, near the project site, along the PS&P rail line, and along the shoreline of Grays Harbor.

Project Site

The project site is located within the city limits of Hoquiam and Aberdeen along the industrial waterfront at the Port. Land on and directly surrounding the project site is designated and zoned for industrial use (Chapter 3, Section 3.8, *Land and Shoreline Use*). The industrial area extends several miles north and south of the project site along the shoreline. The PS&P rail line borders this industrial area to the north and east, dividing the industrial area from high-density residential, recreational, and other uses to the north and northeast. The rail line and industrial area are dividing elements near the project site in that they separate these residential areas from the Grays Harbor shoreline. However, physical and visual access to Grays Harbor is provided via the 28th Street Boat Ramp and Viewing Tower located north of the project site.

US Route 101 (US 101) is north of the project connecting Hoquiam to the west and Aberdeen to the east. Local road access to the project site is provided via Port Industrial Road at the intersection with West 1st Street.

PS&P Rail Line

The PS&P rail line links the densely populated cities of Hoquiam and Aberdeen (to the west) and Centralia (to the south and east), largely following the Chehalis River; in between, development is much less dense. Land uses mostly consist of agricultural fields and forested open space interspersed with smaller cities and communities, including (west to east) Junction City, Central Park, Alder Grove, City of Montesano, Brady, Satsop, City of Elma, Malone-Porter, City of Oakville, the Chehalis Reservation, Rochester, Grand Mound, and Fords Prairie (Chapter 2, *Proposed Action and Alternatives*, Figure 2-1).

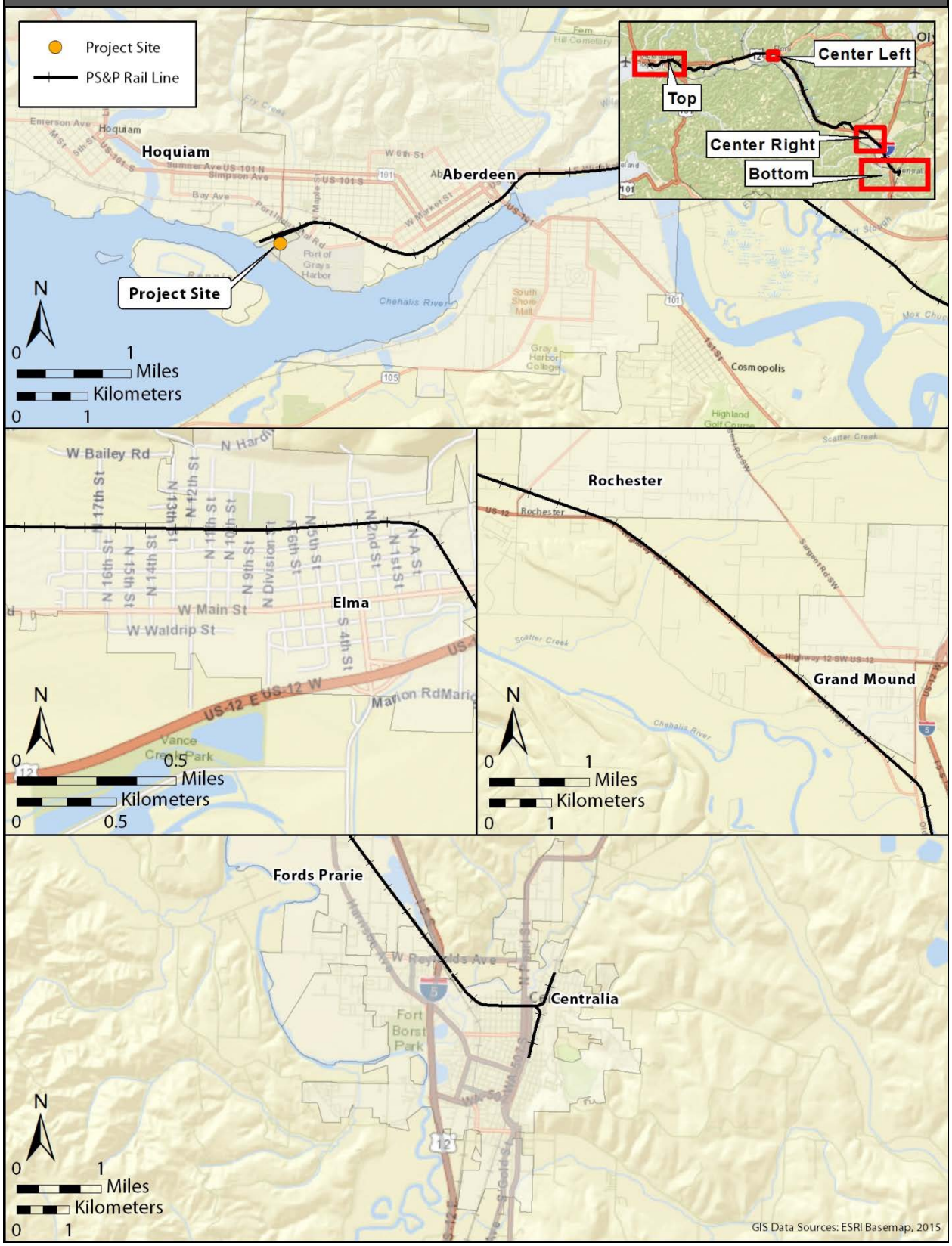
[5] For comparison, the U.S. Environmental Protection Agency considers impacts on minority populations to be disproportionate if the minority population exceeds 50% of the study area population or if the minority population percentage of the study area is meaningfully greater than the minority population percentage in the general population or the reference area the study area (Council on Environmental Quality 1997).
[6] The study area spans three counties; the census block groups were evaluated against the county in which they are located.

The PS&P rail line travels along the outskirts of most communities; however, it intersects Centralia, Fords Prairie, Ground Mound, Rochester, Elma, and Aberdeen, where it divides portions of these communities. When a train is traveling through this corridor, access from one side of the town to the other can be temporarily blocked. With the exception of impacts in Aberdeen, the delay typically lasts the duration of the train passing (approximately 3 minutes with some periods of longer delay in Centralia due to slower speed restrictions).

Elsewhere along the rail line are additional locations where access is completely blocked by a passing train, meaning there are no alternative routes. These access limitations are summarized below (Figure 7-1).

- In Centralia, from north to south, the PS&P rail line cuts through an industrial district, crosses the Skookumchuck River, and traverses a variety of mid- to high-density residential and commercial uses. Interstate 5 also runs north-south along the western side of the city.
- In Fords Prairie, the PS&P rail line runs through the northern part of the city, bisecting a large commercial complex from some scattered residential development. During the passing of the train, access into the warehouse area to the north is temporarily blocked.
- In the Rochester and Grand Mound area, the PS&P rail line bisects scattered residential areas with most development occurring to the north of the rail line. Some isolated areas, including primarily agricultural development and rural residential uses, are temporarily blocked from access when trains pass.
- From Rochester to Elma, access is temporarily limited in some scattered areas. These areas mostly consist of agricultural development and rural residential land uses.
- In Elma, the PS&P rail line runs through the length of the community and separates the northern portions, primarily residential development, from the more concentrated residential and commercial development to the south. When a train is passing, access to the Lloyd Murray Park is temporarily blocked.
- From Elma into Aberdeen, a passing train temporarily blocks access to some smaller groupings of residential land uses.
- In Aberdeen, the PS&P rail line mostly splits industrial uses to the south and most other uses (mainly commercial and residential) to the north. East of the Wishkah River; however, the rail line divides residential and commercial uses on the north from a popular commercial area (Olympic Gateway Plaza) on the south. When a train is passing, access into the Olympic Gateway Plaza is blocked (Chapter 3, Section 3.16, *Vehicle Traffic and Safety*).

Figure 7-1. Communities Intersected by the PS&P Rail Line



Grays Harbor

Lands surrounding Grays Harbor are relatively sparsely populated outside of the cities and communities. Communities along the harbor include Cosmopolis, Westport, Cohassett Beach, and Ocean Shores. General land uses surrounding the harbor include residential, industrial, commercial, transportation/communications/utilities, recreation, resource production (i.e., agriculture, fishing, and mining activities and designated forest land), and undeveloped land (Chapter 3, *Affected Environment, Impacts, and Mitigation*, Figure 3.8-1). Generally, development is more concentrated on the eastern and western sides of the harbor and most undeveloped land is located along the northern and southern sides.

Grays Harbor encompasses many recreational areas, including several state and local parks and designated wildlife areas. Fishing, shellfishing, bird and wildlife viewing, hiking, and boating are popular recreational activities throughout the harbor. Most of Grays Harbor's recreational areas are on the western half of the harbor in and near the northern and southern peninsulas.

Besides the industrial area along the eastern end of the harbor in which the project site is located and along where the rail line runs, there are no major dividing elements along the Grays Harbor shoreline. Although present, US 101 and State Route 109 (SR 109) are not dividing elements because they are accessible from local roadways.

As described in Chapter 3, Section 3.17, *Vessel Traffic*, Grays Harbor experiences many forms of vessel activity, including large commercial vessels that transit the harbor via the Grays Harbor Navigation Channel destined for Port terminals and other private wharves further east along the Chehalis River. Commercial fishing vessels also tend to congregate along the navigation channel east of the Hoquiam River, and recreational fishing and pleasure boats move throughout the harbor, mostly in the summer. The navigation channel could be considered a dividing element among commercial fishers and recreationalists using the harbor, because the latter vessels must make way for the large commercial vessels whose transit through the harbor is restricted to the navigation channel. As noted in Chapter 3, Section 3.10, *Recreation*, Section 3.12, *Tribal Resources*, and 3.17, *Vessel Traffic*, existing deep-draft vessel traffic currently does cause some disruption to recreation boaters and fishers and tribal and commercial (treaty and nontreaty tribal) fishing.

7.2.3.2 Community Welfare

Community welfare analysis identifies the factors that influence the existing sense of welfare in the study area, such as living in a healthy and safe environment and relatively easy access to public amenities and services.

Project Site

As noted in Chapter 3, *Affected Environment, Impacts, and Mitigation*, in general, project site does not have significant documented concerns with air quality or water quality. Easy access to the harbor and the Chehalis River provides recreational and commercial opportunities. There are also recreational facilities and public facilities in Hoquiam and Aberdeen, such as ballparks, boat launches, restaurants, and other businesses. However, closest to the project site, there are areas that experience some exposure to increased noise and environmental health and safety risks associated with the existing industrial facilities. These land uses are described in Chapter 3, Section 3.8, *Land and Shoreline Use*.

PS&P Rail Line

The PS&P rail line links the densely populated cities of Hoquiam and Aberdeen (to the west) and Centralia (to the south and east), largely following the Chehalis River. In between, land uses generally consist of agricultural fields and forested open space interspersed with smaller cities and communities. In general, environmental conditions along the PS&P are good. There are no known concerns with air quality or water quality. There are numerous recreational facilities and public facilities in the cities along the rail line. However, residents are exposed to noise and environmental health and safety risks associated with existing rail operations, primarily related to train horn noise and some risks of incidents. Existing noise conditions are discussed in Chapter 3, Section 3.7, *Noise and Vibration*, and existing safety risks are addressed in Chapter 4, *Environmental Health and Safety*. Additionally, there are areas where rail operations result in increased vehicle delay and limited vehicle access, primarily in East Aberdeen and around the project site. These limitations are discussed in Section 7.2.3.1, *Community Cohesion*, and in Chapter 3, Section 3.16, *Vehicle Traffic and Safety.*

Grays Harbor

As described in Section 7.2.3.1, *Community Cohesion*, lands surrounding the harbor are relatively sparsely populated outside of the cities and communities. In general, environmental conditions around the harbor are good. There are no known concerns with air quality or water quality. There are numerous recreational facilities and public facilities in the surrounding cities. Views of Grays Harbor are relatively intact and are available from land- and water-based vantages. Numerous recreational and wildlife areas are located around the bay with views of the water. Additionally, water-based views are available from recreational, commercial, and industrial vessels. Views in the region vary based on viewers' location in the landscape. Many views are of high visual quality, featuring the harbor and rivers, tidal areas, forested hillsides, and relatively low levels of development. However, other views are somewhat degraded and include industrial operations and infrastructure juxtaposed against the forested hillsides and waterfront.

The shoreline of Grays Harbor provides opportunities for hiking, biking, picnicking, wildlife viewing, bird watching, and hunting at the numerous state and city parks and designated wildlife areas that surround the harbor. Miles of public shoreline with multiple public access options provide opportunities for beachcombing and shellfishing; public boat launches provide access for recreational fishing and boating. Wave riding and surfing are other popular activities near the south jetty.

However, there is increased exposure to some risks associated with existing vessel operations. This includes the low potential for incidents, as discussed further in Chapter 4, *Environmental Health and Safety*, and some low level of disturbance to recreational boaters, commercial fishers, and tribal fishers in the study area, as discussed in greater detail in Chapter 3, Section 3.10, *Recreation*, Section 3.12, *Tribal Resources*, and Section 3.17, *Vessel Traffic*.

7.2.3.3 Population Growth

This section describes recent population growth in the study area. As noted in Section 7.1.3.1, *Regional Population*, Washington State's population increased between 2000 and 2012 by 17% and Grays Harbor County's population increased by 6.7% (Table 7-9). Over the same period, population increased in most of the cities and communities in the study area. The exceptions are Hoquiam

(-2.9%), Westport (-5.0%), Junction City (-77.5%), Elma (-0.6%), and Fords Prairie (-0.1%) (Table 7-9).

