Shell Anacortes
RAIL UNLOADING FACILITY

Environmental Impact Statement

Draft

October 2016

SKAGIT COUNTY WASHINGTON Serving With Pride

DEPARTMENT OF ECOLOGY State of Washington

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Accommodations for limited English proficiency populations are available at www.shellraileis.com. To request materials in alternate formats, follow the instructions at www.shellraileis.com.

Si necesita información en español sobre el Proyecto, por favor comuníquese con Gretchen Newman, 360-407-6097, preguntas@ecy.wa.gov.

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SEPA EIS FACT SHEET

Project Title

Shell Anacortes Rail Unloading Facility

Project Description

Equilon Enterprises, LLC (Shell) proposes to construct and operate a rail unloading facility at the Shell Puget Sound Refinery (PSR) located on March Point in Anacortes, Washington. The proposed project includes building a rail spur from the existing adjacent BNSF Railway Anacortes Subdivision onto the Shell PSR property to accommodate trains transporting crude oil from the mid-continent area, e.g., the Bakken region of Montana and North Dakota.

Each unit train arriving at the rail unloading facility would carry approximately 60,000 to 70,000 barrels of crude oil. The facility would receive six unit trains per week, with each train transporting up to 102 tank cars.

The proposed project would not result in a change in the refining capacity of the Shell PSR. The refinery currently receives delivery of crude oil via marine vessel from the Alaska North Slope. Overall production from the North Slope is declining and that trend is expected to continue. The crude oil received at the Shell PSR by rail would be used to replace the declining North Slope supply.

In addition to building the rail spur, the project would include installing equipment and facilities to pump oil from rail cars to existing tanks within the refinery, constructing stormwater detention ponds, and installing safety and spill response measures.

Shell proposes mitigation for on-site wetland impacts by restoring a portion of a nearby diked and now defunct tree farm on Padilla Bay. The activities necessary to implement this wetland mitigation are included as part of the proposed project.

The objective of the Shell Anacortes Rail Unloading Facility is to provide the capability to receive crude oil from the mid-continent area to maintain operations at the Shell PSR at the current level. Two alternatives are evaluated in this draft environmental impact statement (EIS): the no action alternative and the proposed project. Chapter 2 – Proposed Project and Alternatives, of this EIS provides a detailed description of these alternatives.

Project Proponent

The project proponent is Equilon Enterprises, LLC (Shell). The projected date for implementation of the proposed project is 2017.

Project Proponent Contact Information

Shell Oil Products
Puget Sound Refinery
8505 South Texas Road
Anacortes, WA 98221

Co-lead Agencies and Responsible Officials

Skagit County and the Washington State Department of Ecology are the co-lead agencies. The following are the responsible officials for the project:

Dale Pernula, AICP, Planning Director
Skagit County
Planning and Development Services
1800 Continental Place
Mount Vernon, WA 98273

Josh Baldi, Regional Director
Washington State Department of Ecology
Northwest Regional Office
3190 160th Avenue SE
Bellevue, WA 98008

Authors and Principal Contributors

Chapter 7 – List of Preparers, of this EIS identifies the personnel who contributed materially to the preparation of this EIS.

Date of Issue and Availability of the Draft EIS

The draft EIS was issued on October 4, 2016. It is available for viewing at several public reading rooms around the state. Chapter 8 – Distribution List, of this EIS provides a list of public reading room locations.

The draft EIS is available for download at the project website: www.shellraileis.com. To obtain a printed copy or a USB drive with an electronic copy of the draft EIS (for the cost of production and shipping), follow the instructions provided at www.shellraileis.com or www.ecy.wa.gov/services/disclosure/disclose.html.

To request ADA accommodation for disabilities, call Hannah Waterstrat at Ecology, 360-407-7668. Persons with impaired hearing may call Washington Relay Service at 711. Persons with speech disability may call TTY at 877-833-6341.

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Comments on the Draft EIS

The public comment period is October 4, 2016 through December 2, 2016. There are multiple ways to provide comments on the draft EIS. All comments are treated equally regardless of the method of submittal.

By Mail

The public mailing address for comments is:

Shell Rail EIS
P.O. Box 21206
Seattle, WA 98111

By Email

Comments may be submitted by email to: comment@shellraileis.com.

Online

Comments may be submitted online at www.shellraileis.com.

By Phone

Comments may be submitted by voicemail message at (844) 254-9668.

In Person

Comments may be submitted verbally and in writing at the public hearings. Written comments may also be submitted in person to Skagit County at:

Skagit County
Planning and Development Services
1800 Continental Place
Mount Vernon, WA 98273

Dates and Locations of Draft EIS Public Hearings

Verbal and written comments on the draft EIS can be submitted in person at the following public hearings. Doors open 30 minutes before verbal comment begins for sign-in and lottery registration.

November 12, 2016
Doors open at 9:30 am
Verbal comment sessions held from 10:00 am to 12:30 pm, and from 1:30 pm to 4:00 pm
Open house and verbal comment session end at 4:00 pm
Anacortes Senior Center
1701 22nd Street
Anacortes, WA 98221

November 16, 2016
Doors open at 1:30 pm
Verbal comment sessions held from 2:00 pm to 4:30 pm, and from 5:30 pm to 8:00 pm
Open house and verbal comment session end at 8:00 pm
Skagit Valley College, McIntyre Hall
2501 E. College Way
Mount Vernon, WA 98273

November 19, 2016
Doors open at 9:30 am
Verbal comment sessions held from 10:00 am to 12:30 pm, and from 1:30 pm to 4:00 pm
Open house and verbal comment session end at 4:00 pm
Washington State Convention Center
705 Pike Street
Seattle, WA 98101

Projected Date of Issue of Final EIS

The projected date of issue of the final EIS is 2017.

Agency Action and Projected Date for Action

After completion of the EIS, Shell will need to obtain permits and authorizations to construct and operate the proposed project. Agencies can use the EIS when making permitting decisions. Chapter 1 – Introduction, of this EIS provides a summary of the anticipated permits and approvals that would be needed to implement the proposed project. The projected date for action is 2017.

Subsequent Environmental Review

There are no subsequent environmental reviews expected at this time.

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APPENDICES

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EIS SUMMARY

Skagit County (County) and the Washington State Department of Ecology (Ecology), co-lead agencies, are overseeing the preparation of this environmental impact statement (EIS) under the Washington State Environmental Policy Act (SEPA) for a project proposed at the Shell Puget Sound Refinery (PSR). The applicant, Equilon Enterprises, LLC (Shell), proposes to construct and operate a rail unloading facility at the Shell PSR located near Anacortes, Washington.

This summary provides an overview of the proposed project and the environmental review process, presents the key findings of the draft EIS, and describes next steps.

INTRODUCTION AND BACKGROUND

The Shell Puget Sound Refinery (PSR) is located on the March Point peninsula near Anacortes, Washington, in unincorporated Skagit County. The peninsula is bordered by Fidalgo Bay to the west and Padilla Bay to the east. Other industrial facilities, including the neighboring Tesoro Anacortes Refinery, are also located on March Point. The Shell PSR was initially owned by Texaco and began operating in 1958. At that time, the refinery processed 45,000 barrels of crude oil per day. In 2016, the Shell PSR processes as much as 145,000 barrels (5.7 million gallons) per day. The facility receives some of its crude oil from Canada via pipeline; however, most of its supplies are delivered via marine vessel from oilfields in the Alaska North Slope region.

In recent years, North Slope oil production has been in decline. To maintain existing refining operations, Shell began to investigate other sources of crude oil that would meet two primary needs: 1) crude oil sources must be refinable at the Shell PSR by using existing technology and equipment, and 2) those sources must be cost effective to transport and process. Shell determined that the most viable source of crude oil would come from the mid-continent area, also known as the Bakken region of Montana and North Dakota. The only economical means of transporting that source of crude oil would be by rail.

As the applicant, Shell proposes to construct and operate a rail unloading facility at the Shell PSR. The proposed project, known as the Shell Anacortes Rail Unloading Facility, includes building a rail spur from the existing adjacent BNSF Railway Anacortes Subdivision onto the Shell PSR property to accommodate the unloading of trains transporting crude oil from the mid-continent area.

Shell has been working with Skagit County and other agencies to develop the proposed project since 2012. In February 2015, the Skagit County Hearing Examiner ordered the County to complete an EIS (Skagit County Hearing Examiner 2015). The County requested that Ecology participate as a SEPA co-lead agency, and Ecology formally agreed to do so in June 2015. On September 21, 2015, the County and Ecology released a determination of significance (DS) for the Shell Anacortes Rail Unloading Facility (Skagit County and Ecology 2015a), initiating the EIS process, which is described below.

ENVIRONMENTAL REVIEW PROCESS

The co-lead agencies are jointly overseeing the preparation of this EIS in accordance with SEPA. According to SEPA, an EIS must be prepared when the lead agency determines a proposal is likely to result in significant adverse environmental impacts. The SEPA environmental review process includes the following steps:

EIS Scoping Process

The first step in the development of an EIS is called scoping. During the scoping process, agencies, tribes, local communities, organizations, and the public are invited to comment on factors that should be analyzed and considered in the EIS. Specifically, the process is intended to collect input on a reasonable range of alternatives; potentially affected resources and extent of analysis to determine impacts; measures to avoid, minimize, and mitigate impacts of the proposal; and cumulative impacts. Scoping for the proposed project occurred between September 21 and November 5, 2015. The scoping process was documented in the Shell Anacortes Rail Unloading Facility Environmental Impact Statement Scoping Report (Skagit County and Ecology 2015b).

Draft EIS Preparation, Publication, and Review

A draft EIS is then prepared using the results of the scoping process. The purpose of an EIS is to provide an impartial discussion of significant environmental impacts and reasonable alternatives and mitigation measures that avoid or minimize adverse environmental impacts. The information in this draft EIS is provided for review and comment by interested parties and will also be used by the co-lead agencies to evaluate the proposed project.

Public, Agency, and Tribal Involvement

As described above, the co-lead agencies solicited feedback from the public, agencies, and tribes during the EIS scoping process, and will do so again during a 60-day comment period from October 4 to December 2, 2016. During the comment period, public hearings will be held on November 12, 2016 (Anacortes), November 16, 2016 (Mount Vernon), and November 19, 2016 (Seattle). Comments will also be accepted by means of a post office box, in person at Skagit County, an online open house, e-mail, and voicemail.

Final EIS Publication

Following the comment period, the co-lead agencies will issue the final EIS. The final EIS will address comments received during the comment period, and may include additional information and input received from Shell, the co-lead agencies, other agencies with jurisdiction or concern, tribes, and the public regarding the proposed project.

Federal, State, and Local Permits and Approvals

After completion of the EIS, Shell will need to obtain permits and authorizations to construct and operate the proposed project. Agencies can use the EIS when making decisions about project permitting, in addition to information submitted with each permit's application. See Chapter 1 – Introduction, of this EIS for additional details about the environmental review process.

OBJECTIVE OF THE PROPOSED PROJECT

The objective of the proposed Shell Anacortes Rail Unloading Facility is to provide the capability to receive crude oil by rail from the mid-continent area so the Shell PSR can maintain operations at its current level. This proposed source of crude oil is expected to replace and supplement the Shell PSR's declining Alaska North Slope supply. It must be refinable with the facility's existing technology and equipment and sustain the Shell PSR's economic viability.

ALTERNATIVES CONSIDERED

SEPA requires lead agencies to evaluate reasonable alternatives to the proposed project. Alternatives considered included on-site alternatives, off-site alternatives, alternatives suggested by commenters during the scoping process, and alternative methods of transporting crude oil to the Shell PSR (e.g., marine vessel, pipeline, or truck). Each potential project alternative was analyzed to determine if it would meet the proposal's objective at a lower environmental cost or decreased level of environmental degradation. Alternatives that failed to meet these criteria were eliminated from further study. See Chapter 2 – Proposed Project and Alternatives, of this EIS for additional information about the alternatives considered.

No Action Alternative

SEPA requires evaluation of a no action alternative as a benchmark from which other alternatives can be compared (WAC 197-11-440(5); Ecology 2004). Under the no action alternative, none of the proposed facilities would be constructed. The existing Shell PSR would continue to operate similarly as it does today; however, Shell would need to find another source of crude oil to maintain the refinery's existing production.

Proposed Project

Shell proposes to construct and operate a rail unloading facility at the Shell PSR. The proposed project includes building a rail spur from the existing adjacent BNSF Railway Anacortes Subdivision onto the Shell PSR property to accommodate unit trains of 102 tank cars transporting crude oil from the mid-continent area. The proposed project would not result in a change in the refining capacity of the Shell PSR.

BNSF Railway transports the majority of bulk crude oil out of the Bakken region. Figure ES-1 shows the anticipated route BNSF Railway would use for trains traveling to and from the Shell PSR.

Figure ES-1 Proposed BNSF Railway Routes Through Washington State

Each unit train arriving at the rail unloading facility would carry approximately 60,000 to 70,000 barrels of crude oil. The facility would receive six unit trains per week, with each train carrying up to 102 tank cars. The facility has been designed to receive 360,000 to 420,000 barrels of crude oil by rail per week. This volume is equivalent to six trains per week and the maximum volume of crude that can be unloaded at the facility.

Shell would use DOT-117 Specification tank cars that meet enhanced safety standards issued by the Pipeline and Hazardous Materials Safety Administration (PHMSA) and the Federal Railroad Administration (FRA). A single DOT-117 tank car is expected to hold approximately 600-700 barrels of crude oil and has a maximum gross rail load of 286,000 pounds.

The proposed project site includes approximately 47.1 acres, of which 45.8 acres are on the Shell PSR property, and 1.3 acres are on adjacent BNSF Railway right of way. There would be an additional 25.7 acres of temporary impacts on the Shell PSR property. Figure ES-2 shows the location of the proposed project. The proposed project site is situated east of the refinery, west of East March's Point Road, south of North Texas Road, and north of South March's Point Road.

Figure ES-2 Proposed Project Location

In addition to building the rail spur, the project would include installing equipment and facilities to pump oil from rail cars to existing tanks within the refinery, constructing stormwater detention ponds, and installing safety and spill response measures. Figure ES-3 presents a graphic representation of the key features of the proposed project.

Figure ES-3 Key Features of the Proposed Project

Shell proposes mitigation for on-site wetland impacts by restoring a portion of a nearby diked and now defunct tree farm on Padilla Bay. The activities necessary to implement this wetland mitigation are included as part of the proposed project. The wetland mitigation site is approximately 2 miles east of the project location at the south end of Padilla Bay. The mitigation site is 100 acres, of which approximately 73 acres would be restored to tidal estuary. Some of the remaining 27 acres would be used for a setback dike, pump station, and stormwater drainage features.

SIGNIFICANT AREAS OF CONCERN

The Skagit County Hearing Examiner identified issues that should be addressed in the EIS (Skagit County Hearing Examiner 2015). In addition, during the EIS scoping process, the co-lead agencies received more than 35,000 comments from the public, governmental agencies, and other interested stakeholders pertaining to the proposed project about a wide range of issues. The following is a list of many of the concerns brought to the attention of the co-leads:

- Determine the potential impacts to the environment associated with an accident during transport of crude oil by rail from the mid-continent area.
- Evaluate how derailments could lead to oil spills, fires, and explosions, which could have large impacts on the local environment, public health, and the economy.
- Identify rail transportation impacts along the delivery and return route corridors, including bridge safety.
- Consider the short-term, long-term, and cumulative impacts of oil spills on sensitive marine habitats and wildlife resources found within the project area, including bald eagles, great blue herons, commercial shellfish and fishing.
- Determine the proposed project's potential for contributing additional greenhouse gas (GHG) emissions at the facility and from rail transport.
- Address climate change and the impacts of contributing GHG sources or actions.
- Identify emergency response capabilities, including response to incidents involving crude oil transported along the rail route within Washington State.
- Analyze potentially impacted environmental justice communities, including minority, low-income, and Native American populations; and,
- Evaluate construction-related impacts from the excavation, hauling, and disposal of over 1 million cubic yards of soil.

Based on the comments, and through additional agency coordination during development of the draft EIS, the co-leads determined the environmental issues that would be studied in this analysis.

Scoping comments were received addressing all SEPA elements of the environment resulting in an EIS that covers direct, indirect, and cumulative impacts, where applicable, for each topic. See Chapter 3 – Affected Environment and Environmental Impacts, which provides analyses of

potential impacts of the proposed project on many environmental resources. See Chapter 4 – Environmental Health and Risk, which addresses the significant area of concern related to the probability of a spill and associated potential impacts to the environment.

SUMMARY OF ENVIRONMENTAL IMPACTS AND PROPOSED MITIGATION MEASURES

The major conclusions of this draft EIS are summarized in the discussion of potential environmental impacts of the proposed project provided below. These impacts are described in detail in Chapters 3 and 4 of this EIS. The potential impacts of the proposed project would be mitigated through implementation of a range of measures described in Chapter 5 – Summary of Impacts and Mitigation. Table ES-1 provides a summary of the mitigation measures proposed to address the potential environmental impacts of the proposed project. The discussion and table also indicate whether the proposed mitigation measures are anticipated to be effective in mitigating potential adverse impacts, or whether significant unavoidable adverse environmental impacts would remain.

In addition to the mitigation measures presented in Table ES-1, many other measures have been included as part of the proposed project, or would be applied as part of permit conditions, that would avoid or minimize potential impacts. These avoidance and minimization measures, and the proposed mitigation measures summarized in the table below, are described in detail in Chapter 5 – Summary of Impacts and Mitigation, of this EIS.

Chapter 3.1 – Earth Resources

Potential Impacts

Construction activities would alter topography, soils and, in some locations, the underlying sedimentary materials at the proposed project and mitigation sites. Substantial amounts of soil would be moved to and from the proposed project and mitigation sites (see Chapter 2 – Proposed Project and Alternatives, for additional detail). Potential construction-related impacts include erosion, loss of topsoil, soil compaction, soil mixing, revegetation, and changes to groundwater hydrology. Removal of large soil volumes would indirectly affect the soil's capacity to support native vegetation or future agricultural uses.

Operation and maintenance of the proposed project would not require additional excavation or disturbance of ground surfaces and no direct or indirect impacts are anticipated. Geologic hazards would be present during construction and operation activities and include seismic hazards, ground motion/shaking, soil liquefaction, tsunamis and seiches, volcanic activity, and landslides.

Cumulative Impacts

Within the study area, there has been significant agricultural, industrial, commercial, and residential development. It is assumed that with this growth, earth resources have been affected to accommodate new construction. In addition, construction and operation of the proposed Tesoro Clean Products Upgrade Project (Tesoro 2015) (see Table 3.0-2 in Chapter 3.0 –

Introduction, for additional project details) has the potential to impact earth resources. The Tesoro project and the proposed project could have cumulative impacts on earth resources. These impacts would be minimized by construction BMPs and localized to the Tesoro Anacortes Refinery site and the proposed project and mitigation sites.

Unavoidable Significant Adverse Impacts

No unavoidable significant adverse impacts were identified.

Chapter 3.2 – Groundwater

Potential Impacts

Construction impacts to groundwater include the potential release of hazardous materials to groundwater, construction stormwater, and construction dewatering. Construction equipment would require refueling and maintenance that poses a risk of contaminant releases to the ground (e.g., fuel, hydraulic fluid, oil, etc.). Excavation equipment would likely encounter groundwater where cut depths exceeded 10 feet along most of the proposed project alignment.

Potential impacts to groundwater from proposed project operations could occur from permanent subsurface modifications, stormwater, and oil leaks and spills. Permanent subsurface modifications at the proposed project site would require collection and conveyance of groundwater that seeps into the cut. Stormwater from the proposed project site has the potential to accumulate hydrocarbons from fuels used on site and other contaminants that seep into local groundwater. Groundwater seepage in the cut slopes of the proposed project site could indirectly affect local groundwater levels and movement.

Cumulative Impacts

Within the study area, there has been significant agricultural, industrial, commercial, and residential development. It is assumed that with this growth and new construction, groundwater has been affected. In addition, construction and operation of the proposed Tesoro Clean Products Upgrade Project has the potential to impact groundwater. The Tesoro project and the proposed project could have cumulative impacts on groundwater. These impacts would be minimized by construction BMPs and localized to the Tesoro Anacortes Refinery site and the proposed project and mitigation sites.

Unavoidable Significant Adverse Impacts

No unavoidable significant adverse impacts were identified.

Chapter 3.3 – Surface Water

Potential Impacts

During construction, direct impacts to stormwater patterns and water quality could occur from flows that cause erosion and sedimentation downstream of soil disturbance activities, runoff that has been in contact with uncured concrete that may have high pH values, or release of pollutants from equipment. During operations, contamination of surface water from leaks or spills from tank cars or petroleum products, lubricants, and chemicals from locomotive engines could occur.

Above-ground leaks that occur within the area of the rail unloading facility would be captured by a concrete platform with curbs and drains. These leaks would then be routed to the oil/water separation pond system for treatment. If any leaks occur on site at the unloading facility, but outside of the unloading platform, they would be routed into the North and South stormwater ponds. The oil/water separation vaults designed as part of the stormwater pond system are intended to capture any releases that could occur during daily operations. Direct impacts from stormwater runoff from additional impervious surfaces could cause a reduction in water quality.

The proposed development of the mitigation site would restore a tidal connection between the 73-acre site and Padilla Bay, which would have a beneficial impact on the wetland mitigation site. Because no construction would take place along the Anacortes Subdivision, there would be no direct or indirect impacts to surface water flows or water quality. Increased train traffic on the Anacortes Subdivision has the potential to increase accidents involving trains traveling along the corridor, and would require continued maintenance of the rail corridor. There could also be leaks or spills from tank cars or leaks of petroleum products, lubricants, and chemicals from locomotive engines along the subdivision from daily operations. These releases are not treated along the Anacortes Subdivision.

Cumulative Impacts

Within the study area, there has been significant agricultural, industrial, commercial, and residential development. It is assumed that with this growth and construction, surface water resources have been affected. In addition, construction and operation of the proposed Tesoro Clean Products Upgrade Project has the potential to impact surface water resources. The Tesoro project and the proposed project could have cumulative impacts on surface water resources. These impacts would be minimized by construction BMPs and localized to the Tesoro Anacortes Refinery site and the proposed project and mitigation sites.

Unavoidable Significant Adverse Impacts

No unavoidable significant adverse impacts were identified.

Chapter 3.4 – Fish and Aquatic Species and Habitat

Potential Impacts

Construction at the proposed project site would impact fish and aquatic resources through the loss or reconfiguration of drainage channels, streams, and riparian habitat. The project would result in the reconfiguration of all drainages crossing the project area. Changes to available fish habitat, introduction of turbid water, and fish handling associated with site isolation and in-water construction activities in Stream S may temporarily affect fish during construction.

Construction at the proposed wetland mitigation site would impact fish and aquatic resources. By removing portions of the perimeter dike and supporting tidal exchange within the site, fish would gain access to habitat previously unavailable to them. The entire extent of estuarine wetlands that would develop on the wetland mitigation site is presumed to be accessible to fish from Padilla Bay, as well as support a diverse mix of estuarine wetland habitats and vegetation. A tidal channel would be constructed within the site to support flow and fish access. These restored

habitats would contribute prey resources and organic matter to Puget Sound and valuable nursery habitat for juvenile salmon.

During operations, water from ditches (except water directed to Stream S) would be captured and conveyed across the study area by either a culvert or stormwater system to one of the two new stormwater ponds. The ponds include pre-treatment oil/water separation systems and provide for detention and controlled release into Padilla Bay. Discharge from the stormwater ponds would be through spreaders that could allow for infiltration during appropriate levels of inundation. When the ground is saturated, the discharge is presumed to form sheet flow into a drainage ditch, wetland, or stream. The reconfiguration of Stream S would provide long-term beneficial impacts to fish through the creation of new habitat.

Cumulative Impacts

Within the study area, there has been significant agricultural, industrial, commercial, and residential development. It is assumed that with this growth and new construction, fish and aquatic resources have been affected. Construction and operation of the proposed Tesoro Clean Products Upgrade Project has the potential to impact these resources. The Tesoro project and the proposed project could have cumulative impacts on fish and aquatic species and habitat. These impacts would be minimized by construction BMPs and localized to the Tesoro Anacortes Refinery site and the proposed project and mitigation sites.

Unavoidable Significant Adverse Impacts

No unavoidable significant adverse impacts were identified.

Chapter 3.5 – Wetlands

Potential Impacts

The proposed project would permanently fill and/or excavate six of the 23 identified wetlands on the proposed project site. In total, 21.21 acres of wetlands would be filled. This would include 0.19 acre of Category II wetlands, 20.71 acres of Category III wetlands, and 0.31 acre of Category IV wetlands.

The project would also convert approximately 1.22 acres of the forested and scrub-shrub wetlands into emergent habitats. The conversions would occur due to the relocation and construction of underground natural gas and water pipelines and be considered permanent impacts. These areas would have a temporal loss of habitat function because it may take some time to reestablish the functional levels lost during the conversions. However, after the new emergent habitats are established, the capacity of these areas to treat runoff would likely be increased from their previous functions.

Both short- and long-term temporary impacts would result from clearing to allow for construction access and the rerouting and installation of underground gas and water pipelines Short-term impacts would occur in portions of seven wetlands, totaling 8.10 acres. The affected areas in the wetlands would consist mostly of pasture grasses. Following construction, these areas would be restored to pre-construction conditions and be reseeded with pasture plant species. Long-term temporary impacts would occur in approximately 0.23 acre. This area would

be restored with native woody vegetation after construction; however, there would be a temporal loss (over a year) of wetland functions until planted woody vegetation became established. Compensation for these long-term temporary impacts would occur at the proposed wetland mitigation site.

Permanent impacts to buffers generally result from the loss of vegetated buffer areas. The proposed project would permanently remove 5.2 acres of forested buffers in five wetlands and 7.38 acres of grazed pasture wetland buffers at eight wetlands.

Temporary buffer impacts would occur in 11 wetlands as a result of clearing to allow for construction access and the rerouting and installation of underground gas and water pipelines. The temporary affected area totals 6.76 acres, which includes 1.88 acres of forested and shrub buffers and 4.88 acres of grazed pasture dominated by nonnative grasses. These temporary cleared areas would be restored to pre-construction contours and planted with native species to comply with the U.S. Army Corps of Engineers (USACE) permit requirements.

Cumulative Impacts

In the cumulative impacts study area, reasonably foreseeable future actions with the potential to impact wetlands include the Tesoro Clean Products Upgrade Project, which would impact about 0.0105 acre, and the Old Highway 99 N Overpass of BNSF Railroad (see Table 3.0-2 in Chapter 3.0 – Introduction, for additional project details), which would impact 0.071 acre. Together, the proposed project and these reasonably foreseeable future actions would contribute to a cumulative impact on wetlands due to filling of wetlands and the permanent loss of wetland functions.

Historically, there has also been significant agricultural, industrial, commercial, and residential development in the study area. It is assumed that with this growth and construction, wetlands have been affected. Impacts from the proposed project would be mitigated by the creation of a 73-acre wetland mitigation site. Mitigation would also be required for the impacts from the reasonably foreseeable future actions through mitigation plans. Because the mitigations plans are required to achieve the goal of no net loss of wetlands, the potential cumulative impacts would be minimized.

Unavoidable Significant Adverse Impacts

If mitigation is implemented as proposed there would be no unavoidable significant adverse impacts.

Chapter 3.6 – Vegetation and Terrestrial Wildlife

Potential Impacts

Vegetation

Removal of vegetation would be required to construct the project. The overall permanent impacts of construction on vegetation are not anticipated to be significant because the primary impacts to pasture vegetation are small-scale in the context of the larger contributing Telegraph Slough-Padilla Bay watershed, which is predominantly agriculture and pasture. Forest stands

that would be permanently affected comprise a fraction of forest stands identified in the study area.

Construction of the wetland mitigation site would require removal of vegetation. However, in accordance with the wetland mitigation plan nearshore ecosystem processes would be reestablished and are anticipated to develop into nearshore habitats over time (mudflats, salt marshes, tidal channels, and upland transition zones).

Because special-status plant species are not known to occur on the project or wetland mitigation sites, it is unlikely that construction would directly affect these species. Construction of the proposed project and mitigation sites may increase the risk of introducing or contributing to the spread of noxious weed species.

Terrestrial Wildlife

Construction of the proposed project and wetland mitigation sites would temporarily disturb and permanently alter wildlife habitat in some vegetation communities. Construction-related water quality impacts may alter foraging opportunities for waterfowl and other aquatic birds because of disturbances to sediments through in-water work.

Impacts might include water clouding, which could obscure prey for waterfowl and other aquatic birds. Noise and light associated with construction activities could cause stress to wildlife and alter behavior patterns. For example, noise and light could interfere with normal reproduction and feeding. Construction impacts from vegetation removal and earthwork are not anticipated to be significant. These disturbances could result in mortality of some individual animals and permanent loss of breeding habitat such as freshwater wetlands. The overall impact is not anticipated to adversely affect the population viability of any species near the project.

Construction would not directly alter marbled murrelet habitat; however, marbled murrelets could be disturbed by construction activities. Construction would permanently remove two active bald eagle nests: one near the Anacortes Subdivision in the southern portion of the proposed project site, and a second within the wetland mitigation site. A third bald eagle nest near the proposed project site would be retained. Because other special-status species or habitats are not known to occur on the project or wetland mitigation sites, it is unlikely that construction would directly affect these species or their habitat.

Operation of the rail unloading facility may result in direct, long-term disturbance to wildlife. Such impacts could include increased degradation of habitat quality, increased animal-train collisions, light and glare impacts, disruption of species' social structures, avoidance or abandonment of previously occupied areas adjacent to the facility, and obstructions to wildlife movement. Operational noise from the project may result in wildlife avoidance in the immediate vicinity. However, this impact is anticipated to be negligible, given the current noise levels from existing operations at the Shell PSR site and other surrounding development.

Operation of the proposed project has the potential to affect behavior of bald eagles at the retained nest near the proposed project site. Operation and maintenance of stormwater facilities

near the retained bald eagle nest would increase human activity within 200 feet of the existing nest, and forested vegetation surrounding the nest would be permanently removed, making human activity visible. The retained bald eagle nest and proposed nest platforms would be at least 400 feet away from the proposed new rail spur, and are not anticipated to be significantly affected by noise from rail operations.

Operation of the proposed project may also affect behavior of great blue herons at the March Point Heronry. Light and noise pollution has the potential to affect behavior; however, impacts to herons from additional light pollution are expected to be negligible. The existing heron colony is surrounded by industrial and transportation development and is acclimated to noise from existing train traffic as evidenced by the sustained productivity of the colony. Therefore, noise impacts would be minimal.

Cumulative Impacts

Within the study area, there has been significant agricultural, industrial, commercial, and residential development. It is assumed that with this growth and construction, vegetation and terrestrial wildlife have been affected. The Tesoro Clean Products Upgrade Project is anticipated to have minimal impacts on vegetation and terrestrial wildlife as the project would be constructed within a previously developed area of the refinery. The proposed project, and to a minimal extent, the Tesoro project, could contribute to a cumulative impact on vegetation and terrestrial wildlife. These impacts would be minimized by construction BMPs and localized to the Tesoro Anacortes Refinery site and the proposed project and mitigation sites.

Unavoidable Significant Adverse Impacts

If mitigation is implemented as proposed there would be no unavoidable significant adverse impacts.

Chapter 3.7 – Cultural Resources

Potential Impacts

The proposed project would disturb previously recorded historic-era archaeological sites located within the proposed project site boundaries. However, the sites have been determined not eligible for listing in the National Register of Historic Places (NRHP) by the USACE and the Washington Department of Archaeology and Historic Preservation (DAHP). No previously documented historic-era buildings, structures, or objects are located within the footprint of the proposed project site.

At the proposed wetland mitigation site, an archaeological site would likely be disturbed by project activities. However, this site has been determined not eligible for listing in the NRHP. Three previously documented historic-era buildings, structures, or objects are located within the proposed wetland mitigation site. However, these three resources have been determined not eligible for listing in the NRHP by the USACE and DAHP.

No archaeological sites, other cultural resources, or historic-era resources have been documented within the immediate vicinity of the potential spoils disposal sites. Because these locations are

operating pits and no expansion is planned for this project, no environmental consequences are anticipated.

Since the March Point area is important for Native American land use, there is a possibility that archaeological sites exist within the proposed project site but were not observed during cultural resource inventory work. These sites may range from occupation locations to fishing or resource procurement and processing locations. Such resources would be an important discovery and would help to better illustrate Native American subsistence, land use, and settlement practices. If resources are made known during the course of project development, the impacts and mitigation would be reassessed.

Cumulative Impacts

Within the study area, there has been significant agricultural, industrial, commercial, and residential development. With this development, there is the potential that NRHP-listed or eligible archaeological sites, historic-era buildings, or objects have been disturbed. However, impacts would have been mitigated. Therefore, no cumulative impacts are anticipated.

Unavoidable Significant Adverse Impacts

If no additional cultural resources are discovered and mitigation is implemented as proposed, there would be no unavoidable significant adverse impacts.

Chapter 3.8 – Treaty and Traditionally Used Resources

Potential Impacts

No Traditional Cultural Properties, Cultural Landscapes, specific gathering areas or plants important to tribes, or specific hunting areas or certain terrestrial animals have been identified in the study area to date; therefore, no impacts from the proposed project were identified.

The study area is located near tribal fisheries. The impacts to tribal fisheries would be the same as those described for fish and aquatic resources in Chapter 3.4 – Fish and Aquatic Species and Habitat. Impacts to tribal fisheries could include loss of or changes to riparian habitat, or changes in water quality that could impact fish. Depending on the degree of direct impacts, treaty resources, traditional lifeways, health, and the culture of tribes could be affected due to degradation of their fisheries.

Cumulative Impacts

The proposed project would not disturb any known Traditional Cultural Properties or Cultural Landscapes; specific gathering areas or plants important to tribes; or specific hunting areas or certain terrestrial animals important to tribes; therefore, the proposed project would not contribute to cumulative impacts on these resources. Tribal fisheries are located near the study area. The cumulative impacts would be the same as described for fish and aquatic resources in Chapter 3.4 – Fish and Aquatic Species and Habitat.

Unavoidable Significant Adverse Impacts

No unavoidable significant adverse impacts were identified based on available information.

Chapter 3.9 – Noise and Vibration

Potential Impacts

Construction of the proposed project and wetland mitigation sites would not exceed thresholds for noise impacts at any sensitive noise receptors; therefore, there would be no adverse noise impacts during construction. Also, construction activities at the proposed project and wetland mitigation sites would not exceed the thresholds for vibration that could result in structural damage to nearby buildings, or the thresholds for annoyance from vibration at nearby residences. Therefore, there would be no adverse vibration impacts during construction.

Operation of unit trains at the proposed project site would produce ground-borne vibration and noise; however, it would not exceed the thresholds for impacts. Operational noise from the unit trains along the Anacortes and Bellingham subdivisions is predicted to result in moderate or severe impacts in residential areas within the study area. The primary cause of these noise impacts would be the use of train horns at public at-grade crossings. Some 168 residential receptors are predicted to be impacted by noise that exceeds the moderate impact threshold; and 44 would experience noise that exceeds the severe impact threshold.

Operation of unit trains would produce ground-borne vibration and noise along the Anacortes and Bellingham subdivisions. However, the levels produced would not exceed the thresholds for impacts.

Cumulative Impacts

The proposed project, combined with past, present, and reasonably foreseeable future actions, would result in a cumulative impact on noise levels. One identified reasonably foreseeable future action would add a total of 18 train trips per day to rail traffic on the Bellingham Subdivision. This action, combined with the proposed project, would add a total of 20 train trips per day, increasing the number of trains from 21 to 41, primarily due to the greater frequency of train horns that would result. The doubling of the train traffic would be expected to increase future noise levels on the Bellingham Subdivision by approximately 3 dBA relative to existing L_{dn} sound levels. For context, a 3 dBA increase is considered the minimum amount of change in sound level that is perceptible to humans.

Unavoidable Significant Adverse Impacts

All of the moderate and severe impacts along the Anacortes and Bellingham subdivisions would remain.

Chapter 3.10 – Air Quality and Greenhouse Gases

Potential Impacts

During construction, the primary sources of emissions would be nonroad construction equipment exhaust, fugitive dust from earthmoving operations, and on-road truck exhaust from hauling away and delivering materials to the project and wetland mitigation sites. Emissions would also result from workers' motor vehicles traveling to and from the construction site.

The direct emissions associated with operation of the rail unloading facility would include a small amount of volatile organic compounds (VOCs) due to equipment leaks and wastewater treatment. No emissions of other criteria air pollutants are anticipated. The operational air emissions from the proposed project would not contribute enough air pollutant emissions to result in an exceedance of the National Ambient Air Quality Standards/Washington Ambient Air Quality Standards (NAAQS/WAAQS). As the levels of the NAAQS and WAAQS are tied to public health, no impacts to public health are anticipated because no exceedances are anticipated. Emissions associated with delays at at-grade railroad crossings would be well below one ton per year for criteria pollutants. No direct emissions during operations are anticipated from the wetland mitigation site.

The proposed project would not increase greenhouse gas (GHG) emissions from the Shell PSR. Emissions resulting from the refinement and consumption of products from the Shell PSR were not assessed because the refinery's operating capacity would not change with implementation of the proposed project. The crude oil shipped to the proposed unloading facility would replace deliveries from the Alaska North Slope currently delivered via marine vessel.

The transport of crude oil from the mid-continent area would result in a 93-percent increase of GHG emissions resulting from changing delivery of oil from tanker ships to rail. The annual emissions from oil tankers delivering oil to the Shell PSR is about 48,224 metric tons per year. The annual emissions from train delivery oil to the Shell PSR would be about 93,211 metric tons per year. The net increase in GHG emissions as a result of this change would be 44,987 metric tons per year.

Cumulative Impacts

The proposed project, combined with past, present, and reasonably foreseeable future actions, would have a cumulative impact on GHG and nitrogen oxide (NO_x) emissions. Reasonably foreseeable future actions that would increase rail traffic would also increase the NO_x emissions for all counties traversed by the trains. However, as of 2008, the U.S. Environmental Protection Agency (USEPA) has revised its emission standards for new and rebuilt locomotives that will lower emissions as older locomotives are replaced or rebuilt. Therefore, the emissions from each locomotive will decrease over time and overall NO_x emissions would be anticipated to decrease.

GHG emissions as a result of proposed project operations would relate only to changes in the transport of materials to the facility, as throughput capacity of the Shell PSR is anticipated to remain the same. The change associated with the proposed project would increase GHG emissions by approximately 44,987 metric tons per year. Because GHGs are a global issue that are transmitted within and beyond the state line, this increase in GHGs may need to be offset in other sectors to reach the state's goals. Therefore, from both global and state perspectives, the proposed project, combined with past, present, and reasonably foreseeable future actions, would contribute to a cumulative impact on GHG emissions.

Unavoidable Significant Adverse Impacts

No unavoidable significant adverse impacts were identified.

Chapter 3.11 – Energy and Natural Resources

Potential Impacts

Construction activities for the proposed project and wetland mitigation site would require fuel consumption for construction activities and to transport materials, equipment, and workers to the project sites. The scope of construction at the project and wetland mitigation sites is similar to other large projects in Skagit County, and would not have an adverse impact on energy supplies. Once constructed and operating, electrical power would be used to run the equipment associated with the rail unloading facility; however, impacts on energy from operations at the proposed project site would be minimal. The wetland mitigation site would require minimal energy use, and be mainly in the form of fuel used by vehicles or equipment for monitoring and maintenance.

Transporting crude oil by rail from the mid-continent area to the Shell PSR would result in a net increase in diesel fuel use over the existing method of transporting crude oil by marine vessel from Valdez, Alaska. Transporting crude oil by rail would require approximately 9.1 million gallons of diesel fuel annually; transporting it via marine vessel would require approximately 4.8 million gallons annually. This increase would have a minimal impact on energy supplies.

Cumulative Impacts

The proposed project would contribute to a cumulative impact on energy and natural resources; however, the fuel and electricity use required for the proposed project and past, present, and reasonably foreseeable future actions would not exceed available supply.

Unavoidable Significant Adverse Impacts

No unavoidable significant adverse impacts were identified.

Chapter 3.12 – Land Use and Social Elements

Potential Impacts

Land Use

Construction and operation of the proposed project and wetland mitigation sites would be compatible with surrounding heavy industrial, light industrial, agricultural, and commercial land uses. It is anticipated that current housing levels would be adequate to support any workers coming from outside the area during construction and operations.

Recreation

Construction and operation of the proposed rail unloading facility would not directly affect recreational resources. Construction of the wetland mitigation site would temporarily limit access to duck hunters in the Swinomish Duck Club. Following construction, however, the duck hunters would be permitted to enter hunting areas that can be accessed via the wetland mitigation site, but would not be able to hunt within the wetland mitigation site boundaries.

Transport of crude by rail to the proposed facility along the Anacortes Subdivision would have direct impacts on recreational facilities from increased noise and vibration and traffic delays. The

added trains would generally result in an increase in overall average noise levels, but would not increase maximum noise levels associated with a single train passing through the area.

Utilities

Construction activities at the proposed project and wetland mitigation sites would result in a temporary increase in water use and the generation of solid waste, including trees cut down at the wetland mitigation site that would require disposal. Operation of the proposed project would result in increased electricity and water use and solid waste generation. Operation of the wetland mitigation site would require negligible electricity, but would not require water use or generate solid waste. No impacts on the supply of any utilities are anticipated. Construction activities for the proposed project site would interrupt operation of the BP Olympic pipeline, Kinder Morgan Puget Sound pipeline, and Puget Sound Energy power lines for up to two days while they were relocated.

Community services

No increases in demand for hospitals, schools, libraries, community centers, or religious facilities are expected during construction or operation of the proposed project and wetland mitigation sites; therefore, no impacts are anticipated.

Minority, Low-Income, and LEP Populations

Construction and operations would not disproportionately impact minority, low-income, or limited English proficiency (LEP) populations. Construction of the proposed project would temporarily increase air emissions from use of construction equipment; however, they would not be anticipated to result in public health effects. Operation of the proposed project would not contribute enough air pollutants to result in an exceedance of the NAAQS/WAAQS and, therefore, are not anticipated to result in public health effects.