Table 7-9. Population Growth[a] in Washington, Grays Harbor County, and Surrounding Communities (2000 and 2012)

Population	2000	2012	Percentage Change
Hoquiam	8,987	8,726	-2.9
Aberdeen	16,461	16,896	2.6
Westport	2,137	2,030	-5.0
Ocean Shores	3,836	5,584	45.6
Cosmopolis	1,595	1,600	0.3
Junction City	80	18[a]	-77.5
Central Park	2,558	2,685[a]	5.0
Montesano	3,312	3,976	20.0
Brady	645	676[a]	4.8
Satsop	619	675[a]	9.0
Elma	3,049	3,030	-0.6
Malone-Porter	473	1,825[a]	285.8
Oakville	233	663	184.5
Rochester	1,829	2,388[a]	30.6
Grand Mound	1,948	2,981[a]	53.0
Fords Prairie	1,961	1,959	-0.1
Centralia	14,742	16,611	-13
Study area communities total	51,723	57,725	11.0
Grays Harbor County	67,194	71,692	6.7
Washington	5,894,121	6,897,012	17.0

Source: U.S. Census Bureau 2013 unless otherwise noted.
[a] U.S. Census Bureau 2010.

7.2.3.4 Minority and Low-Income Populations

This section identifies minority and low-income populations in the study area based on the census block group data (U.S. Census Bureau 2014c). Of the 57 census block groups in the study area, 31 have minority populations that exceed their respective county levels (minority populations account for 19.1% of the Grays Harbor population, 14.4% of the Lewis County population, and 21.9% of the Thurston County population), ranging from 15.5 to 56.8% of the total population. Table 7-10 presents the average percentage of populations for each element of the study area, project site, PS&P rail line, and Grays Harbor, compared to area counties. Appendix P, *Census Block Group Data*, presents minority and poverty data for each block group in the study area.

In addition, 25 of the 57 census block groups in the study area have low-income populations that exceed their respective county levels (low-income populations account for 19.0 % of the Grays Harbor population, 15.4% of the Lewis County population, and 11.7% of the Thurston County population), ranging from 17.0 to 57.6%. This information is also summarized in Table 7-10 with more information for all census block groups presented in Appendix P, *Census Block Group Data*.

Overall, 39 of the 57 census block groups in the study area are considered minority and/or low-income populations for the purposes of this analysis (Figure 7-2). Relative to the project site, PS&P rail line, and Grays Harbor shoreline, these populations occur as follows.[7]

- Nearest the project site, all three of the census block groups are minority and/or low income.
- Along the PS&P rail line, 31 of the 43 (or 72%) census block groups are minority and/or low income. These populations occur along almost the entire length of the line with the exception of a small portion of Rochester (in Thurston County) and the area between Satsop and Montesano.
- Along the shoreline of Grays Harbor, 15 of the 22 (or 68%) census block groups are minority and/or low income, primarily concentrated around Ocean Shores, Hoquiam, Aberdeen, Cosmopolis, and along the southern shore of the harbor.

[7] Some census block groups are considered with respect to more than one of the study area features (i.e., project site, PS&P rail line, and Grays Harbor shoreline).

Table 7-10. 2013 Minority Populations and Poverty Status

Census Block Groups or Area	Average Percentage of Population that is a Minority Population	Comparison to Grays Harbor County Average Minority Population	Comparison to Lewis County Average Minority Population	Comparison to Thurston County Average Minority Population	Comparison to Washington State Average Minority Population	Average Percentage of Population Below Poverty Level[a]	Comparison to Grays Harbor County Average Low-Income Population	Comparison to Lewis County Average Minority Population	Comparison to Thurston County Average Low-Income Population	Comparison to Washington State Average Low-Income
Study area	20.0	0.9% higher	5.6% higher	1.9% lower	2.7% lower	17.8	1.2% lower	2.4% higher	6.1% higher	1.4% lower
Project site	26.9	7.8% higher	12.5% higher	5.0% higher	4.2% higher	31.6	12.6% higher	16.2% higher	19.9% higher	12.4% higher
PS&P rail line	21.1	2.0% higher	6.7% higher	0.8% lower	1.6% lower	18.1	0.9% lower	2.7% higher	6.4% higher	1.1% lower
Grays Harbor shoreline	21.6	2.5% higher	7.2% higher	0.3% lower	1.1% lower	21.1	2.1% higher	5.7% higher	9.4% higher	1.9% higher
Grays Harbor County	19.1	--	4.7% higher	2.8% lower	3.6% lower	19.0	--	3.6% higher	7.3% higher	0.2% lower
Lewis County[b]	14.4	4.7% lower	--	7.5% lower	8.3% lower	15.4	3.6% lower	--	3.7% higher	3.8% lower
Thurston County	21.9	2.8% higher	7.5% higher	--	0.8% lower	11.7	7.3% lower	3.7% lower	--	7.5% lower
Washington State	22.7	3.6% higher	8.3% higher	0.8% higher	--	19.2	0.2% higher	3.8% higher	7.5% higher	--

Table includes average percentage of populations for each element of the study area, project site, PS&P rail line, and Grays Harbor, compared to area counties.

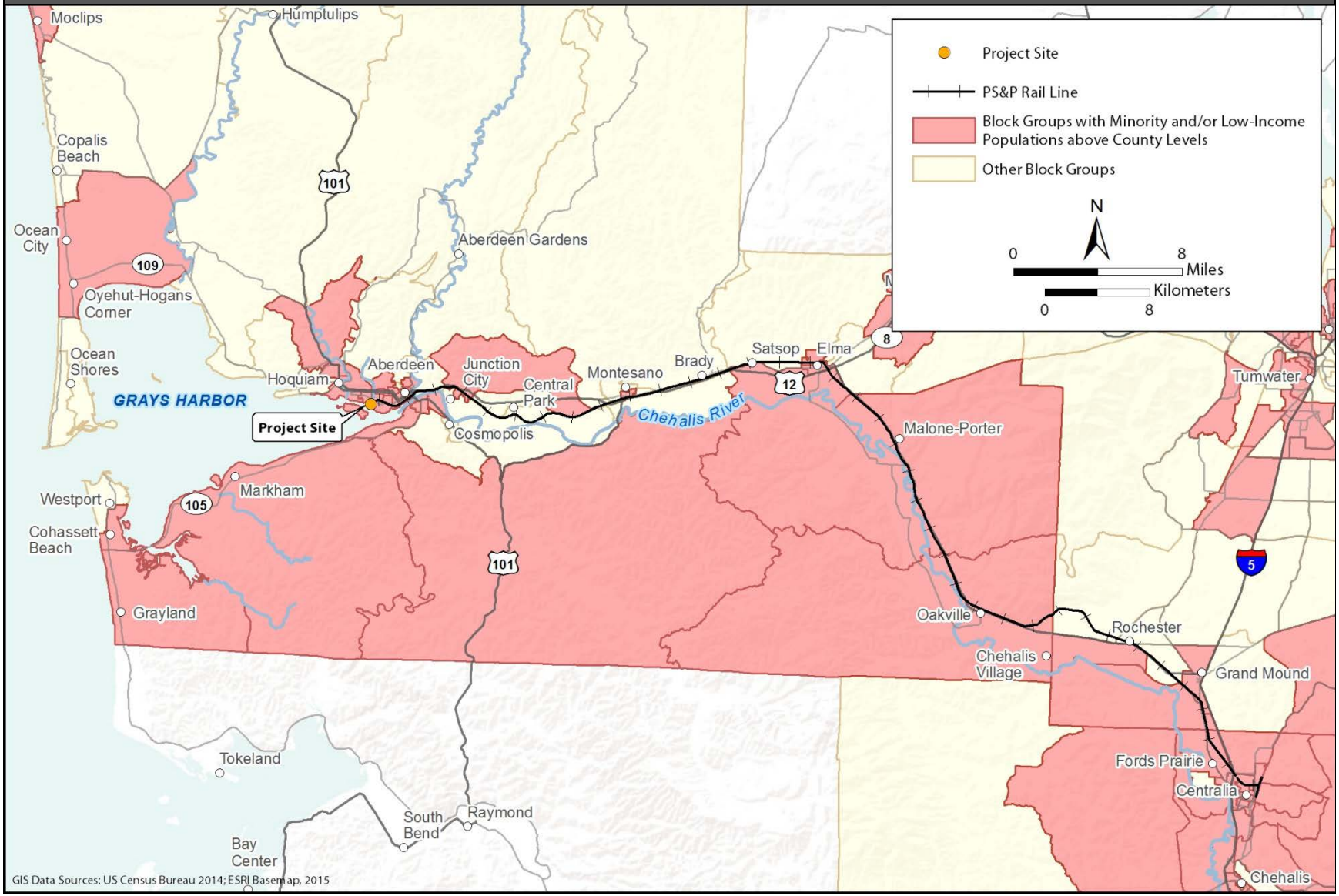
[a] Percentage of individuals with incomes below poverty level, as established by the U.S. Census Bureau.

[b] Lewis County numbers are provided for comparison with census block groups in and near Centralia.

[c] Thurston County numbers are provided for comparison with census block groups in and near Rochester and Grand Mound.

Source: U.S. Census Bureau 2014c

Figure 7-2. Minority and Low-Income Populations in the Study Area



7.2.4 What are the potential impacts on social policy?

This section describes impacts on social policy that could occur in the study area. Potential impacts of the no-action alternative are described first, followed by potential impacts of the proposed action.

7.2.4.1 No-Action Alternative

Under the no-action alternative, the applicant would continue to operate its existing facility as described in Section 2.1.3.2, *Existing Operations*. Although the proposed action would not occur, it is assumed that growth in the region would continue under the no-action alternative. This growth could lead to development of another industrial use at the project site, which could result in impacts similar to those described construction and operation of the proposed action. However, for the purposes of this analysis, it is assumed that no future development would occur at the project site. Rail and vessel traffic projection for 2017 and 2037 described in Section 3.15, *Rail Traffic*, and Section 3.17, *Vessel Traffic*, respectively, are considered in the potential impacts below.

7.2.4.2 Proposed Action

This section describes the impacts that could occur in the study area as a result of construction and operation of the proposed action. First, this section describes impacts from construction of the proposed action. It then describes impacts of operation at the project site and of rail and vessel transport to and from the project site.

Construction

Community Cohesion

The project site is located in an existing industrial area and construction of the proposed action would not bisect, disrupt, or isolate any established communities or change the existing community character, nor would it require relocating any residences or businesses. As described in Chapter 3, Section 3.16, *Vehicle Traffic and Safety*, transport of materials and workers to and from the project site during construction is not expected to result in a substantial increase in traffic that could adversely affect the level of service of area roadways. Moreover, increased traffic related to construction of the proposed action would occur over a relatively short period (approximately 10 to 12 months for each phase).

Community Welfare

Construction of the proposed action would affect community welfare if it were to substantially degrade air quality, increase noise, reduce access to parks and recreational uses, or reduce property values.

As described in Chapter 3, Section 3.2, *Air*, construction of the proposed action would result in emissions of criteria pollutants; however, these emissions are not expected to cause a significant contamination of the air and are unlikely to affect sensitive receptors surrounding the project site. Construction of the proposed action could result in emissions of toxic air pollutants, primarily associated with diesel particulate matter, a known human carcinogen. The construction-related emissions would be short-term and intermittent, with total diesel particulate matter emissions of less than 0.17 ton per year, which would be less than 0.2% of total 2011 diesel particulate matter

emissions for Grays Harbor County (9.5 tons per year) (Washington State Department of Ecology 2014). Off-site exposure would likely be well below any level of concern based on the level considered acceptable for permitting new stationary sources of toxic air pollutants in Washington State.

As discussed in Chapter 3, Section 3.7, *Noise and Vibration*, construction of the proposed action would result in a temporary increase in daytime[8] noise and vibration from construction equipment operations. While construction noise would likely be audible in nearby residential areas and recreational uses, the levels would relatively low level and are not expected to adversely affect the surrounding these areas.

As described in Chapter 3, Section 3.10, *Recreation*, construction activities, including the transport of workers and materials to the project site, would not disrupt access to nearby recreation uses, including the 28th Street Boat Ramp and Viewing Tower.

Construction can also affect community welfare by temporarily lowering property values during construction. Specifically, potential buyers may find a property less attractive if views are altered by the visible and audible presence of construction equipment and activity. However, as noted in Chapter 3, Section 3.9, *Aesthetics, Light, and Glare*, views of the project site by residents are relatively limited and consist of elements that are already industrial in nature (e.g., large storage tanks, rail-loading equipment).

Population Growth

Construction of the proposed action could affect population growth, housing, or relocation if construction workers were to move from outside of the area. Because the period of construction is relatively short (10 to 12 months for each phase), it is expected that construction workers would commute from nearby communities. Therefore, construction of the proposed action would not result in the permanent relocation of workers from outside the study area, displacement of local residents, or the requirement for additional housing.

Minority and Low-Income Populations

As shown in Table 7-10, minority and low-income populations in the census block groups near the project site are much higher (7.8 and 12.6%, respectively) than Grays Harbor County levels. Because construction-related impacts described above would be relatively low and would only last during the construction period, construction of the proposed action is not anticipated to significantly and adversely affect these populations.

Operations

Community Cohesion

Operation of the proposed action would affect community cohesion if activities were to bisect, disrupt, or isolate any established communities or change the existing community character, such as by requiring the relocation of residences or businesses.

[8] No nighttime construction is proposed.

Onsite

Onsite operation of the proposed action would not require acquisition of new properties that would require relocating any residences or businesses, nor would it change the existing community character. The project site is located in an existing industrial area and the proposed facility is consistent with the existing facility at the project site.

Onsite operation of the proposed action would affect community cohesion if it were to block or obstruct access to important community resources. Although onsite activities would occur within the boundaries of the existing industrialized site, loading of tank vessels at the Terminal 1 dock could disrupt fishing activities adjacent to the dock.

As described in Chapter 3, Section 3.12, *Tribal Resources*, and Section 3.17, *Vessel Traffic*, onsite operations would reduce access to fishing areas immediately adjacent to the dock as result of increased frequency of vessels docked at the Terminal 1 berth.

As described in Chapter 3, Section 3.16, *Vehicle Traffic and Safety*, onsite operation of the proposed action would result in additional employee vehicle trips to and from the project site. However, this increase would be minimal and would not noticeably affect surrounding roadways. Operations related to bringing rail cars onto the project site are addressed below under *Rail*.

Although there would be increased development and activity under the proposed action, the project site and surrounding area are already developed for industrial uses. In general, the increased activity occurring at the project site would be similar to the no-action alternative.

Rail

As described in Chapter 3, Section 3.15, *Rail Traffic*, operation of the proposed action at maximum throughput would add approximately 1.25 trips[9] per day on average (458 per year maximum) along the PS&P rail line to approximately three train trips per day (1,100 per year) under the no-action alternative. Although the PS&P rail line is an existing facility, the increased traffic associated with the proposed action would affect community cohesion if it were to block or obstruct access to important community resources.

As discussed for existing conditions, the rail line is one of the primary dividing elements in the study area, especially in Centralia, Fords Prairie, Ground Mound, Rochester, Elma, Aberdeen, and Fords Prairie. Existing rail traffic already causes vehicle delay and temporary access limitations in these communities.

Increased unit train traffic related to the proposed action would result in increased occupancy of PS&P rail line grade crossings (Chapter 3, Section 3.15, *Rail Traffic*). As noted in Chapter 3, Section 3.16, *Vehicle Traffic and Safety*, these areas would result in increases in vehicle delay along the rail line. However, for the majority of the line (between Centralia and Aberdeen), although there would be an increase in the total number of minutes each grade crossing would be blocked for an average 24-hour period, the actual traffic impacts (level of service) would not notably worsen. This is primarily because existing (and future) vehicle traffic is projected to remain relatively low along the PS&P rail line. In other words, for an average driver, the chances of encountering and having to wait for a passing train would not notably change compared to the no-action alternative. However, as noted in Section 3.16, there are locations in Aberdeen and Hoquiam where vehicle delay and

[9] A trip represents one-way travel; in other words, an inbound trip and an outbound trip are counted as two trips.

access would notably worsen. As described in Section 3.15, *Rail Traffic*, this has to do with switching activity (i.e., delivering and removing trains from the project sites). Vehicles at grade crossings in Aberdeen would experience the most substantial increase in average vehicle delay with the addition of the proposed action trains (Chapter 3, Section 3.16, *Vehicle Traffic and Safety*, Table 3.16-5). These grade crossings are located in two general areas.

- **Port of Grays Harbor area:** Average and peak-hour vehicle delay would worsen at several crossings in the Port area due to switching operations at the Poynor Yard to break down unit trains and the delivery of the rail cars across Industrial Road to the project site, as described in Section 3.16.While no crossings would drop below LOS D under average conditions, Washington Street would degrade below LOS D under peak-hour conditions
- **Olympic Gateway Plaza area:** Average vehicle delay would worsen in the Olympic Gateway Plaza area with the proposed action. Delays at grade crossings blocked by activities at the Poynor Yard under existing conditions would lengthen with the addition of proposed action trains (Section 3.16). The level of service would degrade below LOS D at the East Heron Street and Newell Street crossings (the western-most crossings in the plaza area).

As further noted in Section 3.16, emergency vehicle delay would also increase with the proposed action and crossing providing access to the above areas in Aberdeen would be blocked during switching operations. The communication and response procedures for providing emergency access to the Olympic Gateway Plaza area if a train is blocking all crossings, described in Section 3.16, would also apply under the proposed action. The alternative route described in Section 3.16 for accessing the Port area would also apply under the proposed action; and the proposed mitigation measure would ensure that the fire departments are able to use this alternative route to access blocked areas.

Vessel

Operation of the proposed action at maximum throughput would add 238 tank vessel trips per year (0.7 trip per day on average) along the navigation channel to projected large commercial vessel trips under the no-action alternative—between 338 and 436 large commercial vessel trips per year in 2017 and 2037, respectively, or approximately one trip per day on average (Section 3.17, *Vessel Traffic*).

Although the navigation channel is an existing transportation route, the increased traffic associated with the proposed action would affect community cohesion, if it were to block or obstruct access to important community resources. Because vessel operations are far from the shore, impacts on community cohesion related to increased vessel traffic would be limited to in-water uses. As described in Chapter 3, Section 3.10, *Recreation*, recreational fishing and pleasure boating occurs throughout the harbor and these vessels would be required to move out of the way of the tank vessels transiting the harbor via the navigation channel. Recreational fishing and pleasure boating occurs throughout the harbor and the small vessel could easily navigate away from tank vessels in transit. As described in Chapter 3, Section 3.12, *Tribal Resources*, and Section 3.17, *Vessel Traffic*, increased vessel traffic would disrupt commercial fishing and tribal fishing that occurs along the navigation channel. Transiting vessels related to the proposed action would limit the timing, duration, and physical area that could be fished. Proposed mitigation providing advance notice of incoming vessels related to the proposed action could help reduce potential conflicts, but the proposed action would still likely result in some community cohesion impacts related to these users.

Community Welfare

Operation of the proposed action would affect community welfare if it were to substantially degrade air quality, increase noise, reduce access to parks and recreational uses, reduce property values, or affect environmental health and safety.

Onsite

As described in Chapter 3, Section 3.2, *Air*, onsite operation of the proposed action would result in emissions of criteria air pollutants from stationary sources (e.g., emissions from storage tank cleaning, combustion of vapors from vessel loading) and from mobile sources (e.g., emissions from rail locomotives and vessel engines that would occur onsite), with the most potentially problematic air pollutant being nitrogen oxides (NO_X). Onsite operation of the proposed action would also result in emissions of toxic air pollutants, which would all be under regulated standards. Onsite operations of the proposed action are not expected to result in increased air emissions that would adversely affect the surrounding community.

As discussed in Chapter 3, Section 3.7, *Noise and Vibration*, noise and vibration levels related to onsite operations are anticipated to be similar to levels generated by other industrial sources and would not result in substantial increases that would be noticeable to surrounding recreational and residential uses. The impacts of air and noise emissions related to the movement of rail cars onto and off the project site are described under *Rail*.

As described in Chapter 3, Section 3.10, *Recreation*, onsite operations would occur entirely within the boundaries of the project site and would not block access to offsite recreational facilities. Increased tank vessel calls under the proposed action would increase the number of days that a vessel would occupy the Terminal 1 berth. Impacts on recreational fishing and pleasure boats would be low because boaters could access other boating and fishing areas throughout the harbor. Potential impacts on community welfare related to commercial and tribal fishers are discussed under *Vessel.*

Onsite operations could also affect local communities as the result of the increased onsite risks compared to the no-action alternative. The increased likelihood of an onsite incident and the potential consequences (e.g., release of crude oil) are described in Chapter 4, Section 4.4, *Environmental Health Risks—Terminal (Onsite)*.

As discussed in Chapter 4, there are regulatory requirements for prevention of, preparedness for, and response to incidents involving the release of crude oil, and mitigation measures are recommended to reduce potential impacts. However, no mitigation measures would completely eliminate the possibility of a spill, fire, or explosion, nor would they completely eliminate the adverse consequences of a spill, fire, or explosion. Depending on the location of the incident, amount spilled, type of crude oil, and environmental conditions, such as the time of year, water flows, and weather conditions, the potential adverse environmental impacts could be significant.

The potential impacts, including those affecting human health, are described in Section 4.7, *Impacts on Resources*. Potential social and economic costs related to the proposed action, including potential impacts on property values, are discussed in Section 7.3.3, *What are the costs of the proposed action?*

Rail

As described in Chapter 3, Section 3.2, *Air*, onsite operations related to the proposed action are not anticipated to result in any exceedance of applicable air quality standards that could affect human health. Although there would be some increases in diesel particulate matter emissions related to the proposed action, primarily in the areas where switching activities would occur (around the project site and in Poynor Yard), the extent of the risk is considered less than significant. See Section 3.2, *Air*, for more information about the analysis of air toxics along the PS&P rail line.

As described in Chapter 3, Section 3.7, *Noise and Vibration*, increased frequency of rail traffic and the associated routine operational activities would increase average daily noise levels primarily related to horns sounding at crossings for safety. This increased noise could result in impacts considered severe on sensitive receptors under FRA/FTA criteria. These impacts would occur near eight grade crossings, representing approximately 33 total receptors with up to approximately eight receptors affected at any one grade crossing.

Section 3.7 proposes a mitigation measure to have the applicant fund and support a process for the affected communities to establish quiet zones under the FRA regulations. Where implemented, quiet zones would eliminate horn soundings from all trains and eliminate potential severe impacts on receptors. Where not implemented, train horns would continue to sound for safety at the grade crossings identified in Section 3.7, and the potential for exposure to severe impacts the crossings would remain.

As described in Section 3.10, *Recreation*, access to one study area park—Morrison Riverfront Park—would be blocked more often and for longer periods due to switching operations related to proposed action trains.

Increased rail traffic related to the proposed action could also affect local communities as the result of the increased rail risk compared to the no-action alternative. The increased in likelihood of an incident (e.g., derailment) and the potential consequences (e.g., release of crude oil) are discussed in Chapter 4, Section 4.5, *Environmental Health Risks—Rail Transport*. As discussed in Chapter 4, there are regulatory requirements for prevention of, preparedness for, and response to incidents involving the release of crude oil, and mitigation measures are proposed to reduce potential impacts. However, no mitigation measures would completely eliminate the possibility of a spill, fire, or explosion, nor would they completely eliminate the adverse consequences of a spill, fire, or explosion. Depending on the location of an incident, amount spilled, type of crude oil, and environmental conditions, such as the time of year, water flows, and weather conditions, the potential adverse environmental impacts could be significant.

Section 4.7, *Impacts on Resources*, describes the types of impacts that could occur, including impacts on human health and the natural and built environment. Any of these impacts, should they occur, could affect community welfare. Moreover, the perceived risk of potential impacts could shape perception of the communities in the study area as unsafe, unhealthy, or undesirable. The potential social and economic costs related to the proposed action, including potential impacts on property values, are discussed in Section 7.3.3, *What are the costs of the proposed action?*

Vessel

As described in Chapter 3, Section 3.2, *Air*, emissions from vessel traffic related to the proposed action would not adversely affect public health because the emissions from transiting vessels do not affect the shoreline.

As described in Chapter 3, Section 3.7, *Noise and Vibration,* increased noise from vessel traffic related the proposed action is anticipated to be within levels similar to existing conditions and would not result in substantial increases that would be noticeable to surrounding recreational and residential uses.

As described in Chapter 3, Section 3.10, *Recreation*, Section 3.12, *Tribal Resources*, and Section 3.17, *Vessel Traffic*, increased tank vessel traffic along the navigation channel under the proposed action would result in some conflict with commercial fishing, tribal fishing and recreational vessels accessing the harbor via the 28th Street Boat Ramp and Viewing Tower. As noted in Section 3.10, recreational impacts are anticipated to be minimal; however, increased vessel activity related to the proposed action could affect community welfare related to commercial and tribal fishing, as described in Sections 3.12 and 3.17. Implementation of the proposed mitigation measures identified in these sections could reduce these impacts.

Increased vessel traffic related to the proposed action could also affect local communities as the result of increased vessel risk compared to the no-action alternative. The increased likelihood of a vessel incident (e.g., vessel collision) and potential consequences (e.g., release of crude oil) are described in Chapter 4, Section 4.6, *Environmental Health Risks—Vessel Transport*.

As discussed in Chapter 4, there are regulatory requirements for prevention of, preparedness for, and response to incidents involving the release of crude oil, and mitigation measures are proposed to reduce potential impacts. However, no mitigation measures would completely eliminate the possibility of a spill, fire, or explosion, nor would they completely eliminate the adverse consequences of a spill, fire, or explosion. Depending on the location of an incident, amount spilled, type of crude oil, and environmental conditions, such as the time of year, water flows, and weather conditions, the potential adverse environmental impacts could be significant. Section 4.7, *Impacts on Resources*, describes the types of impacts that could occur, including impacts on human health and the natural and built environment. Any of these impacts, should they occur, could affect community welfare. Moreover, the perceived risk of potential impacts could shape the perception that the communities in the study area as unsafe, unhealthy, or undesirable. The potential social and economic costs related to the proposed action, including potential impacts on property values, are discussed below in Section 7.3.3, *What are the costs of the proposed action?*

Population Growth

Operation of the proposed action would have a limited potential to affect population demographics primarily associated with the creation of an estimated 36 direct jobs in Grays Harbor County. Although some of these jobs could be filled by new residents moving into the area, it is more likely they would be filled by current residents or by workers living outside the area (as would likely be the case with rail and vessel operators). Some additional indirect and induced jobs would also be created (estimated 73 additional jobs) throughout the county; however, the population is unlikely to increase noticeably to meet this need. Therefore, impacts of operation of the proposed action related to population growth—permanent relocation of workers from outside the study area, displacement of local residents, and the requirement for additional housing—would be low.