Cumulative Impacts

Land Use

The proposed project is not anticipated to contribute to a cumulative impact on land use or social elements. Since 1958 (the beginning of the timeframe for the cumulative impacts analysis), there has been significant agricultural, industrial, commercial, and residential development in the study area. Land uses have changed with this growth; however, development has been compatible with applicable Skagit County and City of Anacortes land use designations and surrounding uses. Construction and operation of the proposed Tesoro Clean Products Upgrade Project (Tesoro 2015) (see Table 3.0-2 in Chapter 3.0 – Introduction, for additional project details) would be compatible with existing land uses. No cumulative impacts are anticipated.

Recreation

The proposed project would temporarily impact recreational resources during construction. This would not contribute to a cumulative impact as the effect would be temporary; therefore, no long-term impacts are anticipated. Past development in the study area has not adversely affected recreational resources and the Tesoro Clean Products Upgrade Project is not anticipated to

adversely affect recreational resources; therefore, no adverse impacts to recreational resources are anticipated. No cumulative impacts are anticipated.

Utilities

The proposed project would temporarily increase demand for utilities during construction and result in a negligible increase in demand for utilities during operations. Past development in the study area has not adversely impacted the supply of any utilities and the Tesoro Clean Products Upgrade Project would not adversely affect future supplies. No cumulative impacts are anticipated.

Community Services and Minority, Low-Income, and LEP Populations

The proposed project would not affect demand for community services or disproportionately impact minority or low income populations, or affect public health. Neither past development in the study area nor the Tesoro Clean Products Upgrade Project are expected to adversely affect these resources. No cumulative impacts are anticipated.

Unavoidable Significant Adverse Impacts

No unavoidable significant adverse impacts were identified.

Chapter 3.13 – Visual Resources

Potential Impacts

Construction and operation of the proposed project would take place in an area with existing industrial development and activities; therefore, visual impacts from construction and operation would be minimal. Operation of the rail unloading facility would produce minor light and glare impacts. The construction of the wetland mitigation site would be largely shielded from the surrounding area by existing stands of trees; therefore, visual impacts during construction would be minimal. The wetland mitigation site would be similar in character to the surrounding area and would not attract the attention of viewers. After construction, viewers would not notice a change to the visual resources at the wetland mitigation site.

A retaining wall would be built along an approximately 1,000-foot-long stretch of the Anacortes Subdivision. Construction activities would result in minor visual impacts from the presence of construction equipment along the rail line. After construction, the retaining wall would be similar in height to the existing tracks, but close to South March's Point Road. This change in the visual environment would result in a moderate impact.

Additional trains traveling along the Anacortes Subdivision would result in an increase in the frequency and the length of time that trains transporting crude oil were running and in view, but would not add a new type of visual impact to the existing rail corridor. Visual impacts from trains associated with the proposed project would therefore be minor.

Cumulative Impacts

Within the study area, there has been significant agricultural, industrial, commercial, and residential development. It is assumed that with this growth and new construction, visual

resources have been affected. Construction and operation of the Tesoro Clean Products Upgrade Project has the potential to impact these resources. Together, these projects would contribute to a cumulative impact on visual resources. However, given their proximity, the impacts would be localized to the Tesoro Anacortes Refinery site and the proposed project and mitigation sites.

Unavoidable Significant Adverse Impacts

No unavoidable significant adverse impacts were identified.

Chapter 3.14 – Economics

Potential Impacts

The construction effort for the proposed project would create a short-term stimulus for the Washington State economy through purchases of materials, supplies, equipment, and services; and labor wages for construction workers. After the proposed project becomes operational, the Shell PSR would experience a change in net employment and payroll, as well as some general operational expenditures, such as energy and office supplies. These impacts are considered minimal.

Cumulative Impacts

Construction of the proposed project and reasonably foreseeable future projects would create a short-term stimulus for the Washington State economy through purchases of materials, supplies, equipment, and services; and labor wages for construction workers. During operations, the proposed projects and reasonably foreseeable future projects would create economic benefits for local economies through the creation of jobs and operational expenditures.

Unavoidable Significant Adverse Impacts

No unavoidable significant adverse impacts were identified.

Chapter 3.15 – Rail Traffic and Transportation

Potential Impacts

Rail access to the unloading facility would be provided by a new connection to the existing Anacortes Subdivision located to the southeast, which would require modifications to the Anacortes Subdivision configuration. Short segments of the existing Anacortes Subdivision and a siding track would be realigned slightly to the south. Temporary construction impacts to rail traffic could occur as the new alignment is brought into operation. The majority of the construction would be done adjacent to the existing rail line and the only disruption to rail traffic would occur when the formal rail line connection is made. BNSF Railway would manage the timing, testing, and opening of the new alignment and maintain current rail operations to the extent possible to minimize delay.

During operation, the proposed project would increase traffic along the Anacortes Subdivision by up to six unit trains per week, or two trips per day on average (one in each direction). Intersection occupancy time by a Shell unit train would be approximately 8 minutes. Marine boat traffic would experience approximately 12-minute delays at the Swinomish Channel Swing

Bridge to allow for the closing of the bridge, the passing of a train, and the re-opening of the bridge.

The direct impact of the proposed project would be additional train traffic on the Anacortes Subdivision. As no other reasonably foreseeable future actions were identified for the Anacortes Subdivision, the cumulative impact would be the same as the direct impact.

Cumulative Impacts

The direct impact of the proposed project would be additional train traffic on the Anacortes Subdivision. As no other reasonably foreseeable future actions were identified for the Anacortes Subdivision, the cumulative impact would be the same as the direct impact.

The proposed project, combined with the past, present, and reasonably foreseeable future actions, would have a cumulative impact on the rail transportation network in Washington State. In the Washington State Rail Plan, the Washington State Department of Transportation (WSDOT) indicates that five of the nine subdivisions used by proposed project unit trains are projected to be overcapacity by 2035 (WSDOT 2014). Although they would represent a small portion of existing and projected traffic, the six additional proposed Shell unit trains per week would contribute to a cumulative impact on the capacity of the rail transportation network. BNSF Railway would likely address key capacity issues as they arise.

Unavoidable Significant Adverse Impacts

No unavoidable significant adverse impacts were identified.

Chapter 3.16 – Vehicle Traffic and Transportation

Potential Impacts

Short-term impacts on vehicular transportation would occur during proposed project construction. Construction activities would result in up to an additional 652 vehicles per day on local roads for the seven-month excavation period, and up to an additional 203 vehicles per day on local roads for the 15-month nonexcavation period. These additional vehicles would degrade the level of service at the SR 20 / Oak Harbor / SR 20 Spur intersection at Sharpes Corner.

During operations, the proposed project would add six unit trains in each direction per week, on average, through the study area. This would result in delays at at-grade crossings. However, no significant impacts are anticipated because the crossing blockage time of 8 minutes is less than the maximum allowed blockage time of 10 consecutive minutes (WAC 480-62-220).

Cumulative Impacts

On the Anacortes Subdivision, no other reasonably foreseeable future actions are associated with specific crossings or intersections. The direct impact of the proposed project is additional intersection traffic delays at crossings. There are no other reasonably foreseeable future actions on the Anacortes Subdivision that would impact vehicle delays; therefore, the cumulative impact to intersection delays would be the same as the direct impact.

The proposed project, combined with the past, present, and reasonably foreseeable future actions, would have a cumulative impact on traffic delays at at-grade crossings along the Bellingham Subdivision. One identified reasonably foreseeable future action would add an estimated total of 18 train trips per day to rail traffic on the Bellingham Subdivision. Combined with the proposed project, this would increase the daily train volume from 21 to 41 trains per day, which would lead to additional delays at at-grade crossings. Although they would represent a small portion of existing and projected traffic, the additional proposed Shell unit trains would contribute to a cumulative impact on traffic delays.

Unavoidable Significant Adverse Impacts

Implementation of signal timing revisions would not completely mitigate traffic delays at at-grade crossings. However, this is not considered an unavoidable significant adverse impact from the proposed project as Shell unit trains would only represent a small portion of the existing and projected rail traffic that would lead to the additional traffic delays.

Chapter 3.17 – Public Services and Incident Response

Potential Impacts

Construction of the proposed project and wetland mitigation sites would increase the potential for injuries or accidents that may require public services. Increased worker and truck traffic during construction would cause delays on access roads, including SR 20, which could affect the response times of fire, police, or emergency medical response teams. However, this impact would be temporary and would subside following construction. Operation of the proposed project and wetland mitigation sites would not create a substantial new demand for public services locally.

During operation, the transport of crude oil by rail to the proposed project site could have impacts on police, fire, and emergency medical response times. Service response times could increase because of additional delays at at-grade railroad crossings on the BNSF Railway main line throughout Washington due to passing unit trains going to and from the project site. There is also the potential for increased demand for emergency services due to a rail accident.

Cumulative Impacts

On the Anacortes Subdivision, there are no other reasonably foreseeable projects that would increase rail traffic. Therefore, the potential for cumulative impacts is the same as direct impacts identified for the proposed project. On the Bellingham Subdivision, the proposed project, when considered with other reasonably foreseeable future projects, would increase delays at at-grade crossings, which could lead to increased police, fire, and emergency medical response times.

Unavoidable Significant Adverse Impacts

Implementation of signal timing revisions would not completely eliminate delays for emergency vehicles at at-grade crossing; however, this is not considered an unavoidable significant adverse impact from the proposed project as Shell unit trains would only represent a small portion of the existing and projected rail traffic that would lead to the additional traffic delays.

Chapter 4 – Environmental Health and Risk

Potential Impacts

If an oil release were to occur from a train traveling to or from the Shell PSR, many environmental resources and sensitive areas could be affected. Biological resources potentially impacted by surface and shoreline oiling include waterfowl, aerial and diving birds, wetland and terrestrial wildlife, fur-bearing marine mammals, pinnipeds (seals and sea lions), and cetaceans (whales and dolphins). Biota potentially impacted by water column toxicity include mobile and stationary bottom-dwelling fish and invertebrates, small fish, bottom-dwelling organisms, and plankton that drift with the currents.

There is also the risk of fire or explosion associated with an accident involving a crude-by-rail train. The probability of a fire or explosion in the event of a release is low, but could have significant impacts on many human, built, and environmental resources were such an accident to take place.

Unavoidable Significant Adverse Impacts

An accidental release of oil resulting in a spill, fire, or explosion, could have unavoidable significant adverse impacts.

Table ES-1 Summary of Impacts and Proposed Mitigation

Resource	Potential Impacts Requiring Mitigation	Proposed Mitigation	Unavoidable Significant Adverse Impacts Following Mitigation
Earth Resources	None	No mitigation proposed at this time.	None
Groundwater	None	No mitigation proposed at this time.	None
Surface Water	None	No mitigation proposed at this time.	None
Fish and Aquatic Species and Habitat	None	No mitigation proposed at this time.	None
Wetlands	Some 25.83 acres of permanent wetland impacts, 0.23 acre of long-term temporary impacts, and 12.58 acres of permanent wetland buffer impacts.	Shell would provide compensatory mitigation for wetland impacts at a wetland mitigation site approximately 2 miles east of the project site at the south end of Padilla Bay.	None if mitigation is implemented and performs as proposed.
Vegetation and Terrestrial Wildlife and Habitat	Construction of the proposed project would permanently remove two active bald eagle nests: one near the Anacortes Subdivision in the southern portion of the proposed project site, and a second found within the wetland mitigation site.	Shell would mitigate for impacts to bald eagle nests by creating two new nesting platforms at the proposed project site and two nesting platforms at the wetland mitigation site.	None if mitigation is implemented as proposed.

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Resource	Potential Impacts Requiring Mitigation	Proposed Mitigation	Unavoidable Significant Adverse Impacts Following Mitigation
Cultural Resources	No NRHP-eligible archaeological site or historic-era resources are found within the Area of Potential Effects. Because the March Point area is important for Native American land use, there is a possibility that archaeological sites exist within the proposed project site but were not observed or known during cultural resource inventory work. Engagement with tribes would help to inform if such sites exist.	Shell would develop and implement an Unanticipated Discovery Plan for use during construction when archaeological monitors are not present.	None if mitigation is implemented as proposed.
Treaty and Traditionally Used Resources	No Traditional Cultural Properties, Cultural Landscapes, specific gathering areas or plants important to tribes, or specific hunting areas or certain terrestrial animals have been identified in the study area to date. No impacts to treaty or traditionally used resources from the proposed project were identified.	No additional mitigation measures are proposed at this time beyond the avoidance and minimization measures described in Chapter 3.4 – Fish and Aquatic Species and Habitat. Should any additional tribal resources be made known, Skagit County and Ecology may reassess potential impacts and mitigation.	None identified at this time.
Noise and Vibration	Operational noise from unit trains along the Anacortes and Bellingham subdivisions is predicted to result in moderate or severe impacts to residential land uses. The primary cause of noise impacts would be the use of train horns at the at-grade crossings. Some 168 residential receptors are predicted to exceed the moderate impact threshold and 44 would exceed the severe impact threshold.	No mitigation measures proposed beyond the avoidance and minimization measures that would be developed and enforced as part of the permitting process.	All of the moderate and severe impacts along the Anacortes and Bellingham subdivisions would remain.

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Resource	Potential Impacts Requiring Mitigation	Proposed Mitigation	Unavoidable Significant Adverse Impacts Following Mitigation
Air Quality and Greenhouse Gases	The transport of crude oil from the mid-continent area would result in a 44,987 metric tons per year net increase of GHG emissions. This 93-percent increase over current shipment operations results from changing delivery of oil from tanker ships to rail.	Shell would assess and update, as necessary, its facility-wide vehicle anti-idling policy to include the rail unloading facility to reduce GHG emissions from construction and operation of the proposed project.	None
Energy and Natural Resources	None	No mitigation proposed at this time.	None
Land Use and Social Elements	None	No mitigation proposed at this time.	None
Visual Resources	None	No mitigation proposed at this time.	None
Economics	None	No mitigation proposed at this time.	None
Rail Traffic and Transportation	None	No mitigation proposed at this time.	None
Vehicle Traffic and Transportation	The proposed project, when considered with other reasonably foreseeable future projects, would increase vehicular traffic delays at at-grade crossings.	Shell would fund a study to evaluate the feasibility of implementing signal timing revisions at specified at-grade crossings along the Bellingham and Anacortes subdivisions in Skagit County.	Implementation of signal timing revisions would not completely mitigate traffic delays at at-grade crossings; however, this is not considered an unavoidable significant adverse impact from the proposed project as Shell unit trains would only represent a small portion of the existing and projected rail traffic that would lead to the additional traffic delays.

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Resource	Potential Impacts Requiring Mitigation	Proposed Mitigation	Unavoidable Significant Adverse Impacts Following Mitigation
Public Services and Incident Response	The impacts of transporting crude oil by rail to the proposed project site would have impacts on police, fire, and emergency medical response times. Service response times could increase because of delays at at-grade railroad crossings. There would be the potential for increased demand for emergency services due to an accident occurring during rail transport. There would be an increased risk of a release of oil in Skagit County and along the proposed project rail transport route through Washington State.	Shell would fund a study to evaluate the feasibility of implementing signal timing revisions at at-grade crossings along the Bellingham and Anacortes subdivisions in Skagit County. Shell would provide funding to create or augment existing oil and hazardous spill response equipment caches along the proposed project rail route throughout the state. Shell would coordinate and fund a deployment drill for a crude-by-rail spill scenario with BNSF Railway and invite the local emergency responders and tribes to participate. Shell would update their existing PSR oil spill contingency plan to reflect operations of the new rail unloading facility. The updated plan would demonstrate financial responsibility for the potential costs of response and cleanup of oil spills, natural resource damages, and costs to the state and affected jurisdictions for response actions to reduce the risks and impacts from an oil spill at the facility.	Implementation of signal timing revisions would not completely mitigate delays for emergency vehicles at at-grade crossings; however, this is not considered an unavoidable significant adverse impact from the proposed project as Shell unit trains would only represent a small portion of the existing and projected rail traffic that would lead to the additional traffic delays.

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Resource	Potential Impacts Requiring Mitigation	Proposed Mitigation	Unavoidable Significant Adverse Impacts Following Mitigation
Environmental Health and Risk	The proposed project would result in an increased probability of rail accidents that could result in a release of oil to the environment and a subsequent fire or explosion.	The risk of a spill occurring during an accident would be minimized by using tank cars that meet or exceed the enhanced safety standards of DOT-117 specification tank cars. Shell would fund the purchase of hand-held VOC monitors for local responders.	A release resulting in a spill, fire, or explosion, could have unavoidable significant impacts.

NEXT STEPS AND ISSUES TO BE RESOLVED

The co-lead agencies will seek comments on the draft EIS and proposed mitigation from agencies, tribes, local communities, organizations, and the public during a 60-day comment period from October 4 to December 2, 2016. The co-lead agencies may refine or augment the mitigation in the final EIS based on the comments received.

Public hearings will be held on November 12, in Anacortes; November 16, in Mount Vernon; and November 19, in Seattle. Please see the SEPA draft EIS Fact Sheet at the beginning of this document, or visit the project website, www.shellraileis.com, for additional details regarding these public hearings. Comments will also be accepted by means of a post office box, in person at Skagit County, an online open house, e-mail, and voicemail. Comments received during the comment period will be addressed in the final EIS.

CHAPTER 1 INTRODUCTION

Skagit County (County) and the Washington State Department of Ecology (Ecology), co-lead agencies, are overseeing the preparation of this environmental impact statement (EIS) under the Washington State Environmental Policy Act (SEPA) for a project proposed at the Shell Puget Sound Refinery (PSR). The applicant, Equilon Enterprises, LLC (Shell), proposes to construct and operate a rail unloading facility at the Shell PSR located near Anacortes, Washington.

This chapter provides an overview of the proposed project, including the factors that led Shell to further its development. The objective and goals of the proposed project are also described, as well as the environmental review process being undertaken by the co-lead agencies. An overview of the content of this draft EIS is outlined at the end of the chapter.

PROJECT OVERVIEW

Equilon Enterprises, LLC (Shell) proposes to construct and operate a rail unloading facility at the Shell Puget Sound Refinery (PSR). The proposed project, known as the Shell Anacortes Rail Unloading Facility, includes building a rail spur from the existing adjacent BNSF Railway Anacortes Subdivision onto the Shell PSR property to accommodate trains transporting crude oil from the mid-continent area, e.g., the Bakken region of Montana and North Dakota.

Each *unit train* arriving at the rail unloading facility would carry approximately 60,000 to 70,000 barrels of crude oil. The facility would receive six unit trains per week, with each train having up to 102 tank cars. As provided in the U.S. Department of Transportation (USDOT) safety advisory 2014-01, Shell would use DOT-117 Specification tank cars that meet enhanced safety standards. These tank cars exceed the CPC 1232-mandated safety standards (AAR 2015). Chapter 2 – Proposed Project and Alternatives, provides additional information about the safety features of DOT-117 Specification tank cars.

A **unit train** carries the same type of product in all cars, from origin to destination.

The proposed project would not result in a change in the refining capacity of the Shell PSR. The refinery currently receives delivery of crude oil primarily via marine vessel from the Alaska North Slope. Overall production from the North Slope is declining and that trend is expected to continue. The crude oil received at the Shell PSR by rail would be used to replace the declining North Slope supply.

In addition to building the rail spur, the project would include installing equipment and facilities to pump oil from rail cars to existing tanks within the refinery, constructing stormwater detention ponds, and installing safety and spill response measures.

Shell proposes mitigation for on-site wetland impacts by restoring a portion of a nearby diked and now defunct tree farm adjacent to Padilla Bay. The activities necessary to implement this wetland mitigation are included as part of the proposed project. Chapter 2 – Proposed Project and Alternatives, provides additional information about the proposed wetland mitigation.

History of Bakken Crude by Rail in Washington

Trains began transporting Bakken crude from Montana and North Dakota to Washington State in 2012. Currently four of the five Washington refineries receive crude by rail from the mid-continent area:

- Tesoro Anacortes Refinery (adjacent to the Shell PSR).
- BP and Phillips 66 (both near Ferndale, WA).
- U.S. Oil & Refining (in Tacoma, WA).

For inbound shipments, all of these refineries use the BNSF Railway main line, which enters Washington near Spokane, proceeds southwest to the Vancouver area, and then travels north to the Puget Sound region. For outbound trains, the refineries use the BNSF Railway main line south to Auburn, east to Kennewick, north to Spokane, and then travel out of Washington State.

Because all of the other Washington State refineries have access to this cost-effective supply of mid-continent crude, Shell views the proposed project as necessary to ensure the continued competitive viability of the Shell PSR (AECOM 2015).

PROJECT BACKGROUND

The Shell PSR requires a reliable supply of crude oil to remain economically viable. The majority of its current supply arrives via marine vessel from the Alaska North Slope, with the remaining portion coming from the Kinder Morgan Puget Sound Pipeline via Canada. In 1988, North Slope production peaked at 2,044,000 barrels per day. By 2015, production had fallen to 455,000 barrels per day (EIA 2015), which equates to a 78-percent decline. Production of North Slope crude in 2024 is currently estimated at 320,000 barrels per day, or 85 percent below 1988 peak levels (Alaska Department of Revenue 2015).

In response to the decline in Alaska North Slope production, Shell began to investigate other sources of crude oil to maintain existing refining operations at the Shell PSR. Options for crude oil supplies are limited by the following factors (AECOM 2015):

- Oil types must be refinable by using the existing technology and equipment at the Shell PSR.
- Oil types and sources must be economically viable for Shell (i.e., the costs of extraction and transport of the crude oil to the Shell PSR do not exceed the value of production).

Based on these factors, Shell determined that the most viable option to replace and supplement declining North Slope supply would be to obtain crude oil from the mid-continent area. Crude oil from the Bakken region represents an oil type that is economically feasible to transport via rail and can be processed at the Shell PSR with existing equipment and under existing permits (AECOM 2015).

Shell has been working with the County and other agencies to develop the proposed project since 2012. In December 2013, Shell submitted permit applications to the County. The County held a public comment period and conducted a SEPA review. In April 2014, the County determined that the proposed project would not have a probable significant adverse impact to the environment, if mitigation measures prescribed by the County were followed and they issued a mitigated determination of nonsignificance (MDNS).

The County received more than 400 comments from the public on the MDNS, which led the County to request additional information from Shell. After review, the County issued a modified MDNS in August 2014 that included additional conditions, supporting information, and another comment period.

In September 2014, Earthjustice, on behalf of RE Sources for Sustainable Communities, Friends of the San Juans, ForestEthics, Washington Environmental Council, Friends of the Earth, and Evergreen Islands, appealed the modified MDNS. In January 2015, the Skagit County Hearing Examiner held an open record administrative appeal, and in February 2015, granted the appeal and ordered the County to complete an EIS (Skagit County Hearing Examiner 2015). The County requested that Ecology participate as a SEPA co-lead agency, and Ecology formally agreed to do so in June 2015.

On September 21, 2015, the County and Ecology released a determination of significance (DS) for the Shell Anacortes Rail Unloading Facility (Skagit County and Ecology 2015a), initiating the EIS process, which is described on the next page.

OBJECTIVE OF THE PROPOSED PROJECT

Defining a proposed project's objective plays a key role in determining the range of alternatives that will be considered and analyzed in an EIS. The objective guides the co-lead agencies in selecting a preferred alternative and eliminates some alternatives from further consideration.

The objective of the Shell Anacortes Rail Unloading Facility is to provide the capability to receive crude oil from the mid-continent area to maintain operations at the Shell PSR at the current level.

The objective of the Shell Anacortes Rail Unloading Facility is to provide the capability to receive crude oil from the mid-continent area to maintain operations at the Shell PSR at the current level. It is intended to fulfill the following goals:

- Replace and supplement the Shell PSR's declining Alaska North Slope supply of crude oil with that from the mid-continent area.
- Obtain replacement supplies of crude oil that can be processed with the Shell PSR's existing technology and equipment.
- Sustain the Shell PSR's economic viability.

ENVIRONMENTAL REVIEW PROCESS

The co-lead agencies are jointly overseeing the preparation of this EIS in accordance with SEPA. According to SEPA, an EIS must be prepared when the lead agency determines a proposal is likely to result in significant adverse environmental impacts. The SEPA environmental review process includes the steps that are described below.

EIS Scoping Process

The first step in the development of an EIS is called scoping. During the scoping process, agencies, tribes, local communities, organizations, and the public are invited to comment on factors that should be analyzed and considered in the EIS. Specifically, the process is intended to collect input on the following topics:

- Reasonable range of alternatives.
- Potentially affected resources and the extent of analysis for those resources.
- Measures to avoid, minimize, and mitigate impacts of the proposal.
- Potential cumulative impacts.

Scoping for the proposed project occurred between September 21 and November 5, 2015. The scoping process was documented in the *Shell Anacortes Rail Unloading Facility Environmental Impact Statement Scoping Report* (Skagit County and Ecology 2015b).

Draft EIS Preparation, Publication, and Review

A draft EIS is then prepared using the results of the scoping process. The purpose of an EIS is to provide an impartial discussion of significant environmental impacts and reasonable alternatives and mitigation measures that avoid or minimize adverse environmental impacts. The information in this draft EIS is provided for review and comment by interested parties and will also be used by the co-lead agencies to evaluate the proposed project.

The co-lead agencies will seek comments from agencies, tribes, local communities, organizations, and the public during a 60-day comment period from October 4 to December 2, 2016. During the comment period public hearings will be held on November 12 in Anacortes; November 16 in Mount Vernon; and November 19 in Seattle. Comments will also be accepted by means of a post office box, in person at Skagit County, an online open house, e-mail, and voicemail. Comments received during the comment period will be addressed in the final EIS.

Final EIS Publication

Following the comment period, the co-lead agencies will issue the final EIS. The final EIS will address comments received during the comment period, and may include additional information and input received from Shell, the co-lead agencies, other agencies with jurisdiction or concern, tribes, and the public regarding the proposed project. The co-leads and other agencies will use the final EIS to inform permitting decisions.

Public, Agency, and Tribal Involvement

Ecology and Skagit County have provided many opportunities for the public; federal, state, and local agencies; tribes; and other interested parties to provide input on the proposed project. Specifically, they announced the scoping period via a press release to local news outlets; sent mailers and e-mails to interested individuals, and published ads online and in local papers.

Also, the co-lead agencies established a project website and hosted an online open house and scoping meetings. Four scoping meetings were held during the 45-day scoping comment period between September 21 and November 5, 2015. Three public scoping meetings were held on October 13, in Mount Vernon; October 14 in Anacortes; and October 19 in Lynnwood. One agency scoping meeting was held on October 27 in Olympia. Comments were accepted via an online open house, voicemail, e-mail, verbal comments during the public meetings, and written format (letters and comment forms). In total, 35,806 comments were received through the various available methods (Skagit County and Ecology 2015b). As described above, the co-leads will seek further input from the public, agencies, and tribes during the draft EIS comment period.

Federal, State, and Local Permits and Approvals

After completion of the EIS, Shell will need to obtain permits and authorizations to construct and operate the proposed project. Agencies can use the EIS when making permitting decisions. Table 1-1 provides a summary of the anticipated permits and approvals that will be needed to implement the proposed project.

Table 1-1 Federal, State, and Local Permits and Approvals

Permit or Approval	Agency / Statute and/or Regulation
Federal	
Clean Water Act Section 404 Individual Permit	U.S. Army Corps of Engineers (USACE)
Eagle Disturbance Take Permit	U.S. Fish and Wildlife Service (USFWS)
Eagle Nest Take Permit	USFWS
State	
Clean Water Act (CWA) Section 401 Water Quality Certification	Washington State Department of Ecology (Ecology)
Coastal Zone Management Consistency Determination	Ecology
National Pollutant Discharge Elimination System (NPDES) Construction Stormwater Permit	Ecology
National Pollutant Discharge Elimination System (NPDES) Operations Stormwater Permit	Ecology
Hydraulic Project Approval	Washington Department of Fish and Wildlife (WDFW)
Forest Practice Conversion Permit	Washington State Department of Natural Resources (DNR)/Skagit County
OAC (Order of Approval to Construct) Air Permit	Northwest Clean Air Agency
Local	
Shoreline Substantial Development/Variance Permit	Skagit County/Ecology
Grading Permit	Skagit County
Floodplain Development Permit	Skagit County
Commercial Building Permit	Skagit County
Special Use Permit for Habitat Restoration within Agriculture-Natural Resource Land	Skagit County

EIS ORGANIZATION

This EIS contains the following nine chapters:

- Chapter 1 – Introduction, provides an overview of the proposed project, its history and objectives, and describes the environmental review process.
- Chapter 2 – Proposed Project and Alternatives, describes the no action alternative, other alternatives considered, and the proposed project, including details on project construction and operation.
- Chapter 3 – Affected Environment and Environmental Impacts, describes the analysis of potential impacts associated with the no action alternative and the proposed project. Chapter 3 is divided into 17 sub-chapters that address specific environmental resource topics. For each topic, the chapter explains the methodology used to analyze impacts, the existing conditions of the affected environment, the potential impacts associated with the alternatives, and any proposed mitigation.
- Chapter 4 – Environmental Health and Risk, investigates the likelihood and potential consequences related to the accidental release of oil into the environment during transport of crude by rail from the mid-continent area to the Shell PSR.
- Chapter 5 – Summary of Impacts and Mitigation, lists the impacts of the proposed project identified in Chapters 3 and 4, and describes the measures proposed to mitigate those impacts. This chapter also describes adverse environmental impacts that cannot be fully mitigated.
- Chapter 6 – References, provides a list of the literature cited throughout this EIS. The references are organized by chapter.
- Chapter 7 – List of Preparers, identifies the personnel who contributed materially to the preparation of this EIS.
- Chapter 8 – Distribution List, identifies interested parties who received this EIS, and provides a list of reading rooms where the EIS is available for viewing by the public.
- Chapter 9 – Acronyms and Glossary, provides definitions for many abbreviations and terms used throughout this EIS.

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CHAPTER 2 PROPOSED PROJECT AND ALTERNATIVES

Skagit County (County) and the Washington State Department of Ecology (Ecology) are co-lead agencies for the preparation of an environmental impact statement (EIS) under the State Environmental Policy Act (SEPA) for a project proposed by the Shell Puget Sound Refinery (PSR). This chapter describes:

- *The no action alternative, including the existing Shell PSR location, facilities and operations, and potential changes if the proposed project is not implemented.*
- *The evaluation of reasonable alternatives to the proposed project.*
- *The proposed project, including proposed facilities, operations, and construction methods and sequencing.*

NO ACTION ALTERNATIVE

The State Environmental Policy Act (SEPA) requires evaluation of a no action alternative as a benchmark from which other alternatives can be compared (WAC 197-11-440(5); Ecology 2004). Under the no action alternative, none of the proposed facilities would be constructed and the proposed wetland mitigation would not occur. The existing Shell Puget Sound Refinery (PSR) would continue to operate as it does today; however, Shell would need to find another source of crude oil to maintain the refinery's existing production output. The location of the Shell PSR, existing facilities and operations, and potential changes to operations if the proposed project were not implemented, are described below.

Location

The Shell PSR is near Anacortes, Washington, in unincorporated Skagit County. Figure 2-1 shows the facility's location and vicinity. The refinery is located on a peninsula called March Point, which is bordered by Fidalgo Bay to the west and Padilla Bay to the east. The Shell PSR is within the Anacortes Urban Growth Area and is designated as a Heavy Manufacturing District by the Anacortes Comprehensive Plan (City of Anacortes 2012). Additional information about existing land use in the vicinity of the Shell PSR is presented in Chapter 3.12 – Land Use and Social Elements.

BNSF Railway Company divides its national rail network into **regions**, **divisions**, and **subdivisions** for operational and management purposes. A region is the largest area and contains multiple divisions. Each division contains hundreds of subdivisions. The proposed project is located on the Anacortes Subdivision, which connects to the Bellingham Subdivision in Burlington, WA.

BNSF Railway Company (BNSF Railway) operates and maintains the existing rail line that runs adjacent to the Shell PSR. The rail line, known as the Anacortes Subdivision, is approximately 14 miles long, extending from the Bellingham Subdivision in Burlington, Washington, to the western side of the March Point peninsula (Figure 2-1). The Anacortes Subdivision is currently used by Shell, Tesoro, and other neighboring industries.

DATA SOURCE: (ESRI 2016, Skagit County 2015, USGS 2015, WSDOT 2015)

N

0 1 2 Mile

Proposed Project Site

Proposed Wetland Mitigation Site

Anacortes Subdivision

Bellingham Subdivision

BNSF Railway

Interstate Highway

State Highway

City Limits

Swinomish Indian Reservation

Figure 2-1
PROJECT VICINITY

Existing Facilities and Operations

Existing Facilities

Existing facilities at the Shell PSR include storage tanks, a pier for marine vessels, refining equipment and facilities, pipelines, a parking and laydown area, a rail line and spur to receive *manifest trains*, paved and graveled roads, and fences. Wastewater from the Shell PSR is treated at the facility's wastewater treatment plant before being discharged into Fidalgo Bay.

A **manifest train** is a mixture of car types and cargoes. A **unit train** carries the same type of product in all cars from origin to destination.

Two buried pipelines cross the Shell PSR site (Figure 2-6). The Kinder Morgan Puget Sound pipeline provides crude oil supplies from Canada. The BP Olympic pipeline is used to distribute refined products to customers in the Pacific Northwest. Puget Sound Energy (PSE) electrical transmission lines on wooden poles are present on the southern and eastern portions of the Shell PSR property (Figure 2-5).

Existing Operations

The Shell PSR is one of five petroleum refineries in Washington State and has been in operation since 1958. The Shell PSR currently employs approximately 750 people (AECOM 2015). The facility has the capacity to refine 5.7 million gallons (145,000 barrels) of crude oil per day. Approximately 75 percent of the Shell PSR's supply of crude oil comes from the Alaska North Slope, which it receives in weekly deliveries via marine vessels. Approximately 25 percent of its crude oil is delivered from Canada via the Kinder Morgan Puget Sound pipeline. No crude oil is currently received by rail because the Shell PSR does not have facilities designed to receive or unload crude oil from unit trains.

The Shell PSR's principal products are automotive gasoline, ultra-low sulfur diesel fuel, and jet fuel. The Shell PSR also produces several byproducts of the refining process, including sulfur, propane gas, and petroleum coke. The Shell PSR distributes these products from the refinery via pipeline, truck, and rail throughout the Pacific Northwest.

The Swinomish Channel Swing Bridge is a prominent feature along the Anacortes Subdivision.

While the Shell PSR does not currently have the capability to receive crude by rail via unit trains, the refinery uses the Anacortes Subdivision to receive materials and distribute products. Approximately two BNSF Railway trains travel daily on the Anacortes Subdivision to serve the Shell PSR, the adjacent Tesoro Anacortes Refinery, and other neighboring industries.

Potential Changes to Existing Operations

If the proposed project were not built, Shell would need to find another source of crude oil to maintain the PSR's existing refining production output. The Shell PSR would continue to receive crude oil shipments from the Alaska North Slope by marine vessels. However, supplies of crude oil from the North Slope are diminishing and no new sources that can be transported by marine vessels to the Shell PSR are known at this time. While it may be possible in the future for Bakken crude oil to be transported to other west coast ports by rail and then shipped to the Shell PSR by marine vessel, this option is not currently available and it is not known when or whether this option would become available.

Would the Shell PSR refine oil from tar sands?

The Shell PSR does not have the capability to refine diluted bitumen (low-grade oil, sometimes referred to as *dil-bit*), which is mined from tar sands. No such facilities are included as part of the proposed project.

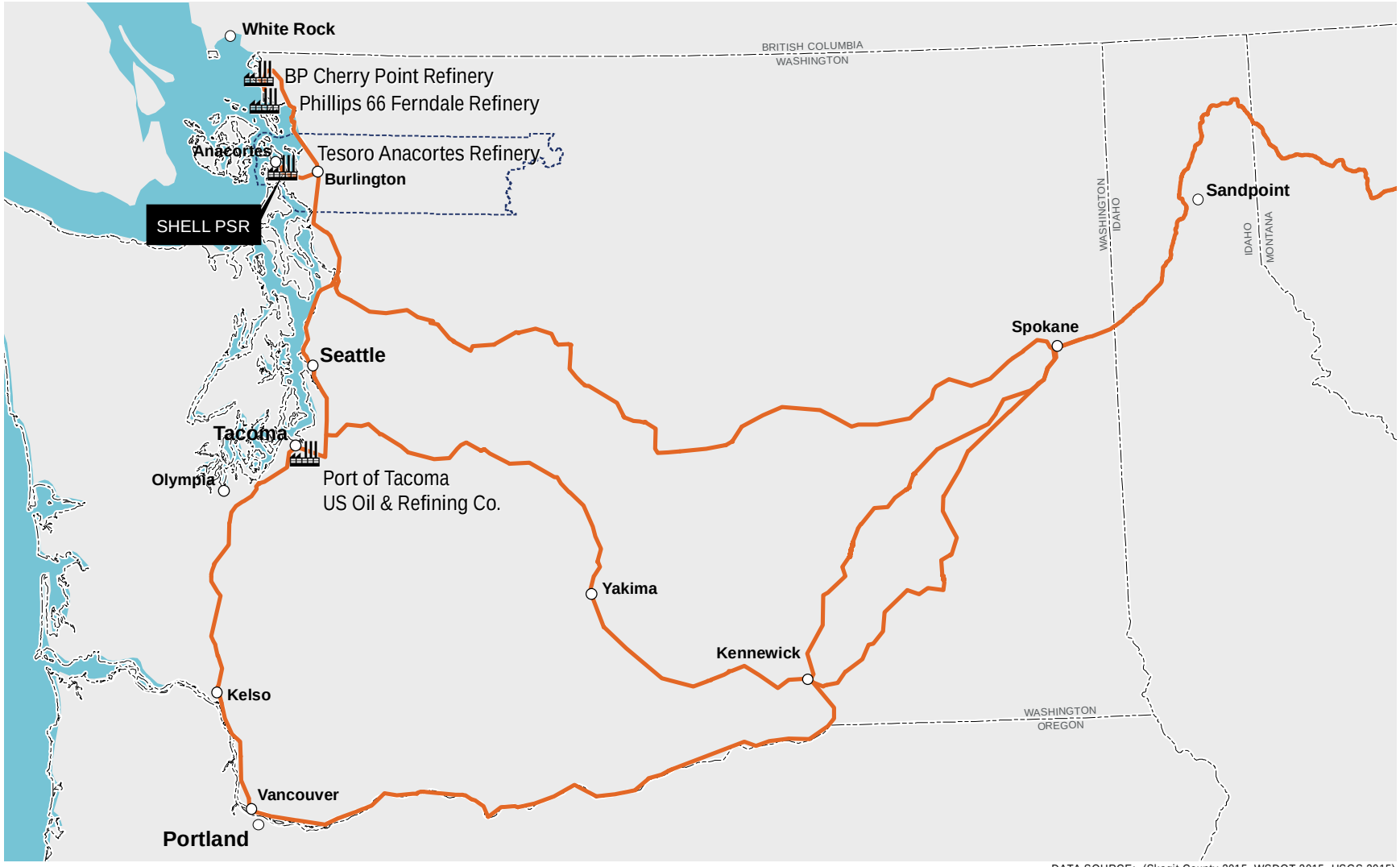
U.S. and Regional Rail Operations

More than 3,000 miles of railroad lines operated by multiple companies currently provide mobility for freight and passengers within Washington State. U.S. crude oil production has greatly increased in recent years with much of the output shipped by rail. Across the U.S., crude oil rail shipments increased from 9,500 carloads in 2008, to 493,146 carloads in 2014 (AAR 2015). As described in Chapter 1 – Introduction, there are four refineries in Washington State that currently receive crude by rail from the mid-continent area (Figure 2-2). According to the Washington State 2014 Marine & Rail Oil Transportation Study, the state receives approximately 19 unit trains per week of Bakken crude (Etkin et al. 2015).

Effective April 1, 2015, Bakken crude oil must be conditioned before being transported by rail to reduce volatility and to meet federal crude oil safety standards (State of North Dakota Industrial Commission 2014).

The U.S. freight railroads are private organizations that are responsible for their own maintenance and improvement projects. The railroads are subject to safety and operations regulation from the Federal Railroad Administration (FRA), a division of the U.S. Department of Transportation (USDOT). The Interstate Commerce Commission Termination Act of 1995 (49 USC 101) identifies the Surface Transportation Board (STB) as the sole regulatory jurisdiction of transportation by rail carriers. Main line construction, operation, and facilities development is regulated at the federal level and preempts state and local authority. Chapter 3.15 – Rail Traffic and Transportation, provides additional information about rail safety, operation, and maintenance requirements.

BNSF Railway is one of the two largest railroad companies operating in Washington State. BNSF Railway transports the majority of bulk crude oil out of the Bakken region. Approximately 17 one-way trains carrying a variety of cargoes (manifest trains) currently travel north or south along the Bellingham Subdivision through Burlington each day. Four additional one-way Amtrak passenger trains (two northbound and two southbound) also travel daily along the Bellingham Subdivision.



DATA SOURCE: (Skagit County 2015, WSDOT 2015, USGS 2015)

Refineries
Railways
State/Provincial/International Boundary
Skagit County

N

0 25 50 Mile

Figure 2-2

BNSF RAILWAY ROUTES WITHIN WASHINGTON STATE AND EXISTING OIL REFINERIES CURRENTLY ACCEPTING CRUDE OIL BY RAIL

In May 2015, the Pipeline and Hazardous Materials Safety Administration (PHMSA), in coordination with the FRA, issued a final rule to reduce the consequences and, in some instances, reduce the probability of accidents involving trains transporting large quantities of flammable liquids (49 CFR § 171-174 and 179). One of the requirements adopted in that rule is for rail carriers to perform a routing analysis that considers, at a minimum, 27 safety and security factors and then select a route based on the findings. These 27 factors include examination of environmentally sensitive or significant areas, population density, venues (e.g., stations, events, places of congregation), presence of passenger traffic, and emergency response capability along the route. BNSF Railway and other railroads use these criteria to evaluate rail routes for potential crude oil transport. The rail carriers must perform a route analysis every calendar year. Chapter 3.17 – Public Services and Incident Response, provides additional information about current and pending regulations pertaining to transport of crude oil by rail.

ALTERNATIVES CONSIDERED

SEPA requires lead agencies to evaluate reasonable alternatives to the proposed project (WAC 197-11-786,197-11-440(5)). As defined in the SEPA handbook, "a reasonable alternative is a feasible alternate course of action that meets the proposal's objective at a lower environmental cost (Ecology 2004)."

The co-lead agencies evaluated potential alternatives using the following criteria:

- Do they feasibly attain or approximate the proposal's objectives?
- Do they provide a lower environmental cost or decreased level of environmental degradation than the proposal?

A reasonable alternative is a feasible alternate course of action that meets the proposal's objective at a lower environmental cost.

Alternatives considered included on-site alternatives, off-site alternatives, alternatives suggested by commenters during the scoping process, and alternative methods of transporting crude oil to the Shell PSR (e.g., marine vessel, pipeline, or truck). Each potential project alternative was analyzed to determine if it would meet the proposal's objective at a lower environmental cost or decreased level of environmental degradation. Alternatives that failed to meet these criteria were eliminated from further study.

On-Site Alternatives

The Shell PSR is located on a peninsula that is already substantially developed. Therefore, the ability to find alternative locations for the proposed rail unloading facility within the Shell PSR property was limited. Shell identified five on-site alternatives, including two configurations for the proposed project site, and three additional locations within the Shell PSR property. Figure 2-3 shows their respective locations.

On-site alternatives were initially developed to satisfy federal guidelines under Section 404(b)(1) of the Clean Water Act (CWA), which requires evaluation of practicable alternatives to a proposal that would have less impact on the aquatic environment (AECOM 2015). The on-site alternatives were evaluated to determine whether they met the proposal's *objective*, taking into account the following factors:

The **objective** of the Shell Anacortes Rail Unloading Facility is to provide the capability to receive crude oil from the mid-continent area to maintain operations at the Shell PSR at the current level.

- **Size and Configuration** – The size and configuration of the alternative site must accommodate one incoming and one outgoing unit train of 102 tank cars at the same time. It must also provide sufficient space to meet BNSF Railway design criteria for safe and effective rail operations.
- **Topography** – The alternative site must be relatively flat to accommodate BNSF Railway design criteria. The facility design must incorporate a limiting grade of 0.3 percent in the rail unloading area to facilitate safe operating conditions and to minimize the risk of accidental rail car movement during unloading activities (AECOM 2015; Appendix A).
- **Security**– The alternative must be located in an area that can accommodate federal security requirements. The Shell PSR is subject to enhanced federal security requirements and standards established by the U.S. Department of Homeland Security. Each alternative was evaluated for such factors as vehicular access, ability to physically secure the site, and the potential for road blockages by trains during operation.
- **Safety and Emergency Management**– The alternative must be located in an area that can accommodate prevention and response measures to emergencies in the design and layout of the facility. Factors considered were spill prevention, stormwater management, equipment malfunction prevention, and rapid and safe response to emergencies.

See Appendix A for the complete Clean Water Act 404(B)(1) Alternatives Analysis completed by Shell for the proposed project (AECOM 2015).

Each alternative that met the proposal's objective was then evaluated to determine whether the alternative would have a lower environmental cost than the proposed project.

DATA SOURCE: (AECOM 2015, HDR 2015, NAIP 2016, Skagit County 2015, USGS 2015, WSDOT 2015)

Alternative 1
Alternative 2
Alternative 3
Alternative 4
Alternative 5
Highway
Local Road
Anacortes Subdivision

Figure 2-3
ON-SITE ALTERNATIVES

Alternatives 1 and 2

Shell identified two alternatives within the proposed project site: a two-track configuration (Alternative 1), and a four-track configuration (Alternative 2). The two-track configuration would be shorter and wider (approximately 6,745 feet by 385 feet); the four-track configuration would be longer and narrower (approximately 8,455 feet by 300 feet). Both alternatives would be located east of the refinery, west of East March's Point Road, south of North Texas Road, and north of South March's Point Road. Alternative 2 would require an extension of the Anacortes Subdivision east of East March's Point Road. The two-track configuration (Alternative 1) was carried forward as the proposed project (Figure 2-3).

The four-track configuration (Alternative 2) met the proposal's objective; however, it was eliminated from further study because of a higher environmental cost than Alternative 1. Construction of Alternative 2 would disturb a sensitive cultural resources area and would have a greater total impact on wetlands than Alternative 1. Alternative 2 would affect 27.5 acres of wetlands; Alternative 1, the proposed project, would affect 25.83 acres of wetlands. In addition, Alternative 2 would impact high-quality estuarine wetlands along Padilla Bay; Alternative 1 would not affect these wetlands. The other on-site alternatives identified by Shell were eliminated from further study because they did not meet the proposal's objective. As described below, Alternatives 3, 4, and 5 could not feasibly be constructed or successfully operated within the constraints of the Shell PSR site.

Alternative 3

Alternative 3 would be located south of the Shell PSR, between South Texas Road and South March's Point Road, adjacent to the existing Anacortes Subdivision. Alternative 3 met criteria for Size and Configuration, and Topography, but did not meet Security, or Safety and Emergency Management requirements. The rail unloading facility would extend outside the Shell PSR property, under Bartholomew Road and across South Texas Road, to provide adequate length for a unit train. This means that the unit train could not be fully contained within the Shell PSR property or isolated from public access while unloading, and would block South Texas Road, a primary access route for emergency response at the Shell PSR. Alternative 3 would also require relocation of utilities and roads, which would have substantial impacts on adjacent property owners and businesses.

Alternative 4

Alternative 4 would be located north and east of the existing Anacortes Subdivision and mostly west of Bartholomew Road. Alternative 4 met the criterion for Topography, but did not meet criteria for Size and Configuration, Security, or Safety and Emergency Management. The location is not long enough to accommodate a unit train. As such, Alternative 4 would require the train to be staged entirely outside of the Shell PSR property during unloading, meaning that the train could not be isolated from public access and would block South Texas Road and an emergency exit (Refinery West Emergency Road). This alternative's need to stage trains outside of the Shell PSR property would also have substantial impacts on adjacent property owners and businesses by disrupting local traffic patterns during the construction period.

Alternative 5

Alternative 5 would be located south of the refinery and would employ an existing rail alignment that is sometimes used to export petroleum coke from the refinery. Alternative 5 met the criterion for Security and potentially lower environmental cost, but did not meet the criteria for Size and Configuration, Topography, or Safety and Emergency Management. The site is not large enough to stage a unit train and the slope of the existing rail spur is too steep for the train's safe operation.

Based on the evaluation described above, the co-lead agencies determined that alternatives 2, 3, 4, and 5 should not be carried forward for analysis in this EIS. Therefore, this EIS analyzes the no action alternative and the proposed project (Alternative 1). Table 2-1 presents the summary results of the evaluation of on-site alternatives and the environmental cost analysis, where applicable.

Table 2-1 Summary Results of On-Site Alternatives Considered or Evaluated

	On-Site Alternatives Considered				
	Alternative 1 (proposed project)	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Size and Configuration	Meets criteria	Meets criteria	Meets criteria	Site cannot accommodate unit train	Site cannot accommodate unit train
Topography	Meets criterion	Meets criterion	Meets criterion	Meets criterion	Site is too steep to meet design criterion for safe train operations
Security	Meets criterion	Meets criterion	Train cannot be isolated from public access	Train cannot be isolated from public access	Meets criterion
Safety and Emergency Management	Meets criteria	Meets criteria	Train would block emergency access	Train would block emergency access	Site is too steep to meet design criteria for safe train operations
Alternative Meets the Proposal's Objective	Yes	Yes	No	No	No
Alternative Results in Lower Environmental Cost	Yes	No	N/A	N/A	N/A

Off-Site Alternatives

When a proposal is presented for a project on a specific, privately-owned site, SEPA requires the lead agency to evaluate the no action alternative and other reasonable alternatives on the same site, but does not require evaluation of off-site alternatives (WAC 197-11-440(5)(d)).

Although not required under SEPA, to satisfy federal guidelines under Section 404(b)(1) of the CWA, Shell was required to evaluate off-site alternatives. The CWA guidelines, established by the U.S. Environmental Protection Agency (USEPA) and implemented by the U.S. Army Corps of Engineers (USACE), require screening of off-site alternatives to identify the least environmentally damaging practicable alternative to a proposed action (40 CFR Part 230). Therefore, Shell identified and evaluated two off-site alternatives (AECOM 2015; Appendix A).

The first off-site alternative, located approximately 6.0 miles east of the refinery, was an undeveloped area zoned for agricultural use. This alternative was eliminated from further consideration when it was deemed not feasible to rezone the site from agricultural to industrial use. Historically, most rezone requests seeking to de-designate agricultural land in Skagit County have been unsuccessful (AECOM 2015; Appendix A).

The second off-site alternative, located approximately 6.3 miles east of the refinery, was at an existing lumber mill zoned for industrial use. This alternative was eliminated from further study when it was deemed to present a safety risk because the rail unloading facility would be located too far away to meet the 15-minute required response time by emergency response personnel at the Shell PSR. This alternative was also deemed not feasible because it was limited by a single means of ingress/egress.

Alternatives Suggested During the EIS Scoping Process

As described in Chapter 1 – Introduction, one of the goals of the EIS scoping process is to identify potential alternatives to the proposed project. Comments related to alternatives are summarized in the *Shell Anacortes Rail Unloading Facility Environmental Impact Statement Scoping Report* (Skagit County and Ecology 2015).

Many commenters suggested that the co-lead agencies consider a no action alternative. As described above, a no action alternative is being considered in this EIS.

Commenters also suggested alternative locations for the project to the east of the Shell PSR site. However, as described above, off-site alternatives were evaluated and were not considered further because they either did not meet the proposal's objective or were not technically feasible.

Commenters suggested a variety of alternatives to the project itself; for example, renewable energy projects, or a smaller project that would require fewer trains or a lesser quantity of oil to be transported. As described in Chapter 1 – Introduction, and above, these suggestions would not meet the proposal's objective of providing the capability to receive crude oil from the mid-continent area to maintain supplies needed for refinement at the existing Shell PSR and, therefore, were eliminated from further study.

Commenters suggested alternative methods of transporting crude oil to the Shell PSR. Several alternative methods were considered and are described below.

Alternative Methods of Crude Oil Transport

Alternative methods of delivering mid-continent crude oil to the Shell PSR were considered, including transport via marine vessel, pipeline, or truck along existing highways. The evaluation of these options is summarized below.

- **Transport via marine vessel** –This alternative would not meet the proposal's objective because the mid-continent area is a landlocked region of the U.S. without access to water-based transportation routes. Mid-continent crude oil could be delivered to the U.S. Gulf Coast and shipped via marine-based vessel to the Shell PSR; however, high shipping costs and transit distance would preclude this option from being economically viable (AECOM 2015). As described for the no action alternative, it is possible that other sources of Bakken crude oil could be accessed by marine vessel from other West Coast ports in the future. This option is not currently available and it is not known when or whether this option would become available.
- **Transport via pipeline** –No existing crude oil pipelines are planned or currently serve the U.S. West Coast from mid-continent production locations. The construction of a new 1,000-mile-long crude oil pipeline is not considered an economically viable option because of the sheer scale of the endeavor.
- **Transport via truck along existing highways** –Transport of crude oil by tanker truck from the Bakken region to the Shell PSR could meet the proposal's objective of providing mid-continent crude. However, transport via truck would not be an economically viable option, would result in greater environmental cost, and would be less safe than transport via rail. Approximately 490 tanker trucks would be required to deliver the same amount of crude oil as that transported by one unit train. Moreover, transporting crude oil by rail would require approximately 80-percent less fuel than moving it by truck. In addition, transport by truck would increase the likelihood of a potential accident or spill. Historically, the largest spills in most inland areas are from overturned tanker trucks (Etkin et al. 2015). Between 2002 and 2007, tanker trucks spilled about 225 barrels of oil per billion-ton-miles, while rail transport resulted in about 25 barrels of oil spilled per billion-ton-miles (CRS 2014).

Based on the review of scoping comments and the analysis summarized above, the alternatives suggested during the scoping process and the alternative methods of transport were eliminated from further study because they did not meet the proposal's objective.

Benefits and Disadvantages of Delaying Implementation

SEPA requires that an EIS discuss the benefits and disadvantages of delaying implementation of a proposed project (WAC 197-11-440(5)(c)(vii)). The urgency of implementing the proposal can be compared with any benefits of delay. The foreclosure of other options should also be considered; that is, if implementation of the proposal would preclude implementation of another project at a later time.

If the proposed project were postponed, the direct, indirect, and cumulative impacts associated with the project would be delayed. This delay could forestall the potential impacts of the project, as well as the economic benefits that could be sustained or increased by employment and tax revenues generated from its construction and operation. If the proposal were implemented, the site would not be available for future development; however, there are no proposals to use the site for an alternative project at this time.

In 2016, Ecology adopted rules (WAC 173-185) to create reporting standards for facilities that receive crude oil by rail, and pipelines that transport crude oil through the state (Ecology 2016a). Additionally, the rule identifies reporting standards for Ecology to share information with emergency responders, local governments, tribes, and the public. Ecology also adopted rules (WAC 173-186) to establish oil spill contingency plan, drill and equipment verification requirements, and provisions for inspection of records for railroads required to submit oil spill contingency plans, and for the response contractors that support the implementation of the railroad plans (Ecology 2016b). These rules go into effect on October 1, 2016. Regardless of when the proposed project is constructed, it would be subject to WAC 173-185 and WAC 173-186 after it is implemented; therefore, there is no apparent benefit of delaying implementation of the project to await the final rules.

PROPOSED PROJECT

Shell proposes to construct and operate a rail unloading facility at the Shell PSR. The proposed project includes building a rail spur from the existing adjacent Anacortes Subdivision onto the Shell PSR property to accommodate trains transporting crude oil from the mid-continent area.

Each unit train arriving at the rail unloading facility would be carrying approximately 60,000 to 70,000 barrels of crude oil. The facility would receive six unit trains per week, on average, with each train comprised of about 102 tank cars. Each tank car would meet weight limits of a maximum gross rail load of 286,000 pounds, prescribed by the PHMSA (49 CFR 179.13).

The proposed project has been designed to receive 360,000 to 420,000 barrels of crude oil by rail per week. This volume is equivalent to *six trains per week*, which is the maximum volume of crude that can be unloaded at the facility, as it takes approximately 12 hours to complete the unloading process.

The proposed project has been designed to receive a volume of crude oil equivalent to **six trains per week**. BNSF Railway does not use a specific schedule for freight trains. Therefore, in any given week, the number of trains arriving at the facility could vary slightly. For example, seven trains could be received at the Shell PSR during one week, and five trains the next.

The proposed project would not result in a change in the refining capacity of the Shell PSR. The facility currently receives delivery of crude by marine vessel from the Alaska North Slope and the Kinder Morgan Puget Sound pipeline. Overall production from the North Slope is on the decline and that downward trend is projected to continue. Therefore, the crude oil received by rail would be used to replace diminishing North Slope supplies.

The project would also include installing equipment and facilities to pump oil from tank cars to existing tanks within the refinery, constructing stormwater detention ponds, and installing safety and spill response measures.

The proposed project site includes approximately 47.1 acres, of which 45.8 acres are on the Shell PSR property and 1.3 acres are on adjacent BNSF Railway right of way. There would be an additional 25.7 acres of temporary impacts on the Shell PSR property. Figure 2-4 shows the location of the proposed project. The proposed project site is situated east of the refinery, west of East March's Point Road, south of North Texas Road, and north of South March's Point Road.

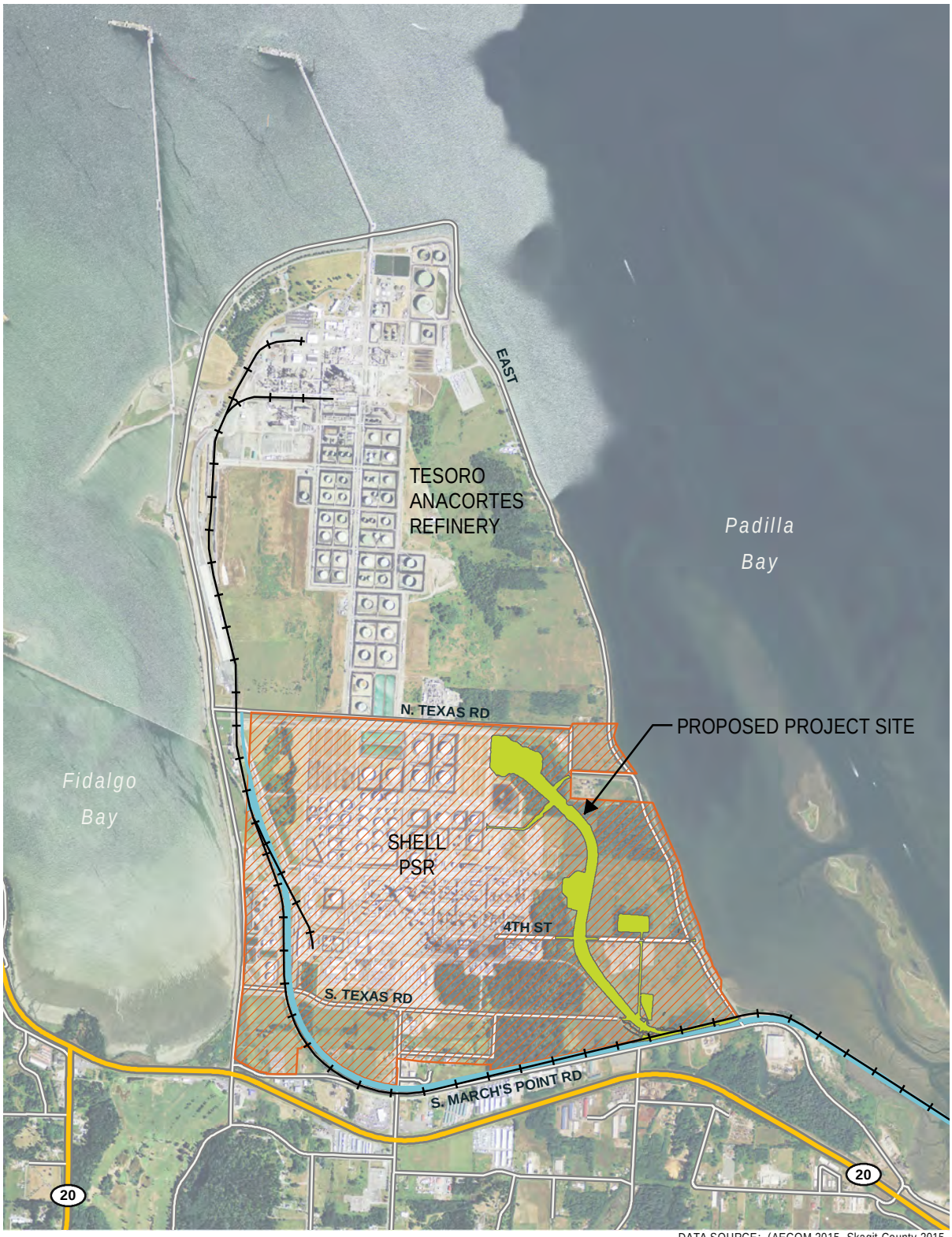
The proposed project site includes approximately 47.1 acres, of which 45.8 acres are on the Shell PSR property and 1.3 acres are on adjacent BNSF Railway right of way.

The proposed project site is a mix of undeveloped and developed industrial land. Undeveloped areas on the project site are pastures that have been used for cattle grazing. The developed areas include:

- An unvegetated soil stockpile covering approximately 5.9 acres.
- Impervious surfaces covering approximately 14.8 acres consisting of:
  - Roadways.
  - Two railroad tracks on the Anacortes Subdivision and one *wye track* leading to the existing Shell PSR facility.
  - Parking and turnaround areas (to be used as a parking and laydown area during construction).

A **wye track** is a triangle of railroad track used for turning locomotives or trains.

Construction of the proposed project would result in wetland impacts that, as described in Chapter 3.5 – Wetlands, would require compensatory mitigation to replace the loss of wetland functions. Shell has identified a potential wetland mitigation site approximately 2 miles east of the project location at the south end of Padilla Bay. The mitigation site is 100 acres, of which approximately 73 acres would be restored to tidal estuary. Some of the remaining 27 acres would be used for a setback dike, pump station, and stormwater drainage features. The number of acres to be restored is pending approval by the USACE and Ecology (AECOM 2015). Additional detail about the proposed wetland mitigation is provided later in this chapter and in Chapter 3.5 – Wetlands.



DATA SOURCE: (AECOM 2015, Skagit County 2015, WSDOT 2015, NAIP 2013)

Proposed Project Site | BNSF Rail ROW | Highway
Anacortes Subdivision | Shell Parcels | Local Road

N 0 0.25 0.5 Mile

Figure 2-4
PROPOSED PROJECT LOCATION

Proposed Facilities and Operations

Proposed Facilities

The proposed project would include the following facilities:

- Arrival and departure rail tracks.
- Rail unloading area with two tracks and a concrete containment pad.
- Designated rail section referred to as a *bad order track*, with facilities for rail cars that require repair before being dispatched.

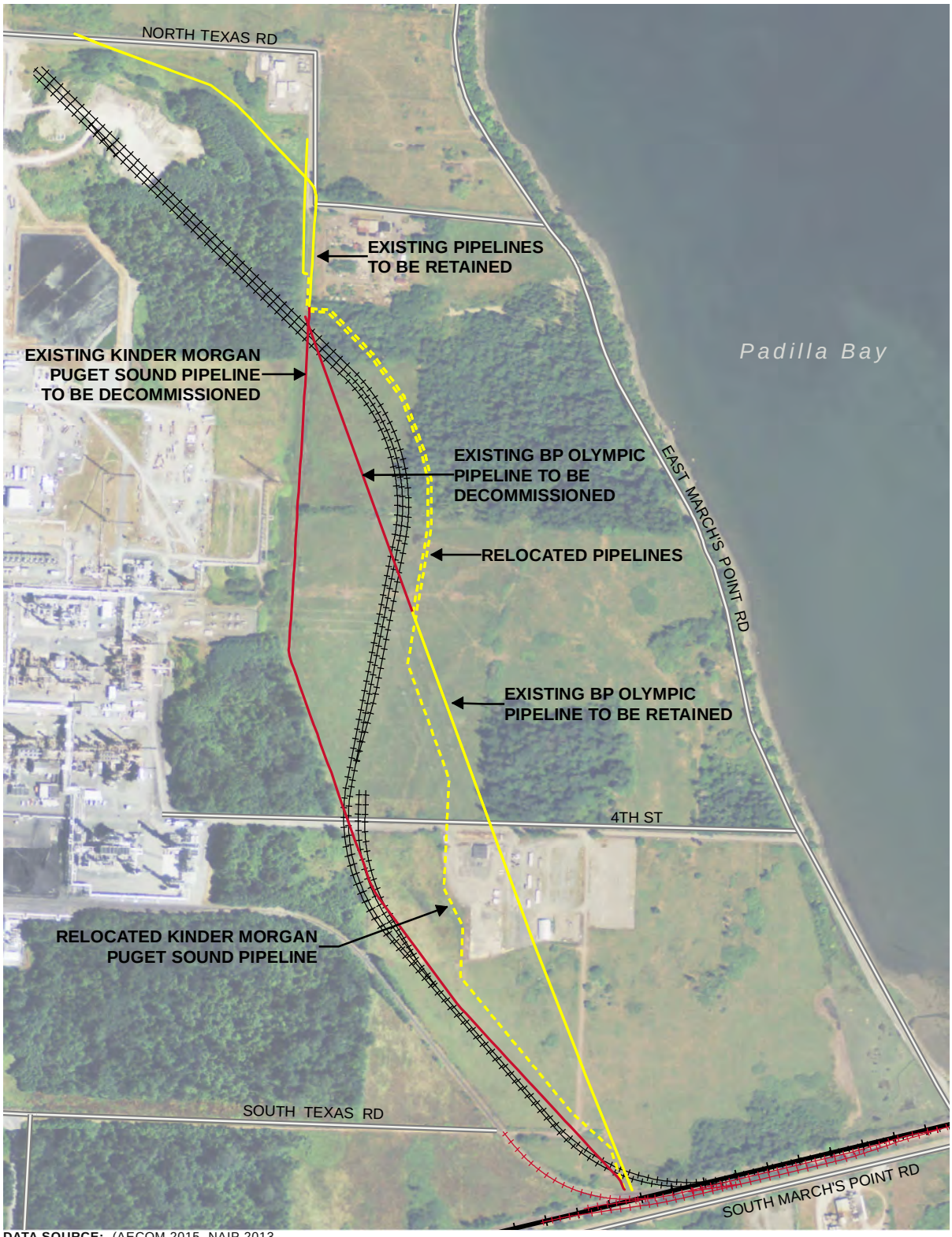
A **bad order track** is designated for rail cars with mechanical defects or that are in need of maintenance.

- Personnel operations building and ancillary facilities. The personnel operations building would contain controls to allow for the efficient operation of pumps and equipment directly associated with the rail unloading facility.
- Perimeter inspection/security road.
- Pumps and an above-ground pipeline to connect the proposed project to existing storage tanks.
- New road connections. Roads would be added and/or modified for safe and efficient ingress/egress of operating personnel, refinery emergency response personnel and equipment, and external emergency equipment and personnel such as the local fire department.
- Relocation of segments of the Kinder Morgan Puget Sound pipeline, the BP Olympic pipeline, and PSE power lines. The existing locations of these pipelines and power lines conflict with the proposed location of the new rail unloading facility. Because of the limited space on the Shell PSR property to align a new rail system and unloading facility, conflicts with the pipeline and power system are unavoidable (Figures 2-5 and 2-6).
- Stormwater facilities.
- Oil/water containment facilities, including pump and piping facilities to route water to the refinery's wastewater treatment plant.
- New electrical power substation.
- Fire response facilities, including monitors, hydrants, fire-fighting foam equipment, and supplies.
- Other ancillary facilities (e.g., lighting, fencing, etc.) typically associated with rail unloading facilities.

Existing PSE Power Line to be Retained
Relocated PSE Power Line
PSE Power Line to be Removed
Proposed Rail Track
BNSF/Shell Rail Improvement
Local Road

DATA SOURCE: (AECOM 2015, NAIP 2013, Skagit County 2015, WSDOT 2015)

Figure 2-5
PROPOSED POWER LINE RELOCATION



DATA SOURCE: (AECOM 2015, NAIP 2013, Skagit County 2015, WSDOT 2015)

N 0 250 500 Feet

Existing Pipeline
Relocated Pipeline
Decommissioned Pipeline
Proposed Rail Track
BNSF/Shell Rail Improvement
Local Road

Figure 2-6
PROPOSED PIPELINE RELOCATION

Rail Line Extension

The proposed project includes construction of over 3 miles of new railroad track on the Shell PSR property, including:

- 8,000 feet of unloading track with a concrete unloading pad.
- 1,300 feet of bad order track for temporary storage of rail cars that are taken out of service for repair or maintenance.
- 7,200 feet of departure track.

A rail spur would be constructed to connect the Shell PSR to the existing Anacortes Subdivision near South March's Point Road. The rail spur would extend in a northwesterly direction approximately 5,500 feet to North Texas Road. Most of this distance would require excavation below existing topography to meet grade requirements.

Rail access would be provided by a new connection to the existing Anacortes Subdivision located to the southeast, which would require modifications to the Anacortes Subdivision configuration. Short segments of the existing Anacortes Subdivision and a *siding track* would be realigned slightly to the south. The existing Shell rail spur would be realigned slightly to the west and new switches would be installed in addition to the new connection. An approximately 1,100-foot-long, 10-foot-high retaining wall would be constructed between the Anacortes Subdivision and South March's Point Road within the BNSF Railway right of way for support of the siding track realignment (Figure 2-7).

> A **siding track** is a low-speed auxiliary track that is separate from a main line or spur. It may connect to a through track or to other sidings.

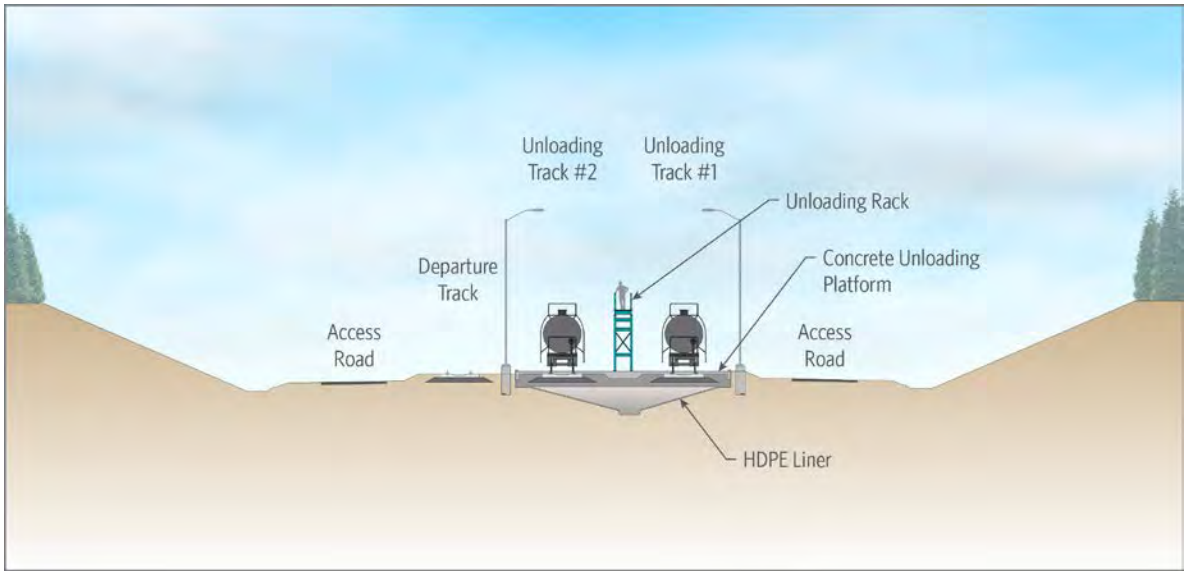
The rail line crosses 4th Street, an existing private road running east-west through the middle of the project site. This portion of 4th Street would be reconstructed underneath the proposed rail line.

Rail Unloading Facility

Figures 2-7 and 2-8 present the key features of the rail unloading facility. The facility would include an unloading rack, concrete unloading platform, vent pipes, a containment area, drain connections, collection pipes, and tank car grounding. The unloading rack is an overhead platform that would run the length of the unloading area and would be the largest structure in the facility, approximately 20 feet high. The unloading facility, including the unloading rack, would be located below grade in a cut in the hillside; as such, most of the facility would not be visible from public rights of way. The unloading facility would include three sets of railroad tracks: Unloading Track 1, Unloading Track 2, and a Departure Track. Both of the unloading tracks would be used simultaneously for unloading a single unit train.

Figure 2-7 Rail Unloading Facility Features

Figure 2-8 Profile View of Rail Unloading Facility



The rail unloading facility would be constructed in a bowl with uphill grades in both directions extending outward from the middle of the facility. This design would contain the oil in the event that the contents of an entire unit train were released at one time. The unloading platform would be paved and curbed to allow containment of both rainwater and potential spills. The bowl design would also prevent tank cars from rolling backward onto the Anacortes Subdivision in the event of brake failure. The facility would also contain a compressor to supply air to the tank cars in the unloading area to ensure the train's brake system is energized in the brake position.

A high-density polyethylene (HDPE) liner would be installed underneath the entire rail unloading platform. In addition, an oil/water separation pond system would be included in the rail unloading facility area to capture any potential leaks or spills. The system would be connected to the Shell PSR's existing wastewater treatment facility located on the west side of the refinery. Additional details about proposed stormwater and spill containment features are provided below and in Chapter 3.3 – Surface Water.

The oil/water separation pond system would be constructed west of the proposed rail unloading platform. It would be comprised of the stormwater drainage system from the unloading platform combined with a lined oil/water separation pond. The system would gather minor leaks, wash-down water, and stormwater from the rail unloading facility and pump it to the existing Shell PSR wastewater treatment plant. This would prevent any drips or potential leaks from entering Fidalgo or Padilla bays. The lined oil/water separation pond would have a capacity of about 82,000 cubic feet (or about 22 full tank cars). However, because the unloading facility is designed as a bowl, with uphill grades extending outward from the middle, the facility itself would be able to contain a spill of 102 full tank cars. In the event of this type of major spill, the oil would be routed to the oil/water separation pond, but would not be sent to the Shell PSR wastewater treatment plant. Rather, the pumps to the treatment plant would be turned off and

the oil would be pumped from the oil/water separation pond into recovery trucks for later processing at the refinery.

Stormwater Management

Two unlined stormwater ponds (North and South) are proposed east of the rail unloading facility. Both ponds have been designed to detain 100-year, 24-hour storm events. A third oil/water separation pond system would provide stormwater drainage for the rail unloading facility (Figure 2-7).

The North Stormwater Pond would receive stormwater collected from the project site, as well as from a portion of the existing Shell PSR facility north of 4th Street. The stormwater would be delivered to the pond via ditches and an underground system. The North Stormwater Pond would discharge into a forested upland.

A similar system, the South Stormwater Pond, would be designed to receive stormwater from the project site south of 4th Street. This system would discharge into an emergent wetland to the east of the pond. Both stormwater ponds would eventually infiltrate into Padilla Bay. See Figure 2-7 for locations of these proposed facilities.

Additional Facilities

The proposed project would include the following supporting facilities:

- Rail car repair facility and operations building.
- Perimeter road with connections to existing roads at 8th Street and North Texas Road at the northern end, and at South Texas Road on the southern end.
- Improvement to 4th Street at the intersection with East March's Point Road.
- Improvements and/or partial extensions of existing private roads on the Shell PSR site to provide access for operating personnel and emergency response personnel and equipment.
- Pumps and below- and above-ground pipelines to connect the proposed project to existing storage tanks.
- Electrical power substation to provide power to the proposed facilities.
- Facility and safety lighting.

Improvements to the BNSF Railway right of way would also be made, including installing power that would eliminate the need for trains to stop and manually be switched into the facility.

Proposed Operations

The Shell PSR proposes to transport crude oil from the mid-continent area—the Bakken region of North Dakota and Montana. Trains would travel to Washington State via BNSF Railway (Figure 2-9). Although BNSF Railway has discretion in the operation of trains on their rail lines, in this EIS it is assumed for analytical purposes that the unit trains traveling to the Shell PSR would take the existing BNSF Railway main line from the mid-continent area, enter Washington State near Spokane, and travel southwest along the Columbia River Valley to the Vancouver area. Then, turning north, the trains would generally parallel the I-5 corridor toward Burlington, exit the Bellingham Subdivision onto the Anacortes Subdivision rail line and head north and west toward the Shell PSR. On the return trip, trains would take a different route by moving south along the I-5 corridor, turning southeast near Auburn, traveling through Stampede Pass and the Yakima Valley. Trains would join up with the original route in Kennewick and then travel north through Spokane.

The proposed project is designed to receive, on average, six unit trains per week, which would result in approximately 624 new train trips per year, or 312 incoming and 312 outgoing unit trains. Each train would include up to 102 tank cars and have a total length of approximately 6,600 feet.

Although the U.S. recently lifted the ban on exportation of oil to foreign countries, Shell is not considering such exports as part of the proposed project.

Would Shell export oil as part of the proposed project?

Although the U.S. recently lifted the ban on exportation of oil to foreign countries, the foreign export of crude oil from the Shell PSR is not being considered as part of the proposed project.

When added to Shell's current five to six manifest trains per week for incoming materials used in the refining process, the proposed project would result in an increase in the overall train traffic to and from the Shell PSR. Overall, that translates to 24 (incoming and outgoing) train trips per week and approximately 1,248 train trips per year.

Currently, approximately 77 marine vessels per year (or about 1.5 per week) deliver crude oil to the Shell PSR. With the proposed project, inbound marine vessels delivering crude oil would be reduced to about 28 per year (or 0.5 per week), when the facility is operating at full capacity. Crude oil deliveries via pipeline are not expected to change.

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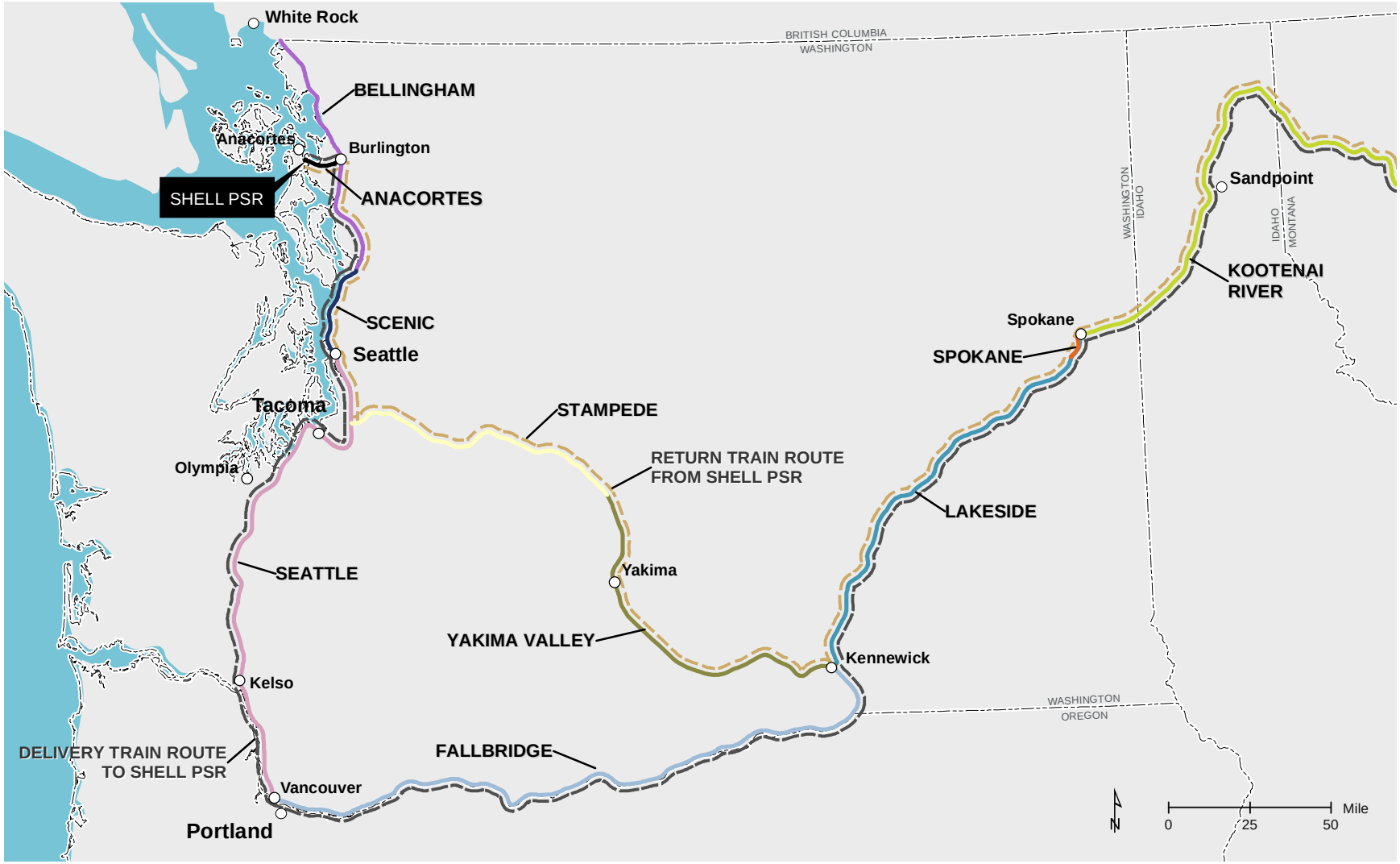


DATA SOURCE: (Skagit County 2015, USGS 2015, WSDOT 2015)

BNSF Subdivisions
Anacortes
Bellingham
Scenic
Seattle
Fallbridge
Stampede
Yakima Valley
Lakeside
Spokane
Kootenai River
Representative Delivery Train Route to Shell PSR
Representative Return Train Route from Shell PSR
State/Provincial/International Boundary

Figure 2-9
PROPOSED PROJECT RAIL ROUTES THROUGH WASHINGTON STATE

Tank Cars

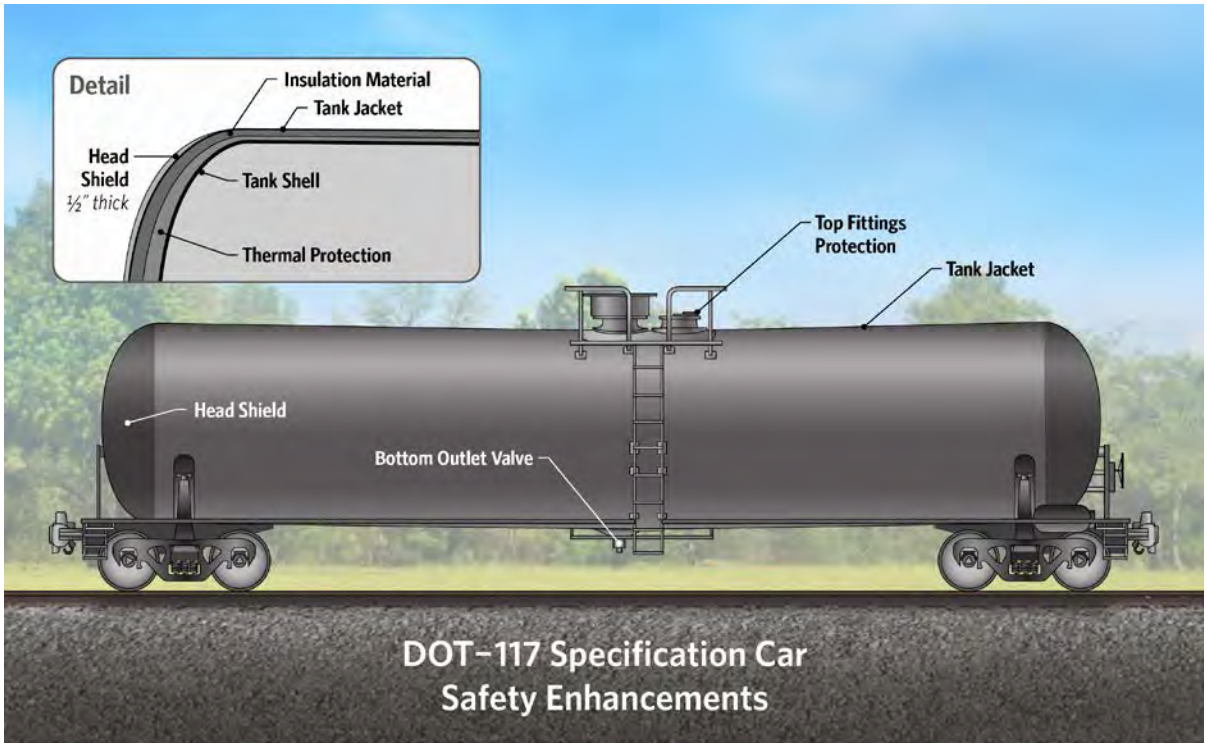
For this project, Shell would use DOT-117 Specification tank cars that meet enhanced safety standards issued by the PHMSA and the FRA (Figure 2-10). A single DOT-117 Specification tank car is expected to hold approximately 600 to 700 barrels of crude oil and has a maximum gross rail load of 286,000 pounds.