Minority and Low-Income Populations

Onsite

As shown in Table 7-10, minority and low-income populations in the census block groups near the project site are higher (7.8 and 12.6%, respectively) than Grays Harbor County levels. However, as noted above, potential impacts from routine onsite operations are not anticipated to result in significant environmental impacts and would, therefore, not be expected to significantly adversely affect minority and low-income populations around the project site.

As discussed in Chapter 4, there is a potential for increased risk of oil spills, fires, or explosions that could result in environmental impacts affecting these populations. As discussed in Chapter 4, there are regulatory requirements for prevention of, preparedness for, and response to incidents involving the release of crude oil, and mitigation measures are recommended to reduce potential impacts. However, no mitigation measures would completely eliminate the possibility of a spill, fire, or explosion, nor would they completely eliminate the adverse consequences of a spill, fire, or explosion. Depending on the location of the incident, amount spilled, type of crude oil, and environmental conditions, such as the time of year, water flows, and weather conditions, minority and low-income populations near the project site could be disproportionately affected. This would also include the potential for impacts related to decreased property values from the perception of increased risks as discussed in Section 7.3.4.2*, Potential Costs Related to Environmental Health and Safety Concerns*.

Although it is not possible to determine the specific outcome of any one event, any event that might adversely affect fisheries or natural resources within the harbor would cause impacts on tribal resources; namely, the Quinault Indian Nation's Usual & Accustomed Fishing Rights and the Chehalis Tribe recreational shellfish area. For additional details about impacts on tribal resources, see Section 3.12, *Tribal Resources.*

Rail

As discussed in Section 7.2.3.4, *Minority and Low-Income Populations,* 31 of the 43 census block groups along the PS&P rail line are considered minority and/or low-income populations for the purposes of this analysis. These populations occur primarily along the entire rail corridor with the exception of a small area near Rochester and between Satsop and Montesano.

As discussed in Chapter 3, Section 3.2, *Air*, increased rail traffic related to the proposed action would result in increases in air emissions. However, as discussed in that section, emissions are not anticipated to be high enough to materially affect the air quality in the air basin or Grays Harbor County. Additionally, the potential for increased rail traffic to result in localized exposure to potentially hazardous air pollutants would be low and would therefore, not result in disproportionate impacts.

As discussed in Chapter 3, Section 3.7, *Noise and Vibration,* there would be increases in noise along the rail line, primarily related to increase horn noise at grade crossings. These impacts are distributed relatively evenly along the line but would affect a greater number of individuals where the residential development occurs closest to the line. As shown in Figure 7-1, the census block groups are large and extend relatively far from the rail line. The impacts of increased horn noise are anticipated to affect only the first or second row of buildings from the rail line. While it is not possible to determine the status of individual residents, it is possible that minority and low-income

populations closest to the rail line could be disproportionately affected by increases in noise depending on the proximity of noise-sensitive receptors (residents) to the line.

As discussed in Chapter 3, Section 3.16, *Vehicle Traffic and Safety*, and noted above, increased rail traffic related to the proposed action could result in significant increases in delay at certain intersections, primarily around the project site and in East Aberdeen. These impacts could disproportionately affect minority and low-income populations in communities immediately surrounding the affected areas.

As discussed in Chapter 4, there is a potential for increased risk of oil spills, fires, or explosions that could result in environmental impacts that would affect these populations. As discussed in Chapter 4, there are regulatory requirements for prevention of, preparedness for, and response to incidents involving the release of crude oil, and mitigation measures are recommended to reduce potential impacts. However, no mitigation measures would completely eliminate the possibility of a spill, fire, or explosion, nor would they completely eliminate the adverse consequences of a spill, fire, or explosion. Depending on the location of the incident, amount spilled, type of crude oil, and environmental conditions, such as the time of year, water flows, and weather conditions, there is the potential for minority and low-income populations to be disproportionately affected. This would also include the potential for impacts related to decreased property values from the perception of increased risks as discussed in Section 7.3.4.2, *Potential Costs Related to Environmental Health and Safety Concerns*.

Vessel

As discussed in Section 7.2.3.4, *Minority and Low-Income Populations,* 15 of the 22 census block groups along the Grays Harbor shoreline are considered minority and/or low-income populations for the purposes of this analysis. These populations occur primarily in Ocean Shores, Hoquiam, Aberdeen, Cosmopolis, and along the entire southern shore of the harbor.

In general, the proportions of minority and low-income populations in the study area communities are higher than at the state and county level, with the most meaningful differences occurring closer to the project site and around the harbor. While any impacts could disproportionately affect minority and low-income populations, as stated previously, vessel-related impacts are anticipated to be relatively low with two exceptions: the potential for conflicts with tribal access to usual and accustomed fishing areas and the potential for environmental health and safety impacts. Impacts on tribal resources are discussed in Chapter 3, Section 3.12, *Tribal Resources*.

As discussed in Chapter 4, there is a potential for increased risk of oil spills, fires, or explosions that could result in environmental impacts that would affect these populations. As discussed in Chapter 4, there are regulatory requirements for prevention of, preparedness for, and response to incidents involving the release of crude oil, and mitigation measures are recommended to reduce potential impacts. However, no mitigation measures would completely eliminate the possibility of a spill, fire, or explosion, nor would they completely eliminate the adverse consequences of a spill, fire, or explosion. Depending on the location of the incident, amount spilled, type of crude oil, and environmental conditions, such as the time of year, water flows, and weather conditions, there is the potential for minority and low-income populations to be disproportionately affected. This would also include the potential for impacts related to decreased property values from the perception of increased risks as discussed in Section 7.3.4.2, *Potential Costs Related to Environmental Health and Safety Concerns*.

7.2.5 What mitigation measures would reduce impacts on social policy?

This section describes the applicant mitigation that would reduce impacts on social policy from construction and operation of the proposed action.

Mitigation measures to reduce impacts related to noise are presented in Chapter 3, Sections 3.7, *Noise and Vibration*.

Mitigation measures to reduce impacts on vehicle traffic and safety are presented in Chapter 3, Section 3.16, *Vehicle Traffic and Safety*.

Mitigation measures to reduce potential impacts related to increased risk of incidents and related consequences are presented in Chapter 4, *Environmental Health and Safety*.

7.2.5.1 Applicant Mitigation

The applicant will implement the following mitigation.

- The applicant will appoint a community liaison to consult with affected communities, businesses, and agencies; develop cooperative solutions to address local concerns; be available for public meetings; and conduct periodic public outreach. The applicant will provide the name, telephone number, and email address of the community liaison to mayors and other local officials in each community through which the PS&P rail line passes.
- The applicant will appoint a tribal liaison to assist in addressing issues of concerns to federally recognized tribes; develop cooperative solutions to tribal concerns; be available for tribal meetings; and conduct periodic outreach. The applicant will provide the name, telephone number, and email address of the tribal liaison to officials of each tribe that wish to be notified.
- The applicant will submit quarterly reports to the City of Hoquiam on the progress of, implementation of, and compliance with all mitigation measures. The reporting period for these reports will begin the first quarter after permit issuance and continue quarterly through the first year of project operations after which the applicant will submit a report annually through the first 5 years of operation.

7.3 Cost-Benefit Analysis

This section describes the cost-benefit analysis required by the City of Hoquiam (HMC 11.10.160). Because the cost-benefit analysis informs the City's decision regarding issuance of the land use permits, the scope of the analysis focuses on potential costs and benefits to the residents of Hoquiam. This section describes costs and benefits related to employment, income, and fiscal revenues as a result of the construction and routine operation[10] of the proposed action. This section also provides information about the range of costs that can result from an incident involving the release of crude oil.

[10] Chapter 4, *Environmental Health and Safety*, addresses the potential impacts from increased risk of incidents (e.g., storage tank failure, train derailments, vessel collisions) and related consequences (e.g., release of crude oil).

7.3.1 What is the study area for the cost-benefit analysis?

The study area for the cost-benefit analysis considers the costs and benefits that would affect the residents of Hoquiam and the city at large. In addition to resources in Hoquiam, this study area includes resources in Aberdeen but only to the extent that job creation in Aberdeen would affect residents of Hoquiam.

7.3.2 How was the cost-benefit analysis conducted?

This section describes the sources of information and methods used to conduct the cost-benefit analysis.

7.3.2.1 Information

Information used in this analysis came from the sources described in Chapter 3, *Affected Environment, Impacts, and Mitigation,* Chapter 4, *Environmental Health and Safety*, and Chapter 5*, Extended Rail and Vessel Transport*, and through conversations with staff at the City of Hoquiam.

7.3.2.2 Impact Analysis

Cost-benefit analysis is a commonly used tool for evaluating proposed policies and actions. Cost-benefit analysis is conducted by estimating the net benefits of a proposed action or the benefits of a proposed action minus the costs of the action. In a cost-benefit analysis, a proposed action is usually evaluated over a period long enough for the main costs and benefits of the action to be realized. Costs and benefits that accrue in future years are then expressed in present value terms through the application of a discount rate. When conducting a cost-benefit analysis, the goal is to express as many impacts in monetary terms as possible. It is often not possible, however, to ascribe a monetary value to all relevant impacts because some impacts are difficult to quantify, and other impacts, even if they can be quantified, are difficult to express in monetary terms. When impacts in a cost-benefit analysis cannot be expressed in monetary terms for either of these reasons, they are discussed and evaluated on a qualitative basis.

This cost-benefit analysis is based on the analysis of impacts from the proposed action on the resources discussed in Chapter 3, *Affected Environment, Impacts, and Mitigation*. Impacts of the proposed action related to increased safety risks (e.g., storage tank failure, train derailments, vessel collisions) analyzed in Chapter 4, *Environmental Health and Safety,* are also considered. However, because there are many factors that contribute to the specific circumstances of an environmental outcome (e.g., crude oil release) related to an incident, it is difficult to predict the specific outcomes that may occur. Therefore, the cost-benefit analysis considers costs that may accrue to the City of Hoquiam related to preparing for the potential consequences rather than identifying the specific costs that may be incurred related to cleanup activities and the related degradation. Costs and benefits from socioeconomic impacts analyzed in previous sections of this chapter are also considered. Short-term impacts during construction and long-term impacts during routine operations are both considered.

Impacts leading to an increase in revenues to the City of Hoquiam are assumed to benefit the residents of Hoquiam because increased revenues would lead to increased local public services, reduced future growth in local taxes paid by current residents, or both. Impacts that correspond to an increase in the demand for local public services are assumed to be a cost to the residents of

Hoquiam because they would result in a need for future increases in local tax collections or would compete with existing local demand. Costs and benefits to the residents of Hoquiam would also result to the extent that the proposed action would affect employment and income, leisure, and nonmarket values, such as those associated with environmental resources (e.g., water quality, clean air).

Impacts are discussed quantitatively, to the extent that quantitative indicators are provided in the analyses in Chapter 3, *Affected Environment, Impacts, and Mitigation*. When quantitative impact estimates are available, the monetary impacts on the residents of Hoquiam are discussed, to the extent possible. All monetized impacts are presented in 2013 dollars. Because it is not possible to monetize all impacts, it is not possible to reach one estimate of net present value of the proposed action for the residents of Hoquiam. No attempt to generate a future stream of costs and benefits is made, and no discount to the monetized value of future impacts is applied. Rather, the costs and benefits are described to summarize information to be used in assessing the financial outcomes of implementing the proposed action. The monetized impacts are presented separately for a single phase of the construction period (for this analysis, assumed to occur in 12 months) and for a representative 1-year period during operations.

As discussed in Chapter 3, *Affected Environment, Impacts, and Mitigation,* although construction and routine operations could affect the resources addressed in that chapter, in general, these impacts would be low either before or after implementation of the recommended mitigation. Because the proposed action would have low impacts on most resources, there would be no measurable benefits or costs to the residents of Hoquiam from those impacts and they are not discussed further in this analysis.

The notable exceptions include potential impacts related to noise, tribal resources, vehicle traffic and safety, and environmental health and safety. With respect to noise, as discussed in Section 3.7, *Noise and Vibration*, substantial increases in noise levels would occur nearby the PS&P rail line. Because the portion of the PS&P rail line that would be used related to the proposed action is located entirely in Aberdeen (and at least 450 feet from residents of Hoquiam) or east of Aberdeen, there would be no significant impacts on residents of Hoquiam.

Additionally, although there would also be impacts on tribal resources, namely, the Quinault Indian Nation's Usual & Accustomed fishing areas, it is not clear how those impacts might directly translate to broader economic losses relative to the residents of Hoquiam or to the city at large. However, as noted in Section 3.12, *Tribal Resources*, there is the potential for economic implications to members of the Quinault Indian Nation, depending on the extent of the disruption as a result of the proposed action.