All railroad cars, regardless of what commodity they hold, must not exceed a loaded maximum gross weight of 286,000 pounds (49 CFR 179.13).

The DOT-117 Specification tank car includes the following features (AAR 2015):

- **Tank shell** is an inner steel jacket or a cylinder of 9/16-inch steel. Most existing nonpressurized tank cars are made of 7/16-inch steel. A 9/16-inch steel jacket is less likely to breach in the event of an accident.
- **Thermal protection** is a layer to help prevent a tank car from overheating if there is an accident with a resultant fire.
- **Tank jacket** is an outer layer of 11-gauge steel that wraps around the shell of the tank car shielding the thermal protection layer and offering additional puncture resistance.
- **Head shield** is a 1/2-inch-thick layer of steel at both ends of the tank car that protects against punctures caused by collisions with adjacent tank cars.
- **Bottom outlet valves** include an enhanced handle design to prevent the valves from opening and releasing oil in the event of an accident. These valves are used to load and unload the oil.
- **Top fittings** are pressure-relief valves located at the top of the tank car. If the internal pressure in a tank car gets too high from liquid inside becoming too hot, the pressure could cause a tank car to rupture. Pressure relief valves are designed to open when pressure reaches a certain level, thereby emitting product in a controlled fashion and lowering the internal pressure.

Figure 2-10 DOT-117 Specification Tank Car



Source: Adapted from USDOT 2016.

Unloading Operations

The proposed project unloading operations would likely be performed during both day and night. An incoming unit train would arrive from the Anacortes Subdivision onto Unloading Track 2. Manual brakes would be set on the northern half of the unit train, and then the southern half of the train would be separated. The southern half would be moved backwards to clear the railroad switch and then moved up to Unloading Track 1. Brakes would be set on the southern half of the unit train to ensure both halves are ready for unloading. To ensure brakes have adequate air pressure, the cars would be connected to a pressurized air system specifically designed for this purpose. BNSF Railway would transfer custody to Shell after all safety checks were performed.

As described above, unit trains entering the facility would be split into two segments using Tracks 1 and 2 on the unloading platform. One track would have 49 cars and the other with 53, respectively. Tank cars would be attached to unloading lines in groups of about 10 cars. Unloading lines would be attached to the bottom drain valve on each tank car; other lines would be attached to vent valves on the top of the tank cars to capture volatile gases released during the unloading process and to control the atmosphere of the tank car. At that point, the crude oil would be pumped to existing storage tanks on the Shell PSR property prior to refining. As the tank cars were emptied, the unloading lines would be transferred to other cars to continue the sequential process until all tank cars in the train were unloaded.

After unloading, the empty unit train would be transferred to the Departure Track, and reassembled starting with Unloading Track 2 and then Unloading Track 1. The train would be inspected for safety before custody would be transferred back to BNSF Railway. At that point, the empty train would be ready to depart for its return to the mid-continent. The entire unloading process described above would take about 12 hours to complete. This limits the volume of oil that can be unloaded to 60,000 to 70,000 barrels per day or up to six trains per week.

Shell anticipates that the proposed rail unloading facility would be initially staffed 24 hours a day, seven days per week. This could change in the future after unit train schedules and logistics are better defined. Approximately 25 new workers are anticipated to operate the proposed project, eight to ten of whom would be expected to work on site at any one time. The number of personnel could change after operational routines are established.

Life of the Proposed Project

The proposed rail unloading facility would be part of the larger operations of the Shell PSR. The proposed project is designed for a 20-year life. However, the facility could operate for a much longer period if components are replaced when needed. Operation of the facility would depend on how long it remains commercially viable to receive crude oil by rail. Maintenance activities during operation may include daily checks of pumps, piping, and instruments. Piping wall thickness would be monitored to identify the timing for replacement well in advance of potential significant thinning. The new rail system would undergo routine inspections by experienced contractors that specialize in rail maintenance. Permit requirements that apply to project operation would remain in place for the life of the proposed project.

Construction Methods and Sequencing

Construction of the proposed project is anticipated to begin as early as 2017, and take about two years to complete. Approximately 200 temporary employees may be needed at the peak of construction. The total construction cost of the unloading facility is estimated at $95 million.

The construction equipment required would include approximately five large excavators, five pay loaders, 75 tractor-trailers, five bulldozers, 10 scrapers, five water trucks, and two service trucks.

Construction activities on the Shell PSR property would mostly occur during daylight hours for 10 hours per day, four days a week (Monday through Thursday); however, there may be a need to work outside these hours because of schedule or time constraints. No night work scenarios are anticipated at this time.

Construction of the proposed project is anticipated to begin as early as 2017, and take about two years to complete.

The proposed project would involve various site preparation activities including, but not limited to, clearing and grading; installation and construction of associated infrastructure improvements such as additional stormwater facilities; and extension of existing services and utilities, including electricity, sanitary sewer, and potable water.

Utility Relocation

Before construction could begin, some existing pipelines and power lines would need to be relocated to create the additional space and clearances necessary for the rail unloading area. Approximately 4,250 feet of the existing Kinder Morgan Puget Sound pipeline and 1,350 feet of the BP Olympic pipeline would be relocated from within the footprint of the rail facility to a common corridor along the unloading facility's eastern side (Figure 2-6).

Approximately 6,830 feet of PSE power lines on the east side of the existing refinery facility would also require relocation. This effort would involve the relocation of three power poles, the removal of 14 existing power poles, and the installation of 18 new power poles.

Clearing and Grading

Standard and heavy earth-moving and grading equipment would be used to construct the necessary base for the proposed rail lines. Approximately 1.1 million cubic yards (cy) of excavated material is anticipated for construction of the rail spur extension and unloading tracks. Approximately 236,000 cy would be excavated from wetlands on the Shell PSR property.

Excavated materials not needed for fill at other proposed project locations would be hauled away to approved disposal sites. All excavated materials would be tested for contaminants and, if any were found, the contaminated materials would be handled and disposed of separately in accordance with state and local regulations. Approximately 400,000 cy of clean excavated material from the proposed project site would be hauled to the proposed wetland mitigation site and approximately 8,500 cy would be placed in wetlands on the Shell PSR property.

The soil characteristics on site do not meet the requirements of the facility; therefore, fill material would need to be imported to the Shell PSR site. Imported backfill would be brought in and stockpiled for use in constructing the facility at approximately the same time excavated material would be removed from the site. Structural fill material would be obtained on site to the extent feasible. It is likely that fill materials such as ballast needed to provide foundation for the rail tracks and select pipeline bedding would be imported to the site. Approximately 175,000 cy of fill materials would be imported.

Clearing limits would be established by surveyors before any earth was moved. Temporary erosion and sediment control measures would be put in place to limit and control construction stormwater runoff and erosion. The site would be cleared of topsoil and minor vegetation and portions of forest would be removed. Surplus excavated materials, including topsoil and vegetation, would be hauled to an approved location within Skagit County (Figure 2-11).

Over the course of about seven months, a total of approximately 55,000 truck trips (up to 384 per day) are anticipated to remove excavated material from the site. Approximately 20,000 truck trips (or up to 140 per day) would be needed to haul materials from the proposed project site to the wetland mitigation site. Approximately 35,000 truck trips (or up to 244 per day) would be needed to haul materials to potential spoils disposal sites (identified on Figure 2-11), but cannot be secured until a contractor is chosen. Potential haul routes from the Shell PSR and the wetland

mitigation sites to the stockpile areas are also shown in Figure 2-11. An additional 8,750 truck trips, or 61 trucks per day, would be anticipated to import fill material to the Shell PSR site. For a period of about two years, construction truck traffic is anticipated on the local roads adjacent to the refinery.

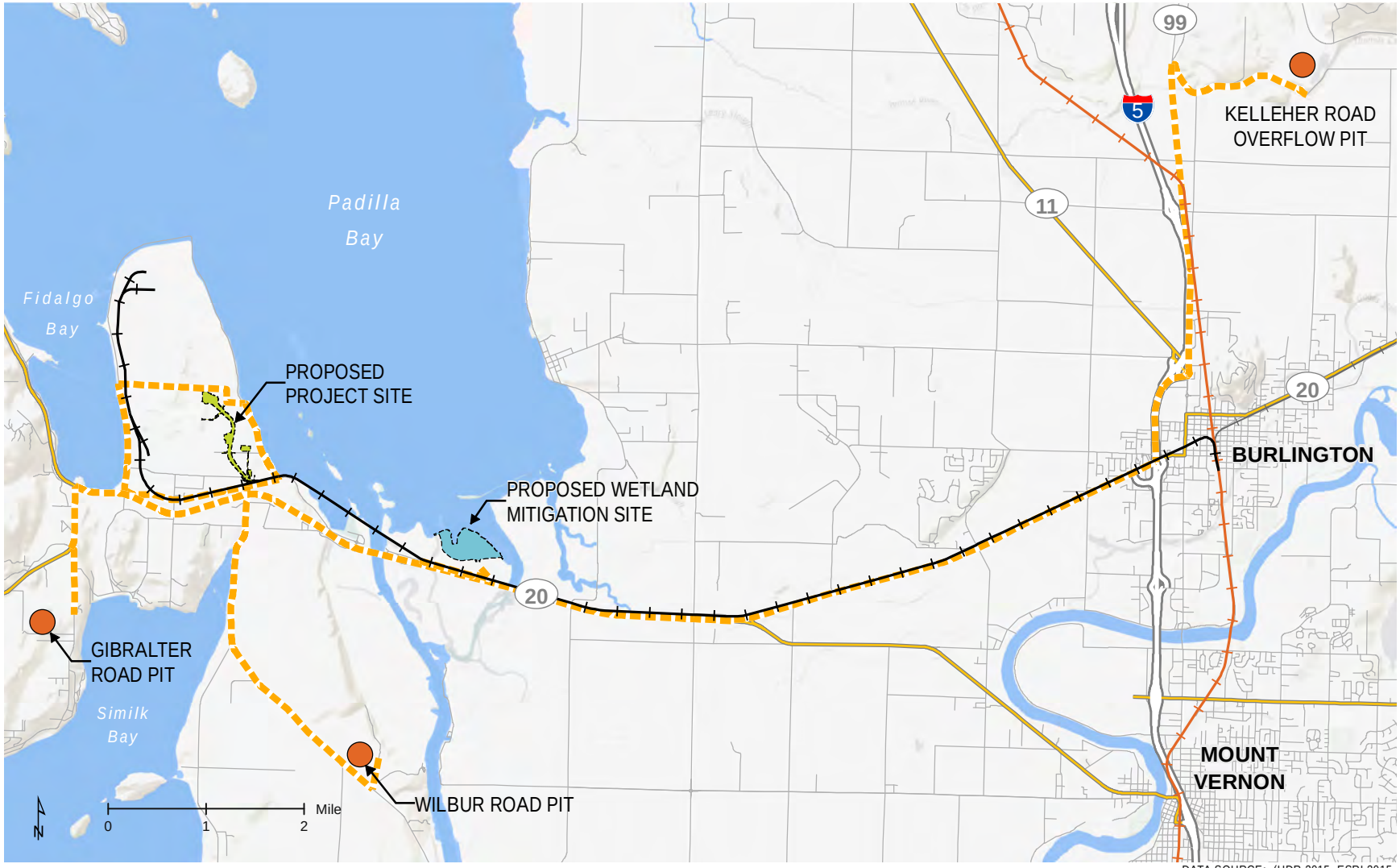
Infrastructure Construction

The HDPE liner would be installed underneath the entire unloading area and under the oil/water separation pond system to capture and control any spills or leaks and preclude such materials from reaching ground or surface waters.

Multiple specialty contractors would be working on the project at the same time. Crews would be excavating foundations while others would be fabricating elements of the various structures. These elements would be delivered by truck to on-site laydown areas and assembled by other subcontractors. Railroad ties would be brought in and placed to support new railroad tracks. The railroad ties would be primarily made of concrete; however, some wooden railroad ties may be used in the switch areas. Railroad tracks would then be brought to the site, either by truck or rail, and welded into continuous strings for assembling this portion of the project.

The below-ground portion of the pipeline connecting the unloading facility to the existing storage tanks would be installed and backfilled before the railroad tracks and elevated structures were finished. Permanent structures would be brought to the site and assembled or placed according to design requirements. The pump pad and pumps for transferring the crude oil to the refinery would be constructed and installed. Emergency fire water system components would be brought in and assembled per state and local requirements.

Work performed inside the Shell PSR would include installing tie-ins for utility services, various piping connections, access road connections, and other essential communications elements.



DATA SOURCE: (HDR 2015, ESRI 2015, Skagit County 2015, USGS 2015, WSDOT 2015)

Proposed Project Site
Proposed Mitigation Site
Proposed Haul Routes
Potential Spoils Disposal Site
Anacortes Subdivision
Bellingham Subdivision
BNSF Railway
Interstate Highway
State Highway
Waterbody

Figure 2-11
PROPOSED HAUL ROUTES AND SPOILS DISPOSAL SITES

Drainage Modifications

Several drainages (ditches and one seasonal stream) would be rerouted or placed into culverts during construction to accommodate the new facilities and modified topography. Approximately 175 linear feet of Stream S would be rerouted and approximately 50 linear feet would be placed in a culvert. Many of the ditches would be rerouted to new stormwater basins. None of the rerouted ditches are proposed to be lined. Additional information about drainage features is provided in Chapter 3.3 – Surface Water.

Wetland Mitigation

Construction of the proposed project would result in 25.83 acres of permanent wetland impacts; 0.23 acre of long-term temporary impacts; 12.58 acres of permanent impacts to wetland buffers; and 0.02 acre of impacts to Stream S. As described in Chapter 3.5 – Wetlands, these impacts would require compensatory mitigation to replace the loss of wetland functions. Shell has identified a potential wetland mitigation site approximately 2 miles east of the project at the south end of Padilla Bay (AECOM 2016). The mitigation site is 100 acres, of which 73 acres would be restored to tidal estuary. Some of the remaining 27 acres would be used for a setback dike, pump station, and stormwater drainage features.

The draft wetland mitigation plan calls for the removal of an existing dike in strategic areas to restore estuarine processes such as tidal flow, channel formation, and connections to existing channels (AECOM 2016). Before the existing dike is removed, a setback dike would be built to protect surrounding properties and facilities from tidal inundation.

Construction at the wetland mitigation site would begin concurrently with that of the rail unloading facility and is expected to take three to four years to complete (AECOM 2016). Filling the site with excavated material from the unloading facility would occur during the first two years of construction. The new setback dike would require at least two years for settlement and supplemental fill before the existing dike is breached.

Construction of the wetland mitigation site would require the use of scrapers, excavators, bulldozers, dump trucks, graders, rollers for soil compaction, and water trucks for dust control. It would require up to 20 workers to construct.

The wetland mitigation site contains properties owned and managed by Skagit County Dike Drainage and Irrigation Improvement District #12 and Triton America (AECOM 2016). Shell and Triton America have entered into a license agreement to allow for the development of the wetland mitigation site and to conduct subsequent monitoring and maintenance (AECOM 2016). The license would also allow the wetland mitigation site to be placed into a conservation easement in perpetuity.

CHAPTER 3 AFFECTED ENVIRONMENT AND ENVIRONMENTAL IMPACTS

3.0 INTRODUCTION

This introductory chapter and subchapters describe the existing conditions (affected environments) for 17 resources that would be potentially impacted by implementation of the proposed project. Analyses describe the potential environmental impacts associated with construction and operation of the proposed facility, the proposed wetland mitigation, and the transport of crude oil from the mid-continent area to the Shell Puget Sound Refinery (PSR) by unit trains.

OVERVIEW OF APPROACH

This chapter describes *direct, indirect, and cumulative impacts* associated with the proposed project. Impacts can be short term (temporary) or long term (permanent). A short-term impact may occur during construction, such as temporary barriers or fencing put in place for safety reasons, or the staging of materials and equipment. Long-term impacts can result when design features—the creation of new stormwater facilities, for example—result in permanent changes within the project vicinity. For this EIS, each environmental resource was analyzed to determine the potential impacts associated with the no action alternative and the proposed project. The analyses of each environmental resource include the following:

- A description of the study area and the methodology used to analyze potential impacts.
- A description of the affected environment.
- A discussion of the potential environmental impacts.
- A list of measures that could be implemented to avoid, minimize, or mitigate potential impacts.

Skagit County (County) and the Washington State Department of Ecology (Ecology), co-lead agencies, hired a third-party consultant team to conduct an independent review of information relating to the proposed project, and to prepare this environmental impact statement (EIS). Chapter 7 – List of Preparers, names the individuals who contributed to the preparation of the EIS. Generally, readily

Direct impacts are caused by an action and occur at the same time and place as the action. Direct impacts can take place through direct interaction of an activity (e.g., construction or operation of the project) with an environmental resource.

Indirect impacts are similar to direct impacts in that they are caused by the same action, but may occur later in time or be farther in distance from the activity causing the impact. A direct impact to one resource may result in an indirect impact to another (e.g., a direct impact to wildlife habitat could cause an indirect impact to recreational hunting opportunities).

Cumulative impacts are incremental impacts of an action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions (e.g., numerous small changes in land use could collectively lead to degradation of a watershed).

available information from local, state, and federal jurisdictions and agencies, as well as materials provided by Shell, were reviewed to describe the affected environments and analyze potential impacts for each environmental resource (see Environmental Resources Considered, below).

Shell provided technical reports, responses to data requests, and preliminary engineering plans and data, along with other materials and analyses to provide sufficient information to evaluate the potential impacts of the proposed project. The following documents were provided by Shell for review and analysis in this EIS:

- Clean Water Act (Section 404B1) Alternatives Analysis (AECOM 2015a; Appendix A).
- Biological Evaluation and Essential Fish Habitat Analysis (AECOM 2016a).
- Draft Mitigation Plan (AECOM 2016b).
- Technical Memorandum for Groundwater Hydrology Monitoring (AECOM 2015b).
- Summary of Environmental Features (Anvil 2015).
- Shell PSR Hydrogeologic and Groundwater Quality Data and Reports (Landau Associates 1988; Landau Associates 1989; URS 2014a; URS 2014b).
- State Environmental Policy Act (SEPA) Analysis Checklist (URS 2013a).
- Wetland Delineation Report and Critical Areas Assessment (URS 2013b).
- Washington State Joint Aquatic Resource Permit Application (JARPA) form (URS 2014c).
- Nest Disturbance Permit (USFWS 2014).
- Stormwater Pollution Prevention Plan (SWPPP) (Wilson and Company 2014).
- Hydrology/Hydraulics Report (Wilson and Company 2015).

The analyses of the affected environment and environmental impacts completed for each resource are described in Chapters 3.1 through 3.17, along with descriptions of select laws, regulations, and applicable guidance that apply.

This chapter focuses on the potential impacts of the proposed project and associated activities including construction and operation of project facilities. Chapter 4 – Environmental Health and Risk, discusses the potential impacts associated with an accidental release of crude oil during rail transport to the Shell PSR.

This chapter also identifies recommendations for mitigation measures that could be used to avoid, minimize, or mitigate potential impacts associated with the proposed project. These mitigation measures are discussed further in Chapter 5 – Summary of Impacts and Mitigation.

OVERVIEW OF STUDY AREAS

The study area for an EIS impact analysis encompasses the area in which environmental resources could be affected by the proposed project. In this EIS, the study area determined for each resource depended on how, and to what extent, that resource could experience direct, indirect, and cumulative impacts. Therefore, the study areas considered for impact analyses are presented at the beginning of each resource section, in Chapters 3.1 through 3.17.

The study area for direct and indirect impacts also includes the area that would be affected by construction activities. Impacts generated from construction are typically considered short term because they occur during a limited timeframe. Conversely, impacts from project operation are considered long term as they extend throughout the life of the facility. In most cases, the study areas described in Chapters 3.1 through 3.17 extend beyond the proposed project and wetland mitigation sites to include the broader expanses potentially affected by construction and operation of the proposed facilities. For example, stormwater runoff from the project site could reach waterbodies outside the site boundaries; vehicle traffic at intersections more than 2 miles from the project site could be affected by trucks hauling construction spoils to disposal sites.

Because this project is intended to support delivery of crude oil by rail to the Shell PSR, the extent of the area studied along the rail corridor varied by resource, depending on the characteristics of the resource and the potential impacts from rail operations. Recognizing that the crude oil destined for the Shell PSR is a concern to many stakeholders, analyses were expanded in some cases to include potential impacts along the BNSF Railway main line. However, to offer specific and meaningful analysis, the study area used in this chapter for the rail corridor was generally limited to the Anacortes Subdivision—the rail segment that would experience the greatest increase in rail traffic relative to existing conditions. Chapter 4 – Environmental Health and Risk, provides additional analysis of the potential risks and consequences of an accidental release of crude oil along the rail corridor.

ENVIRONMENTAL RESOURCES CONSIDERED

The co-lead agencies identified several environmental topics in the Determination of Significance to be studied in this EIS (Skagit County and Ecology 2015a). These topics include: earth, air, water, plants and animals, environmental health, land and shoreline use, transportation, and public services and utilities.

As described in Chapter 1 – Introduction, the co-lead agencies invited the public, agencies, and tribes to comment on potentially affected resources, the extent of analysis to be included, and potential measures to mitigate impacts of the proposed project. The comments received are summarized in the *Shell Anacortes Rail Unloading Facility Environmental Impact Statement Scoping Report* (Skagit County and Ecology 2015b).

The co-lead agencies reviewed the scoping comments and refined the scope of this EIS to include the study of 17 environmental resource topics. Table 3.0-1 lists the environmental resources considered in this chapter.

Table 3.0-1 Environmental Resources Considered in this Chapter

Resource	Discussion
3.1 – Earth Resources	An analysis of bedrock geology, topography, and soils within the proposed project area. The regional and local geologic setting included identification of significant topographic features and landforms, soil types, and mineral resources. The potential for geologic hazards to affect the proposed project was also addressed.
3.2 – Groundwater	An evaluation of the geology and soils that influence groundwater flow (hydrogeology) and groundwater quality within the proposed project vicinity. The hydrogeologic analysis considered the groundwater elevation ranges, confining geologic units that overlay or delineate distinct aquifers, and the hydraulic conductivity of the soils and geologic units.
3.3 – Surface Water	An analysis of surface water flows and surface water quality including ditches, streams, sloughs, wetlands, and marine shorelines associated with area receiving waters, in this case, Padilla and Fidalgo bays.
3.4 – Fish and Aquatic Species and Habitat	An analysis of the types of fish and aquatic species and their habitats that exist within the proposed project vicinity, and the potential impacts that could result from construction and operation. Marine mammals and their habitats are also considered.
3.5 – Wetlands	An assessment of the wetlands and buffers that would be affected at the project site in terms of type, size, and function, and the associated mitigation measures proposed at a nearby wetland mitigation site.
3.6 – Vegetation and Terrestrial Wildlife	An analysis of the types of vegetation and terrestrial wildlife that exist within the proposed project and wetland mitigation sites, and the potential impacts that could result from construction and operation.
3.7 – Cultural Resources	An evaluation of the proposed project and its potential impacts relative to locations of special importance for Native American groups in the project vicinity.

Resource	Discussion
3.8 – Treaty and Traditionally Used Resources	An evaluation of how the proposed project could affect traditionally used resources within the project vicinity, namely, impacts that could affect tribal lifeways and culture or the exercise of tribal treaty reserved rights.
3.9 – Noise and Vibration	An assessment of existing noise and vibration levels in and around the project vicinity relative to how those levels would change as a result of both construction and operation of the proposed project.
3.10 – Air Quality and Greenhouse Gases	An evaluation of the types and quantities of atmospheric pollutants and their sources, along with the potential contributing impacts that the proposed project may have on greenhouse gas emissions.
3.11 – Energy and Natural Resources	An examination of the estimated energy requirements of the proposed project and the availability of local natural resources (namely fill materials). The use of fuel to transport crude oil to the Shell PSR and any changes in fuel consumption related to that transport were also considered.
3.12 – Land Use and Social Elements	An analysis of current land uses in the project vicinity, including residential, commercial, and industrial. Recreational resources such as parks, wildlife reserves, and nature trails were also evaluated. Social elements considered include minority, low income, and limited English-speaking populations, community services, and utilities.
3.13 – Visual Resources	An analysis of the visual resources (key observation points) that exist in the vicinity of the proposed project, their sensitivity levels, and how those resources could be altered as a result of project construction and operation.
3.14 – Economics	An evaluation of potential economic impacts resulting from the construction (short term and temporary) and operation (long term and permanent) of the proposed project. These impacts are addressed at both the local and statewide level.

Resource	Discussion
3.15 – Rail Traffic and Transportation	An analysis of how the addition of six round-trip trains per week traveling to and from the Shell PSR would affect at-grade railroad crossing operations as well as the proposed project's potential impacts on the regional rail transportation network.
3.16 – Vehicle Traffic and Transportation	An analysis of how the proposed project could create changes in traffic during the construction period or cause changes in access or vehicle delays on roadways and intersections near at-grade railroad crossings during operation.
3.17 – Public Services and Incident Response	An assessment of existing services within the proposed project vicinity and the potential demands on those services, along with a discussion of incident response capabilities.

OVERVIEW OF CUMULATIVE IMPACTS ANALYSIS

SEPA requires the County and Ecology, as co-lead agencies, to consider the cumulative impacts of the proposed project in this EIS (WAC 197-11-060). A cumulative impact is defined as the incremental impact of an action when added to other past, present, and *reasonably foreseeable future actions*. Cumulative impacts can result from individually minor but collectively significant actions taking place during a determined timeframe (40 CFR § 1508.7).

Reasonably foreseeable future actions were considered in this cumulative impacts analysis if they met at least one of the following criteria:

- Projects are currently within the planning stage and have funding secured for the action.
- Projects are currently undergoing SEPA review.
- Projects have completed the SEPA process and review is in another permitting phase.

An example of a cumulative impact is the additive effect of numerous small changes in land use from natural vegetation to hard surfaces. One individual change within a watershed may not noticeably affect the rate of stormwater runoff or sediment load that enters a stream. However, numerous changes within the watershed could collectively lead to increased rates of stormwater runoff that the receiving stream channel could not accommodate. The cumulative impacts are described within the evaluation of each environmental resource.

The cumulative impacts analysis was prepared in accordance with SEPA (WAC 197-11-060). Additional guidance developed by the Council on Environmental Quality (CEQ) was also considered (CEQ 1997). The following steps were used to analyze cumulative impacts:

1. Identify the cumulative impacts study area for each environmental resource.
2. Determine the timeframe that will be used to analyze the impacts from past, present, and reasonably foreseeable future projects.
3. Identify past, present, and reasonably foreseeable projects.
4. Analyze the cumulative impacts for each environmental resource.

This cumulative impacts analysis evaluates the impacts resulting from construction and operation of the proposed project and the potential for cumulative impacts. Potential cumulative impacts associated with an accidental release of oil during transport of crude by rail are discussed in Chapter 4 – Environmental Health and Risk.

Cumulative Impacts Study Areas

The study areas for cumulative impacts are used to assess the impacts of other past, present, and reasonably foreseeable future actions to determine if those actions, combined with project impacts, have a cumulative impact on environmental resources. For some resources, the study area used to assess direct and indirect impacts may be sufficient to analyze cumulative impacts. In other cases, the study area may be expanded to evaluate impacts to the resource within the scale of human communities, landscapes, watersheds, or air sheds. For this EIS, the study areas for cumulative impacts are described within the discussion of each resource reviewed.

Timeframe for Cumulative Impacts Analysis

The timeframe for cumulative impacts analysis defines the period in which to consider the incremental impacts of past, present, and reasonably foreseeable future actions combined with the proposed project. For this proposed project, the timeframe used to assess cumulative impacts from past actions begins in 1958—the year the Shell PSR began operation. Currently, Shell anticipates that the project would become operational in 2018 (if permits are approved) and be in operation for at least 20 years (see Chapter 2 – Proposed Project and Alternatives). Therefore, the timeframe for this cumulative impacts analysis is 1958 to 2038. Permit requirements that apply to project operation would remain in place for the life of the proposed project.

Past, Present, and Reasonably Foreseeable Future Actions

The identification of past, present, and reasonably foreseeable future actions can provide insight into determining the cause-and-effect relationship between human actions and resources or ecosystems. This requires an evaluation of available data within the resource-specific study area for cumulative impacts. Only the past, present, and reasonably foreseeable future actions that could impact individual resources were included in this analysis. The impacts of past actions were considered as part of the existing environmental conditions. A qualitative assessment of past human impacts on individual resources is also provided in this study.

State and local sources were used to identify present actions for localized study areas (such as Skagit County). For resources with larger study areas (such as Washington State), present projects were addressed qualitatively.

Reasonably foreseeable future actions were considered in this cumulative impacts analysis if they met at least one of the following criteria:

- Projects are currently within the planning stage and have funding secured for the action.
- Projects are currently undergoing SEPA review.
- Projects have completed the SEPA process and review is in another permitting phase.

Table 3.0-2 identifies past, present and reasonably foreseeable future actions based on a review of state and local information sources. Figure 3.0-1 identifies their locations.

The **Gateway Pacific Terminal Project** is a proposed marine export facility located in Whatcom County, WA (Table 3.0-2). In May 2016, the EIS for the project was suspended, and the U.S. Army Corps of Engineers (USACE) determined that the project, as submitted, could not be permitted. However, in an effort to provide a conservative analysis of potential cumulative impacts, the Gateway Pacific project was included in this analysis as a reasonably foreseeable future action.

Table 3.0-2 Past, Present, and Reasonably Foreseeable Future Actions

Project	Description*	Status
BP Cherry Point Refinery, Blaine, WA	Beginning operations in 1971, the Cherry Point facility currently processes more than 9 million gallons (approximately 214,300 barrels) of crude oil a day, primarily transportation fuels. It provides about 20 percent of the gasoline market in Washington and Oregon, the majority of jet fuel for Seattle, Portland, and Vancouver, B.C. international airports, and is the largest West Coast supplier of jet fuel to the U.S. military (British Petroleum 2016).	Past
BP Rail Logistics, Whatcom County, WA	Constructed in 2014 as part of the BP Cherry Point Refinery, the BP Rail logistics facility is composed of a 10,200-linear-foot rail loop interconnected to the BNSF Railway Custer Spur to transfer crude oil between tank cars and the refinery. The facility is permitted to receive one train per day (one inbound and one outbound train trip) (Whatcom County 2012).	Past
Burlington Northern Railway Old Highway 99N Overpass of BNSF Railroad	Skagit County Public Works is seeking to replace an existing 1,183-foot- long timber trestle bridge on Old Highway 99N where it passes over the BNSF Railway north of Cook Road (north of Burlington). The existing bridge will be replaced with a three-span concrete bridge (Skagit County 2016a). Currently it is anticipated that the project would impact about 0.091 acre of wetlands (Skagit County 2016b).	Reasonably Foreseeable Future Action
Burnaby Refinery and Rail Facility, Vancouver, B.C.	Chevron Canada operates the Burnaby Refinery on the shores of Burrard Inlet near Vancouver, B.C. Crude oil is supplied to the refinery from northern British Columbia, Alberta, and Saskatchewan mainly via pipeline, with supplemental deliveries by rail and truck. The crude oil supply by rail consists of up to 10 tank cars per day to deliver approximately 8,000 barrels. Approximately 57,000 barrels of fuels are refined daily (Chevron Canada 2016; Vancouver Sun 2015).	Past

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Project	Description*	Status
Gateway Pacific Terminal, Whatcom County, WA	Pacific International Terminals, Inc. has proposed a deep water marine terminal at Cherry Point in Whatcom County, WA. The project would handle import and export of up to 54 million metric tons per year of dry bulk commodities. In a related project, BNSF Railway has proposed to modify rail facilities adjacent to the terminal site, including installation of receiving/departure tracks west of the BNSF Railway Bellingham Subdivision and development of a second track along the approximately 6-mile Custer Spur to the proposed terminal site (Gateway Pacific Terminal 2013). This would allow for up to 18 train trips per day.	Reasonably Foreseeable Future Action
Imperium Bulk Liquid Terminal Facility Project, Port of Grays Harbor, WA	Imperium Terminal Services, LLC, proposes to expand its existing bulk liquids terminal. The project involves additional storage tanks and expanding rail unloading capacity and vessel loading capacity for ethanol, oil, and biofuels (crude oil is not part of the proposal). The project results in an additional 400 vessel trips per year and up to two unit train trips per day (Ecology 2015a).	Reasonably Foreseeable Future Action
Millennium Bulk Terminals, Longview, Cowlitz County	Millennium Bulk Terminals proposes to build a coal export terminal on a portion of an existing industrial site that would consist of rail unloading, storage, reclaiming, and loading ships with coal. The planned total throughput capacity of the facility would be 44 million metric tons per year (Millennium Bulk Terminals Longview 2010). An estimated 16 train trips per day are anticipated.	Reasonably Foreseeable Future Action
Northwest Innovation Works, Methane Terminal, Port of Kalama, WA	Northwest Innovation Works is proposing to construct and operate a methanol production plant in an industrial park owned by the Port of Kalama. The plant would manufacture methanol from natural gas. Natural gas would be delivered to the methanol plant by a new lateral distribution pipeline to be constructed by Northwest Pipeline GP. As part of the same development, the Port is proposing a new deep draft marine terminal facility to load methanol onto ships (Port of Kalama 2016).	Reasonably Foreseeable Future Action
NuStar Terminal, Vancouver, WA	NuStar proposes to convert a 120,000-barrel methanol tank for crude oil; receive approximately 22,000 barrels per day. They also proposed to add rail off-load capability. A Determination of Significance was issued on April 3, 2015. Currently, full unit trains cannot be received. Less than one unit train per day could be off loaded (0.6 train trips per day) (NuStar Terminal Services 2015).	Reasonably Foreseeable Future Action

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Project	Description*	Status
Phillips 66 Refineries, Ferndale, WA	Phillips 66 constructed a tank car crude oil unloading facility along existing rail infrastructure at its refinery near Ferndale, WA. The refinery has a throughput capacity of 75,000 barrels per day. The project would provide for the arrival and departure of one unit train every other day (an average of one train trip per day) in addition to the existing rail traffic on the BNSF Railway Custer Spur (Whatcom County 2013).	Past
Puget Sound Energy LNG Project, Port of Tacoma, WA	Puget Sound Energy has proposed a liquefied natural gas (LNG) facility at the Port of Tacoma, WA. The LNG receiving facility would be located on a 30-acre site and provide natural gas to residents, commercial customers, and marine vessels. It is projected to be completed by 2018 (PSE 2016).	Reasonably Foreseeable Future Action
Tesoro Anacortes Refinery, Anacortes, WA	The Tesoro Refinery has a total crude oil storage capacity of 120,000 barrels. It receives crude feedstock via pipeline from Canada, by rail from North Dakota and the central U.S., and by tanker from Alaska and foreign sources (Wilson and Company 2016; Tesoro 2015a). The facility accommodates an estimated two train trips per day.	Past
Tesoro Clean Products Upgrade, Anacortes, WA	Tesoro Refinery and Marketing Company LLC, proposes to install a new marine vapor emissions control system to capture hydrocarbon emissions from marine vessels displaced during marine loading operations. Other proposed improvements include construction of an aromatics recovery unit capable of producing 15,000 barrels per day of mixed xylenes, a new steam boiler, expansion of the naphtha hydrotreater to process 46,000 barrels of naphtha per day, and installation of a new isomerization unit. Additionally, new storage tanks will be installed adjacent to the existing refinery storage tank area, expanding the tank storage area to the west (Skagit County Planning and Development Services 2016). Currently it is anticipated that the project would impact about 0.0105 acre of wetlands (Tesoro 2015b).	Reasonably Foreseeable Future Action

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Project	Description*	Status
Vancouver Energy Distribution Terminal Facility (Tesoro-Savage), Vancouver, WA	Tesoro Savage Petroleum Terminal, LLC, is proposing to construct a facility that would receive 360,000 barrels of crude oil per day by rail, store on site, and then load onto marine vessels for transport. An average of eight unit train trips per day would occur at the facility (Ecology 2014a; Washington Energy Facility Site Evaluation Council 2015).	Reasonably Foreseeable Future Action
U.S. Oil Refinery and Rail Facility, Port of Tacoma, WA	U.S. Oil and Refining Co., operates a refinery with current crude capacity of 48,000 barrels per day at the Port of Tacoma, WA. The refinery receives crude oil by truck, train, and marine vessel. The facility can accommodate approximately one unit train trip per day (Ecology 2014a).	Past
Westway Terminal Expansion Project, Port of Grays Harbor, WA	Westway Terminal Company, LLC, proposes to expand its existing bulk storage terminal at Port of Grays Harbor to allow for the receipt of crude oil unit trains, storage of crude oil, and outbound shipment of crude oil by vessel and/or barge from the Port of Grays Harbor. The project would accommodate 1.25 unit train trips per day and one vessel or barge trip every other day (Ecology 2015b).	Reasonably Foreseeable Future Action

Notes:

* All train trip data provided by Ecology (2016).

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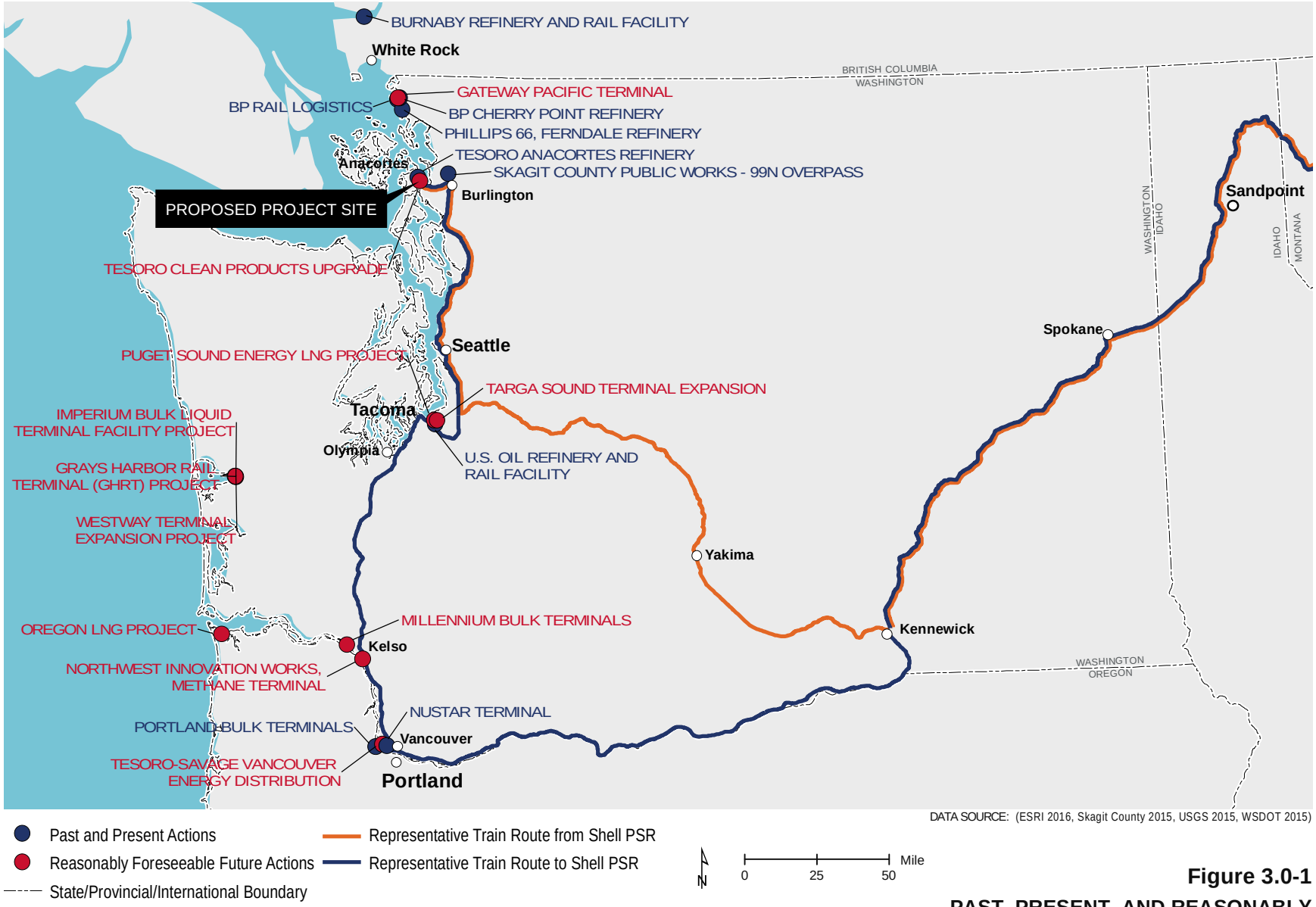

DATA SOURCE: (ESRI 2016, Skagit County 2015, USGS 2015, WSDOT 2015)

Past and Present Actions
Reasonably Foreseeable Future Actions
State/Provincial/International Boundary
Representative Train Route from Shell PSR
Representative Train Route to Shell PSR

N 0 25 50 Mile

Figure 3.0-1

PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS

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3.1 EARTH RESOURCES

The earth resources addressed in this analysis include bedrock geology, topography, and soils. The regional and local geologic setting is described and includes identification of significant topographic features and landforms, soil types, and mineral resources. Geologic hazards that could affect construction and operation of the proposed project include: seismic activity, fault rupture, volcanic activity, ground motion/shaking, soil liquefaction, landslides, tsunamis and seiches. The intent of the analysis is to determine whether the proposed project would affect valuable earth resources or be at risk from geologic hazards.

STUDY AREA AND METHODOLOGY

The study area for earth resources includes the proposed project and wetland mitigation sites, where earth moving activities during construction would remove soils and change slopes. The Anacortes Subdivision also is included in the study area to assess earth resources impacts related to operations along the rail corridor. Regional geology is described to provide a general context for earth resources at the proposed project and wetland mitigation sites. Geologic hazards potentially affecting the proposed project are described based on the area of influence. For example, the study area for seismic hazards includes fault zones several miles from the proposed project site that may be active and have an impact on project facilities; volcanic activity more than 30 miles away could result in debris flows and ash falls that reach the Anacortes Subdivision. Because the potentially affected earth resources are within the footprint of the proposed project and wetland mitigation sites and immediate areas, the cumulative impacts study area for earth resources includes these areas and the land in their immediate vicinity.

To address concerns expressed during the EIS scoping process about landslides on rail corridors, the study area was extended to include the area along the BNSF Railway main line south of the proposed project site where landslides have affected rail transportation in the past (Figure 3.1-4). While landslide hazards exist on other portions of the rail corridor (e.g., along the Columbia River Gorge and near Mount St. Helens), it is beyond the scope of this EIS to address all potential hazards along the existing operational rail corridor.

Potential impacts to earth resources have been assessed by reviewing published reports on geology and geotechnical and soils studies from previous projects in and around the study area, from government resources agencies and from Shell. The following data sources were used in the impacts analyses:

- Washington State Department of Natural Resources (DNR) Geology and Earth Resources references (DNR 2016).
- U.S. Geological Survey (USGS) geological and fault zone maps (USGS 2016).

- U.S. Department of Agricultural-National Resource Conservation Service (USDA-NRCS) soil survey of Skagit County and Soil Survey Geographic (SSURGO) database (USDA-NRCS 2016).

Select laws, regulations, and guidance applicable to earth resources associated with the proposed project are summarized in Table 3.1-1.

Table 3.1-1 Laws, Regulations, and Guidance for Project-Related Earth Resources

Laws, Regulations, and Guidance	Description
Federal	
The Federal Coastal Zone Management Act	Through the Federal Coastal Zone Management Act, coastal states with approved Coastal Zone Management Programs (CZMP) require projects operating under a federal permit or license to demonstrate consistency with the CZMPs. Federal Consistency allows states to review those projects that are likely to affect state coastal resources or uses.
National Earthquake Hazard Reduction Program (NEHRP)	Develops, disseminates, and promotes knowledge, tools, and practices for earthquake risk reduction through coordinated, multidisciplinary, interagency partnerships among the partner agencies and their stakeholders.
State	
State Environmental Policy Act (SEPA) (RCW 43.21c; WAC 197-11)	Helps state and local agencies in Washington identify possible environmental impacts that could result from a proposed action, alternatives to the proposed action, and potential impact minimization and mitigation measures. Information learned through the review process can be used to change a proposal to reduce likely impacts and inform permitting decisions at the state and local levels.
Washington State Coastal Zone Management Program	Under Washington's Coastal Zone Management Program (WCZMP), projects that are likely to affect state coastal resources or uses must be consistent with the WCZMP's enforceable policies found in the Shoreline Management Act, the Ocean Resource Management Act, the Water Pollution Control Act, and the Clean Air Act and all state regulations that implement those Acts.
Washington Hazardous Waste Management Act (RCW 70.105; WAC 173–303)	Establishes and implements a comprehensive statewide framework for the planning, regulation, control, and management of hazardous waste that will prevent land, air, and water pollution and conserve the natural, economic, and energy resources of the state.

Laws, Regulations, and Guidance	Description
Farmland Preservation (RCW 89.10)	Establishes the Office of Farmland Preservation and the State's commitment to the retention of agricultural land and supports the viability of farming for future generations.
Local	
Skagit County Critical Areas Ordinance (SCC 14.24)	This ordinance was developed under the directives of the Growth Management Act to designate and protect critical areas and to assist in conserving the value of property, safeguarding the public welfare and providing protection for these areas. Critical areas are defined as wetlands, aquifer recharge areas, frequently flooded areas, geologically hazardous areas, and fish and wildlife habitat conservation areas.
Skagit County Comprehensive Plan	The Natural Resource Lands Element establishes the purpose and intent of policies to guide long-range planning, programs, and regulations to conserve agricultural, forest, and mineral natural resource lands.
Skagit County Grading Permit	A Fill and Grade Permit may be required for any grading work involving substantial ground-disturbing activity (either fill or excavation) or any additional activity that affects drainage in the area.

Consistent with the SEPA Handbook, the impacts analysis predicted direct construction and operational impacts of the proposed project on geologic and soil conditions, as well as indirect impacts on these resources (Ecology 2004). Potential impacts could include changes to the geologic structure, soil loss and erosion, or loss of economic mineral resources values. Included in the analysis is an assessment of geologic hazards that could affect the proposed project.

The proposed changes to earth resources have been evaluated and assessed for significance based on whether the resources are rare or unique, or in other ways important for their economic or cultural value. Potential impacts related to geologic hazards need to be taken into consideration because they could have implications for design, construction, and operation of the proposed project.

AFFECTED ENVIRONMENT

Regional Geologic Setting

The geology of the study area is dominated by glacial deposits (drift, glaciomarine, and till) that have accumulated over the last 15 million years.

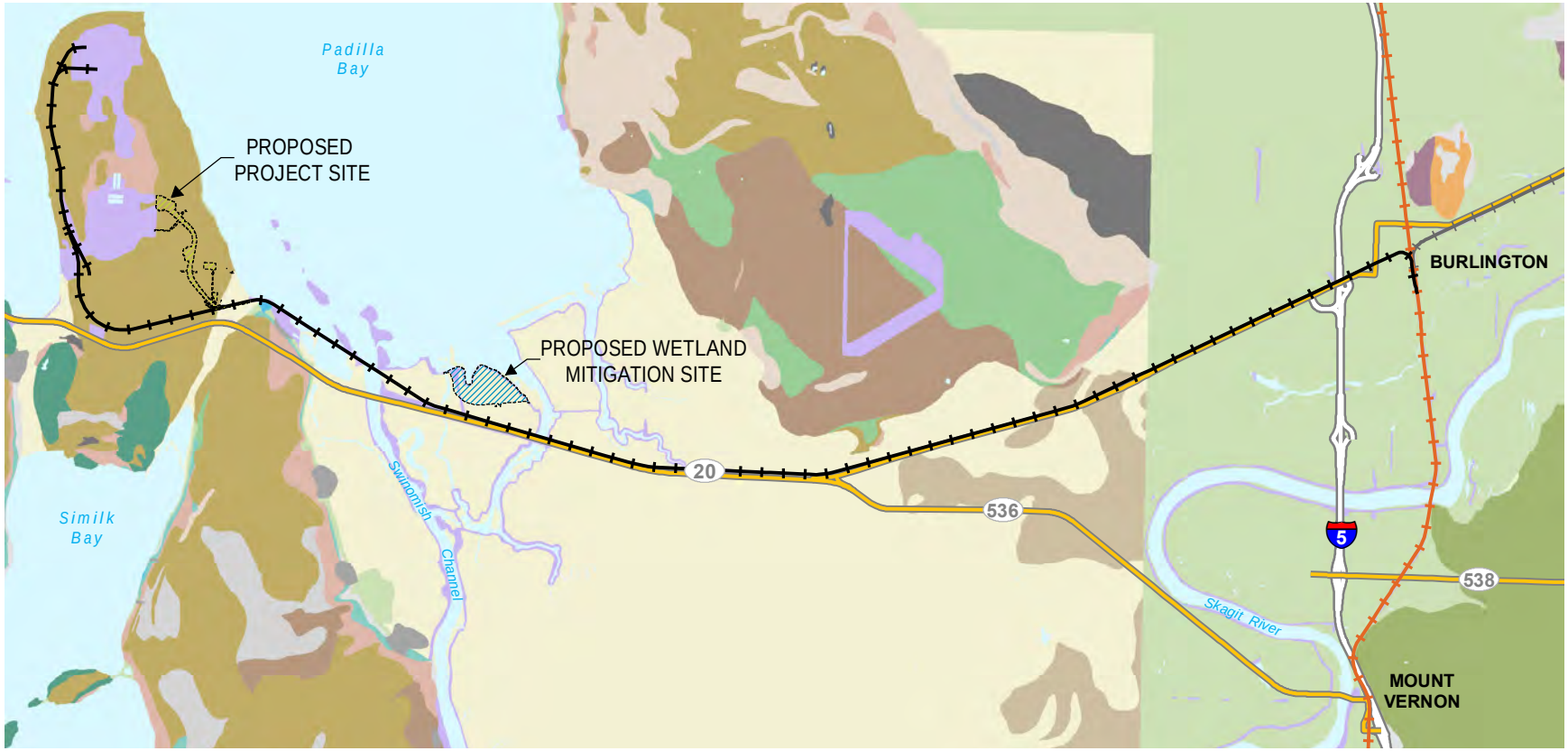
The proposed project is located in the geologic region known as the Puget Lowland Physiographic Province. Area geology consists primarily of glacial deposits of the Pleistocene age deposited over older ocean sediments (Dragovich et al. 2000). These deposits are consistent with glacial marine drift and outwash, composed of clayey silt, silty clay, and clay, with localized lenses and layers of sandy, gravelly, and silty outwash (depicted in Figure 3.1-1 as $Qgdm_e$). Underneath these drift deposits are nonstratified glacial till deposits (depicted in Figure 3.1-1 as Qgt_v), which are dense to very dense glacially consolidated soils consisting of clay, silt, sand, and gravel in various proportions, with scattered cobbles and boulders, and rare lenses of sand or gravel. Holocene nearshore deposits also occur in the region (Q_n in Figure 3.1-1) and are comprised of fine sand, silt, and clay, with localized flood overbank and peat deposits.

During the most recent glacial period, glaciers advanced into and occupied the Puget Sound region for approximately 10,000 years. The advance and retreat of the ice sheets resulted in the geologic deposits and topography commonly seen today.

The underlying bedrock in the study area consists of metamorphic formations (e.g., rock units that have been subject to heat and pressure such that their mineral composition has been altered). The depth to bedrock is generally far below the surface, up to 1,000 feet deep in the Puget Lowlands (DNR 2016). In the geotechnical investigations at the proposed project site, bedrock was not encountered in borings to a depth of greater than 100 feet (URS 2014a). No construction activities are planned for such depths. There are no mineral resources of economic value in the areas proposed for construction.

Topography

The topography is relatively flat from the proposed project site east along the Anacortes Subdivision to Burlington. The proposed project site is on a gently sloping glaciomarine terrace at an elevation of 10 to 80 feet above mean sea level. At the southern and middle portions, slopes are gentle and relatively flat, generally under 3 percent. Slopes become steeper in the northern portion. Slope grades are greater on the west side of the rail spur alignment and decrease at a gentle grade on the east side of the alignment toward Padilla Bay (URS 2014a). The wetland mitigation site and the Anacortes Subdivision are nearly completely flat.



Geologic Units (1:24,000 Scale)

- Glacial and nonglacial deposits (Qe)
- Ablasion or flow till (Qgt(e))
- Alluvium (Qal)
- Artificial Fill (af)
- Beach deposits (Qgom(ee))
- Fine glaciomarine sediment (Qgdm(ec))
- Glaciomarine outwash (Qgd/om(e))
- Glacial Till (Qgt(v))
- Interbedded fine-grain metasedimentary rocks (KJm*
- Lahar runout deposits (Qvl)
- Landslide deposits (Qls)
- Metasedimentary rocks (Jhs)
- Metavolcanic rocks (Jhg)
- Nearshore deposits (Qn)
- Peat (Qp)
- Possession stiff till (ot)
- Silt and Clay Deposits (Qga(v))
- Unsorted glacial deposits (Qgdm(ed))

DATA SOURCE: (Skagit County 2015, USGS 2015, WSDOT 2015)

- Proposed Project Site
- Proposed Wetland Mitigation Site
- Anacortes Subdivision
- Bellingham Subdivision
- BNSF Railway
- State Highway
- Interstate Highway

N

0 1 2 Mile

Figure 3.1-1

GEOLOGIC UNITS – PROPOSED PROJECT VICINITY

Geologic Hazards

Geologic hazards identified for this project include seismic activity (earthquakes/faults), volcanic activity, ground motion/shaking, soil liquefaction, erosion, landslides, and tsunamis and *seiches*.

A **seiche** is a temporary series of waves in an enclosed or partially enclosed body of water (e.g., harbors, lakes, bays, and rivers) as a result of earthquake shaking. Typically, seiches do not occur close to the epicenter of an earthquake, but from earthquakes that have occurred hundreds of miles away.

Seismic Activity

Two major tectonic plates—the North American and Juan de Fuca—converge off the coast of western Washington. The crust beneath the Pacific Ocean that comprises the Juan de Fuca plate is slowly sinking (known as subduction) beneath the North American continent at a rate of just over 1 inch per year. This geologic process is responsible for earthquakes throughout the Pacific Northwest and results in northwest-trending fault zones.

While there are no fault trenches or other expressions of seismic faults at the proposed project site, fault zones have been mapped in the surrounding region. The closest projected fault trace is approximately 8 miles south of the proposed project site. The Darrington-Devils Mountain Fault is the largest in the region and runs east to west approximately 10 miles to the south of the proposed project site. Other faults that could have consequences in the study area, if active, are the Southern Whidbey Island Fault and the Seattle Fault, which are approximately 22 and 64 miles south of the proposed project site, respectively. Several earthquakes on record have originated in the region, all less than magnitude 2.5 and at depths of greater than 6.8 miles below the surface (DNR 2016).

Ground Motion/Shaking

Ground motion during a seismic event can cause damage to buildings and other structures, and can be a human health risk. The National Earthquake Hazard Reduction Program (NEHRP) establishes site classes (B through F) representing the potential for enhanced ground shaking based on existing soil conditions. An area classified as site class B would have the lowest potential for increased ground shaking; site class F would have the highest potential. Within the project study area, the following site classes exist (Palmer et al. 2004):

- Proposed project site (site class C).
- Proposed wetland mitigation site (site class D-E).
- Anacortes Subdivision (site class D-E or site class E).

Site class C indicates that earthquake shaking would be slightly amplified, but would be unlikely to generate substantial ground-motion hazards. Site classes D-E and E indicate that there is the possibility of generating high ground-motion hazards during a large earthquake.

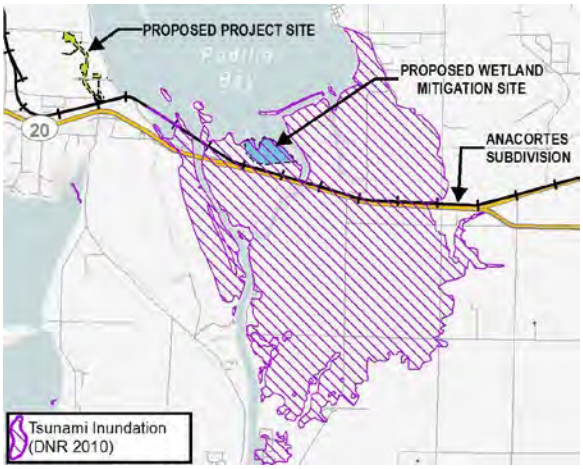
Soil Liquefaction

Liquefaction occurs when the shaking of a strong earthquake causes soil to rapidly lose its strength and behave like quicksand. This phenomenon typically occurs in artificial fills and in areas of loose, water-saturated soils. While the risk of liquefaction within the proposed project site is low, there is moderate to high risk of liquefaction at the wetland mitigation site and along the Anacortes Subdivision from the Swinomish Channel Delta east to Burlington (DNR 2016) (Figure 3.1-2).

Tsunamis and Seiches

There is no written historical record of tsunamis or seiches affecting Skagit County (Skagit County Department of Emergency Management 2008); however, there is still some risk of a tsunami or seiche occurring in the study area. Based on currently available data for common earthquake scenarios (Walsh et al. 2005), a tsunami could cause water to surge onto land and cover the low-lying areas east of the proposed project site from about 0.5 mile west of the Swinomish Channel to the approximate location where State Route (SR) 536 and the Anacortes Subdivision meet (Figure 3.1-3). In such an event, water over this area, also known as inundation, could be 0.5 to 2 feet deep. As March Point is surrounded by two partially enclosed bays (Padilla and Fidalgo), there is the risk that an earthquake event could generate a seiche, which could result in damage to shoreline areas that are outside of the tsunami inundation area (Skagit County Department of Emergency Management 2008).

Figure 3.1-3 Tsunami Inundation Zone



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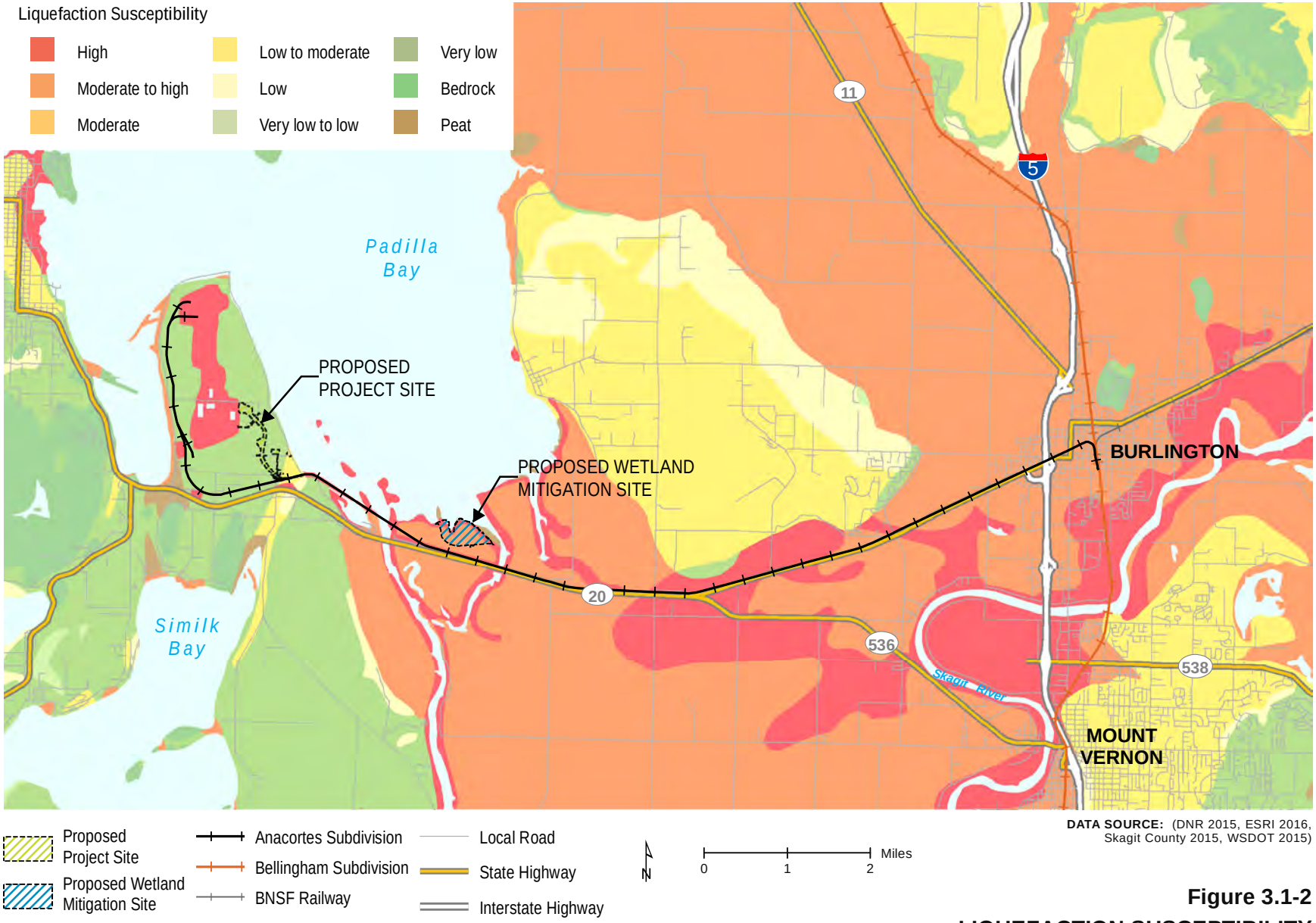


DATA SOURCE: (DNR 2015, ESRI 2016, Skagit County 2015, WSDOT 2015)

Figure 3.1-2
LIQUEFACTION SUSCEPTIBILITY

Volcanic Activity

Two volcanoes in the Cascade Range, east of the proposed project site and outside of Skagit County, present a potential hazard to the project site, wetland mitigation site, and Anacortes Subdivision. These volcanoes are Mount Baker (about 39 miles to the northeast), and Glacier Peak (about 70 miles to the southeast). Both volcanoes have been active in the past 4,000 years with eruptions that have resulted in pyroclastic flows, ash falls, lava flows, and *lahars* (Washington Military Department 2012).

A **lahar** is a type of mudflow or debris flow composed of a slurry of volcanic material, rocky debris, and water. The material moves down from a volcano, typically along a river valley.

According to a USGS National Volcano Early Warning System assessment of the threat of eruption, both Mount Baker and Glacier Peak are ranked as having a very high threat of eruption (USGS 2016). The proposed wetland mitigation site and Anacortes Subdivision are in a volcanic hazard zone for both Mount Baker and Glacier Peak because a lahar from either volcano could inundate the Skagit River Valley (Gardner et al. 1995a; Waitt et al. 1995). Lahars extending from Glacier Peak to Puget Sound have occurred during at least two eruptive episodes in the past 15,000 years (Waitt et al. 1995). However, it is unknown whether lahars from Mount Baker have reached the Skagit River (Gardner et al. 1995b). There is a 1 in 100 annual probability that small lahars or debris flows would impact river valleys below Mount Baker, and less than a 1 in 1,000 annual probability that the large destructive lahars would flow down the slopes of Glacier Peak (Washington Military Department 2012).

A volcanic threat is defined as the qualitative risk posed by a volcano to people and property. It combines volcanic hazards (the dangerous or destructive natural phenomena produced by a volcano) and exposure (the people and property at risk from the volcanic phenomena).

Ash from nearby volcanic eruptions is likely to be carried away from the proposed project site by the prevailing winds, which trend toward the east and northeast. Some ashfall could reach the project site, but would not likely occur in significant quantities (Washington Military Department 2012).

Landslides

Landslide hazards occur in areas where there is a risk of the downward movement of soil, rock, and debris. Most landslides that take place in the Puget Lowland are shallow slope failures that commonly turn into debris flows, which are a moving mass of loose mud and soil (Harp et al. 2006). The occurrence and severity of landslides is generally dependent on the slope gradient, slope shape, surface and subsurface materials, precipitation, surface and subsurface water conditions, vegetation, and seismic events. According to Skagit County's Potential Landslide and Erosion Areas map, no part of the proposed project or wetland mitigation sites is susceptible to landslides (Skagit County Geographic Information Services 2016). In Department of Ecology's Slope Stability Maps – Coastal Zone Atlas for Skagit County (Ecology 1979), an area along South March's Point Road southeast of the proposed project site near the Anacortes Subdivision is identified as "intermediate" with respect to slope stability. The map shows this area adjacent to slopes that have been modified. There is also a borrow pit in that area, which may have resulted in the modified slope designation and intermediate stability.

Figure 3.1-4 Landslide Susceptibility

Shallow landslides commonly occur in weathered glacial deposits and colluvium on Puget Sound bluffs after periods of relatively heavy rainfall or snowmelt (Baum et al. 2002). On the BNSF Railway main line south of the Anacortes Subdivision between Everett and Seattle, frequent landslides have occurred during the wet winter season, causing damage to rail facilities and resulting in service interruptions (Figure 3.1-4). For example, during 1996 and 1997, landslides in this area blocked one or both tracks in about 100 places and came close to the tracks in about 30 more locations. Although most landslides that temporarily blocked the tracks did not collide with trains, one large slide derailed part of a train and caused significant damage (Baum et al. 2000).

In the past decade, more than 200 slides have occurred along the coastline between Everett and Seattle (LaBoe 2015). In December 2012, a freight train was derailed near the Port of Everett when it was struck by a landslide. An Amtrak train was partially derailed by a landslide near Everett in April 2013. These and other landslide incidents along the rail corridor in this area have led to a growing public concern for the safe transport of hazardous material by rail, as evidenced in scoping comments on this EIS.

Record numbers of passenger rail service interruptions during the 2012–2013 winter season prompted a collaborative effort among Washington State Department of Transportation (WSDOT), BNSF Railway Company (BNSF Railway), Sound Transit, Amtrak, and stakeholders to address the issue of landslides in the corridor between Everett and Seattle. This effort led to the development of the Landslide Mitigation Action Plan (WSDOT 2014), a report that quantifies landslide-related impacts, identifies the primary factors within the corridor that contribute to landslides, and provides mitigation strategies to reduce their occurrence and impact.

The probability of a landslide or other accident causing derailment and the release of crude oil from a tank car is examined in detail in Chapter 4 – Environmental Health and Risk.

While targeted to passenger rail service, the landslide mitigation strategies identified in the report would also benefit the movement of freight. The report notes that it is virtually impossible to predict the location and impacts of a single event within such a long landslide-prone corridor, given the wide range of potential factors that influence the initiation of landslides; e.g., slope, subsurface materials, precipitation, vegetation, and surface materials. The report does not identify vibration or weight from train traffic as a contributing factor to landslide potential). The report acknowledges that reducing landslide-related impacts to rail service in the Everett to Seattle corridor will require "substantial investments in capital improvement projects" such as drainage improvements and stabilization (WSDOT 2014). It goes on to state, "Depending on the financial resources available, as well as factors such as permitting, design, and construction scheduling, the time required to achieve significant reductions in landslide-related service interruptions will likely take one or more decades" (WSDOT 2014).

WSDOT is spending $16.1 million in federal funds on landslide management projects to help shore up slopes along rail lines (WSDOT 2015). Work is being conducted at six sites (four sites west of Mukilteo, one site west of Everett, and one site north of Everett) and includes building retaining walls and slide detection fences (for early landslide warning), slope stabilization and erosion control, and drainage system improvements. The current BNSF Railway hazard mitigation process serves to detect landslides with trip wires and halt all subsequent passenger trains for 48 hours following a slide. Freight trains are allowed to resume operations as soon as the debris has been cleared from the tracks (WSDOT 2014).

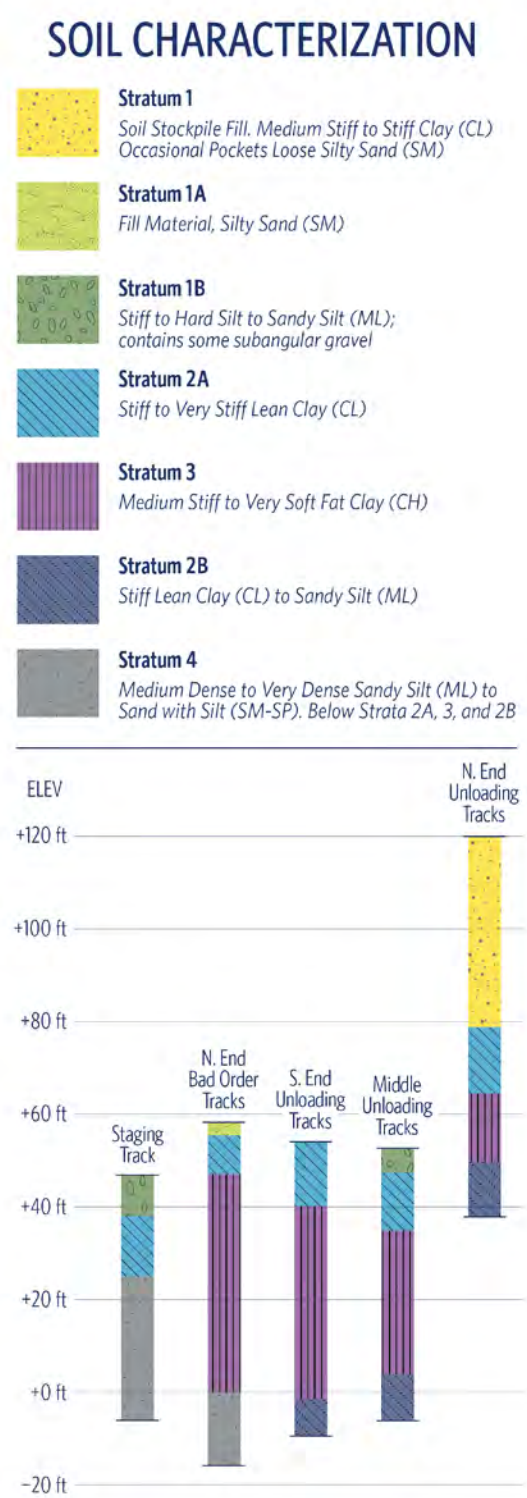
Soils

The soils at the proposed project and wetland mitigation sites, and along the Anacortes Subdivision, are predominantly gravelly loam, gravelly loamy sand, and silt loam. They tend to be very deep, somewhat poorly drained soils. They formed in gravelly glacial drift over glaciolacustrine deposits (derived from glaciers and deposited in glacial lakes) and volcanic ash. These soils have low permeability and a seasonal high water table.

Soils at the proposed project site have been characterized by recent geotechnical investigations (URS 2014a; URS 2014b), and further classified along the rail alignment (from shallow to deep) into the following components (shown on Figure 3.1-5):

- Stratum 1 – Soil Stockpile Fill: Medium Stiff to Stiff Clay (CL), Occasional Pockets Loose Silty Sand (SM).
- Stratum 1A – Fill: Silty Sand (SL).
- Stratum 1B – Stiff to Hard Silt to Sandy Silt (ML).
- Stratum 2A – Stiff to Very Stiff Lean Clay (CL).
- Stratum 3 – Medium Stiff to Very Soft Fat Clay (CH).
- Stratum 2B – Stiff Lean Clay (CL) to Sandy Silt (ML).
- Stratum 4 – Medium Dense to Very Dense Sandy Silt (ML) to Sand with Silt (SM-SP).

Figure 3.1-5 Soil Characterization



The general soils profile along the project alignment varies substantially, as depicted in Figure 3.1-5. The northern end of the proposed unloading track alignment has a soil stockpile of stiff clay and pockets of loose silty sand (Stratum 1, CL and SM) created from materials excavated at various locations around the Shell Puget Sound Refinery (PSR) throughout its development. The depth of the soil stockpile ranges from about 29 to 46 feet. Additional fill material composed of silty sand (Stratum 1A, SL) is located near 4th Street (near the terminal end of the bad order tracks) and is generally 2 to 5 feet deep.

The shallowest native deposit is silt to sandy silt (Stratum 1B, ML) and is frequently encountered just below the topsoil layer south of, and occasionally north of, 4th Street. This stratum is typically 3 to 5 feet deep and contains some subangular gravel.

Lean brownish yellow to brown Clay (Stratum 2A, CL) is consistently present beneath Stratum 1B or at the surface (where Stratum 1B is not present), and varies in depth from approximately 6 to 25 feet.

Fat gray clay (Stratum 3, CH) underlies Stratum 2A throughout the proposed project site, although it was absent along the southern half of the rail alignment. Stratum 3 ranges in depth from approximately 15 to 48 feet.

Lean clay (CL) to sandy silt (ML) (Stratum 2B) was encountered underneath Stratum 3 and was generally absent in portions of the southern half of the alignment, where Stratum 3 was also absent. Stratum 2B is similar to Stratum 2A with stiff clay, is generally gray in color and medium stiff to stiff in consistency, and frequently contains traces of sand and fine gravel.

Brown and gray sandy silt (ML) to sand with silt (SM-SP) (Stratum 4) was the deepest soil stratum encountered. The depth of this stratum was not determined. Stratum 4 was encountered below Strata 2A, 3, and 2B.

Soils at the proposed project site are considered prime farmland, meaning they have the best combination of characteristics for agricultural production, but only if drained (USDA-NRCS 2016). Currently, the depth to groundwater is too shallow for agricultural production. The soils also have some shrink-swell properties associated with the clay component, which limits development unless the soils are properly drained. The soils can be muddy when moist and unsurfaced roads are sticky and slippery to the point of being impassable.

At the northern-most terminus of the proposed project site, the soils have been heavily altered: there is a substantial depth of fill that includes a significant thickness of silt and clay underlain by dense sand and gravel. These materials were excavated from various locations in the surrounding area during development. Dark organic material, grass and grass roots, and woody material are intermixed with the soil material (URS 2014a).

The soils at the wetland mitigation site are mostly hydric (66-99 percent), and were likely converted from entirely *hydric soils* following drainage and diking to provide land for cultivation (USDA-NRCS 2016) (Figure 3.1-6).

Hydric soils are formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions (i.e., without oxygen) in the upper part.

Soil erosion is a continuing natural process that can be accelerated by human disturbance. Factors such as soil texture, structure, slope, vegetative cover, rainfall intensity, and wind intensity can influence the degree of erosion. No soils at the proposed project and wetland mitigation sites, and along the Anacortes Subdivision, have been identified by the USDA-NRCS Soil Survey of Skagit County as having severe soil erosion potential. Along the BNSF Railway main line south of the Anacortes Subdivision between Everett and Seattle, sections of the coastline are classified as having moderate to severe erosion potential. The severe classification indicates that erosion is very likely and that erosion-control measures, including revegetation of bare areas, are advised. The soils at the proposed project and wetland mitigation sites, and along the Anacortes Subdivision, have a high potential for restoration under ordinary climatic conditions (USDA-NRCS 2016).

There are no soils at the proposed project and wetland mitigation sites, and along the Anacortes Subdivision, that have been identified by state or local agencies as rare or unique, or in other ways important for their economic or cultural value. All of the soils have low resistance to compaction. There is no known frost action in the soils at the proposed project and wetland mitigation sites or along the Anacortes Subdivision.

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DATA SOURCE: (Skagit County 2015, WSDOT 2015, USGS 2015)

Hydric (100%)
Hydric (66 to 99%)
Hydric (33 to 65%)
Hydric (1 to 32%)
Not Hydric (0%)
Not rated or not available
Proposed Project Site
Proposed Wetland Mitigation Site
Anacortes Subdivision
Bellingham Subdivision
BNSF Railway
N
0 1 2 Miles

Figure 3.1-6

HYDRIC RATING BY SOIL MAP UNIT

ENVIRONMENTAL IMPACTS

No Action Alternative

Because no construction or operation would take place under the no action alternative, there would be no impacts to geology, topography, or soils. Existing conditions would remain the same unless affected by other projects in the future. The potential for geologic hazards, including seismic hazards, ground motion/shaking, soil liquefaction, tsunamis and seiches, volcanic activity, and landslides, still exists under the no action alternative.

Proposed Project

Potential impacts to earth resources would be largely attributable to the direct impacts caused by construction activities at the proposed project and wetland mitigation sites. Such activities would alter topography, soils, and, in some locations, the underlying sedimentary materials. Project operations and long-term use of the proposed project and wetland mitigation sites would have limited impacts on these earth resources. Impacts related to geologic hazards, while not considered an environmental consequence of the project, are noted in this chapter to describe potential conditions that could affect project facilities and operations.

Direct Impacts

Construction

Direct construction impacts would result in permanent changes to the surface geology, topography, and soils. For example, soil removal, grading, and clearing necessary to complete construction of permanent facilities would cause permanent alterations to earth resources. No impacts are anticipated on mineral resources of economic value as none are found in the study area.

The proposed project would require alteration to 47.1 acres of ground surface, with additional temporary ground disturbance to 25.7 acres. Approximately 1.1 million cubic yards (cy) of material are anticipated to be excavated during construction activities. An existing soil stockpile that contributes to steep slopes at the northern end of the proposed project site would be excavated and graded. Excavated material would be tested for any contamination. If contaminants were found, the materials would be removed from the proposed project site and disposed of in accordance with state and local regulations. Potential spoil disposal sites are identified in Chapter 2 – Proposed Project and Alternatives, Figure 2-11. The transport of spoils material is discussed in Chapter 3.16 – Vehicle Traffic and Transportation.

The topography of the proposed project site would be altered during construction. The proposed project would require a gentle and even grade for rail operations. Soil grading is required for site development and would include a modest increase in grade (up to 10 feet) and more extensive lowering (cutting) of grades (up to 70 feet) for acceptable rail elevations at the northern end of the proposed rail spur (URS 2014a). Because much of the area already has been altered by development, the changes from the proposed site development and soil grading would not significantly alter the natural landscape.

Approximately 400,000 cy of clean soil removed from the proposed project site would be placed at the wetland mitigation site to restore surface elevations to what existed prior to agricultural use. Preliminary investigations estimate a typical fill depth of 3 feet would be sufficient for the creation of wetland conditions. Fill would be placed at higher elevations on the perimeter of the site and at lower elevations along the banks of new channels. Regrading low-lying areas would allow tides to inundate the site. This would modify the soil chemistry of imported soils to facilitate development of salt marsh vegetation. Preliminary geotechnical analyses performed by Shell (AECOM 2016) indicate there may be settlement of approximately 0.5 foot after placement of fill material. The wetland mitigation site would be graded to slope gently toward the designed channels to allow for drainage and prevent ponding.

The primary concerns with respect to construction impacts on soils are erosion, loss of topsoil, soil compaction, soil mixing, construction suitability, revegetation, and changes to groundwater hydrology (for groundwater hydrology, see Chapter 3.2 – Groundwater). Construction of the proposed project would cross three soil types; the wetland mitigation site would encompass two soil types.

The soils at the proposed project and wetland mitigation sites are classified as having slight water erosion potential, meaning that little or no erosion is likely. A small area in the southeastern-most part of the project footprint is classified as having moderate water erosion potential where some erosion is likely. These classifications are based on existing slopes, which are relatively flat. Some steep slopes would be created as part of the proposed project, which could increase the susceptibility of these areas to erosion; however, erosion and sediment control measures would be put in place to stabilize slopes and control construction stormwater runoff.

Operation

No grading or re-grading is planned during operation; therefore, surface geology and topography would not be affected at the proposed project site. Changes in site elevations during construction would be long term and persist through the operational phase. Minimal settlement of the underlying soils is expected (1 to 2 inches over 30 years). At the wetland mitigation site, it is anticipated that suspended sediments would be retained from the mudflat, thereby increasing the elevation of the site slowly over many years.

After the proposed rail unloading facility is operational, impacts to soil resources would be negligible. Soil contamination from increased train emissions is not expected, based on the findings in the air quality analysis (see Chapter 3.10 – Air Quality and Greenhouse Gases). Following construction, exposed ground surfaces would be stabilized in accordance with the methods described in the construction Stormwater Pollution Prevention Plan (Wilson and Company 2014). Operation and maintenance of the proposed project would not require additional excavation or disturbance of ground surfaces.

Indirect Impacts

Construction

The proposed changes to the surface geology, topography, and soils could result in indirect impacts to earth resources. Installation of drainage infrastructure would result in a lowering of the water table, thereby drying the soils to some degree. Soils would be converted from those that support native vegetation to soils more suited for industrial uses. Removal of large soil volumes would effectively remove the soil's capacity to support native vegetation or future agricultural uses. Unsuccessful or slow revegetation could lead to increased erosion on bare soil surfaces. Erosion would lead to a long-term loss of soil productivity in discrete locations.

Operation

A long-term or permanent loss of soil productivity and quality would occur in association with permanent project facilities and infrastructure. Installation of drainage infrastructure would change the depth to groundwater at the proposed project site. The soils in the study area have no economic or productivity value as a local or state resource.

Potential Impacts Resulting from Geologic Hazards

Geologic hazards would not be affected by the proposed project; rather the potential for these hazards to affect construction and operations would need to be considered. Geologic hazards would be present during construction and operation activities and include seismic hazards, ground motion/shaking, soil liquefaction, tsunamis and seiches, volcanic activity, and landslides. Such hazards are discussed in relation to the project components.

Seismic Hazards

There is the potential for earthquakes in the study area. The proposed project site does not cross any known faults, but many small and large faults exist nearby, such as the Darrington-Devils Mountain Fault. The geotechnical investigation of the proposed project site concluded that there was no potential for ground-surface rupture should a major earthquake on the Darrington-Devils Mountain fault zone occur (URS 2014a). The unconsolidated, deep soils present at the proposed project site may somewhat amplify ground motion and shaking during an earthquake. The potential for such an occurrence is greater at the wetland mitigation site where the soils are looser and wetter. Seismic design standards and building codes would be applied to minimize the likelihood of negative impacts from ground motion.

Seismic hazard impacts along the Anacortes Subdivision could vary from negligible to moderate. The potential for moderate seismic activity capable of disrupting rail transportation is considered particularly high within Washington State as a whole, which includes possible derailment.

The potential for impacts from soil liquefaction at the proposed project site is low because of the density of the underlying soils. At the wetland mitigation site, the hazard is considered moderate-high to high because of the looseness of the soil and the potential to alter site topography. Soil liquefaction could cause the wetland mitigation site to lose elevation and become inundated. However, no significant impacts are anticipated because the site would be used for wetland mitigation purposes and have no permanent structures.