As discussed in Chapter 3, Section 3.16, *Vehicle Traffic and Safety*, in Chapter 4, *Environmental Health and Safety*, and in Section 7.1, *Economics*, there is the potential for significant impacts that could affect the City of Hoquiam related to these resources and they are therefore, addressed further in the cost-benefit analysis. Although there could also be substantial increases in noise (Section 3.7, *Noise and Vibration*) and disturbance to tribal fishing (Section 3.12, *Tribal Resources*), impacts on these resources would not likely affect Hoquiam residents and are not considered further in this analysis. The following sections focus on assessing the costs and benefits related to the potential impacts of the proposed action. As noted in Section 7.1, *Economics*, benefits are related to increased employment and income and fiscal revenues that could accrue to the City of Hoquiam as the result of the proposed action. The discussion of costs focuses on those that would affect the City of Hoquiam

as the result of increased vehicle traffic and safety concerns, environmental health and safety concerns, and impacts on property values related to the real and perceived impacts that would occur within or affect the City of Hoquiam.

7.3.3 What are the benefits of the proposed action?

This section describes the beneficial impacts of the proposed action that could occur in the study area.

7.3.3.1 Employment and Income

As discussed in Section 7.1.4.2, *Proposed Action*, construction and operation of the proposed action would result in increased employment and income associated with direct spending related to labor salaries and benefits and material purchases. Additionally, these activities would result in indirect and induced employment and income impacts. As discussed below, it is possible to estimate the proportion of employment and income likely to benefit the City of Hoquiam.

Construction

As presented in Appendix O, *Economic Impact Analysis,* the construction of Phase 1 of the proposed action would support 82 direct jobs and an additional 211 indirect and induced jobs in Washington. Each job would consist of a full-time or part-time position during a 1-year period. The 82 direct jobs provide construction services at the project site. The remaining 211 indirect jobs could occur anywhere in Washington. Construction of Phase 2 would add 46 direct jobs for site construction and 144 indirect and induced jobs in Washington State.

U.S. Census Bureau estimates of commuting patterns indicate that approximately 23% of workers employed in Hoquiam reside in the city and 27% of workers employed in Aberdeen reside in Hoquiam (U.S. Census Bureau 2011). If the workers employed at the construction site show similar patterns of residence as to those of the general population, and if each 1-year job is filled by one worker,[11] between 19 and 22 direct construction workers (between 23 and 27% of total) would likely reside in Hoquiam during Phase 1. An additional 11 to 12 construction workers (between 23% and 27% of total) would reside in Hoquiam in Phase 2. A share of the indirect and induced employment could also occur in Hoquiam although it is not possible to determine the specific numbers of jobs that would be filled by Hoquiam residents.

ECONorthwest (2014) estimated that each onsite construction job would pay approximately $125,000 a year in total compensation (wages and benefits). If 30 to 34 of the 128 onsite construction jobs are filled by construction workers that reside in Hoquiam (as assumed above), construction would generate an estimated $3.8 million to $4.3 million in labor income for construction workers residing in Hoquiam during both Phase 1 and Phase 2 of construction.

Additional labor income would be generated in Hoquiam, associated with indirect and induced jobs. ECONorthwest estimates 355 indirect and induced jobs would be generated during construction

[11] ECONorthwest (2014) estimates the number of jobs associated with the proposed action. These jobs are defined as 1-year part-time or full-time employment. Because two workers employed for 6 months each would correspond to one job, and one worker employed for 2 years would correspond to two jobs, jobs and employed persons are not the same. For analytical purposes, this section assumes each job corresponds to one worker employed over a 1-year period.

(both Phases 1 and 2) in Washington State. It is not possible to infer from the ECONorthwest study and from readily available data how many of these jobs would be likely to occur in Hoquiam. These jobs would average $53,500 in annual labor income per job (ECONorthwest 2014).

Operations

During operations, ECONorthwest (2014) estimated that 11 direct jobs would be supported at the terminal if only Phase 1 infrastructure were operational, and an additional four direct jobs would be supported at the terminal if both Phase 1 and Phase 2 infrastructure were operational. An additional 10 indirect and induced jobs (six in Phase 1 and four in Phase 2) would be generated in Grays Harbor County, associated with the creation of the direct jobs at the project site. As noted in Section 7.1, *Economics*, additional direct, indirect, and induced employment in Grays Harbor County would be associated with vessel and rail transportation; however, it is anticipated that most of these jobs would occur outside the local communities. Although some rail and vessel jobs may be filled by residents of Hoquiam or Aberdeen, for the purposes of providing a conservative estimate, job creation associated with increased rail and vessel operations is not included.

Assuming all direct jobs in Grays Harbor County would be located in Hoquiam and Aberdeen (excluding vessel and rail transportation direct jobs), it is possible to estimate the number of operations jobs filled by workers who reside in Hoquiam. Assuming each job is filled by one worker, and using the same U.S. Census Bureau commuting pattern estimates used to analyze construction jobs, between 23 and 27% of direct operations workers would reside in Hoquiam. This would correspond to three to four workers (from a total of 15). A share of the indirect and induced employment could also occur in Hoquiam.

ECONorthwest (2014) estimated that each direct onsite job would pay approximately $65,000 a year in total compensation (wages and benefits). Under this assumption, total labor income in Hoquiam, supported by operational jobs directly linked to the proposed action, would correspond to between $195,000 (3 multiplied by $65,000) and $260,000 (4 multiplied by $65,000), assuming a full build-out (after Phase 1 and Phase 2 construction).

Additional labor income would be generated in Hoquiam, associated with indirect and induced jobs. ECONorthwest (2014) estimates 37 indirect and induced jobs would be generated during operations (at full build-out) in Grays Harbor County. It is not possible to infer from the ECONorthwest study and from readily available data how many of these jobs would be likely to occur in Hoquiam. These jobs would average $38,600 in annual labor income per job (ECONorthwest 2014).

Operations jobs would be permanent. Because permanent jobs generate income year after year, they are more likely to induce additional economic activity attracting businesses and local investment than temporary construction jobs.

7.3.3.2 Fiscal Revenues to the City of Hoquiam

As discussed in Section 7.1.4.2, *Proposed Action*, in addition to generating increased employment and income, construction and routine operations of the proposed action would also result in increased fiscal revenues. It is possible to estimate the proportion of revenues that would likely accrue to the City of Hoquiam. Increased revenues would be generated by the property tax, sales tax, business and occupation tax, utility taxes, and building permits.

Property Tax and Leasehold Excise Tax

The Port is a public port and a taxing district. The use of public land and publicly owned property pays a leasehold tax to the Port in lieu of real estate property taxes. A portion of the leasehold tax is transferred to the city where the property is located. The tax rate for the city's portion of the leasehold tax is up to 4% of the rent paid for the property, with the remaining of the 12.84 % tax rate going to the county and state (Washington State Department of Revenue 2010). There is currently no information on changes in property rents paid by the applicant to the Port due to the proposed action. To the extent that property rents increase, the City of Hoquiam portion of the leasehold excise tax would increase as well.

Owners of private improvements at the Port pay regular property taxes to the city where their property is located, including taxing districts within the city such as school districts (Washington State Department of Revenue 2010). The property tax levy rate for the City of Hoquiam in 2014 was approximately $10.98 per $1,000 of assessed value, including the Hoquiam school district and an emergency medical service levy (Washington State Department of Revenue 2014a).

ECONorthwest (2014) estimated property taxes to be paid by the applicant and REG (formerly Imperium Terminal Services) based on information provided directly by both. Jointly, the two projects would pay $223,222 in property taxes during construction and $1,869,393 during each year of operations, assuming a full build-out (Phase 1 and Phase 2). ECONorthwest does not report the portion attributable to the applicant's proposed action and the portion attributable to the REG proposed action. However, it is reasonable to assume that the assessed value of each proposed action is proportional to construction costs. In this case, approximately 48.1% of the total assessed value of these two proposed actions corresponds to the applicant's proposed project.[12] The tax rate paid by the applicant and REG would not necessarily be the same, because the applicant's facility would be partially located in Aberdeen, while the REG facility would be mostly located in Hoquiam.[13] Assuming 50% of the applicant's assessed property value is taxed by the City of Aberdeen and 50% by the City of Hoquiam (based on the location of the project site relative to the city borders), property tax collections by the City of Hoquiam can be estimated to be approximately $55,783 during construction and approximately $467,161 during each year of operation.

Sales and Use Tax

As of January 2015, the Hoquiam local sales/use tax rate is 6.5% (Washington State Department of Revenue 2014b). In other words, for each dollar spent in Hoquiam, the city collects 6.5% in local sales/use tax. During construction of the proposed action, construction service providers would pay City of Hoquiam sales taxes to the extent that they are established within the city boundaries. This would also be the case of subcontracted companies, providers of inputs, and establishments where workers spend their income. Similarly, sales by establishments located in Hoquiam during operations would also pay City of Hoquiam sales taxes. There is no information on the extent to which service and input providers, during construction or operations, would be located in Hoquiam, or the extent to which earnings associated with construction and operations of the proposed action would be spent in Hoquiam. Therefore, it is not possible to estimate sales and use taxes collected by the City of Hoquiam from construction and operation of the proposed action.

[12] ECONorthwest (2014) estimated total construction costs for the proposed action to be $61.3 million at full build-out and for the REG (formerly Imperium Terminal Services) Expansion Project to be $66.1 million.
[13] In 2014, the property tax levied by the City of Aberdeen was $9.25 per $1,000 compared to $10.98 per $1,000 for the City of Hoquiam (Washington State Department of Revenue 2014a).

Business and Occupation Tax

Washington State does not have an income tax. The business and occupation tax is assessed on gross receipts of businesses in specific occupations. The City of Hoquiam imposes a local business and occupation tax, in addition to that imposed by the State of Washington. As of January 2014, Hoquiam's business and occupation tax rate was 0.2% of gross receipts for all major categories of business (manufacturing, retail, wholesale and services) (Association of Washington Cities 2014). During construction of the proposed action, construction service providers would pay City of Hoquiam business and occupation taxes to the extent that they are established within the city boundaries. This would also be the case of subcontracted companies, providers of inputs, and establishments where workers spend their income. Similarly, gross receipts by establishments located in Hoquiam during operations would also pay City of Hoquiam business and occupation taxes. As in the case of sales and use tax collections, there is not enough information to estimate the business and occupation tax collections by the City of Hoquiam that would be associated with the proposed action. This would require estimating the extent to which construction and operations service and input providers would be located in Hoquiam, as well as the location of establishments where proposed action- related earnings would be spent.

Utility and Other Taxes, Licenses, and Permits

The City of Hoquiam taxes gross operating revenues derived from business in the city of various types of utilities, including gas, electricity, cable TV, telephone, garbage collection and water, sewer and stormwater collection. Tax rates range between 6 and 8% (HMC 4.88). During both construction and operations of the proposed action, increased business revenues, and labor income in Hoquiam associated with employment at the terminal and with train and vessel operations, and input and service providers to construction and operations, would result in increased utility revenues and, consequently, increases utility tax collections for the City of Hoquiam. Because the increase in demand for utilities associated with the proposed action was determined to be minor (Chapter 3.13, *Public Services and Utilities*), the increase in utility tax collections to the City of Hoquiam would be expected to be minor as well.

Other minor City of Hoquiam revenues derived from the proposed action would include revenues from licenses and permits, particularly building permits.

7.3.4 What are the costs of the proposed action?

Potential costs relevant to the City of Hoquiam would be the result of potentially significant impacts that would directly affect residents or the city at large. This section discusses the costs that could occur as the result of increased vehicle traffic and safety concerns, and of real and perceived risks associated with onsite operations and rail and vessel transport due to environmental health and safety impacts. This includes a discussion of the broader social and economic costs that could occur and the potential for the perception of increased risk to affect property values in Hoquiam.

7.3.4.1 Potential Costs Related to Increased Vehicle Traffic and Safety

As discussed in Chapter 3, Section 3.15, *Rail Traffic*, and 3.16, *Vehicle Traffic and Safety*, operation of the proposed action would result in increased rail traffic along the PS&P rail line that would increase vehicle delays at certain grade crossings and surrounding intersections during operations. Additionally, increased train traffic would result in increased risks of accidents at grade crossings

along the entire PS&P rail line. The average number of train trips along the PS&P rail line is expected to increase from approximately three train trips per day by an additional 1.25 trips per day.

Although none of the directly affected intersections is located in Hoquiam, Hoquiam residents commuting to Aberdeen and other areas east of the project site would have increased potential to be delayed at a grade crossing by a train or to be affected by increased congestion at surrounding intersections as motorists attempt to bypass blocked grade crossings. As a result, depending on the timing of such an event and on commuting routes, residents may see their commuting times increase.