Tsunami or seiche inundation is considered unlikely at the proposed project site; however, large, unusual, and unexpected tsunamis have been known to occur around the world. The wetland mitigation site and a portion of the Anacortes Subdivision have been identified as tsunami inundation areas with a potential to experience between 0.5 to 2 feet of water. Heavy inundation at the wetland mitigation site has the potential to wash away backfill and accumulated sediments. Seiches that occur after an earthquake could result in damage to shoreline areas that are outside of the tsunami inundation area; however, the risk is considered low as there are no historical records of seiches in Skagit County.

Volcanic Activity

While ashfall from a nearby volcanic eruption would most likely be carried eastward with the prevailing wind, some ashfall could reach the proposed project site, wetland mitigation site, and Anacortes Subdivision, but not likely in significant quantities. At the proposed project site, impacts from ashfall could include ash accumulation on structures and infrastructure; disabling of certain electronics, machinery, and filters; suspension of abrasive fine particles in the air; and ash accumulation on transportation routes and vegetation. In the event of a large eruption, implementation of on-site emergency plans could significantly reduce the impacts of ashfall. Ashfall could disrupt operations along the Anacortes Subdivision, but any impacts would likely be temporary. No significant impacts of ash on the wetland mitigation site are anticipated.

A lahar moving down the Skagit River Valley could reach the Bellingham Subdivision and the eastern edge of the Anacortes Subdivision. A lahar of that extent could affect rail operations along those corridors.

Landslides

The potential for landslides is considered negligible or nonexistent at the proposed project and wetland mitigation sites due to the relatively flat topography and the stiff, dense, and/or cohesive soils present. Slopes steeper than what currently exists at those sites would be created during grading activities and could increase the risk of slope failure; however, numerous retaining walls would be constructed and appropriate erosion and sediment control measures would be in place at the proposed project site to minimize the risk of slope failure. No permanent clearing or creation of steep slopes would occur at the wetland mitigation site, so the potential for slope failure would be minimal.

Ecology (1979) maps a slope stability concern along the Anacortes Subdivision, which may be related to an old borrow pit. A more recently published map by Skagit County (2016) does not indicate a landslide hazard in the project area. Landslides are a frequent occurrence along the BNSF Railway main line between Everett and Seattle. A landslide could result in rail closures and emergency activities that disrupt freight and passenger rail service. However, the risk of a landslide occurring that results in a train derailment would be extremely low. Further, independent of any activities related to the proposed project, WSDOT, in coordination with BNSF Railway, is making improvements along the main line to minimize the potential for landslides and their associated impacts.

Cumulative Impacts

As described above, construction and operation of the proposed project could result in impacts to earth resources. Since 1958 (the beginning of the timeframe for the cumulative impact analysis), there has been significant agricultural, industrial, commercial, and residential development in the study area. It is assumed that with this growth, earth resources have been affected to accommodate new construction. Construction and operation of the proposed Tesoro Clean Products Upgrade Project (Tesoro 2015) (see Table 3.0-2 in Chapter 3.0 – Introduction, for additional project details) has the potential to impact these resources. The Tesoro project and the proposed project could have cumulative impacts on earth resources. These impacts would be minimized by construction BMPs and localized to the Tesoro Anacortes Refinery site and the proposed project and mitigation sites.

MITIGATION MEASURES

Avoidance and Minimization

Impacts to earth resources would be minimized by implementation of the *best management practices* (*BMPs*) required as part of the National Pollutant Discharge Elimination System (NPDES) Construction Stormwater Permit, Clean Water Act (CWA) Section 404 Individual Permit, Skagit County Grading Permit, and Shoreline Substantial Development Permit. For example, as described above, soils would be tested for contamination and disposed of properly per Skagit County's grading permit. In addition, to minimize disturbance during construction, Shell PSR would mark the boundaries of the project ahead of time and maintain those boundaries throughout construction. These "no work" areas would be off limits to construction personnel during nonwork activities (e.g., breaks and walks). Construction workers would receive "Environmental Awareness Training," emphasizing the avoidance of adjacent natural areas (i.e., no-work areas).

Specific **best management practices (BMPs)** and minimization measures would be developed during the preparation of the permits required for the project.

Mitigation

No additional mitigation measures are proposed beyond the avoidance and minimization measures that would be developed and enforced as part of the permitting process.

3.2 GROUNDWATER

Groundwater is water that collects or flows beneath the Earth's surface, filling the porous spaces in soil, sediment, and rock. It is stored in, and moves slowly through, geologic formations of soil, sand, and rock called aquifers. Groundwater originates from rain and from melting snow and ice and is the source of water for aquifers, springs, and wells. It is used for drinking water and domestic/municipal, agricultural, and industrial purposes. Changes in the groundwater quality (such as high concentrations of toxic compounds or high turbidity), aquifer elevations, and subsurface flow can affect these uses.

STUDY AREA AND METHODOLOGY

The study area includes the proposed project site at the Shell Puget Sound Refinery (PSR), the proposed wetland mitigation site, the Anacortes Subdivision rail line, and an area within 0.25 mile of these project features. Groundwater resources include shallow, alluvial/recessional, and advanced outwash aquifers. The groundwater study area overlain on the map of geologic units is shown on Figure 3.2-1. Because the potential impacts associated with groundwater are localized, the cumulative impacts study area for groundwater includes the proposed project and wetland mitigation sites and the land in their immediate vicinity.

Potential impacts to groundwater have been assessed by reviewing public reports and public database records on groundwater, hydrogeology, and groundwater in and around the study area, and comparing study area conditions to proposed project actions. The following public data sources were used in the impacts analyses:

- United States Geological Survey (USGS) shallow groundwater characterization (Savoka et al. 2009).
- Skagit County aquifer recharge areas map (Skagit County 2010).
- U.S. Department of Agriculture-Natural Resources Conservation Service web soil survey (USDA-NRCS 2016).
- Washington State Department of Ecology (Ecology) Skagit Delta groundwater report (Ecology 1996), well log database (Ecology 2016a), and cleanup site database (Ecology 2016b).
- Washington State Department of Health (DOH) Wellhead Protection Guidance Document (DOH 2010) and drinking water source assessment database (DOH 2016).

Select laws, regulations, and guidance applicable to groundwater associated with the proposed project are summarized in Table 3.2-1.

Table 3.2-1 Laws, Regulations, and Guidance for Project-Related Groundwater

Laws, Regulations, and Guidance	Description
Federal	
National Pollutant Discharge Elimination System (NPDES) Permit Program	Addresses water pollution by regulating point sources that discharge pollutants to waters of the United States. Created in 1972 by the Clean Water Act, the NPDES permit program is authorized to state governments by the U.S. Environmental Protection Agency (USEPA) to perform many permitting, administrative, and enforcement functions.
State	
State Environmental Policy Act (SEPA) (RCW 43.21c; WAC 197-11)	Helps state and local agencies in Washington identify possible environmental impacts that could result from a proposed action, alternatives to the proposed action, and potential impact minimization and mitigation measures. Information learned through the review process can be used to change a proposal to reduce likely impacts and inform permitting decisions at the state and local levels.
Water Pollution Control Act and Water Quality Standards for Groundwaters of the State of Washington (RCW 90.48; WAC-173-200)	Establishes and implements policies to maintain the highest quality of the state's groundwaters and protects existing and future beneficial uses of the groundwater through the reduction or elimination of the discharge of contaminants.
Drinking Water/Source Water Protection (RCW 43.20.050)	Requires that the Washington State Board of Health cooperate with environmental agencies to ensure safe and reliable public drinking water and to protect public health.
Model Toxics Control Act (MTCA) and Cleanup Regulation (RCW 70.105D; WAC 173-340)	Sets cleanup standards to ensure that the quality of cleanup and protection of human health and the environment are not compromised and requires potentially liable parties to assume responsibility for cleaning up contaminated sites.
Water Resources Act of 1971 (RCW 90.54)	Sets forth fundamentals of water resource policy to ensure that waters of the state are protected and fully used for the greatest benefit to the people.
Washington State Shoreline Management Act (RCW 90.58)	Provides a statewide framework for managing, accessing and protecting shorelines of the state and reflects the strong interest of the public in shorelines and waterways for recreation, protection of natural areas, aesthetics, and commerce.

Laws, Regulations, and Guidance	Description
Local	
Skagit County Critical Areas Ordinance (SCC 14.24)	This ordinance was developed under the directives of the Growth Management Act to designate and protect critical areas and to assist in conserving the value of property, safeguarding the public welfare, and providing protection for these areas. Critical areas are defined as wetlands, aquifer recharge areas, frequently flooded areas, geologically hazardous areas, and fish and wildlife habitat conservation areas.
Skagit County Shoreline Master Program (SCC 14.26)	The Shoreline Master Program (SMP) is comprised of local land use policies and regulations designed to manage shoreline use. The SMP protects natural resources for future generations, provides for public access to public waters and shores, and plans for water dependent uses. It was created in partnership with the local community and Ecology and must comply with the Shoreline Management Act and Shoreline Master Program Guidelines.
Skagit County Grading Permit	A Fill and Grade Permit may be required for any grading work involving substantial ground disturbing activity (either fill or excavation) or additional activity that affects drainage in the area.

Groundwater resources are described based on the geology and soils that influence groundwater flow, known as hydrogeology and groundwater quality. Hydrogeology is described in terms of the apparent groundwater elevation ranges, confining geologic units that overlay or delineate distinct aquifers, and the hydraulic conductivity of the soils and geologic units. Sole source aquifers (SSAs), well protection areas, water wells, and potential seawater intrusion areas in the study area were mapped and compared to the location of the proposed project and wetland mitigation sites. Lastly, areas of known groundwater contamination in the study area were mapped and compared to the location of the project. SSAs were also mapped throughout Washington State and compared to the proposed rail route by which crude oil would be transported.

The impacts analysis on groundwater considered those that would occur in the short term (construction of the facilities) and those that would occur in the long term (operation of the facilities). Potential construction impacts to groundwater include the following:

- Construction dewatering.
- Construction stormwater.
- Construction equipment and material use.

Potential operational impacts to groundwater include the following:

- Permanent subsurface modifications.
- Stormwater.
- Oil leaks and spills.

Potential construction and operational impacts to groundwater movement and elevation were characterized by comparing existing conditions with the potential for subsurface modifications and dewatering to influence existing conditions.

Construction materials and equipment use were characterized in terms of the likelihood of contaminant releases to groundwater. Stormwater facilities and treatments were described.

Potential impacts of contaminant releases were qualitatively evaluated in terms of: 1) the susceptibility of groundwater resources to contamination based on their geologic and hydrogeologic attributes, and 2) avoidance and minimization measures proposed as part of the project. The rail unloading facility was described in terms of the potential for spills, migration to local groundwater, and spill management.

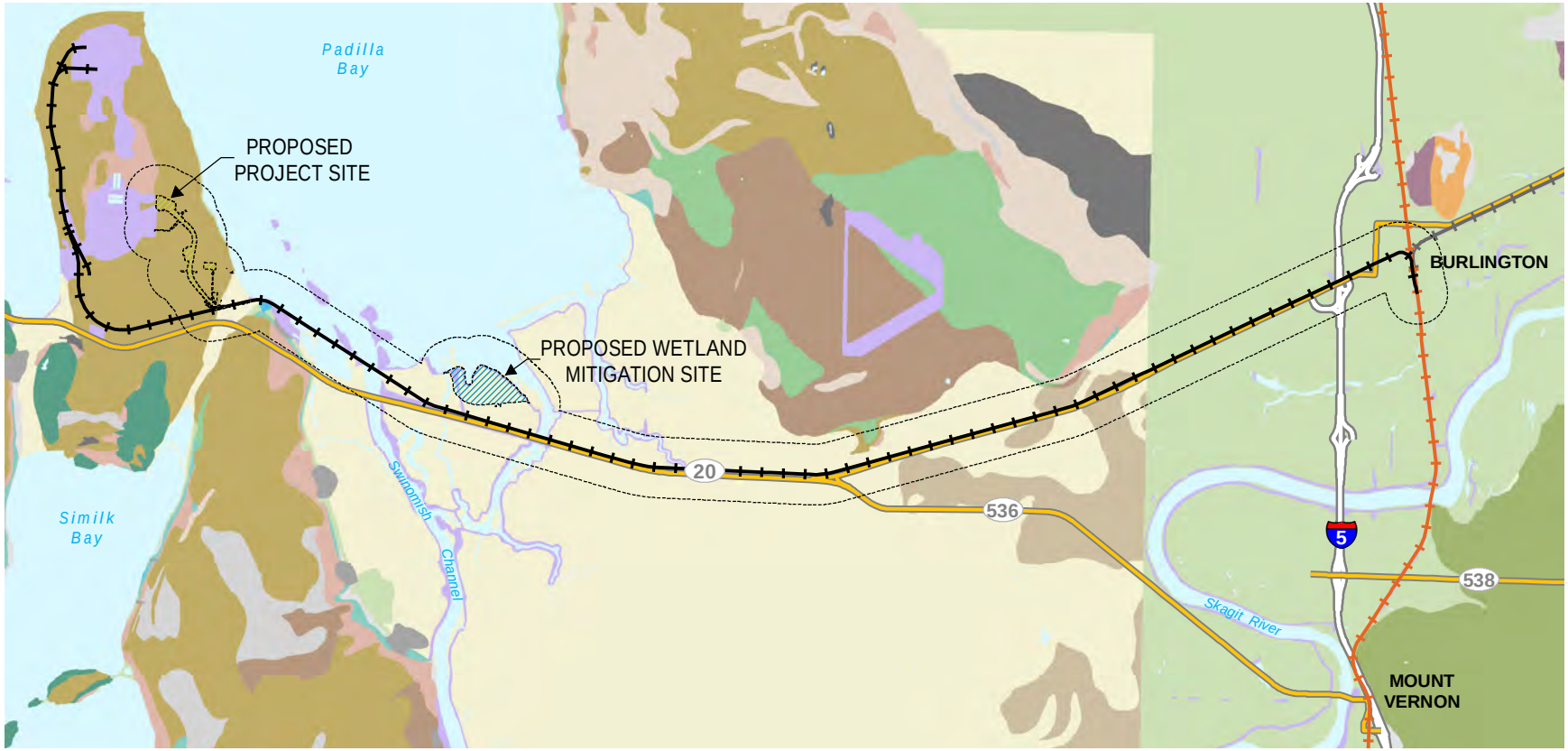
Significant impacts to groundwater were evaluated as defined by SEPA in terms of there being "a reasonable likelihood of more than a moderate adverse impact on environmental quality" (WAC 197-11-794). For groundwater, a significant impact must have a likely impact on groundwater flow and elevation at the aquifer scale, as well as affect existing groundwater uses. Groundwater contamination exceeding groundwater quality or drinking water standards would also be considered a significant impact.

AFFECTED ENVIRONMENT

Proposed Project Site

Hydrogeology

Groundwater occurs in the soil strata and underlying glacial deposits at the proposed project site. As described in Chapter 3.1 – Earth Resources, the proposed project site is underlain by deposits of Pleistocene glaciomarine drift and outwash, along with glacial till ($Qgdm_e$ in Figure 3.2-1). These drift deposits are underlain by nonstratified, dense to very dense glacially consolidated soils consisting of clay, silt, sand, and gravel in various proportions, with scattered cobbles and boulders, and containing rare lenses of sand or gravel (Qgt_v in Figure 3.2-1).



Geologic Units (1:24,000 Scale)

- Glacial and nonglacial deposits (Qe)
- Ablasion or flow till (Qgt(e))
- Alluvium (Qal)
- Artificial Fill (af)
- Beach deposits (Qgom(ee))
- Fine glaciomarine sediment (Qgdm(ec))
- Glaciomarine outwash (Qgd/om(e))
- Glacial Till (Qgt(v))
- Interbedded fine-grain metasedimentary rocks (KJm*
- Lahar runout deposits (Qvl)
- Landslide deposits (Qls)
- Metasedimentary rocks (Jhs)
- Metavolcanic rocks (Jhg)
- Nearshore deposits (Qn)
- Peat (Qp)
- Possession stiff till (ot)
- Silt and Clay Deposits (Qga(v))
- Unsorted glacial deposits (Qgdm(ed))

- Ground Water Study Area
- Proposed Project Site
- Proposed Wetland Mitigation Site
- Anacortes Subdivision
- Bellingham Subdivision
- BNSF Railway
- State Highway
- Interstate Highway

N

0 1 2 Mile

DATA SOURCE: (Skagit County 2015, USGS 2015, WSDOT 2015)

Figure 3.2-1

GEOLOGIC UNITS IN THE PROPOSED PROJECT VICINITY

Soils in the study area are predominantly gravelly loam, gravelly loamy sand, and silt loam. They tend to be very deep, somewhat poorly drained soils with moderately low to moderately high *hydraulic conductivity* (0.06 to 0.2 inches per hour), and depths to water table ranging from 0 to 18 inches. They formed in gravelly glacial drift over glaciolacustrine deposits (derived from glaciers and deposited in glacial lakes) and volcanic ash. These soils have low permeability and a seasonal high water table (USDA-NRCS 2016). Chapter 3.1 – Earth Resources, provides detailed descriptions of the soils in the study area.

Hydraulic conductivity is a property of soils and rocks that describes the ease with which a fluid can move through pore spaces or fractures.

The hydrogeology of the proposed project site has been described in studies conducted by Landau Associates (1988, 1989) and URS (2014a, 2014b). The groundwater regime consists of an upper aquifer in Stratum 2A clay and a lower aquifer in Stratum 4 sand. The two aquifers are separated by Stratum 3, which functions as an *aquitard*. The existence of the upper aquifer in the Stratum 2A clay unit was attributed in part to the presence of fractures in the clay.

An **aquitard** is a confining soil layer that slows, but does not prevent, the flow of water to or from an adjacent aquifer.

Groundwater levels fluctuate seasonally. A 38-foot-deep well was drilled near the bad order track (see Chapter 2, Figure 2-7) to monitor groundwater levels at the project site. It extended 14 feet into Stratum 4. No water was encountered from the time the hole was first drilled in September of 2013, through mid-November of 2013 (URS 2014a). However, groundwater was present in late December of 2013, at a depth of about 13 feet, and continued to rise until reaching a depth of about 2 feet in mid-March 2014. Near the proposed Unloading Track 2 (Chapter 2, Figure 2-7), soil sampling during well installation found "wet" Stratum 4 soil at a depth of 18 feet, but no water accumulation on the day it was completed. The measured water level in the well slowly increased until late December 2013, when it was measured at only 1.5 feet below the ground surface. From late December through mid-March, the water depth varied from 0.5 to 2.6 feet below the ground surface. In general, groundwater will rise seasonally to near the top of the Stratum 2A, resulting in groundwater depths as shallow as 0.5 to 2 feet below ground surface in the lower lying parts of the site, and 30 to 40 feet below ground surface at the soil stockpile near the north end of the site.

These shallow groundwater dynamics were verified by recent groundwater level monitoring on either side of the proposed project site alignment (AECOM 2015). This monitoring indicated that after the water table rose to the surface in the fall, it generally remained close to the soil surface throughout the winter and early spring. This appears to be true despite short rainless periods that may occur. Wells in the wetter locations have brief periods of ponding. Greater fluctuations in the water table begin to occur in April and continue to early to mid-May when the perched water table disappears or drops below 2 feet of the soil surface.

Shallow aquifer groundwater contouring in the north end of the proposed project site indicates that shallow groundwater is moving in an easterly direction (Landau Associates 1988, 1989). Groundwater flow direction has not been characterized in the southern portion of the proposed

project site. Southeast of the site, at the Whitmarsh Landfill, shallow groundwater generally flows east to southeast toward Padilla Bay (AMEC 2014).

Groundwater Protection

The Skagit County Critical Areas Ordinance provides protection for aquifer recharge areas and restricts land uses where there are SSAs, seawater intrusion areas, or *wellhead protection areas* for public water systems, or any area within 0.5 mile of a surface water source limited stream (SCC 14.24.310(1)(a)). Surface water source limited streams have ecological uses that are sensitive to flow and have managed minimum flows. Group A wellhead protection areas are managed for public water supplies with more than 15 connections or more than 25 persons served. Group B wellhead protection areas are managed for public water supplies with fewer than 15 connections or fewer than 25 persons served. There are no SSAs in the study area or surface water source limited streams within 0.5 mile. As shown in Figure 3.2-2, the BNSF Railway main line traverses three SSAs in Washington (i.e., Central Pierce County Aquifer, Troutdale Aquifer System, and Spokane Valley Rathdrum Prairie Aquifer). The nearest SSAs to the project study area are on Guemes Island and Whidbey Island. As noted on Figure 3.2-3, the proposed project site is within a potential seawater intrusion area.

Wellhead protection areas refer to the area surrounding a pumping well, wellfield, or spring that encompasses all areas or features that supply groundwater recharge to the well, wellfield, or spring. Wellhead protection programs were established under the Safe Drinking Water Act and are regulated for the purpose of preventing drinking water contamination.

The Washington State Department of Health defines sensitive groundwater resources in terms of water system wellhead protection areas (DOH 2010). Individual water wells (i.e., wells for consumptive use of groundwater) exist near the proposed project site at approximately five locations (Figure 3.2-3). These wells have multiple uses, including residential drinking water, irrigation for agriculture, and industrial purposes.

The USEPA defines a sole source aquifer as one that supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer.

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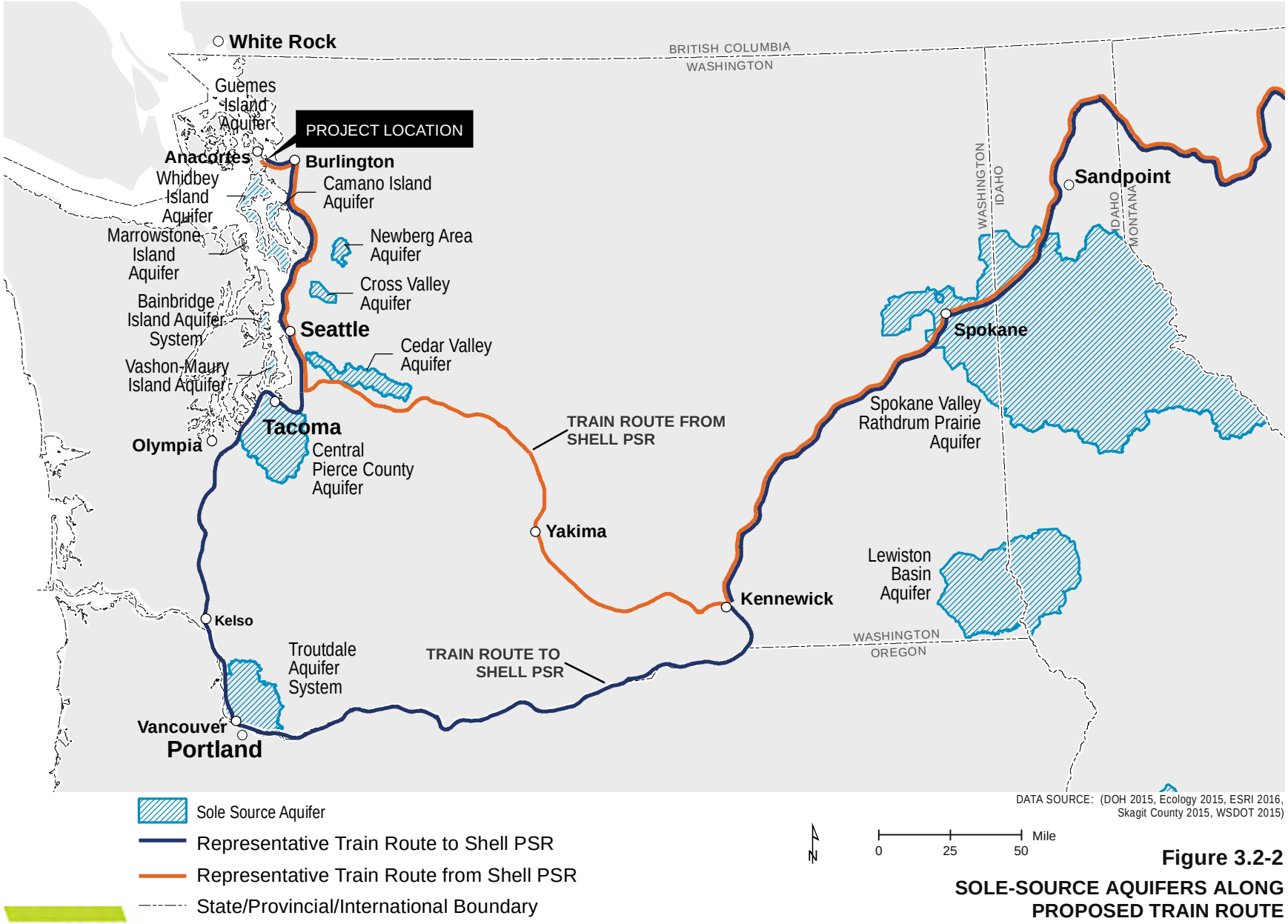

DATA SOURCE: (DOH 2015, Ecology 2015, ESRI 2016, Skagit County 2015, WSDOT 2015)

Figure 3.2-2

SOLE-SOURCE AQUIFERS ALONG PROPOSED TRAIN ROUTE

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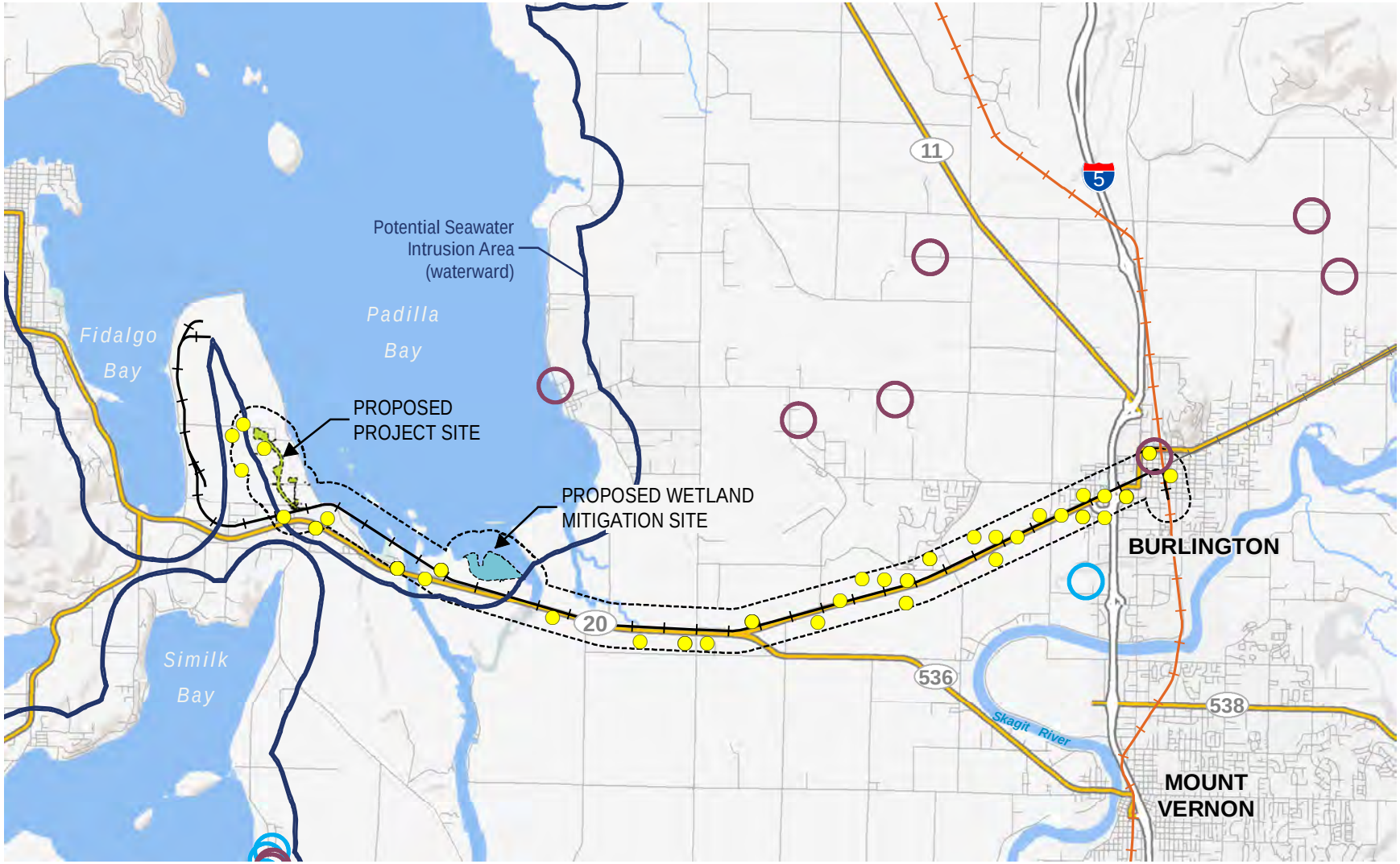

Proposed Project Site
Proposed Wetland Mitigation Site
Groundwater Study Area
Potential Seawater Intrusion Area (waterward)
Water Well
Wellhead Protection Area
System Group A
System Group B
Anacortes Subdivision
Bellingham Subdivision
BNSF Railway
N
0 1 2 Mile

DATA SOURCE: (DOH 2015, Ecology 2015, ESRI 2016, Skagit County 2015, WSDOT 2015)

Figure 3.2-3

GROUNDWATER PROTECTION AREAS AND WATER WELLS

Groundwater Quality

No instances of groundwater contamination are currently listed in the Washington State Department of Ecology (Ecology) cleanup site database at or near the proposed project site.

Wetland Mitigation Site and Anacortes Subdivision

Hydrogeology

The proposed wetland mitigation site and most of the Anacortes Subdivision rail line are in an area known as the Skagit River Delta. This delta is characterized by quaternary alluvium (Q_n) that is mostly estuarine and tidal flat deposits transitioning to glacial runout deposits (Qvl) near the current location of the Skagit River.

The shallow groundwater system in the Skagit River Delta consists of alluvial, lahar runout, and recessional outwash deposits composed of sand, gravel, and cobbles, with minor lenses of silt and clay (Savoca et al. 2009). The aquifer is generally unconfined, but may be locally confined when fully saturated and overlain by layers of clay. Groundwater flow in the shallow groundwater system generally moves in a southwesterly direction away from the Skagit River and toward the Swinomish Channel and Similk Bay. Local groundwater flow toward the Skagit River is inferred from measured groundwater and surface water elevations (Savoka et al. 2009). Water levels vary seasonally. However, these levels generally ranged from less than 3 feet (August 2007) in the west, to about 15 feet (May 2008) in the east.

Seasonal changes in groundwater levels in most of the wells in the Skagit River Delta follow a typical pattern for shallow wells in western Washington. Water levels rise in the fall and winter when precipitation is high, and decline during the spring and summer when precipitation is lower. Groundwater levels in wells along the eastern margin of the study area are likely influenced by the stage of the Skagit River. During monitoring, water levels in these wells remained elevated through April, and did not begin to recede until the end of May, in response to declining river stage. Groundwater levels near the marine shoreline also exhibited periodic fluctuations and corresponded closely to predicted tidal extremes.

The soils at the proposed wetland mitigation site are very poorly drained, have moderately high hydraulic conductivity (0.2 to 0.57 inches per hour), and a typical depth to water table of 12 to 36 inches. Soils in the Anacortes Subdivision rail corridor vary from very poorly to moderately well drained with a moderately high to high hydraulic conductivity (0.2 to 1.98 inches per hour), and a typical depth to water table of 0 to 48 inches.

Groundwater Protection

The proposed wetland mitigation site and the western portion of the Anacortes Subdivision rail line are within areas of potential seawater intrusion from Padilla Bay. There is a wellhead protection area at the eastern end of the Anacortes Subdivision in the City of Burlington. As noted above, there are no SSAs in the study area (Figure 3.2-2). The proposed wetland mitigation site and Anacortes Subdivision are within the Lower Skagit flow-sensitive basin. Groundwater pumping in flow-sensitive basins is not allowed to affect instream flows in the Skagit River (SCC 14.24; WAC 173-503). The

Washington State Department of Health defines sensitive groundwater resources in terms of water system wellhead protection areas.

At least 29 individual water wells (i.e., wells for consumptive use of groundwater) exist along the Anacortes Subdivision rail line (Figure 3.2-3). These wells have multiple uses, including residential drinking water, irrigation for agriculture, and industrial purposes.

Groundwater Quality

Groundwater quality in the Skagit River Delta (which includes the proposed wetland mitigation site and Anacortes Subdivision) has a pH between 6.2 and 8.7, a conductance between 200 and 1,000+ microseconds per centimeter (µS/cm), and highly variable nitrate concentrations (less than 0.01 milligrams per liter [mg/L] to 26.2 mg/L) (Ecology 1996).

Groundwater contamination has occurred at several locations near the Anacortes Subdivision (Figure 3.2-4; Table 3.2-2). Along the Anacortes Subdivision and the proposed project rail spur connection, two cleanup sites are suspected to have contributed corrosive waste, petroleum hydrocarbons, polycyclic aromatic hydrocarbons, phenolic compounds, *halogenated* solvents/organics, metals, and conventional contaminants to local groundwater (Figure 3.2-4; Table 3.2-2). Along the Anacortes Subdivision, three cleanup sites near Avon Allen Road have contributed petroleum, benzene, *nonhalogenated* solvents/organics, and metals contaminants to local groundwater.

Halogenated refers to chemical compounds that contain halogen atoms—fluorine, chlorine, bromine, or iodine. An example of a halogenated solvent is perchloroethylene (PCE), a chlorinated solvent that is widely used in dry cleaning.

Nonhalogenated means no halogen atoms are present. An example of a nonhalogenated solvent is acetone, which is commonly used in nail polish remover and paint thinner.

Near the eastern extent of the study area along the Anacortes Subdivision, five cleanup sites have contributed petroleum, polycyclic aromatic hydrocarbons, benzene, halogenated and nonhalogenated solvents/organics, and conventional contaminants to local groundwater. No groundwater contamination has been documented near the proposed wetland mitigation site.

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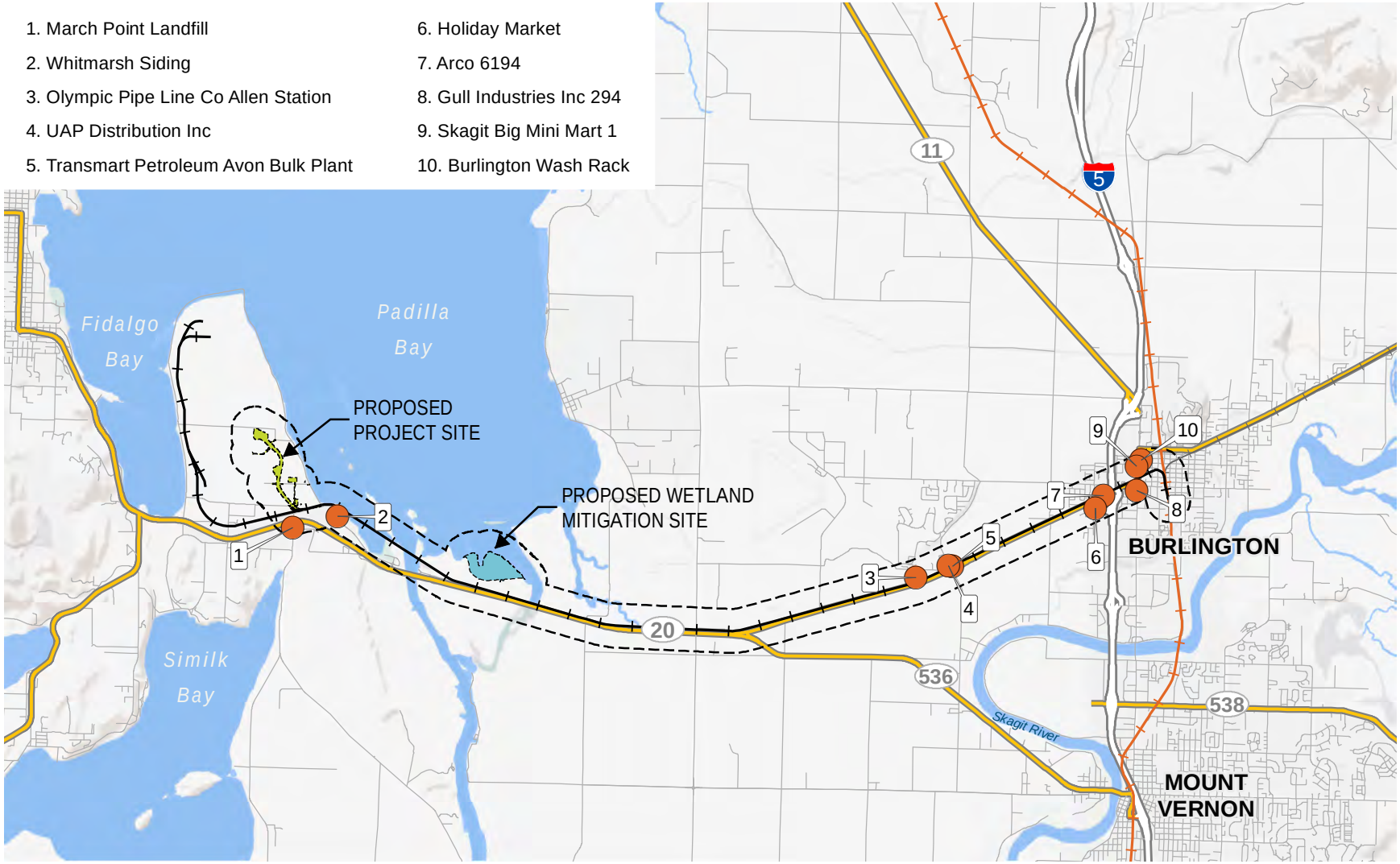
1. March Point Landfill
2. Whitmarsh Siding
3. Olympic Pipe Line Co Allen Station
4. UAP Distribution Inc
5. Transmart Petroleum Avon Bulk Plant
6. Holiday Market
7. Arco 6194
8. Gull Industries Inc 294
9. Skagit Big Mini Mart 1
10. Burlington Wash Rack



Contaminated Groundwater Site
Groundwater Study Area
Proposed Project Site
Proposed Wetland Mitigation Site
Anacortes Subdivision
Bellingham Subdivision
BNSF Railway
N
0 1 2 Mile

DATA SOURCE: (Ecology 2015, ESRI 2016, Skagit County 2015, WSDOT 2015)

Figure 3.2-4

AREAS OF CURRENT AND HISTORICAL GROUNDWATER CONTAMINATION

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Table 3.2-2 Existing Cleanup Sites With Groundwater Contamination in the Study Area

Contaminant	Arco 6194	Transmart Petroleum Avon Bulk Plant	Burlington Wash Rack	Gull Industries, Inc. 294	Holiday Market	March Point Landfill	Olympic Pipe Line Co Allen Station	Skagit Big Mini Mart 1	UAP Distribution, Inc.	Whitmarsh Siding
Petroleum Gasoline	C	C	C	C	C			C		
Petroleum Diesel		C		C	C					
Petroleum Products - Unspecified						S	C			S
Polycyclic Aromatic Hydrocarbons				C		S				S
Benzene	C	C		C	C			C		
Methyl Tertiary-Butyl Ether				C				C		
Other Halogenated Organics									B	
Other Nonhalogenated Organics				C	C					
Arsenic									C	
Halogenated Pesticides									B	
Pesticides - Unspecified						S				
Phenolic Compounds						S				S
Polychlorinated Biphenyls						S				

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Contaminant	Arco 6194	Transmart Petroleum Avon Bulk Plant	Burlington Wash Rack	Gull Industries, Inc. 294	Holiday Market	March Point Landfill	Olympic Pipe Line Co Allen Station	Skagit Big Mini Mart 1	UAP Distribution, Inc.	Whitmarsh Siding
Metals - Other									C	
Nonhalogenated Pesticides									B	
Metals Priority Pollutants				B		S				
Lead				C						
Nonhalogenated Solvents	C			C		S				
Corrosive Wastes										S
Conventional Contaminants - Inorganic						S				
Conventional Contaminants - Organic						S				

Notes:
All sites have a status of "Awaiting Cleanup" or "Cleanup Started"
B = Below Cleanup Level
C = Confirmed Above Cleanup Level
S = Suspected
Source: Ecology 2016b.

ENVIRONMENTAL IMPACTS

No Action Alternative

Because no construction or operation would take place under the no action alternative, there would be no impacts to groundwater resources. Existing groundwater conditions would remain the same unless affected by other projects in the future.

Proposed Project

Direct Impacts

Construction

Construction impacts to groundwater include the potential release of construction materials to groundwater, construction stormwater, and construction dewatering. Construction would require the use of heavy equipment, as described in Chapter 2 – Proposed Project and Alternatives. The equipment would require refueling and maintenance that poses a risk of contaminant releases to the ground (e.g., fuel, hydraulic fluid, oil, etc.). This risk would be minimized by conducting refueling and maintenance in a paved area that would be impervious to groundwater infiltration and have a stormwater collection system that ran either to the oil/water separation pond or directly to the Shell PSR wastewater treatment plant.

Construction stormwater has the potential to transport contaminants into local groundwater. The Shell PSR would obtain a National Pollutant Discharge Elimination System (NPDES) construction stormwater permit and would follow all permit conditions. Construction site operators are required to be covered by a Construction Stormwater General Permit if they are engaged in clearing, grading, and excavating activities that disturb one or more acres and discharge stormwater to surface waters of the state. As part of this permit, construction operators must develop stormwater pollution prevention plans and implement sediment, erosion, and pollution prevention control measures. Permit conditions are expected to minimize runoff and the introduction of pollutants into the stormwater. Construction stormwater would be managed by establishing the limits of construction and temporary erosion and sediment control measures.

Groundwater dewatering would be required during construction of the proposed project. Excavation would likely encounter groundwater where cut depths exceeded 10 feet along most of the proposed project alignment. At the northern end of the alignment, the excavation would likely encounter groundwater at about 30 feet to 40 feet below ground surface. The probability of finding groundwater would vary depending on time of year, precipitation, and construction sequencing (URS 2014a).

These excavations would require proper design measures to control erosion caused by groundwater seepage from the side slopes, precipitation, and runoff. Horizontal drains, drainage swales, and trench drains could be used during construction to manage seepage and stormwater. Pore pressure sensors would be installed in boreholes in the slopes at least three months prior to the start of excavation to establish baseline readings of groundwater levels. Groundwater monitoring wells installed for this study, and those placed previously by others in the vicinity of the soil stockpile and

elsewhere near the proposed project alignment, would continue to be monitored monthly to better understand groundwater levels and flow prior to construction.

Soil compaction from construction activities may temporarily reduce the capacity of surface soils to infiltrate precipitation. This potential impact is likely small because the soils are somewhat poorly drained and have low permeability even without compaction (see Chapter 3.1 – Earth Resources). The effects of any decreased infiltration of water to the local aquifer would be minimized by limiting the area of temporary soil compaction and managing construction stormwater.

Provisions would be made for encountering potentially contaminated materials during site excavation and grading. If contaminants were encountered, those materials would be managed in accordance with the relevant regulations, including the NPDES Construction Stormwater General Permit. A detailed plan for sampling the potentially contaminated runoff would be developed. Similarly, a plan would also be developed for groundwater dewatering, including the prevention of erosion at the discharge point. Details would be described in the Stormwater Pollution Prevention Plan (SWPPP) as part of the NPDES Construction Stormwater General Permit.

Operation

Potential impacts to groundwater from operations could occur from permanent subsurface modifications, stormwater, and oil leaks and spills. Permanent subsurface modifications associated with the proposed project site would require the constant collection and conveyance of groundwater that seeps into the cut. Geotechnical studies indicated that the total groundwater seepage from the proposed project site would likely be 13 gallons per minute (Table 3.2-3) (URS 2014b). The groundwater seepage would be collected and conveyed to the Shell PSR wastewater facility and treated before being discharged to Fidalgo Bay.

Groundwater seepage in the cut slopes of the proposed project site would affect local groundwater levels and movement. Because groundwater likely flows from west to east, groundwater seepage from the west is expected to continue, but seepage from the east is expected to decrease over time (URS 2014b). The reduction in shallow groundwater to the east of the rail spur cut would be a local impact on the shallow aquifer, but would not likely cause significant adverse impacts to the shallow aquifer as a whole or affect the deeper aquifer. Groundwater level monitoring in shallow monitoring wells is expected to occur after project construction and would measure any changes (AECOM 2015).

Table 3.2-3 Estimated Seepage Rates From Proposed Project Site Cut Slopes

Excavation Location	Total Cut Length (feet)	Cut Depth (feet)	Best Estimate Seepage Rate (gpm)	Maximum Estimate Seepage Rate (gpm)
Staging/ Bad Order Tracks	1,800 x 2	0 - 15	2	20
Unloading Tracks (middle)	1,300 x 2	0 - 20	2	20
Unloading Tracks (north end)	700 x 2	43	3	45

Excavation Location	Total Cut Length (feet)	Cut Depth (feet)	Best Estimate Seepage Rate (gpm)	Maximum Estimate Seepage Rate (gpm)
Access Roads	400 x 2	10 - 12	1	10
North Retaining Wall	400	10 - 27	5	25

Note: Excavation locations are stationed for arrival/ unloading Track 2; total cut lengths include both the western and eastern slopes; gpm = gallons per minute.

Source: URS 2014b.

Stormwater from the proposed project site has the potential to accumulate hydrocarbons and other contaminants and seep into local groundwater. Stormwater drips and potential leaks at the unloading tracks present the greatest risk of contaminants being conveyed to groundwater. However, the unloading tracks are proposed to be in a topographic depression or "bowl" that would passively contain leaks of stormwater and associated contaminants. The unloading area would be underlain by a high density polyethylene (HDPE) liner and concrete platform (see Chapter 2 – Proposed Project and Alternatives). Stormwater would be collected and conveyed to an oil/water separation pond system, then sent to the Shell PSR wastewater facility to be treated before being discharged to Fidalgo Bay. These measures would minimize the risk of stormwater contaminants migrating to groundwater. Chapter 3.3 – Surface Water, provides additional detail about stormwater features and spill containment measures.

The remaining stormwater at the proposed project site would be conveyed to stormwater ponds immediately adjacent and to the east of the new rail spur. Contaminants could enter stormwater from the surface of the rail cars, engines, and tracks. The new railroad ties would primarily be made of concrete although some wooden railroad ties may be used in the switch areas and would have the potential to leach wood preservative into stormwater. However, waters in on-site ditches would be tested regularly for contaminants. The stormwater in the ponds would be conveyed to adjacent forested areas and a pasture wetland, and ultimately to Padilla Bay. Some stormwater could infiltrate to the local aquifer before reaching Padilla Bay.

Potential spills during transit to the rail unloading facility would not be contained by these engineering controls. The glacial till geologic unit that underlies the spur connection, bad order tracks, and return tracks would not readily infiltrate spilled crude oil to the underlying aquifer, although the shallow aquifer in this location is seasonally very shallow and local contamination may occur prior to cleanup. Between the Swinomish Channel and the proposed project area, the Anacortes Subdivision is underlain by the alluvial and recessional outwash aquifer. This geologic unit is composed of sand, gravel, and cobbles, with minor lenses of silt and clay, and is more susceptible to migration of crude oil contaminants into the shallow aquifer.

SSAs along the BNSF Railway main line are susceptible to contamination from oil leaks and spills. No impacts are anticipated with normal operation. The probability of a spill accident in specific locations of SSAs was not studied, but the risk of an accident in any given area along the rail route through Washington State is discussed in Chapter 4 – Environmental Health and Risk.

Indirect Impacts

Installation of drainage infrastructure would change the depth to groundwater at the proposed project site, resulting in a permanent loss of soil productivity and quality. The soils in the study area have no economic or productivity value as a local or state resource.

Cumulative Impacts

As described above, construction and operation of the proposed project could result in impacts to groundwater. Within the study area, there has been significant agricultural, industrial, commercial, and residential development. It is assumed that with this growth and new construction, groundwater has been affected. Construction and operation of the proposed Tesoro Clean Products Upgrade Project (Tesoro 2015) (see Table 3.0-2 in Chapter 3.0 – Introduction, for additional project details) has the potential to impact groundwater. Together, these projects could have cumulative impacts on groundwater. These impacts would be minimized by construction best management practices (BMPs) and localized to the Tesoro Anacortes Refinery site and the proposed project and mitigation sites.

MITIGATION MEASURES

Avoidance and Minimization

Shell has incorporated engineering and operational measures into the design of the proposed project to avoid and minimize impacts to groundwater. Specific design measures that would minimize the potential for impacts from a release of oil at the proposed rail unloading facility are described in Chapter 3.3 – Surface Water. In addition, impacts to groundwater would be minimized by implementation of the BMPs required as part of the NPDES Construction Stormwater Permit, CWA Section 404 Individual Permit, CWA Section 401 Water Quality Certification, Skagit County Grading Permit, and Shoreline Substantial Development Permit. For example, all waste oils and machinery fluids would be stored, handled, and disposed of in accordance with appropriate regulations and permit conditions.

Mitigation

No additional mitigation measures are proposed beyond the avoidance and minimization measures that would be developed and enforced as part of the permitting process.

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3.3 SURFACE WATER

Surface water moves over land as sheet flow and as channelized flow within streams and ditches. Surface water serves as habitat for wildlife, a source of hydrology for wetlands, a place for recreation, and a source of drinking water, industrial process water, and irrigation. Changes in surface water quality can occur from an increase in toxic chemicals, temperature, or turbidity. Surface water quantity can be affected when water is rerouted from one receiving water body to another or from increased impervious surfaces that do not allow for infiltration into groundwater. These changes are regulated through the National Pollution Discharge Elimination System (NPDES) stormwater permits, state water quality standards for surface water, and county regulations.

STUDY AREA AND METHODOLOGY

The surface water study area includes ditches, streams, sloughs, wetlands, and marine shorelines associated with Padilla and Fidalgo bays. These features are crossed by or could receive runoff and stormwater discharge from the proposed project site at the Shell Puget Sound Refinery (PSR), the proposed wetland mitigation site, and the Anacortes Subdivision. Figures 3.3-1 and 3.3-3 identify the surface water features on the proposed project and wetland mitigation sites, respectively. The analysis considers the impacts of the proposed project on surface water flows and surface water quality in these receiving waters.

Impacts on surface water flow and water quality were identified by reviewing the information provided by Shell as outlined in Chapter 3 – Affected Environment and Environmental Impacts. A field visit to evaluate and verify descriptions of the project site was conducted on December 8, 2015.

In addition, applicable regulations and policies were evaluated to assist in placing potential project impacts into context of the state and local regulatory environment. Select laws, regulations, and guidance applicable to surface water associated with the proposed project are summarized in Table 3.3-1.

Because the potential impacts associated with surface water are localized, the cumulative impacts study area for surface water would be the same as that described above for the direct and indirect impacts. It includes the ditches, streams, sloughs, wetlands, and marine shorelines associated with Padilla and Fidalgo bays.

Table 3.3-1 Laws, Regulations, and Guidance for Project-Related Surface Water

Laws, Regulations, and Guidance	Description
Federal	
Clean Water Act (CWA) (33 USC 1251 *et seq.*)	Establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulates quality standards for surface water. Section 303(d) requires states, territories, and tribes to develop lists of impaired waters. These are waters that are too polluted or otherwise degraded to meet the water quality standards set by states, territories, or authorized tribes. Section 401(33 USC 1251) Water Quality Certifications are required for any activity that requires a federal permit or license to discharge any pollutant into waters of the United States. This certification attests that the responsible agency has reasonable assurance the proposed activity will meet its water quality standards. Section 402 (33 USC 1342) prohibits the discharge of any pollutant to waters of the United States without a permit. Section 402 also establishes the National Pollutant Discharge and Elimination System (NPDES) permitting program, under which such discharges are regulated both during construction and facility operation. Section 404 (33 USC 1344) establishes a program to regulate the discharge of dredged and fill material into waters of the United States, including wetlands.
The Federal Coastal Zone Management Act	Through the Federal Coastal Zone Management Act, coastal states with approved Coastal Zone Management Programs (CZMP) require projects operating under a federal permit or license to demonstrate consistency with the CZMPs. Federal consistency allows states to review those projects that are likely to affect state coastal resources or uses.
National Pollutant Discharge Elimination System (NPDES) Permit Program	Addresses water pollution by regulating point sources that discharge pollutants to waters of the United States. Created in 1972 by the Clean Water Act, the NPDES permit program is authorized to state governments by U.S. Environmental Protection Agency (USEPA) to perform many permitting, administrative, and enforcement functions.

Laws, Regulations, and Guidance	Description
State	
State Environmental Policy Act (SEPA) (RCW 43.21c; WAC 197-11)	Helps state and local agencies in Washington identify possible environmental impacts that could result from a proposed action, alternatives to the proposed action, and potential impact minimization and mitigation measures. Information learned through the review process can be used to change a proposal to reduce likely impacts and inform permitting decisions at the state and local levels.
Water Resources Act of 1971 (RCW 90.54)	Sets forth fundamentals of water resource policies for the state to ensure that waters of the state are protected and fully used for the greatest benefit to the people.
Water Pollution Control Act (RCW 90.48)	Maintains the highest possible standards to ensure the purity of all waters of Washington State are consistent with public health and public enjoyment, the propagation and protection of wildlife, birds, game, fish and other aquatic life, and industrial development of the state. To that end, requires the use of all known available and reasonable methods by industries and others to prevent and control the pollution of state waters.
Model Toxics Control Act (MTCA) and Cleanup Regulation (RCW 70.105D; WAC 173-340)	Sets cleanup standards to ensure that the quality of cleanup and protection of human health and the environment are not compromised and requires potentially liable persons to assume responsibility for cleaning up contaminated sites.
Oil and Hazardous Substance Spill Prevention and Response (RCW 90.56)	Establishes a comprehensive prevention and response program to protect Washington's waters and natural resources from oil spills.
Water Quality Standard for Surface Waters of the State of Washington (WAC 173-201A)	Establishes water quality standards for surface waters of Washington State consistent with public health and public enjoyment of the waters and the propagation and protection of fish, shellfish, and wildlife.
Sediment Management Standards for Waters of the State of Washington (WAC 173-204)	Establishes marine, low salinity, and freshwater surface sediment management standards in Washington State.

Laws, Regulations, and Guidance	Description
Washington State Shoreline Management Act (RCW 90.58)	Provides a statewide framework for managing, accessing, and protecting shorelines of the state and reflects the strong interest of the public in shorelines and waterways for recreation, protection of natural areas, aesthetics, and commerce.
Washington State Coastal Zone Management Program (WCZMP)	Under Washington's Coastal Zone Management Program (WCZMP), the above projects and activities that are likely to affect state coastal resources or uses must be consistent with the WCZMP's enforceable policies found in the Shoreline Management Act, the Ocean Resource Management Act, the Water Pollution Control Act, and the Clean Air Act, and all state regulations that implement those Acts.
Washington State Hydraulic Code (WAC 220-660)	A hydraulic project is the construction or performance of work that will use, divert, obstruct, or change the natural flow or bed of any of the salt or fresh waters of the state. Unless otherwise provided, any person who wishes to conduct a hydraulic project must get a construction permit called the hydraulic project approval (HPA) from the Washington Department of Fish and Wildlife (WDFW). The purpose of the HPA is to ensure that construction or performance of work is done in a manner that protects fish life.
Stormwater Management Manual for Western Washington (SWMMWW)	Provides guidance on the measures necessary to control the quantity and quality of stormwater.
Local	
Skagit County Stormwater Management (SCC 14.32)	Mandates and sets requirements that stormwater discharge be controlled and treated to provide available and reasonable methods of erosion control, flood control, and water quality treatment for both temporary and long-term stormwater management.
Skagit County Critical Areas Ordinance (SCC 14.24)	This ordinance was developed under the directives of the Growth Management Act to designate and protect critical areas and to assist in conserving the value of property, safeguarding the public welfare, and providing protection for these areas. Critical areas are defined as wetlands, aquifer recharge areas, frequently flooded areas, geologically hazardous areas, and fish and wildlife habitat conservation areas.

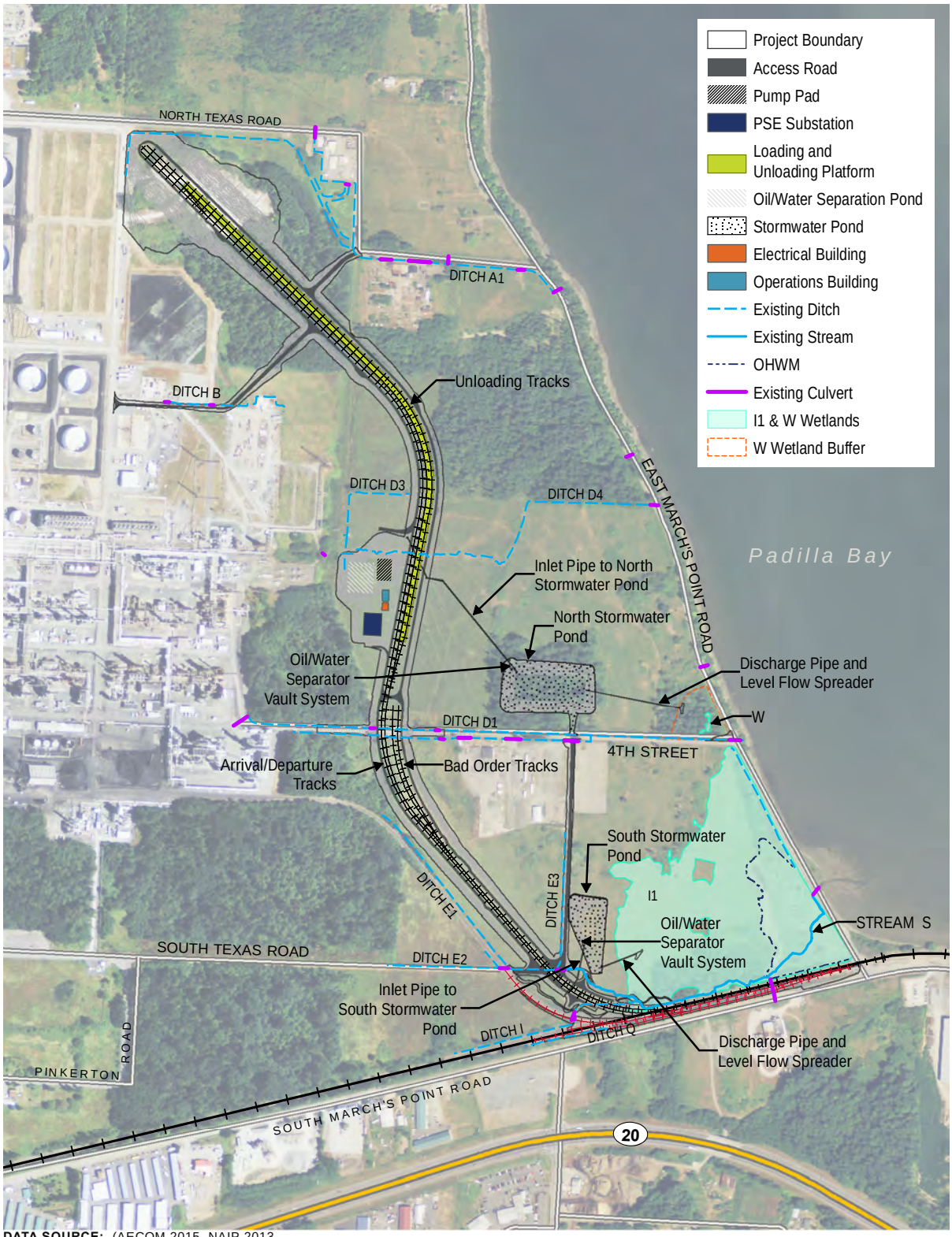
Laws, Regulations, and Guidance	Description
Skagit County Shoreline Master Program (SMP) (SCC 14.26)	The Shoreline Master Program (SMP) is comprised of local land use policies and regulations designed to manage shoreline use. The SMP protects natural resources for future generations, provides for public access to public waters and shores, and plans for water dependent uses. It was created in partnership with the local community and Ecology and must comply with the Shoreline Management Act and Shoreline Master Program Guidelines.
Skagit County Grading Permit	A Fill and Grade Permit may be required for any grading work involving substantial ground disturbing activity (either fill or excavation) or any additional activity that affects drainage in the area.

Historical and more current sources of information regarding existing conditions of surface water bodies in the study area were reviewed to characterize surface water resources and how they came to be in their current configuration. This information also provided the context for evaluating potential project impacts on the existing surface water resources. Based on a review of *floodplain* mapping in the area of the proposed project site, no floodplains would be encroached upon by the proposal.

A **floodplain** is an area of low-lying ground adjacent to a river, formed mainly of river sediments and subject to flooding.

The proposed project would affect surface water resources through direct changes to existing topography and increased *impervious surfaces*. These changes would alter existing surface water pathways through redistribution of surface water flows and collection and management of stormwater on the project site. Permanent changes in the distribution of study area surface waters could lead to direct and indirect impacts to environmental resources. Changes in the hydroperiod of wetland soils—the time during which soils are waterlogged and the depth and duration of flooding—could affect these resources. Stormwater is also the primary potential distribution mechanism for spills and other pollutant constituents from the project vicinity to adjacent receiving waters. Therefore, stormwater management and spill containment is a major focus of the surface water discussion.

Impervious surfaces are those areas in the landscape that do not effectively absorb or infiltrate rainwater.



DATA SOURCE: (AECOM 2015, NAIP 2013, Skagit County 2015, WSDOT 2015)

N

0 200 400 Feet

Proposed Rail Track
BNSF Rail Improvement
Anacortes Subdivision
Local Road
State Highway

Figure 3.3-1
SURFACE WATER FEATURES – PROPOSED PROJECT SITE

AFFECTED ENVIRONMENT

Proposed Project Site

The proposed project site is located on the March Point peninsula in the Lower Skagit-Samish watershed, in Water Resource Inventory Area 3 (WRIA 3). Washington State is divided into 62 WRIAs that delineate the state's major watersheds that drain into rivers, lakes, or other waterbodies. Topography of the proposed project site slopes down to the east into Padilla Bay. The site is a mix of undeveloped and developed industrial lands. Undeveloped areas on the project site have been used as pasture for cattle grazing. Developed areas include a large unvegetated soil stockpile, roadways, railroad tracks, parking, and laydown areas.

Site soils are described in detail in Chapter 3.1 – Earth Resources. In general, soils consist of gravelly loam with low to moderate infiltration rates and are poorly drained. Twenty-one wetlands were identified on the proposed project site by Shell in 2013 (URS 2013). Wetland delineations are preliminary and are subject to review and verification by the Washington State Department of Ecology (Ecology) and the U.S. Army Corps of Engineers (USACE) as part of the Section 401 and 404 permitting process. Chapter 3.5 – Wetlands, describes the existing wetlands identified on the proposed project site. In 2013, Shell also identified streams and ditches on the site; one stream and 13 ditch segments were delineated (URS 2013) (Figure 3.3-1).

The ditches identified on the proposed project site combine into three primary drainage systems that discharge into Padilla Bay along the shoreline east of East March's Point Road through perched metal culverts. Ditches discharging into Padilla Bay follow 4th Street, North Texas Road, and a point midway between these roads. The ditches are presumed to have flow during much, if not all, of the year.

What are Ecology's water quality assessment categories?

Category 1 - Meets tested standards for clean waters. The water body met standards for all the pollutants for which it was tested.

Category 2 - Waters of concern. Waters where there is some evidence of a water quality problem, but not enough to require development of a water quality improvement (WQI) project (including total maximum daily load [TMDL]) at this time.

Category 3 - Insufficient data. Water where there is insufficient data to meet minimum requirements.

Category 4 - Polluted waters that do not require a TMDL. Waters that have pollution problems that are being solved in one of three ways:

- **Category 4a** - Has a TMDL. Water bodies that have an approved TMDL in place and are actively being implemented.
- **Category 4b** - Has a pollution control program. Water bodies that have a program in place that is expected to solve the pollution problems.
- **Category 4c** - Is impaired by a non-pollutant. Water bodies impaired by causes that cannot be addressed through a TMDL.

Category 5 - Polluted waters that require a TMDL or other WQI project. The list of impaired water bodies is known as the 303(d) list. Placement in this category means that Ecology has data showing that the water quality standards have been violated for one or more pollutants, and there is no TMDL or pollution control plan. TMDLs or other approved WQI projects are required for the water bodies in this category.

The stream on the proposed project site is identified as Stream S, which is a natural drainage channel that appears on historic maps (USCGS 1886). Historically, this stream may have extended south of the Anacortes Subdivision and South March's Point Road; however, this area does not appear to be part of the current watershed because of local development patterns. Stream S receives surface flow from several ditches, including those draining areas adjacent to the Anacortes Subdivision (Ditches Q and I), the existing rail spur to the Shell Puget Sound Refinery (PSR) (Ditch E1), and South Texas Road (Ditches E2 and E3). Stream S flows to an estuarine wetland complex (Wetland I1) that is connected to Padilla Bay through two 62-inch-tall, 102-inch-wide concrete box culverts under East March's Point Road (Figure 3.3-1).

A 2015 hydrology/hydraulics report provided the results of modeled existing surface water flows for the proposed project site. The pre-developed condition was modeled as a flat forested system. The existing two-year peak stormwater flow rate for the project site is 10.47 cubic feet per second (cfs), and the 10-year peak flow rate is 13.79 cfs (Wilson and Company 2015a).

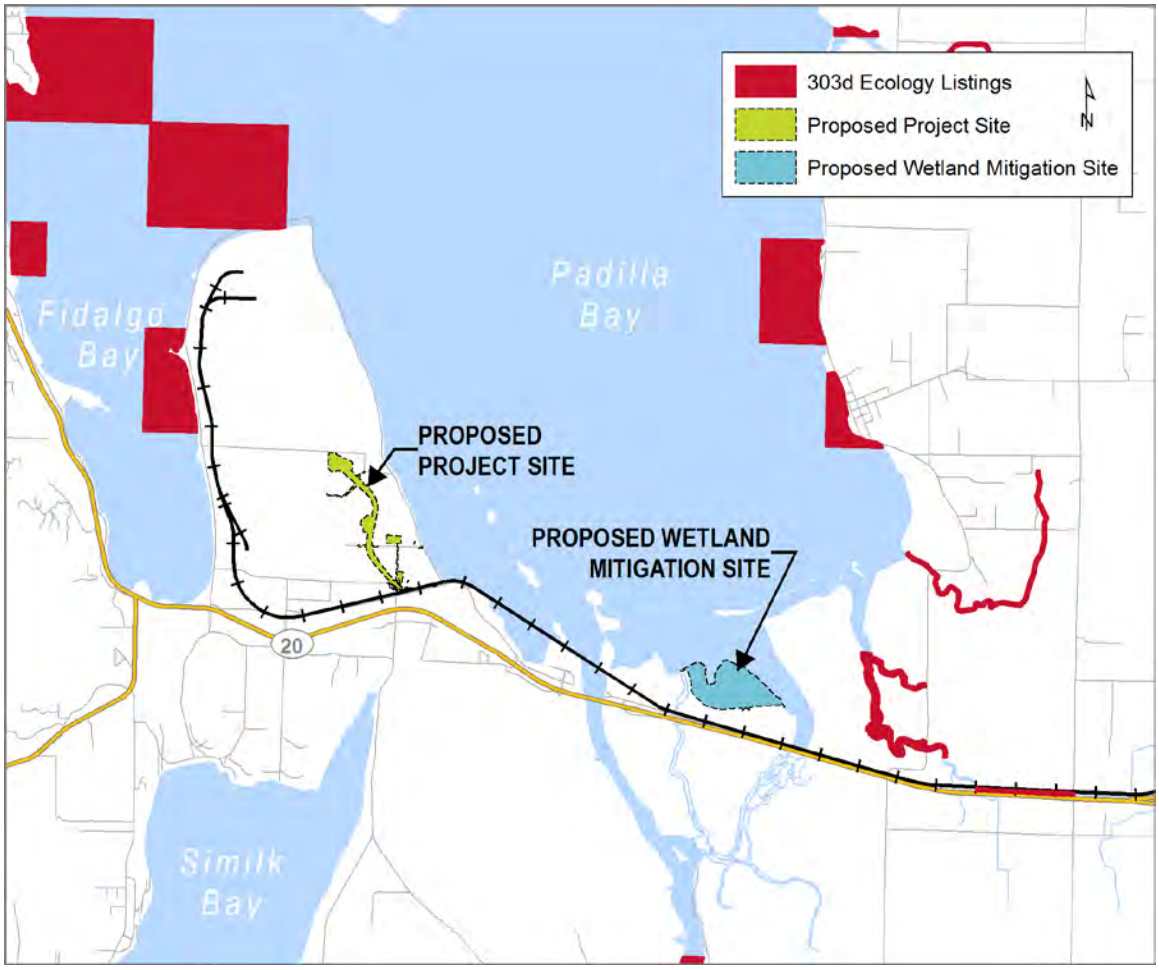
Section 303(d) of the CWA requires states, territories, and tribes to develop lists of impaired water bodies. Ecology categorizes this list of impaired water bodies based on the level of impairment within the water body (see sidebar on page 3.3-7), Portions of Padilla Bay and some of its freshwater tributaries have high levels of fecal coliform bacteria that currently do not meet state water quality standards and are listed as a *Category 5* 303(d) water body (Ecology 2015) (Figure 3.3-2). Category 5 waters are impaired and require a *total maximum daily load (TMDL)*. Cattle grazing, along with other activities, has contributed fecal coliform bacteria to Padilla Bay. Ecology is developing a water cleanup plan to reduce these bacteria within the bay (Ecology 2015).

A **total maximum daily load (TMDL)** is a numerical value representing the highest amount of pollutant a surface water body can receive and still meet water quality standards. Any amount of pollution over the TMDL level needs to be reduced or eliminated to achieve clean water. The Clean Water Act requires that states develop a TMDL for each of the water bodies on the state's 303(d) list. The state sends the finalized TMDL to the U.S. Environmental Protection Agency (USEPA) as part of a water quality improvement report for approval.

On the northern tip of the March Point peninsula in Padilla Bay there is a 303(d) listing for chrysene (a polycyclic aromatic hydrocarbon [PAH]) and 2,3,7,8-TCDD (Tetrachlorodibenzo-p-dioxin), a known carcinogen. The chrysene listing is based on tissue samples collected in 1999 and the 2,3,7,8-TCDD is listed based on tissue samples collected in 2007 (Ecology 2016). Both of these listings are considered Category 5 by Ecology.

West of the Shell PSR facility in Fidalgo Bay there is a 303(d) Category 5 listing for chrysene based on tissue samples collected in 1999. Benz[a]anthracene, also a PAH, is listed as Category 5 for this area based on tissue samples collected in 1999 (Ecology 2016).

Figure 3.3-2 303(d) Ecology Listings



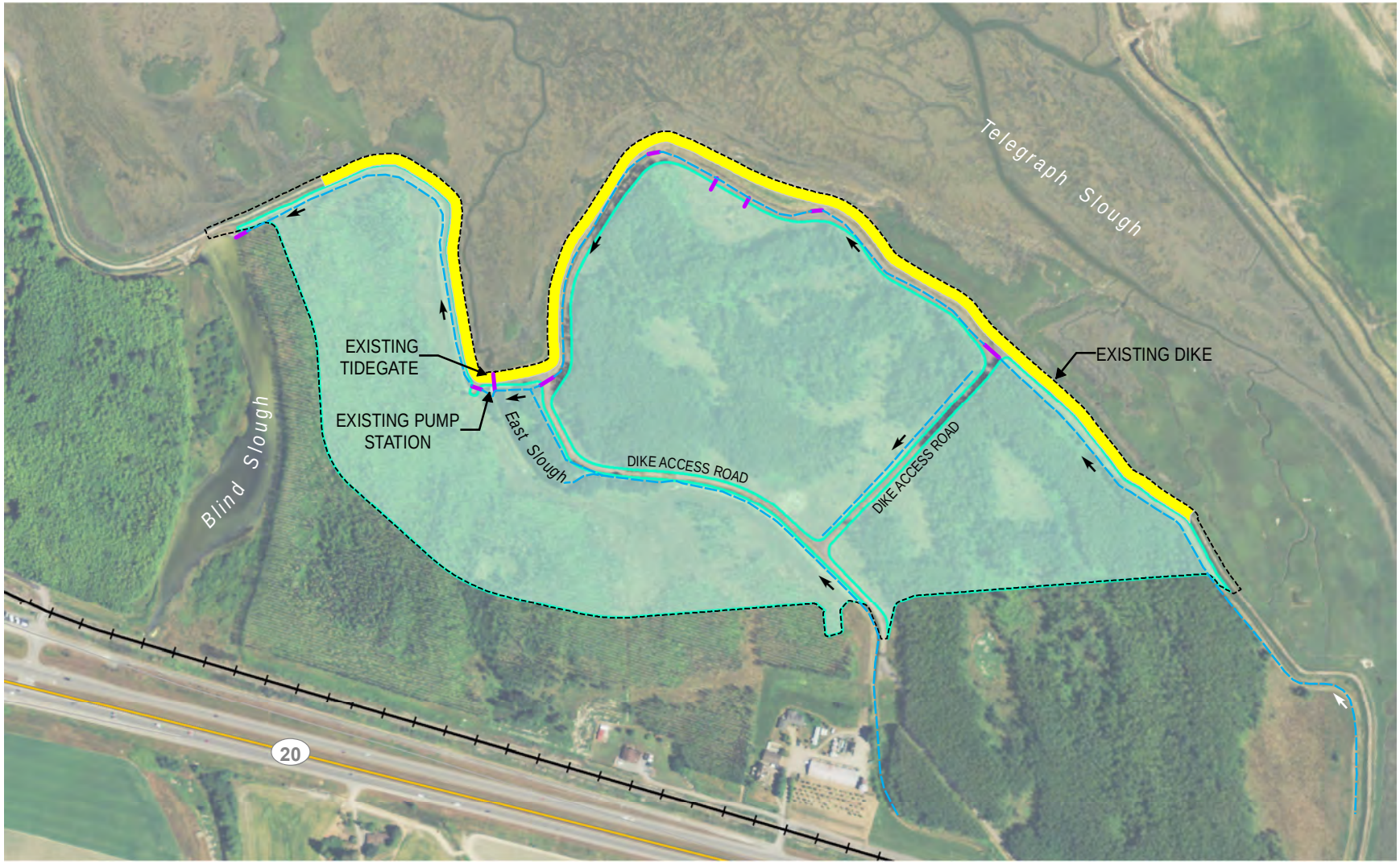
Wetland Mitigation Site

The proposed wetland mitigation site located at the south end of Padilla Bay (Figure 3.3-3) was historically estuarine wetlands and tidal sloughs. This land was diked and drained more than 100 years ago to convert the area to uplands to support agriculture including, most recently, hybrid poplar cultivation. The site is mapped within the 100-year floodplain. Hydrology at the wetland mitigation site has been altered by the perimeter dike and construction of State Route (SR) 20 and the Anacortes Subdivision to the south. Flow paths, water quality, and water regimes within the diked area have been significantly altered by the installation of drainage ditches, cultivation, and the creation of elevated tree planting berms on the proposed mitigation site (AECOM 2016).

A remnant tidal channel, commonly known as East Slough, crosses the center of the mitigation site along a dike access road. Because of the dike, this tidal channel is no longer connected to Padilla Bay and largely serves as a drainage ditch. East Slough flows north along the access road into a small ponded area at the base of the dike where an existing pump station and a tidegate are located (Figure 3.3-3). The pump house is no longer operational. The ponded area is approximately 3 feet deep and 30 feet wide (AECOM 2016).

Another small ditch (approximately 2 feet deep and 7 feet wide) is located on the northern end of the wetland mitigation site and runs parallel to the dike and the access road. East Slough and the small drainage ditch do not appear to effectively drain the mitigation site, as evidenced by high groundwater levels. No evidence was observed that this ditch receives surface flow from under SR 20 or the Anacortes Subdivision tracks (AECOM 2016). Water ponding occurs in low depressions and in many of the swales between the elevated tree planting berms.

None of the waterways immediately adjacent to or within the wetland mitigation site is currently listed on Ecology's 303(d) list for water quality issues (Figure 3.3-2).



DATA SOURCE: (AECOM 2016, NAIP 2013, Skagit County 2015, WSDOT 2015)

Proposed Wetland Mitigation Site
Existing Ditch
Existing Culvert
Existing Dike
Wetlands
Ditch Flow Direction
Anacortes Subdivision
State Highway
Interstate Highway

N

0 200 400 Feet

Figure 3.3-3

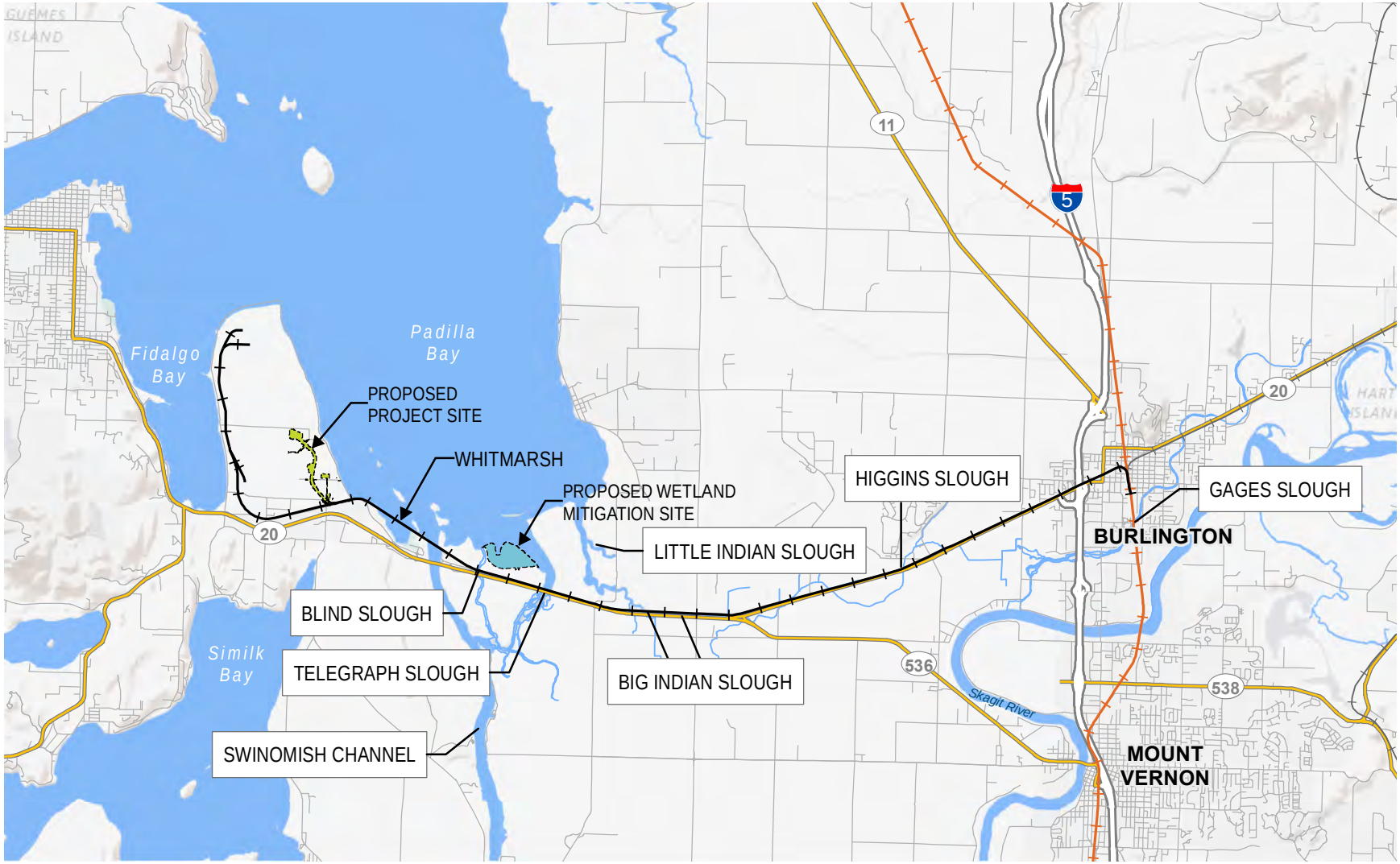
EXISTING WATERCOURSES – WETLAND MITIGATION SITE

Anacortes Subdivision

The Anacortes Subdivision runs between the proposed project site and Burlington, Washington, where it connects to the Bellingham Subdivision. Traveling from west to east, the existing railroad crosses several waterbodies: Whitmarsh/Padilla Bay, Swinomish Channel/Padilla Bay, Blind Slough, tributaries to Padilla Bay, Telegraph Slough, Big Indian Slough, tributaries to Big Indian Slough and Higgins Slough. Land use along the Anacortes Subdivision is discussed in Chapter 3.12 – Land Use and Social Elements. In general, the land along the rail line is characterized as agricultural (51 percent) or industrial (24 percent).

Big Indian Slough crosses the Anacortes Subdivision in multiple locations and runs parallel to the rail corridor (Figure 3.3-4). Big Indian Slough is tidally influenced and is characterized as a "Managed Watercourse" by the Washington Department of Fish and Wildlife (WDFW), meaning that there are tidegates or other control structures present in the system that affect the movement of water. Portions of Big Indian Slough adjacent to the rail line are being restored by Drainage and Irrigation Improvement District 19 as compensatory mitigation for continued maintenance of their flow control structures (WDFW 2008 and USACE 2015).

Big Indian Slough is the only 303(d) waterbody listed by Ecology on the Anacortes Subdivision (Figure 3.3-2). Along the rail line, Big Indian Slough is listed for bacteria (Category 5, see sidebar, page 3.3-7), dissolved oxygen (Category 5), and pH (Category 2). Downstream of the rail line, as the slough empties into Padilla Bay, it is listed for dissolved oxygen (Category 5) and temperature (Category 2). Ecology is currently implementing a TMDL study for fecal coliform within the Padilla Bay system that would include Big Indian Slough (Ecology 2015).



DATA SOURCE: (ESRI 2016, Skagit County 2015, USGS 2015, WSDOT 2015)

Proposed Project Site
Proposed Wetland Mitigation Site
Anacortes Subdivision
Bellingham Subdivision
BNSF Railway
Local Road
State Highway
Interstate Highway
Streams
Waterbody

N

0 1 2 Mile

Figure 3.3-4

STREAM AND WATERWAY CROSSINGS – ANACORTES SUBDIVISION

ENVIRONMENTAL IMPACTS

No Action Alternative

Because no construction or operation would take place under the no action alternative, there would be no impacts to surface water flow or water quality. Surface water conditions at the proposed project and wetland mitigation sites would remain the same unless affected by other projects in the future.

Proposed Project Site

Direct Impacts

Direct impacts to surface water at the project site would occur from both construction and operation of the proposed project. These impacts are discussed below. Habitats affected by surface water impacts are discussed in Chapter 3.4 – Fish and Aquatic Species and Habitat.

Construction

As part of construction of the facility, the upper channel of Stream S would be moved away from the existing BNSF Railway embankment and approximately 700 linear feet of channel would be constructed (AECOM 2016). (See Figure 3.4-3, Chapter 3.4 – Fish and Aquatic Species and Habitat.) Several ditches currently contribute flow to Stream S near its point of origin (Figure 3.3-1). Flow from these ditches would be redirected into the newly constructed channel segment of Stream S originating slightly west of its current headwaters.

During construction, direct impacts to stormwater patterns and water quality could occur from water flows that cause turbidity through erosion and sedimentation downstream of soil disturbance activities, runoff that has been in contact with uncured concrete that may have high pH values, or release of pollutants from equipment. However, adherence to best management practices (BMPs) and minimization measures as required by permits would reduce the potential for adverse impacts.

Also, as discussed in Chapter 3.2 – Groundwater, soil compaction from construction activities may temporarily reduce the capacity of surface soils to infiltrate precipitation. The effects of any decreased infiltration of stormwater would be minimized by limiting the area of temporary soil compaction and managing construction stormwater according to the NPDES construction permit.