It is not possible to estimate how much commuting time would increase for these residents because it is not possible to know what specific roads would be taken or what share Hoquiam residents would represent of the vehicles on roads affected by delays during commuting times. Increases in commuting times would have a cost to the residents of Hoquiam. This cost would correspond to the estimated opportunity cost of their time; i.e., the value of the time they would spend in other activities (work or leisure) were they not delayed in traffic. The U.S. Department of Transportation developed a measure of this value that it uses in regulatory analysis (Belenky 2011). The opportunity cost of one hour in surface traffic for all-purpose traffic (business and personal) is estimated to be between $9.66 and $16.18 per person for local traffic and between $16.51 and $24.76 per person for intercity traffic, in 2013 dollars.[14]

As discussed in Chapter 3, Section 3.16, *Vehicle Traffic and Safety*, increased rail and vehicle traffic would contribute to an increase in the expected number of vehicle accidents at grade crossings. Although none of these grade crossings is located in Hoquiam, residents commuting to Aberdeen and other nearby areas could face increased risk of accidents if commuting routes include affected grade crossings. It is not possible to estimate this increase in risk because there is not enough information on commuting routes for residents of Hoquiam. Accidents have an economic cost that includes the cost of damage to property, lost productivity associated with injury and death, the cost of medical and emergency services, travel delays, added fuel consumption, and pollution impacts caused by congestion, among others.

A recent study from the National Highway Traffic Safety Administration (2014) estimated the total economic costs of traffic accidents (not including the value of lives lost or the loss of quality of life due to nonfatal injuries) to be from $3,037 per person to $1.5 million per person in 2013 dollars, depending on the severity of injuries or on fatalities.[15] Individuals involved in these crashes pay for approximately 25% of these costs, the remaining being paid by insurance companies, public revenues, and other third parties such as motorists delayed in traffic and health care providers.

7.3.4.2 Potential Costs Related to Environmental Health and Safety Concerns

As discussed in Chapter 4, *Environmental Health and Safety*, operation of the proposed action could increase safety risks (e.g., storage tank failures, train derailments, and vessel collisions) that could result in harm to both humans and the surrounding environment, depending on the specific circumstances of such an event and the related consequences (e.g., oil spill, fire, or explosion).

[14] Values reported in 2009 dollars were adjusted for inflation using the U.S. Bureau of Labor Statistics Consumer Price Index (2014).
[15] Values reported in 2010 dollars were adjusted for inflation using the U.S. Bureau of Labor Statistics Consumer Price Index (2014).

In terms of potential costs to the City of Hoquiam, the proposed action could increase safety risks due to train derailments and other kinds of rail incidents. These events pose a variety of risks to environmental health and safety, including potential injuries and fatalities for railroad staff and other individuals, loss and damage of property (both property belonging to the railroad and adjacent properties), environmental damage resulting from spills from train cars, loss of freight, and cleanup and wreck removal costs.

The possibility of train derailments is of particular concern considering the derailments that have occurred along the PS&P rail line between 2014 and 2016, which are described in greater detail in Chapter 4, Section 4.5, *Environmental Health Risks—Rail Transport*. Although these incidents resulted in minimal costs besides the damage to the rail cars and loss of freight, they raised concern about the potential for damages if similar derailments occurred for rail shipments of crude oil. The potential costs related to an incident would depend on a variety of factors, including the severity of the incident (i.e., number of affected rail cars) and the proximity of the incident to people, property, and sensitive environments.

As discussed in Chapter 4, *Environmental Health and Safety*, regulatory standards are or will soon be in place that will require the implementation and maintenance of emergency preparedness and response protocols intended to reduce the risks related to the proposed action. Depending on the specific circumstances, the consequences of an incident could be significant. Therefore, mitigation is identified in Chapter 4 to minimize these risks.

Costs related to emergency preparedness, response, and recovery are described below.

Costs of Emergency Preparedness

Costs related to emergency preparedness include emergency response equipment, staff, and training. Although cleanup of environmental impacts of hazardous material release or oil spills is typically not the responsibility of local jurisdictions, the local fire, police, and medical services are typically first responders and have the responsibility of protecting the public from harm. As described in Chapter 4, Section 4.4, *Environmental Health Risks—Terminal (Onsite)*, the existing equipment and capabilities of the fire departments near the project site and along the rail line. As described in that section, current capabilities are not adequate to respond to potential risks under existing or proposed action conditions. The Hoquiam and Aberdeen Fire Departments have expressed a need for training at the project site and along the PS&P rail line to review and practice hazardous material release emergency responses.

The Hoquiam Fire Department is funded by the City of Hoquiam general funds and by fees for ambulance services. The main source of revenues for the City of Hoquiam general funds are property, sales and use, business and occupation, and utility taxes (City of Hoquiam 2012). Increased demands for training and equipment would require increases in local tax collections unless funded by other sources, such as a specific agreement with the applicant or through funding by public grants. There is currently not enough information on the extent of training or equipment needed to quantify these costs.

To address concerns about these costs, Chapter 4 includes, in addition to other measures, mitigation related to providing equipment and training to the Hoquiam and Aberdeen Fire Departments to response to potential risks at the project site. The equipment and training also would improve the departments' capabilities to respond to an incident along the rail line.

Costs Related to Response to and Recovery from a Crude Oil Spill, Fire, or Explosion

This section provides information on the economic and social costs of rail and vessel incidents involving crude oil. The information is presented in terms of the range of impacts that could be expected because the costs of a potential incident would vary based on the material spilled, volume, weather, location, proximity to sensitive resources, and other factors. It does not specifically identify the responsible party. For more information about the liability and responsibility for responding to and cleaning up an oil spill, refer to Chapter 4, *Environmental Health and Safety*.

The types of costs that would be incurred because of a crude oil spill, fire, or explosion can be divided into the following three categories (Fejes et al. 2011).

- Direct costs are the damages that result directly from the incident and response such as the value of oil lost, damage to property, and cost of cleanup.
- Market costs are the indirect economic costs of the incident such as financial losses to local businesses and increased healthcare costs.
- Nonmarket costs are social values that cannot be priced in a market but that affect the health and well-being of a community such as reduction in recreation opportunities and loss of ecosystem services (e.g., food production, provisioning of clean water).

Considering all types of costs, economic as well as social, provides a more holistic picture of the cost of oil spills. The direct, market, and nonmarket costs of oil spills, fires, and explosions are discussed below, followed by descriptions of recent oil spills, fires, and explosions and their monetary costs.

Direct Costs

Direct costs of an oil spill, fire, or explosion would include the loss of the market value of the oil spilled, physical damage to rail cars or vessels and rail infrastructure or marine facilities, damage to other property, reimbursement for the state's expenses to respond, assess and investigate an incident, penalties for violations of federal or state laws, and response and cleanup activities. Oil spill cleanup operations are generally one of the highest costs associated with an oil spill (Montewka et al. 2013). Costs can range widely depending on the complex interaction of location, volume, oil type, and other factors and are extremely challenging to forecast.[16] Location is considered the most important determinant of cleanup costs (Etkin 1999). Spills that occur in sensitive habitats or popular tourist destinations would cost more to clean up than spills in other areas, as would spills that result in oil spreading to connecting tributaries or adjacent watersheds (Great Lakes Commission 2015). A spill in open water away from shore could be much less costly to abate than a spill close to shore and near sensitive habitat or a populated area (Frittelli 2014).

[16] Various studies have attempted to estimate oil spill cleanup costs. Montewka et al. (2013) provides a review of recent publications. Deterministic models of oil spill costs, such as the model advanced by Etkin (1999), are intended to yield single solutions based on factors such as broad geographic region (e.g., United States), shoreline oiling, oil type, cleanup strategy, and volume spilled. As Etkin (1999) readily admits, however, the circumstances surrounding a spill are complex and advancing a single per-unit cleanup cost (e.g., cost per barrel spilled) can be meaningless in the face of numerous complicating factors and specific location. Montewka et al (2013) developed a probabilistic model using a case study in the Gulf of Finland, which considered more site-specific factors such as evaporation, wave height, effects of booms, and response times. The model was not compared to an actual event so it is difficult to determine the efficacy of the model, although it is reasonable to assume that, because location is the most important factor in determining oil spill costs, a geographically tailored estimate would provide more precise results.

Large oil spills from vessels or marine facilities that occur near shore are the most costly to clean up. The 1989 Exxon Valdez oil spill cost $2.1 billion to clean up while cleanup operations for the 2010 Deepwater Horizon oil spill are estimated at $14 billion (Exxon Valdez Oil Spill Trust Council 2016; Ramseur 2015). Spills from train derailments are typically much less expensive to clean up as they occur most often over land and cleanup procedures are less resource intensive, usually involve less spilled oil, and, unless the oil spill reaches water, are limited in geographic scope. However, costs for explosions or fires related to train derailments can vary depending on the scale of the incident and the resources affected. The 2013 Lac-Mégantic train explosion in Quebec, Canada, which destroyed several buildings in the town center of Lac-Mégantic, provides an example of the magnitude and cost of cleanup efforts that can be required following a fire or explosion. Cleanup costs from the incident are estimated at $200 million (Beaudin 2014).

The type of oil can also affect the time and resources necessary to clean up an oil spill. Heavier crude oils with high viscosity and persistence are generally more expensive to remove from water than lighter oils. Bakken crude oil is characterized as a light crude oil and is easier to remove from the environment than heavier oils, although the volatility and flammability of Bakken oil could pose a concern for responders and complicate cleanup efforts (Lee et al. 2015). Certain types of heavy crude oil may sink to the bottom of a body of water, making extraction more difficult. As noted in Chapter 4, Section 4.3, *Risk Considerations*, diluted bitumen, derived from Canadian oil sands and diluted with lighter oils, can behave differently than other heavy oils because of the added diluents. A 2010 spill from a pipeline owned by Enbridge Inc. released 850,000 gallons of diluted bitumen into Talmadge Creek, a tributary of the Kalamazoo River in Michigan, and is the only known spill of diluted bitumen in an aquatic environment (Frittelli et al. 2014). Three years after the oil spill occurred, cleanup was still ongoing because the diluted bitumen had sunk to the river bottom and had not appreciably degraded. EPA ordered the pipeline owner to dredge the river to remove the oiled sediment. In 2013, the cost of the cleanup was estimated at approximately $1.2 billion, which, according to a 2014 Congressional Research Service report on rail transportation of crude oil, "is substantially higher than the average cost of cleaning up a similar amount of conventional oil" (Frittelli et al. 2014). Section 4.3.1.2, *Crude Oil*, provides a detailed description of the characteristics of crude oil that would be transported under the proposed action and their implications for cleanup.

Damage to natural resources, such as loss of plant life and organisms, could be considered a nonmarket value because the value to society is often based on the recreational or ecosystem services they provide. However, under Washington State law (RCW 90.56.370), anyone responsible for spilling oil into state waters is liable for damages resulting from injuries to public resources. As discussed in Chapter 4, Sections 4.4.6, 4.5.6, and 4.6.6, the process for determining damages for an oil spill is called a natural resource damage assessment and is established under Washington State rules (WAC 173-183). The rule establishes a process to calculate damages based on the habitat and organisms affected by the spill, the type of oil spilled, and the volume of oil spilled. The overall objective of this process is to restore natural resources to a pre-spill condition. The Washington State Department of Ecology is responsible for implementing the rule to collect compensation based on a dollar per gallon charge. For spills less than 1,000 gallons the range is $1 to $100 per gallon range. For spills of 1,000 gallons or more the range is $3 to $300 per gallon spilled (Washington State Department of Ecology 2016a). Between 1991 and 2016, the compensation claims ranged from $5.2 million to $25 million based on the natural resources affected (Washington State Department of Ecology 2016b). At the federal level, an oil spill can trigger a natural resource damage assessment under the Oil Pollution Act of 1990. Ecology would represent the State of Washington during a

federal assessment, which is typically conducted by the U.S. Fish and Wildlife Service or the National Oceanic and Atmospheric Administration.

Penalties are issued for violations of federal and state law. The amount depends on the nature of the violation, prior behavior and actions taken to correct the problem. In Washington, penalties can be assessed under multiple rules, including oil spill prevention (RCW 90.56), vessel oil spill prevention and response (RCW 88.46), state toxics control (RCW 70.10D) and coastal protection (RCW 90.48).

Fines, legal fees, and court-imposed settlements can impose additional direct costs because of an oil spill. Civil fines and penalties can be imposed under federal and state regulatory frameworks, which are described in detail in Chapter 4, Section 4.2*, Applicable Regulations*. These costs and associated legal settlements can be substantial. Although the mechanisms of spill were different from what could occur under the proposed action, the following provide examples of civil fines related to spills. BP plc, the owner of the Macondo oil well that blew out in the Gulf of Mexico in the 2010 Deepwater Horizon oil spill, was required to pay $15 billion to federal, state, and local governments and private parties for economic claims and reimbursements for response costs and another $6 billion in civil and criminal settlements (Ramseur 2015). Legal proceedings involving the smaller 2010 Enbridge pipeline spill are still ongoing; current estimates of civil fines and penalties total $63 million (Enbridge 2016).

Market Costs

For the purposes of this discussion, market costs are considered the indirect costs from an oil spill, such as financial losses to local businesses forced to close in the aftermath of an oil spill incident, closure of commercial fisheries, and human health costs. As with direct costs, market costs are highly variable depending on numerous variables such as the severity of the incident and proximity to populated areas and economic activity. An oil spill or explosion resulting from a train derailment in the middle of an urban setting could result in major indirect costs (e.g., loss of business and healthcare costs); an isolated spill from a vessel in open water that does not reach shore may have limited market costs. The primary market costs that could affect the City of Hoquiam and surrounding region are disruptions to local industries, such as tourism and commercial fishing, as well as impacts on human health, such as increased health care costs from exposure to toxic fumes.

Business Costs

Businesses could experience a financial cost if an oil spill, fire, or explosion caused physical damage to assets or restricted customer or worker access. An oil spill or explosion in a populated area could have substantial impacts on businesses depending on the scale of the incident. The Lac-Mégantic disaster in Quebec province, Canada on July 6, 2013, involved the derailment of a train carrying crude oil which derailed near downtown and destroyed nearly 40 buildings (Goodman and Rowan 2013). In addition to the direct physical losses, damages could also result from the loss of revenue and productivity if businesses are forced to close during evacuations and cleanup activities. Conversely, some businesses, especially those in the hospitality industry such as hotels and restaurants, could experience an increase in revenue associated with the oil spill and event response activities. The increase in business spending associated with an oil spill typically drops off quickly after event response activities are completed, while the effects on other industries, such as tourism, can linger (Tourism Economics 2011), as described below.

Leisure Spending

Impacts on tourism and visitor spending could result from oil spills that physically affect areas popular with visitors and recreationists and that negatively affect people's perception of the region and reduce leisure visitation. The costs to the City of Hoquiam and the region could include the loss of revenue associated with visitor spending if fewer visitors patronize hotels, restaurants, and other leisure businesses, such as commercial sport fishing. The greatest potential for impacts would occur in the event of a large spill along a waterway or popular natural area (Section 4.7.1.5, *Recreation*). The impacts on visitor spending would be most significant in the immediate aftermath of the spill and, depending on the scale of the impacts, could be depressed for months or years. Following the Exxon Valdez oil spill in 1989, recreation and tourism dramatically declined in Prince William Sound and the surrounding area and took years to recover (Exxon Valdez Oil Spill Trust Council 2016). In the year following the spill, visitor spending decreased 35% in Southwest Alaska for a net loss of $19 million (McDowell Group 1990).

In 1999, the freighter New Carissa ran aground off the coast of Oregon during a winter storm and released an estimated 70,000 to 140,000 gallons of fuel into the marine environment, affecting several beaches and federal and state recreation sites. As part of the Natural Resource Damage Assessment process, federal, state, and tribal agencies estimated 27,974 to 29,204 public recreation trips were lost or diminished in the affected areas, valued between $395,756 and $413,056 (U.S. Fish and Wildlife Service 2012). These losses accounted only for recreational trips associated with federal- and state-managed land and resources and did not account for losses to private industry.

Perception about a region or industry can affect visitor behavior long after an oil spill and response activities have been completed. A study prepared by Oxford Economics measured the duration of time visitor spending was reduced below pre-spill levels for six large oil spills (Exxon Valdez, Ixtoc, Amoco Cadiz, Erika, Prestige) (Oxford Economics n.d.). On average, it took 12 to 28 months for spending to rebound to normal levels from these large spills. An oil spill or fire resulting from a train derailment would typically only directly affect a narrow geographic area and therefore have limited impacts on recreational resources and resulting visitor spending to the region. However, if a spill were to occur near and enter a waterway, such as the Columbia River or Chehalis River, effects could be more widespread.

A 2011 study commissioned by the Louisiana Office of Tourism following the Deepwater Horizon oil spill in April 2010 found that perceptions of the impacts on the leisure and seafood industry were often more impactful than the spill itself (Tourism Economics 2011). A quarter of people surveyed thought that certain recreational areas and business catering to leisure visitors (e.g., boat tours) were closed because of the spill when they were in fact open. The influence of people's perceptions was most pronounced associated with seafood—over half of people surveyed thought that oysters harvested in Louisiana were unsafe when food safety tests demonstrated otherwise (Tourism Economics 2011).

Tribal and Other Commercial Fishing

Economic costs to the commercial fishing industry in Grays Harbor or the Chehalis River could occur in the event an oil spill limits access to fishing areas or affects the number of fish available for harvest. As described in Section 4.7.1.6, *Commercial Fishing*, and 4.7.1.8, *Tribal Resources*, the impact of reduced fish harvest could last several years from residual amounts of oil persisting in the environment. Fishing could also be affected by restrictions or closure of fisheries to protect a species

as well as temporary closures during an event response. Seafood safety measures, such as fishery closures or public warnings about consumption, could be put in place to protect the public from consumption of contaminated shellfish and fish. As discussed above, after the direct impacts on fisheries have subsided, perception of seafood safety can have long-lasting impacts on people's willingness to consume local seafood and could further affect the commercial fishing industry. Depending on the scale of the spill, the economic costs to the commercial fishing industry could be significant.

Although total monetary costs to fishing from the 1999 New Carissa oil spill and 2004 Dalco Passage oil spill were not quantified, these spills provide examples of the types of costs to tribal and commercial fishing in the Pacific Northwest that could result following an oil spill on the coast. The grounding of the New Carissa off the coast of Oregon released between 70,000 and 140,000 gallons of fuel, which resulted in low levels of direct mortality to harvestable fish and shellfish, reducing by a small amount the total catch available to commercial fishers (M/V New Carissa Natural Resource Trustees 2006). Studies performed as part of the Natural Resource Damage Assessment process (M/V New Carissa Natural Resource Trustees 2006) estimated that chronic impacts on fish larvae from long-term exposure could have occurred up to 5 kilometers north and south of the oil spill site, potentially reducing future harvests. The Oregon Department of Agriculture closed commercial shellfish harvesting in several locations near the site of the spill for approximately 3 weeks because of concern for potential contamination and risks to consumers. Marine fish have a higher capacity to metabolize and excrete hydrocarbons than most types of shellfish and no closure of commercial marine fish harvesting was issued.

The Dalco Passage oil spill, which resulted in the release of an estimated 7,000 gallons of crude oil in Puget Sound, resulted in similar types of impacts on commercial fishing as the New Carissa oil spill. The Natural Resource Damage Assessment process (Dalco Pass Oil Spill Natural Resource Trustees 2009) found that while no acute injuries to marine organisms, including fish and shellfish, were observed following the oil spill, elevated levels of petroleum in the water near the spill presented a risk to developing fish embryos, potentially affecting future commercial fish and shellfish harvests. Tissue samples from shellfish collected at oiled beaches, although below levels known to cause lethal or sublethal effects, were sufficiently high to cause concern over human consumption and the Washington Department of Health issued a harvest advisory for oyster and clams for 148 days. There were no studies performed for either the New Carissa or Dalco Passage oil spills evaluating long-term impacts associated with the public's perception of seafood safety.

Human Health

An oil spill, fire, or explosion could affect human health through bodily injury or mortality from an explosion or fire, increased exposure to hazardous pollutants, and psychological stress following an incident. Depending on the scale of the incident, the personal costs of these impacts could be severe and have long-lasting physical and emotional impacts on affected individuals and their families. While the personal and emotional effects following an incident cannot be monetized, human health impacts could pose market costs on society associated with increases in healthcare costs of individuals affected by an incident and loss of productivity from sick or injured workers.

The impacts on human health from an oil spill are described in Section 4.7.1.9, *Human Health,* and the impacts from a fire and explosion are described in Section 4.7.2.2, *Human Health.* Although the risk of acute exposure health effects to the public and response workers in the event of a release is relatively low, as described in these sections, should exposure occur, serious health consequences

are possible. Depending on the severity of the impacts, medical intervention could be required resulting in increased healthcare costs. If the symptoms are severe enough, there could be a loss of economic productivity if affected individuals are unable to work.

In addition to the physical effects of an oil spill, fire, or explosion, psychological stresses can result from the trauma of an extreme event or the potential loss of financial earning capacity, such as due to damages to commercial fisheries. Studies of communities affected by the 1989 Exxon Valdez oil spill found that many people experienced psychological and social effects associated with the spill, in large part because of damage to fisheries that were extremely important to the local economy (Gay et al. 2010). There is also evidence that many native Alaskans who depended on the sea for subsistence experienced psychological symptoms because they could not practice many cultural traditions (Gay et al. 2010). An extreme event, such as a fire or explosion, can also trigger psychological distress that can result in heightened anxiety and difficulty coping with the emotional effects of the traumatic event. Residents affected by the Lac-Mégantic train explosion in Quebec province, Canada in 2013 have reported anxiety problems that were twice as frequent in Lac-Mégantic as they were in the rest of the geographical region (Canadian Press 2016). During the year that followed the explosion, the local health authority indicated 423 people were treated for psychological stress associated with the incident (Blatchford 2014). Similar to the physical impacts described above, psychological stresses from an oil spill, fire, or explosion can result in increased healthcare costs for mental health treatment and reduce economic productivity if workers are unable to perform to their full potential.

Nonmarket Costs

Nonmarket costs include losses of public goods that are not valued in the market. These losses occur when non-priced services, such as ecosystem services, clean air, clean water, and aesthetic quality, are affected. As described in Section 4.7, *Impacts on Resources*, crude oil spills can endanger air and water, human health, animal and plant life, recreational and aesthetic values, and other resources. The loss or damage of these resources can impose a high cost on society.

The impacts on air, water, and other natural resources can be looked at in terms of their costs on ecosystem services, a term used to describe the value natural resources provide to humans. Ecosystem services are an example of non-market values that provide a benefit to society which cannot be priced in a market. Ecosystem services are commonly thought of in four categories: supporting (e.g., nutrient cycle, soil formation), provisioning (e.g., food, fresh water), regulating (e.g., climate regulation, water purification), and cultural (e.g., aesthetic, recreation) (Millennium Ecosystem Assessment 2005). An example of how ecosystem services could be affected by an oil spill is the loss of marine life that would affect food provisioning, as seafood would not be available for human consumption, and cultural, as fisheries would be depleted and not available for recreational or tribal fishing.

Section 4.7, *Impacts on Resources,* describes impacts on environmental and human resources from an oil spill, fire, or explosion that could affect ecosystem services. The costs to ecosystem services from these impacts would be greatest if an oil spill reached water and affected marine life, coastal ecosystems, and beaches or other popular recreational areas. The area in and around the City of Hoquiam and Grays Harbor provides numerous ecosystem services including commercial, recreational, and tribal fishing, bird watching and scenic beauty. It provides basic supporting services such as habitat for marine and terrestrial animals and production of oxygen and regulating services such as carbon sequestration. The loss or degradation of these ecosystem services from an

oil spill, while not valued in a market, would impose nonmarket and social costs to the City of Hoquiam and the region.

Recent Oil Spills, Fires, and Explosions

Table 7-11 presents costs related to recent incidents involving oil spills, fires, and explosions provide. This information represents the range of potential economic and social costs of an incident. Spills resulting from pipeline ruptures are included to illustrate the effects of oil spills on freshwater aquatic habitats.

Table 7-11 Range of Potential Economic and Social Costs of Rail, Vessel, or Pipeline Incidents

Location	Description	Volume Spilled	Injuries and Evacuations	Estimated Damages
Rail Transport				
Mt. Carbon, West Virginia	On February 16, 2015, a CSX crude oil unit train derailed 27 loaded tank cars in Mount Carbon, West Virginia. Crude oil from the punctured tank cars discharged into the Kanawha River and contaminated soils in the area. Much of the released oil was consumed in the post-accident fire.	378,000 gallons of crude oil	One nearby resident received minor injuries, 300 people evacuated	$2.5 million
Aliceville, Alabama	On November 8, 2014, a Genesee and Wyoming crude oil unit train derailed 25 cars near Aliceville, Alabama. The spilled oil discharged into nearby marsh and some of it caught fire.	455,520 gallons of crude oil	No injuries or evacuations reported	$5 million
LaSalle, Colorado	On May 9, 2014, a Union Pacific train derailed 17 cars near LaSalle, Colorado spilling an estimated 7, 932 gallons of crude oil.	7,932 gallons of crude oil	No injuries or evacuations reported.	$0.3 million
Lynchburg, Virginia	On April 30, 2014, a CSX Transportation crude oil unit train derailed near the James River in Lynchburg, Virginia. Three of the derailed cars were partially submerged in the James River, one of which was breached and released approximately 30,000 gallons of crude oil into the river, some of which caught fire.	29,868 gallons of crude oil	No injuries, 350 people and 20 businesses evacuated	$1.2 million
North Vandergrift, Pennsylvania	On February 13, 2014, a Norfolk Southern train derailed 21 cars near North Vandergrift, Pennsylvania, spilling an estimated 9,800 gallons of crude oil.	9,800 gallons of crude oil	No injuries, 16 people evacuated	$4.5 million
Casselton, North Dakota	On December 30, 2013, a BNSF crude oil unit train derailed near Casselton, North Dakota resulting in the breach of 18 tank cars carrying crude oil which caught fire.	400,000 gallons of crude oil	No injuries, 1,400 people evacuated	$6.1 million
Lac-Mégantic, Quebec, Canada	On July 6, 2013, a crude oil unit train derailed in Lac-Mégantic, Quebec because of an improperly set brake. A large fire and series of explosions followed, resulting in the destruction of much of the town center as well as the deaths of 47 people.	1.6 million gallons of crude oil	Forty-seven deaths, 2,000 people evacuated	$460 million
Vessel Transport				
Port Arthur, Texas	In January 2010, an oil tanker collided with a barge near Port Arthur, Texas. Up to 460,000 gallons of crude oil spilled into the Sabine-Neches Waterway.	460,000 gallons of crude oil	No injuries, 12 people evacuated	Unknown

Location	Description	Volume Spilled	Injuries and Evacuations	Estimated Damages
Philadelphia, Pennsylvania	On November 26, 2004, the hull of a 750-foot tanker carrying crude oil was punctured on the Delaware River. The resulting spill affected 280 miles of shoreline and resulted in a three-day shutdown of the Port of Philadelphia.	265,000 gallons of crude oil	No injuries or evacuations reported	$150 million
Dalco Passage, Washington	On October 13, 2004, an oil spill occurred in Puget Sound during a ballasting operation on board a tank vessel.	7,000 gallons of crude oil	No injuries or evacuations reported	$2.3 million
Coos Bay, Oregon	On February 4, 1999, the 640-foot freighter New Carissa ran aground on the Oregon coast during a major winter storm, releasing between 70,000 and 140,000 gallons of fuel.	70,000-140,000 gallons of fuel	No injuries or evacuations reported	$85 million
Prince William Sound, Alaska	On March 24, 1989, the Exxon Valdez struck a reef and released between 11 million and 38 million gallons of crude oil.	11-38 million gallons of crude oil	No injuries or evacuations reported.	Over $2 billion
Pipeline				
Yellowstone River, Montana	In July 2011, a pipeline ruptured on the Yellowstone River in Montana. Approximately 63,000 gallons of crude oil spilled because of the rupture, affecting 70 miles of the river.	63,000 gallons of crude oil	No injuries reported, evacuation of nearby residences	$135 million
Talmadge Creek, Michigan	In July 2010, a pipeline rupture near Talmadge Creek in Michigan spilled an estimated 843,000 gallons of diluted bitumen. High rains pushed the oil over dams into the Kalamazoo River, where it flowed 35 miles downstream. The spill was contained before any oil reached Lake Michigan.	843,000 gallons of diluted bitumen	No injuries reported, evacuation of nearby residences	$1.2 billion

Source: National Transportation Safety Board 2014a, 2014b, 2015, 2016; Transportation Safety Board of Canada 2014; Seba 2010; Graham 2006; Cornwall 2006; Ferrell 2006; Exxon Valdez Oil Spill Trust Council 2016; Jorgensen 2015; Frittelli et al. 2014

7.3.4.3 Potential Impacts on Property Values

Impacts on property values from the proposed action could result during construction and, to a larger extent, during operation of the proposed action. Impacts from these activities could affect property values by making surrounding properties less desirable as the result of impairing natural amenities such as air and water quality, increasing ambient noise levels and traffic congestion, and increasing risks that could adversely affect surrounding land uses (e.g., increased chance of incidents that could lead to hazardous materials releases and environmental damage).

Hedonic pricing is a method that uses data on real estate transactions to estimate the impact of various attributes on the values of nearby properties. It is commonly used to estimate the impacts of environmental amenities and other landscape features on property values. This method uses data on property values to estimate the value of an environmental amenity in terms of its effect on the values of nearby properties. More specifically, the hedonic pricing method uses statistical techniques to infer the value of a property attribute by comparing values of properties that have a given attribute and those that do not. Attributes evaluated in hedonic pricing studies can have either positive or negative impacts on property values.

Hedonic pricing is based on the assumption that individuals view goods such as houses as a bundle of attributes. In the case of houses, these attributes may include structural characteristics (e.g., size, number of bedrooms), neighborhood characteristics (e.g., crime rate, school quality, recreation opportunities), and environmental attributes (e.g., trees, proximity to open space, air quality, proximity to undesirable land uses). Individuals choose houses based on a combination of these attributes. Differences in the market price of houses can be used to derive an implicit value of each attribute. The implicit value of an attribute reflects what individuals, on average, are willing to pay for that attribute. The result of the hedonic pricing method is a function that relates the value of a property to a set of housing attributes, including the specific attribute being valued.

Although previous hedonic pricing studies suggest that there could be impacts on property values from construction and onsite operations of the proposed action, the impacts on property values that could be directly attributed to the proposed action are negligible. Because the project site is located in an already industrialized area, any negative impacts on nearby properties from construction or onsite operations would already have been realized and would not be a result of the proposed action.

Therefore, the potential for the proposed action to affect property values would occur primarily as the result of the perception of increased risk of impacts that could occur during transport. To evaluate the potential for these impacts, a literature review was conducted of other studies that have estimated the impacts of rail lines on property values. The studies, and their estimated impact of freight rail lines on property values, are summarized in Table 7-11.

Table 7-12. Summary of Studies Estimating the Impacts of Freight Rail Lines on Nearby Property Values

Authors and Publication Year	Study Title	Description of Rail Line Impact	Estimated Impact per Property	Distance Factor
Futch, M. (2011)	*Examining the Spatial Distribution of Externalities: Freight Rail Traffic and Home Values in Los Angeles*	Large increase in rail traffic along the Alameda Corridor, leading from the Ports of Los Angeles and Long Beach, California	Average per-property decrease in value of $3,500	Impact dissipates with distance, and is strongest for properties within 0.33 mile, less significant for properties within 0.66 mile of the rail line. Impact is not significant for properties greater than 0.66 miles from the rail line.
Simons, R.A. and A. El Jaouhari (2004)	*The Effect of Freight Railroad Tracks and Train Activity on Residential Property Values*	Increase in freight rail traffic on existing rail lines in Cuyahoga County, Ohio	Average decrease in value between $3,800 and $5,800. Impact increases with each additional train trip	Impact estimated for properties within 750 feet of the rail line.
The Eastman Company (2012)	*Increased Coal Train Traffic and Real Estate Values*	Large increases (between 9 and 18 daily trips) resulting from proposed Gateway Pacific Terminal at Cherry Point Washington	Decreases in property values between 5 and 20% for increases of 18 train trips per day. Decreases in property values between 3 and 5% for increases of 9 trips per day	Study focused on properties within 600 feet of the rail line, but suggests that impacts also would be experienced by properties further out from this zone.

From this review, it can be seen that proximity to freight rail lines can affect property values, and this impact increases with increasing rail traffic. These studies also show that the impact of rail lines on property values dissipates with distance. The most severe impacts are for properties within roughly 1,000 feet of the rail line and become negligible at distances of roughly 0.66 mile from the rail line.

To evaluate the potential for impacts on property values in Hoquiam, geographic information system (GIS) data were analyzed to determine the number of properties close to the rail line. As shown in Table 7-12, this analysis resulted in a count of the number of properties within given distance bands of 0 to 0.33 mile (1,760 feet), 0.33 to 0.66 mile (3,520 feet), and 0.66 mile to 1 mile (5,280 feet). As shown in Table 7-13, only a small number of properties within the boundaries of Hoquiam are located close to the rail lines and could possibly experience property value impacts from the proposed action.

Table 7-13. Properties in Hoquiam Potentially Affected by Rail Traffic—Proposed Action

Distance from Rail Line	Number of Residential Properties
0 to 0.33 mile (1,760 feet)	7
0.33 mile to 0.66 mile (3,520 feet)	25
0.66 mile to 1 mile (5,280 feet)	33

Although other studies have shown an impact on the values of nearby properties from increases in freight rail traffic, it is not possible to use these studies as a basis for quantifying the impact of the proposed action on potentially affected properties in Hoquiam. The studies by The Eastman Company (2012) and Simons and El Jaouhari (2004), for example, only estimate impacts for properties less than 1,000 feet from the rail line, and no residential properties in Hoquiam are that close to the rail line. Futch (2011) estimated impacts on property values that were significant up to 0.66 mile from the rail line, meaning that 32 (7 plus 25) residential properties within the city boundary could experience property value impacts. It is difficult, however, to use the results of the Futch study to determine an impact for affected properties in Hoquiam, as the property value impacts estimated in the Futch study were for a very large increase in rail traffic. In contrast, the increase in rail traffic from the proposed action would be much smaller. The property value impacts from increased rail traffic due to the proposed action would thus likely be much smaller than the impacts estimated by these studies, which involved much larger increases in rail traffic.

7.3.5 What are the likely costs and benefits of the proposed action?

In summary, implementation of the proposed action would result in some economic and financial benefits to Hoquiam as well as some costs. Table 7-14 summarizes the main benefits and costs that are likely to occur as the result of the proposed action. When enough information was available, monetary estimates are provided in 2013 dollars.

If additional projects, such as the REG (formerly Imperium Terminal Services) Expansion Project or Grays Harbor Rail Terminal Project are implemented, the potential for more significant impacts on rail congestion, vehicle congestion, and the related safety concerns would also increase. The potential cumulative impacts related to these topics are discussed in Chapter 6, *Cumulative Impacts*.

Table 7-14. Main Benefits and Cost to the City of Hoquiam—Proposed Action (2013 Dollars)

Benefits	Quantification
Employment and Income	
Direct labor income (including benefits) during construction	Estimate: $3.8 million to $4.3 million
Annual direct labor income (including benefits) during each year of operations	Estimate: $195,000 to $260,000 per year
Additional labor income (including benefits) associated with indirect and induced jobs in during construction and operations	Not estimated
Fiscal Revenues	
Property tax collections during construction	Estimate: $55,783
Property tax collections during each year of operations	Estimate: $467,161 per year
Additional tax collections during construction and operations from local sales and use tax, business and occupation tax and utility taxes	Not estimated
Costs	
Vehicle Traffic and Safety	
Increased traffic delays	Previous studies estimate: $9.66 and $16.18 per person delayed in traffic, per hour, for local traffic $16.51 and $24.76 per person delayed in traffic, per hour, for intercity traffic
Increased exposure to traffic accidents risks	Previous studies estimate: $3,037 per person to $1.5 million per person involved in a traffic accident, depending on severity of incident
Environmental Health and Safety	
Cost of training for the City of Hoquiam Fire Department on flammable liquid fires risks and to review and practice material release emergency response	Not estimated
Property Values	
Potential decrease in property values	Previous studies estimate: $3,500 to $5,800 on average 3 to 5% for increases of 9 trips per day 5 to 20% for increases of 18 trips per day

Chapter 8
Distribution List

19th District—Representatives
19th District—Senator
24th District—Representatives
24th District—Senator
32nd District—Representative
36th District—Representatives
36th District—Senator
38th District—Senator
46th District—Representatives
Aberdeen, City Council
Aberdeen, Community Development Department
Aberdeen Timberland Library
Anacortes, City Council
Association of Washington Businesses
Bellingham, City Council
Capitol Land Trust
Centralia Stream Team
Centralia, City Manager
Centralia Timberland Library
Chehalis Basin Partnership
Chehalis Land Trust
Chehalis River Council
Chehalis, Community Development Department
Citizens for a Clean Harbor
Clark County, Fire and Rescue
Climate Solutions
Coalition of Coastal Fisheries
Coeur d'Alene Tribe
Coastal Dungeness Crab Advisory Board
Columbia River Gorge Commission
Columbia River Inter-Tribal Fish Commission
Columbia Riverkeeper
Confederated Tribes of the Chehalis Reservation
Cosmopolis
Ecology SEPA Register
Elma, City Council
Forest Ethics
Friends of Grays Harbor
Friends of San Juans
Friends of the Columbia Gorge
Grays Harbor Audubon
Grays Harbor Chamber of Commerce
Grays Harbor Council of Governments
Grays Harbor County Division of Emergency
Hoquiam Timberland Library
Management *and* Grays Harbor Local Emergency Planning Committee
Grays Harbor County, Planning Division
Grays Harbor Economic Development Council
Grays Harbor Marine Resources Committee
Grays Harbor National Wildlife Refuge
Grays Harbor, Office of County Commissioners
Greater Grays Harbor, Inc.
Hood River, City Council
Hoquiam, City Council
Hoquiam Development Association
Jefferson County, Board of Commissioners
Lacey Timberland Library
Lewis County Emergency Management, Local Emergency Planning Committee
McCleary, City of
McCleary Timberland Library
Montesano, City Council
Montesano, Community Development Department
National Park Service
Nature Conservancy
NOAA National Marine Fisheries Service
North Pacific Coast Marine Resources Committee
Northwest Indian Fisheries Commission
Oakville, City Hall
Ocean Shores, City Council
Ocean Shores Public Library
Ocean Shores, Planning Department
Olympia, City Council
Olympia, Port Commission

Olympic Coast National Marine Sanctuary
Olympic Region Clean Air Agency
Olympia Timberland Library
Port of Grays Harbor
Quinault Indian Nation
RE Sources for Sustainable Communities
Renewable Energy Group (REG)
Ridgefield, City of
Safe Energy Leadership Alliance
Seattle, City Council
Shoalwater Bay Tribe
Sierra Club
Spokane Lands Council
Spokane Riverkeeper
Spokane Tribe
Spokane, City Council
Surfrider Association
Timberland Regional Library System
U.S. Army Corps of Engineers
U.S. Fish and Wildlife Service
U.S. Coast Guard Sector Columbia River
Vancouver, City Council
Vancouver, City Manager
Washington Coastal Marine Advisory Council
Washington Department of Archaeology and Historic Preservation
Washington Department of Fish and Wildlife
Washington Department of Natural Resources
Washington Emergency Management Division
Washington Energy Facility Site Evaluation Council
Washington Environmental Council
Washington Public Ports Association
Washington State Council of Firefighters
Washington State Department of Transportation
Washington Utilities and Transportation Commission
Washougal, City of
Westport, City of
Westway Terminal Company, LLC
Willapa Grays Harbor Oyster Growers Association
Yakama Nation

Chapter 9
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