A construction stormwater pollution prevention plan (SWPPP) would be submitted to Ecology prior to start of construction as a requirement of the construction NPDES permit. The construction NPDES permit would require that water quality levels for turbidity not exceed 25 nephelometric turbidity units (NTU) for the downstream receiving water body.

The construction NPDES permit would require that the SWPPP also identify sampling of pH at the discharge points of the stormwater ponds. Concrete pouring and curing processes during construction could cause alkaline water to be released to wetlands and eventually to Padilla Bay. Monitoring of pH would be conducted during these activities. The construction NPDES permit

would require that water quality levels not exceed a pH of 8.5. Any results above the benchmarks for turbidity or pH would activate additional monitoring and BMP activities.

To mitigate the possible release of turbid or alkaline waters, the construction NPDES permit would require sampling for both turbidity and pH at the discharge points for the stormwater ponds and the exit points of the culverts under East March's Point Road, or other applicable discharge locations. Mitigation measures designed to avoid and minimize impacts that would be implemented during project construction are further discussed in Chapter 5 – Summary of Impacts and Mitigation.

As described in Chapter 2 – Proposed Project and Alternatives, railroad ties installed for new rail lines would be constructed primarily of concrete. It is possible that treated wood railroad ties would be used in switch areas. Wooden railroad ties are typically treated with creosote and contain more than 300 chemicals including polycyclic aromatic hydrocarbons (PAHs), such as chrysene, which could leach out and contaminate soil and surface water. Presently, the number of ties that could be used is unknown; however, few switching areas are proposed within the project site, therefore, the potential amount of chrysene that could enter the stormwater system would be minimal. Furthermore, any treated wood ties that would be used in switch areas would be well seasoned and handled properly during construction to minimize their contact with soil, stormwater, or surface water.

Operation

Permanent impacts to surface water flows could result at the proposed project site from the rerouting of surface water, or an increase or decrease to the peak flow rates associated with pre-development patterns.

If treated wood railroad ties are used, it is possible that chrysene would be released over time into the stormwater that is routed to the proposed stormwater ponds. The stormwater ponds would discharge to land surfaces, not directly to the stream or ditches on site, so any chrysene entering the stormwater system would not be discharged directly into streams or ditches leading to Padilla Bay. When wood ties are replaced during rail maintenance activities, proper handling procedures and disposal of hazardous waste would be followed to minimize exposure of soil and surface waters to creosote leachate.

Direct impacts to water quality during operation of the facility could occur during rail unloading activities. In particular, leaks or spills could occur from tank cars carrying crude oil, or other petroleum products, lubricants, and chemicals from locomotive engines. Brake pads could also contribute heavy metals in the form of dust as they break down from normal wear. Within the rail unloading platform area, leaks and spills would be captured in an oil/water separation pond system that would be constructed as part of the proposed project. Outside the unloading platform area, spills and heavy metals would enter into the new stormwater pond system. The *primary, secondary, and tertiary spill containment,* as well as stormwater systems, is described in further detail below.

Multiple levels of spill containment are provided by the rail unloading facility design:

Primary Containment – Serves to contain spills and releases that occur from daily operations.

Secondary Containment – Serves to contain spills and releases that occur from larger events.

Tertiary Containment – Serves to contain spills that may bypass the primary or secondary containment systems.

The rail unloading facility system, valves, and connections to the tank cars would be designed to prevent spills from occurring. However, to assess the functionality of the proposed project features that would contain a potential spill event and how impacts to surface waters in the project vicinity could be prevented, engineering drawings of the proposed facility were reviewed (Wilson and Company 2015b).

The main elements of the proposed rail unloading facility (tracks, oil/water separation pond system, and operations buildings) would be located in an excavated area and can be envisioned as a "bowl." The unloading track area has uphill grades in both directions extending outward from the middle of the facility. This configuration would prevent tank cars from rolling backward onto the Anacortes Subdivision in the event of brake failure. A secondary benefit of the bowl design would be its capacity to contain an oil spill before it could escape to the surrounding area.

Impervious surfaces

The proposed project would add about 10 acres of impervious surfaces for a total of approximately 25 acres within the project site (Wilson and Company 2015a). Direct impacts from stormwater runoff from these additional impervious surfaces could cause a reduction in water quality. The reduction in water quality would come from contribution of contaminants and erosion from increased runoff if not adequately contained. New impervious areas include:

- Concrete platform underneath the length of the rail unloading area.
- Crude unloading operational areas.
  - Oil/water separation pond system.
  - Pump pad.
  - Operations building.
  - Electrical building.
  - PSE substation.

- Asphalt access roads.
- Concrete stormwater conveyance channels.

Spill containment system

Several components, designed to work together, would provide various levels of containment for up to the entire volume of crude oil within a 102-tank car unit train on the project site. Details for spill prevention and response at the Shell PSR would be included as part of the Spill Prevention, Control, and Countermeasure (SPCC) plan that would be finalized and approved during the individual NPDES permitting process. The Shell PSR facility has an existing individual NPDES permit and any changes to the facility, like adding new operations, could require that the NPDES permit be modified and reviewed by Ecology.

This plan would outline the various design and operational measures put in place to prevent spills on site and identify procedures that would be implemented in the event of a spill. Regular inspection and maintenance inspections of all shut-off valves would be incorporated into the SPCC plan to ensure they remain fully operational. Following the SPCC plan would lower the likelihood of spills that could be released from the facility to either the uplands east of the North Stormwater Pond or Wetland I1 east of the South Stormwater Pond. See Chapter 4 – Environmental Health and Risk, for discussion of accidental spills during transport of crude oil to the Shell PSR. In addition, Chapter 3.17 – Public Services and Incident Response, provides information about Shell's contingency planning efforts, and the capabilities of Shell, BNSF Railway, and other organizations in the region to respond if an oil spill were to occur.

Three levels proposed for spill containment are described above, listed below, and illustrated in Figure 3.3-5. Spill capacities for each level of containment are listed in Table 3.3-2.

1. Primary containment: Paved and curbed unloading platform.
2. Secondary containment: Oil/water separation pond system.
3. Tertiary containment: Stormwater system.

Figure 3.3-5 Surface Water and Spill Containment System Plan View

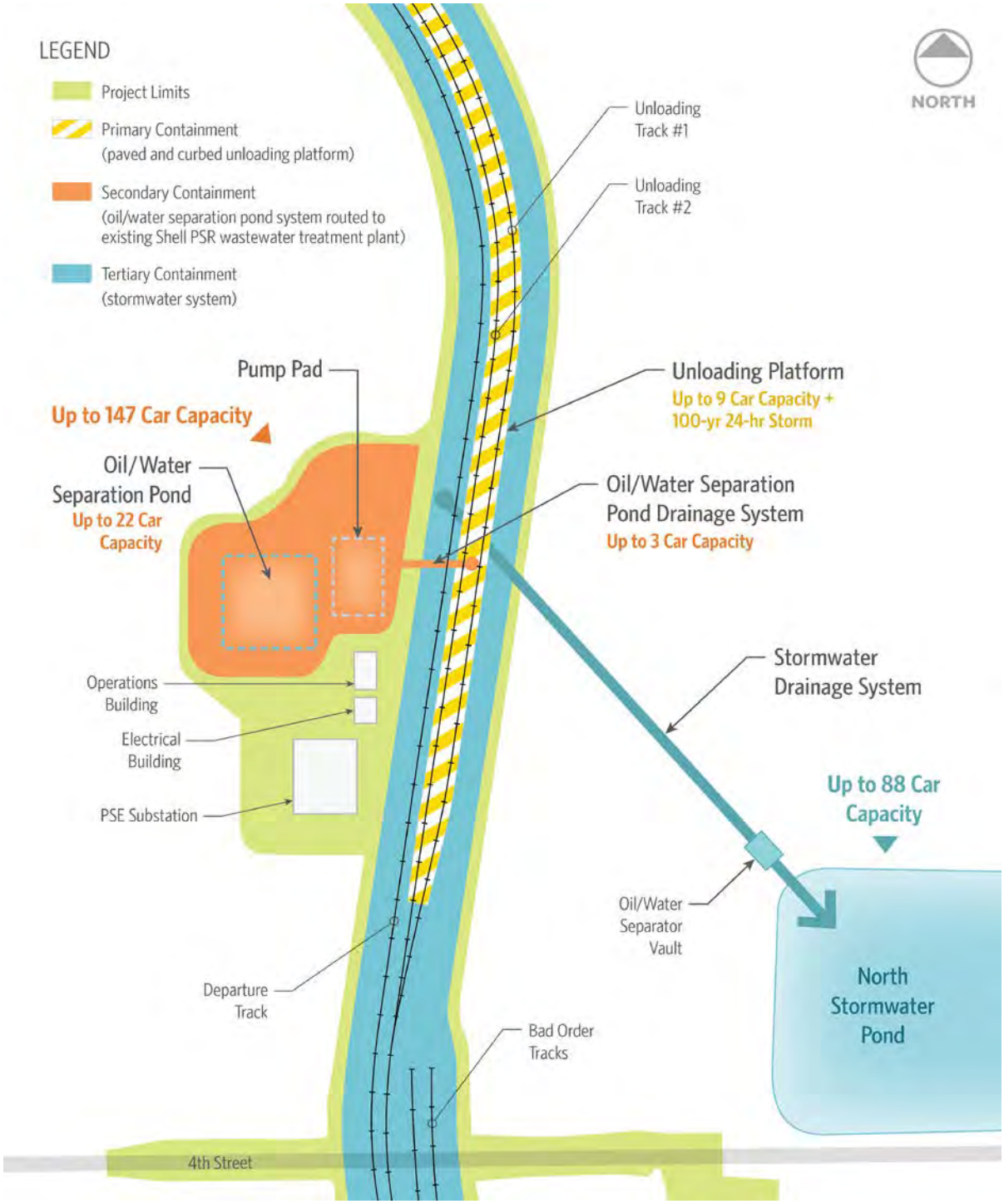


Table 3.3-2 On-Site Spill Containment Capacity

Site Feature	Capacity (barrels)	Tank cars (based on 650 barrels per car)	Level of Containment
Unloading platform[1]	8,998	9	Primary
Underground piping to oil/water separation pond system	1,913	3	Secondary
Oil/water separation pond[3]	14,617	22	Secondary
Area surrounding oil/water separation pond	95,900	147	Secondary
North stormwater pond[2]	57,490	88	Tertiary

Notes:
1. This includes capacity to hold a 100-year storm event (3,050 barrels) in addition to the spilled oil.
2. Source: Wilson and Company 2015a.
3. Source: Anvil 2015.

Paved and curbed unloading platform

The paved and curbed unloading platform would serve as the first level of containment in the event of a spill during the unloading process. The paved unloading platform was designed to accommodate an entire 102-tank car unit train split into two sections on parallel tracks, with one track holding 49 tank cars and the other track holding 53 tank cars. Unloading operations would take place on as many as 10 tank cars at any one time. Unloading equipment and procedures are designed to minimize spillage during unloading. The unloading platform would be underlain with a high-density polyethylene (HDPE) liner and a leak detection system to prevent soil and groundwater contamination.

The platform would be sloped toward the center (within the bowl) and have a variable height curb running its entire length (3,200 feet). The minimum curb height would be 6 inches and increase to 18 inches at the center, or lowest, point in the platform. The curbed platform would have the capacity to contain a volume of crude oil of approximately nine tank cars in addition to stormwater from a 100-year, 24-hour duration event.

The unloading platform would also be equipped with a trench drain system of 8-inch drain pipes that connect to a 24-inch drain line. Any spills or stormwater collected on the rail unloading platform would enter these drains and be routed to the oil/water separation pond system and its associated oil/water separator vaults.

If these drains were blocked for any reason, there is a possibility that oil would overflow the curb system and enter into the concrete-lined ditches that serve the stormwater pond system. A spill of this volume would likely overwhelm the oil/water separator vaults and the shut-off valves located on the discharge lines from the stormwater ponds would then need to be closed to prevent discharge of oil.

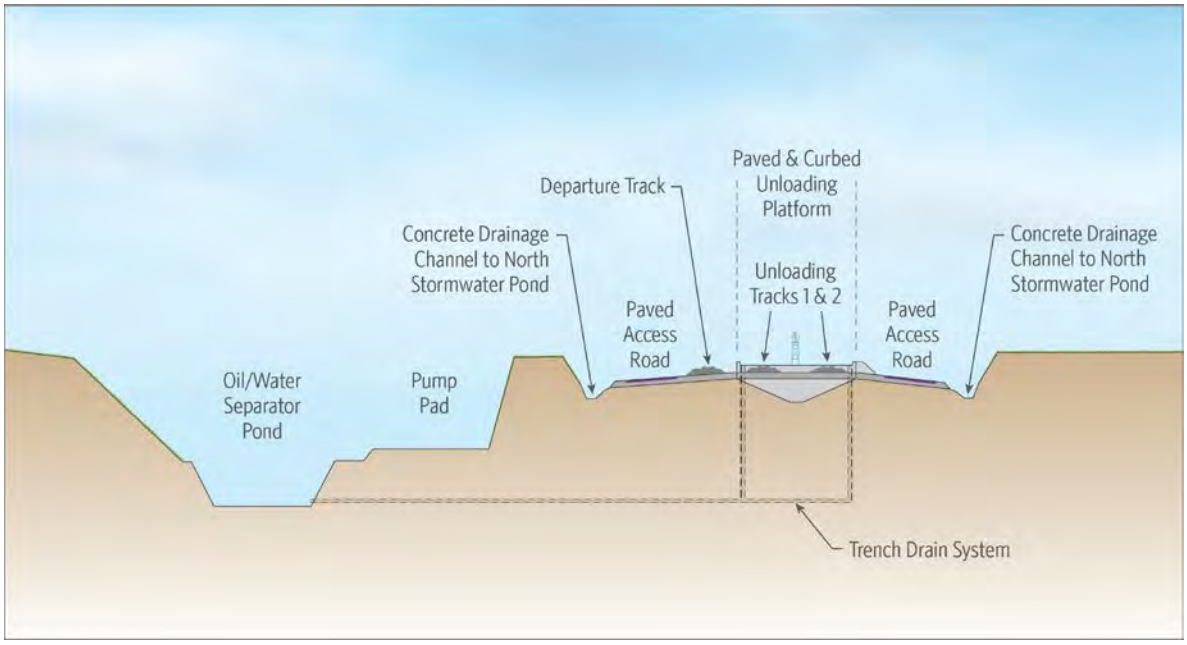
Oil/water separation pond system

The secondary containment would be comprised of the stormwater drainage system from the rail unloading platform combined with the oil/water separation pond, a lined pond (14,617-barrel capacity) located at the lowest point and west of the unloading facility (Figures 3.3-1 and 3.3-6). The drain system connecting the unloading platform to the oil/water separation pond was designed to contain an additional three tank cars of crude oil. The oil/water separation pond provides 22 tank cars of containment prior to overflowing into the surrounding area. The combination of the oil/water separation pond, the area immediately around the pond, the oil/water separation pond drainage system, and the unloading platform were designed to contain the volume of crude oil from an entire 102-tank car unit train (Anvil 2015). All components of primary and secondary levels of containment would be needed to contain a spill equivalent to 102 tank cars.

Similar to the rail unloading platform, the oil/water separation pond facility would be underlain with a HDPE liner and a leak detection system to prevent soil and groundwater contamination. Stormwater collected from the unloading platform, oil/water separation pond drainage system, and operations buildings would be routed to the oil/water separation pond and then to the existing wastewater treatment plant inside the Shell PSR. After being treated, the water would be released to Fidalgo Bay according to the Shell PSR's existing NPDES permit.

During a spill event, the pumps and valves that allow discharge to the wastewater treatment plant would be shut off. Materials from the spill would then be pumped into recovery trucks and transferred to refinery tanks for later processing at the Shell PSR (Anvil 2015).

Figure 3.3-6 Rail Unloading Facility Cross Section



Stormwater system as spill containment

In the event that the first two elements of the containment system do not function as proposed, it is possible that a major spill during unloading operations could escape the curbed system of the rail unloading platform and enter into the drainage channels of the stormwater system that run parallel to the unloading platform. In this scenario, the crude oil would be routed from the vicinity of the unloading platform to the North Stormwater Pond (description provided below).

Also, if a spill occurred outside the area of the unloading platform, that spill would be collected in the drainage channels of the stormwater system. Depending on the location of the spill, either the North or South stormwater pond would be affected (Anvil 2015). The stormwater ponds are designed with oil/water separation vaults for pre-treatment of stormwater. These vaults are intended to capture any spills that could occur outside of the unloading platform during normal, daily operations. These vaults would be sized to treat stormwater entering the ponds at a rate equivalent to the flow rate during a 100-year storm.

If a spill were to occur that overwhelmed the oil/water separation vaults in either stormwater pond (North or South), the discharge lines would be shut off so that a release to Padilla Bay would not occur. In the event that the shut-off valves were not activated in time to prevent a release to Padilla Bay, Shell would be required to report the release and conduct cleanup and mitigation for any areas impacted by the spill.

If a spill were to occur within the project site and crude oil were to be released to the unlined stormwater ponds, thereby overwhelming the oil/water separator vault systems, accumulated oil would need to be removed along with any contaminated soils in the area. Crude oil entering the

stormwater ponds would likely be removed with recovery trucks and taken either to the wastewater treatment facility in the Shell PSR or to storage tanks for refining. Any soils or groundwater contaminated by spilled product would be excavated and removed from the site for remediation. The stormwater facilities would need to be reconstructed following cleanup activities to restore their intended design functions. This cleanup would be required prior to resuming direct releases from the stormwater pond system.

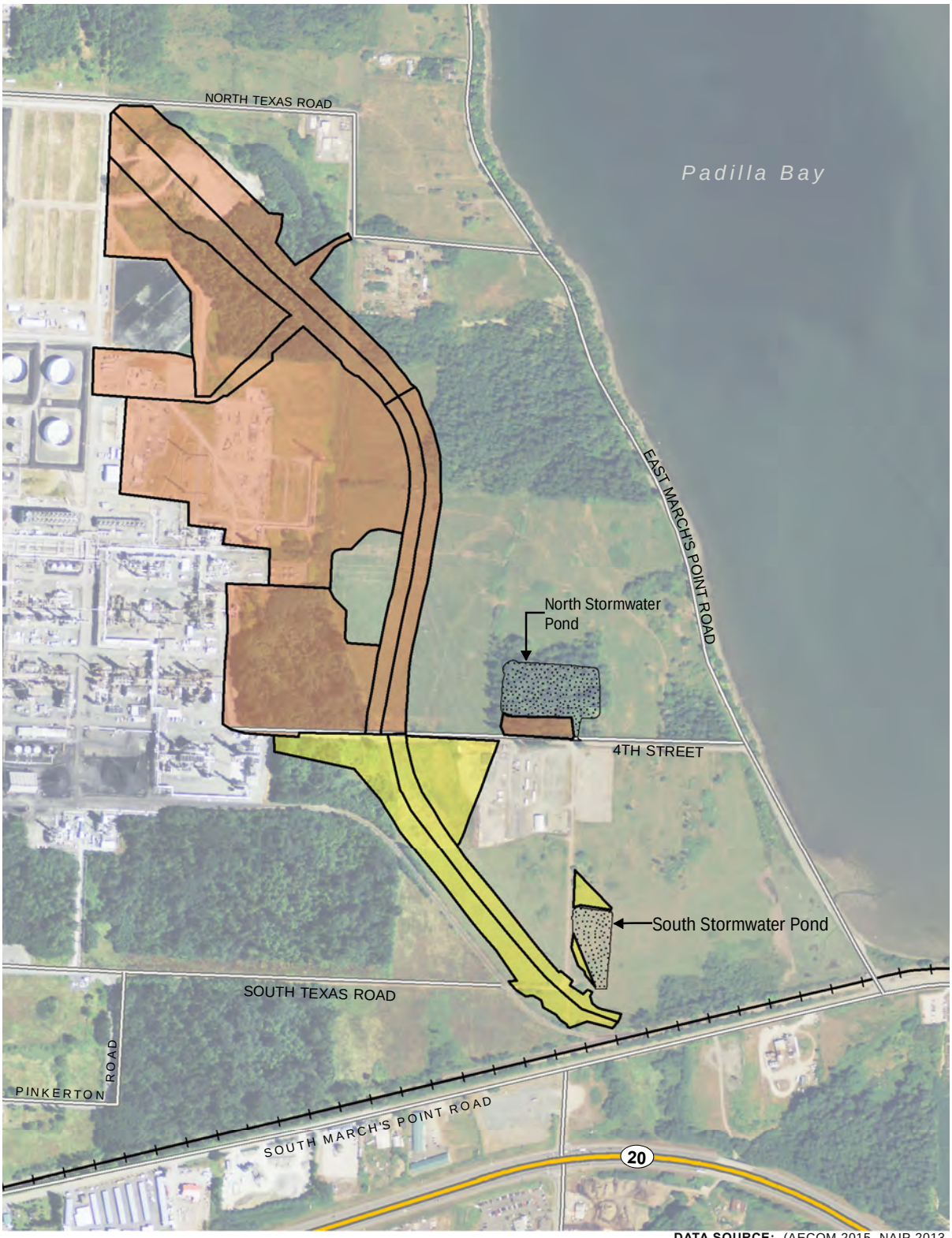
Stormwater ponds

Two unlined stormwater ponds (North and South) would be located east of the rail unloading facility (Figure 3.3-1). The purpose of these stormwater ponds is to detain flows and release them slowly over time to prevent erosion. The stormwater ponds have been designed to detain a 100-year, 24-hour duration storm event. The Western Washington Hydrologic Model (WWHM) Version 4.0 was used to size both ponds (Wilson and Company 2015a). Neither of the ponds discharges directly to Stream S, ditches, or Padilla Bay. The North Stormwater Pond discharges to the upland buffer of Wetland W and the South Stormwater Pond discharges to the freshwater slope area of Wetland I1. It is not anticipated that the discharge of freshwater in these areas would have measurable impacts to the salinity levels within Padilla Bay because it is not a direct discharge to Padilla Bay.

The Skagit County Code (SCC) was recently updated and the new code (effective January 1, 2016) requires compliance with Ecology's 2014 Stormwater Management Manual for Western Washington (SWMMWW). One specific discharge requirement that would need to be addressed is the discharge to wetlands. The SCC 14.32.080(3) requires that stormwater discharges to wetlands be allowed only when consistent with SWMMWW Minimum Requirement #8 and Appendix I-D. Minimum Requirement #8 specifies that total discharge to a wetland must not deviate by more than 20 percent of pre-project volumes on a daily basis, and must not deviate by more than 15 percent of pre-project volumes on a monthly basis. The design of the stormwater ponds for detention capacity and discharge would be updated to meet this code requirement as part of the permitting process for the project.

Drainage basin data provided by Shell (Wilson and Company 2015a) formed the basis for the design of the stormwater ponds (Figure 3.3-5). As part of this drainage basin analysis, areas were identified as impervious (see Impervious Surfaces above) and the following new areas were considered to be pervious:

- 7,200 feet of departure tracks.
- 750 feet of unloading tracks.
- 1,300 feet of bad order tracks.



Stormwater Drainage Basins Contributing To:
- North Stormwater Pond
- South Stormwater Pond
- Anacortes Subdivision
- Local Road
- State Highway

N

0 200 400 Feet

DATA SOURCE: (AECOM 2015, NAIP 2013, Skagit County 2015, Wilson and Company 2015, WSDOT 2015)

Figure 3.3-7

DRAINAGE BASINS – PROPOSED PROJECT SITE

In general, the North Stormwater Pond would receive stormwater from the project site and from a portion of the existing Shell PSR facility north of 4th Street (Figure 3.3-7). This pond would have a detention volume of 7.41 acre feet with 1 foot of *freeboard*. Prior to entering the North Stormwater Pond, stormwater would be routed through an oil/water separator vault system to remove oil (*sidebar*). This vault system would have a maximum water quality treatment flow rate of 34.7 cfs and a peak flow rate of 46.7 cfs. The 100-year storm event would cause a flow of 62.0 cfs into the North Stormwater Pond, which would overwhelm this vault system (Wilson and Company 2015a). Revisions to the design of the pond and vault system would occur as part of the permitting process and appropriate sizing of the vault would be addressed at that time.

Freeboard is the vertical distance between the crest of an embankment and the reservoir water surface.

What is the purpose and function of the oil/water separator vaults?

The oil/water separator vaults associated with both stormwater ponds proposed for the project would be designed to remove minor amounts of oil prior to entering the stormwater ponds. Because oil is less dense than water, it floats on the surface. The baffle plates in the vault deflect flow and in the vault work to contain any oil that could occur on the water's surface in one section, and then allow discharge of treated water to take place below.

The combination of these two mechanisms would reduce the likelihood of oil contamination migrating to the ponds and being discharged under normal stormwater flow conditions. However, if the flows or oil concentrations entering the vault system become higher than the design flow or treatment rates, the system would be overwhelmed and oil could enter into the ponds. The pond discharge lines would then need to be manually shut off so that a release to lands that drain to Padilla Bay would not occur.

The South Stormwater Pond would receive stormwater from the project site south of 4th Street (Figure 3.3-7), and have a detention volume of 2.08 acre feet with 1 foot of freeboard. Prior to entering the South Stormwater Pond, stormwater would be routed through an oil/water separation vault system to remove oil. This vault system would have a water quality flow rate of 14.8 cfs and a peak flow rate of 20.0 cfs. The 100-year storm event would cause a flow of 12.7 cfs into the South Stormwater Pond, which would fall within the design parameters for this vault system (Wilson and Company 2015a).

To address increased flows as a result of the proposed project, the stormwater ponds would discharge to flow spreaders as recommended in the Ecology SWMMWW (Ecology 2014). Flow spreaders are used to reduce the erosive energy of concentrated flows by distributing the runoff as sheet flow. Both the North and South stormwater ponds have emergency shut-off valves on their discharge lines.

The North Stormwater Pond discharge flow spreader would be located approximately 500 feet to the east of the pond upslope and within the forested upland buffer of Wetland W (Figure 3.3-1). The South Stormwater Pond discharge flow spreader would be located approximately 200 feet to the east of the pond within Wetland I1 (Figure 3.3-1). The flow spreader would allow for

controlled sheet flow of water through the emergent freshwater portion of Wetland I1 before entering Stream S or the salt marsh portion of Wetland I1 and discharging to Padilla Bay.

It is possible that additional dissolved or suspended metals could enter into the stormwater system for the proposed project. If required NPDES permit monitoring were to show these levels increasing above NPDES thresholds, Shell would need to implement mitigation measures to remove metals prior to discharge. Treatment systems exist that can be installed within the current footprint of the facility and should not require an increased stormwater pond footprint. Additional wetland impacts could be avoided if this additional treatment step is needed.

Other facilities

The departure track, bad order tracks, and access roads are outside of the concrete containment system proposed for the rail unloading platform. The tracks and access roads south of 4th Street are also outside of this area and do not have additional spill protection. Therefore, any spills in these areas would enter the proposed stormwater system serving these facilities (stormwater channels leading to the North or South stormwater ponds).

Surface water flows

Existing surface water flows at the proposed project site would be changed by routing stormwater through the stormwater ponds or through the existing Shell PSR wastewater treatment system. The acreage of the contributing basin for Ditch D4 would be less than prior to construction. The upper portion of the drainage basin for this ditch would be rerouted to the North Stormwater Pond. The western portion of the ditches that drain along 4th Street would also be rerouted to either the North Stormwater Pond or the South Stormwater Pond, depending on the side of the street the surface water flowed. A portion of the stormwater that contributes to flows for Ditch D4 would also be routed to the wastewater treatment system in the Shell PSR through the oil/water separation pond and then discharged to Fidalgo Bay. This rerouting of stormwater would decrease the volume of water being discharged to Padilla Bay and route it to Fidalgo Bay. This is not expected to have a measureable effect on either Padilla Bay or Fidalgo Bay due to requirements set by the NPDES permit.

Based on modeling results reported (Wilson and Company 2015a), the existing and proposed peak flows at the proposed project site are listed in Table 3.3-3.

Table 3.3-3 Existing and Proposed Peak Flows for Entire Facility

Storm Event	Existing Peak Flows (cfs)	Proposed Peak Flows (cfs)	Percent Increase
2-year	10.47	18.85	80%
10-year	13.79	30.84	124%

The stormwater pond system is designed for detention and controlled release rates. The stormwater ponds would capture runoff volume and peak flows that would prevent erosion and sediment transport to the wetlands, streams, and ditches downslope of the pond discharges, and eventually into Padilla Bay, over the life of the project.

While the oil/water separation vaults associated with both the North and South stormwater ponds would capture daily operational oil releases, the system is not currently designed to address dissolved metals. The design is based on the assumption that the existing system would meet all water quality parameters on discharge and that the current discharge conditions would not change during operation of the proposed facility. It is possible, however, that the new facility and additional train traffic to the area could increase some constituents in the stormwater (e.g., dissolved metals from equipment wear). Future monitoring, as required by the facility's NPDES permit, would indicate whether additional treatment is warranted.

Indirect Impacts

The proposed project could produce changes to shallow groundwater and/or redirection of surface water flows. This rerouting would result from excavations within the project site to construct the unloading platform and associated facilities that currently support wetland hydrology and/or surface water flows in existing drainage ditches. These activities could also affect the hydroperiod of the wetlands adjacent to the proposed project facilities. Changes in the timing and/or volume of water discharging from the proposed stormwater ponds to wetlands downstream of these facilities could also lead to changes in vegetation communities that are adapted to the current hydroperiod of these areas. If changes in flow are great enough, the existing wetland boundaries could also be altered over time. Because the stormwater ponds would be designed to function as detention ponds, there would be changes to flow patterns adjacent to wetland areas compared with the existing conditions.

Wetland Mitigation Site

Direct Impacts

The wetland mitigation site is approximately 100 acres, and Shell is proposing to restore approximately 73 acres of the site to tidal estuary. The proposed development would restore a surface water connection between the 73-acre site and Padilla Bay by breaching the existing dike in selected areas and lowering the dike elevations down to mean higher high water (MHHW) in other areas. The dike breach and constructed tidal channels would allow for full exchange of tidal water while maintaining separation between the site and an expansive estuarine wetland to the east. Full exchange means that water levels within the site would match those in Padilla Bay and the dike breach openings would be wide enough to allow the site to drain during low tide.

A setback dike would be constructed to prevent flooding of the remaining 27 acres of the site, thereby protecting the existing structures such as buildings, natural gas pipeline, roads, and the Anacortes Subdivision. An objective of the wetland mitigation site design is to prevent flooding of surrounding property, either directly from tidal waters or indirectly from alterations to flows and water levels. In addition to the setback dike, flood protection would require the redirection of

surface flows and drainage channels from adjacent parcels and water bodies into the site. The wetland mitigation plan states that "[e]ither the pump station will need to be relocated to outside the proposed setback dike or a detention and gravity drain system will need to be used if possible. A pump station may be included as a back up to a gravity drainage system to allow pumping of stormwater over the dike during an intense storm to protect adjacent property from flooding" (AECOM 2016). If a pump system is used, the system would need to be maintained in perpetuity to ensure flooding is addressed.

Indirect Impacts

Over time, the establishment of tidal processes is expected to increase hydrologic and habitat functions within the wetland mitigation site. This would be accomplished by restoring tidal inundation and reestablishing an estuarine environment for vegetation and animals. The tidal channel configuration (i.e., shape, length, and location) would adjust to estuarine processes and is anticipated to sustain the appropriate tidal regime for the site. Historic hydrologic functions of the wetland mitigation site would be greatly improved by reconnecting the site with Padilla Bay, and restoring natural hydrology and tidal exchange. As a result, the wetland mitigation site would have beneficial impacts on surface water.

Anacortes Subdivision

Direct Impacts

Increased train traffic on the Anacortes Subdivision has the potential to increase accidents and require continued maintenance of the rail corridor. Maintenance and operation activities contribute petroleum-based products and heavy metals to stormwater discharge, which are currently not treated along the Anacortes Subdivision. The potential impacts of spills associated with transport of crude by rail to the Shell PSR are discussed in Chapter 4 – Environmental Health and Risk.

Train operations also likely contribute to deposition of airborne pollution. Deposition of particulate matter from diesel train exhaust is described in Chapter 3.10 – Air Quality and Greenhouse Gases. These materials currently are not at concentrations or levels known to affect human or aquatic life. However, concentrations of particulate matter are expected to increase with the additional trains and the number of trains idling in the area.

The Anacortes Subdivision contains a trestle and a swing bridge—the Swinomish Channel Swing Bridge.

The Anacortes Subdivision contains a trestle and moveable swing bridge across the Swinomish Channel. Passage over this bridge by unit trains proposed for the project is expected to take approximately 5 minutes each direction. Moving the bridge into position and then reopening the bridge (the swing bridge is open by default) would take an additional 2 to 5 minutes. Boats queuing for the bridge to reopen may contribute to an increase in water pollution associated with idling vessels.

Cumulative Impacts

As described above, construction and operation of the proposed project could result in impacts to surface water. Within the study area, there has been significant agricultural, industrial, commercial, and residential development. It is assumed that with this growth and construction, surface water resources have been affected. Construction and operation of the proposed Tesoro Clean Products Upgrade Project (Tesoro 2015) (see Table 3.0-2 in Chapter 3.0 – Introduction, for additional project details) has the potential to impact these resources. The Tesoro project and the proposed project could have cumulative impacts on surface water resources. These impacts would be minimized by construction BMPs and localized to the Tesoro Anacortes Refinery site and the proposed project and mitigation sites.

MITIGATION MEASURES

Avoidance and Minimization

Shell has incorporated engineering and operational measures into the design of the proposed project to avoid or minimize the potential for impacts on surface water, including:

- The proposed project would restore an estimated total of 700 linear feet of stream S and eight acres of riparian area.
- Several ditches currently contribute flow to Stream S near its point of origin. Flow from these ditches would be redirected into the newly constructed channel segment of Stream S originating slightly upslope (west) of its current headwaters.
- A new fence would be installed to maintain the new riparian buffer on Stream S that would be planted with native trees and shrubs. This buffer is expected to improve stream temperature, reduce erosion, improve channel structure, and benefit resident and migrating fish, including nonnatal Chinook salmon and Puget Sound steelhead.
- As described above, the rail unloading facility has been designed to contain and capture leaks or spills associated with operations to prevent the release of material into nearby waterbodies.

In addition, impacts to surface water would be minimized by implementing the BMPs required as part of the NPDES Construction and Industrial Stormwater Permit, CWA Section 401 and 404 permits, Hydraulic Project Approval, Skagit County Grading Permit, and Shoreline Substantial Development Permit. For example, to minimize a possible release of turbid or alkaline waters, water would be sampled for both turbidity and pH. This activity should occur at both the discharge points for the stormwater ponds and the exit points of the culverts under East March's Point Road, or other applicable discharge locations. This monitoring and reporting of water quality would be conducted during construction.

Mitigation

No additional mitigation measures are proposed beyond the avoidance and minimization measures that would be developed and enforced as part of the permitting process.

3.4 FISH AND AQUATIC SPECIES AND HABITAT

The chapter addresses fish and aquatic resources, which include fish, aquatic species, and their habitats, as well as marine mammals. Terrestrial and marine birds are discussed in Chapter 3.6 – Vegetation and Terrestrial Wildlife. The marine nearshore is the transition zone between terrestrial, freshwater, and marine ecosystems. A wide range of resources depend upon the nearshore because of its physical complexity, high productivity, complex food webs, diverse habitats, and organisms (Kozloff 1973).

STUDY AREA AND METHODOLOGY

The study area used to evaluate impacts on fish and aquatic species and habitat includes the *jurisdictional ditches*, streams, sloughs, and marine shorelines associated with Padilla and Fidalgo bays that are crossed by, or could receive runoff and stormwater discharge from, the proposed project site, the proposed wetland mitigation site, and the Anacortes Subdivision. This is the same study area used for the analysis of surface water resources as project construction and operations affecting surface waters could affect fish and aquatic species and habitat. Rail transport beyond the Anacortes Subdivision was not included in the study area because incremental increases in transport activities beyond this area are not anticipated to affect fish and aquatic species. Potential impacts from an accidental release of crude oil along the rail corridor are discussed in Chapter 4 – Environmental Health and Risk. Because the potential impacts associated with fish and aquatic species and habitat are localized, the cumulative impacts study area would be the same as that described above for direct and indirect impacts. It includes the ditches, streams, sloughs, wetlands, and marine shorelines associated with Padilla and Fidalgo bays.

Jurisdictional ditches are upland ditches carrying relatively permanent flow to traditionally navigable waters that are under the jurisdiction of the Clean Water Act and regulated by the U.S. Army Corps of Engineers (USACE).

Select laws, regulations, and guidance applicable to fish and aquatic species and habitat associated with the proposed project are summarized in Table 3.4-1.

Table 3.4-1 Laws, Regulations, and Guidance for Project-Related Fish and Aquatic Species and Habitat

Laws, Regulations, and Guidance	Description
Federal	
Clean Water Act (CWA) (33 USC 1251 et seq.)	Establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulates quality standards for surface water. Section 404 (33 USC 1344) establishes a program to regulate the discharge of dredged and fill material into waters of the United States, including wetlands.
The Federal Coastal Zone Management Act	Through the Federal Coastal Zone Management Act, coastal states with approved Coastal Zone Management Programs (CZMP) require projects operating under a federal permit or license to demonstrate consistency with the CZMPs. Federal Consistency allows states to review those projects that are likely to affect state coastal resources or uses.
Endangered Species Act (ESA) (16 USC 1531 et seq.)	Requires that applicants seeking a federal action undergo consultation with U.S. Fish and Wildlife Service (USFWS) and/or National Marine Fisheries Services (NMFS). This ensures the federal action is not likely to jeopardize the continued existence of any listed threatened or endangered animal species or result in the destruction or adverse modification of designated critical habitat. The USFWS and the NMFS share responsibility for implementing the ESA. The USFWS is responsible for terrestrial and freshwater species. The NMFS is responsible for marine species. Both NMFS and USFWS are responsible for designating critical habitat for ESA-listed species.
Magnuson-Stevens Fishery Conservation and Management Act, as amended by the Sustainable Fisheries Act of 1996 (Public Law 94-265)	Addresses needs for improved fishery monitoring, enhanced research, greater consideration of fishing communities, identification of essential fish habitat, formation of constituent advisory panels, and analysis of fishing capacity, among other activities.
State	
State Environmental Policy Act (SEPA) (RCW 43.21c; WAC 197-11)	Helps state and local agencies in Washington identify possible environmental impacts that could result from a proposed action, alternatives to the proposed action, and potential impact minimization and mitigation measures. Information learned through the review process can be used to change a proposal to reduce likely impacts and inform permitting decisions at the state and local levels.

Laws, Regulations, and Guidance	Description
Washington State Coastal Zone Management Program (WCZMP)	Under Washington's Coastal Zone Management Program (WCZMP), projects that are likely to affect state coastal resources or uses must be consistent with the WCZMP's enforceable policies found in the Shoreline Management Act, the Ocean Resource Management Act, the Water Pollution Control Act, and the Clean Air Act and all state regulations that implement those Acts.
Washington State Growth Management Act (RCW 36.70A)	Requires state and local governments to manage Washington's growth by identifying and protecting critical areas and natural resource lands, designating urban growth areas, and preparing comprehensive plans and implementing them through capital investments and development regulations.
Washington State Shoreline Management Act (RCW 90.58)	Provides a statewide framework for managing, accessing and protecting shorelines of the state and reflects the strong interest of the public in shorelines and waterways for recreation, protection of natural areas, aesthetics, and commerce.
Washington State Hydraulic Code (WAC 220-660; RCW 77.55)	A hydraulic project is the construction or performance of work that will use, divert, obstruct, or change the natural flow or bed of any of the salt or fresh waters of the state. Unless otherwise provided, any person who wants to conduct a hydraulic project must get a construction permit called the hydraulic project approval (HPA) from the Washington Department of Fish and Wildlife (WDFW). The purpose of the HPA is to ensure that construction or performance of work is done in a manner that protects fish life.
Water Pollution Control Act (RCW 90.48)	Maintains the highest possible standards to ensure the purity of all waters of Washington State are consistent with public health and public enjoyment, the propagation and protection of wildlife, birds, game, fish, and other aquatic life and industrial development of the state. To that end, requires the use of all known available and reasonable methods by industries and others to prevent and control the pollution of state waters.
Local	
Skagit County Critical Areas Ordinance (SCC 14.24)	This ordinance was developed under the directives of the Growth Management Act to designate and protect critical areas and to assist in conserving the value of property, safeguarding the public welfare and providing protection for these areas. Critical areas are defined as wetlands, aquifer recharge areas, frequently flooded areas, geologically hazardous areas, and fish and wildlife habitat conservation areas.

Laws, Regulations, and Guidance	Description
Skagit County Grading Permit	A Fill and Grade Permit may be required for any grading work involving substantial ground-disturbing activity (either fill or excavation) or any additional activity that affects drainage in the area.
Skagit County Shoreline Master Program (SMP) (SCC 14.26)	The Shoreline Master Program (SMP) is comprised of local land use policies and regulations designed to manage shoreline use. The SMP protects natural resources for future generations, provides for public access to public waters and shores, and plans for water-dependent uses. It was created in partnership with the local community and the Washington State Department of Ecology (Ecology) and must comply with the Shoreline Management Act and Shoreline Master Program Guidelines.

Direct impacts on fish and aquatic resources were identified at the proposed project site by reviewing the stream and ditch delineations conducted in 2013 (URS 2013), and overlaying the project footprint onto the identified aquatic resources. Marine resources in Padilla Bay were identified by reviewing available literature (Fresh 1979; Bulthuis 2013) and by conducting a site visit. Planned construction and mitigation activities were reviewed with Shell's representatives during a visit to both the proposed project and the wetland mitigation sites on December 8, 2015.

Existing available information was used to determine potential impacts on fish and aquatic resources at the proposed wetland mitigation site, including Shell's impact assessment, the draft mitigation plan (AECOM 2016b), draft biological evaluation (AECOM 2016a), and an analysis completed by a regional restoration planning project (PSNERP 2012).

To evaluate potential impacts associated with structures, streams, and ditches near the Anacortes Subdivision, maps identifying streams and county studies of stream resources were reviewed (Skagit County 2016).

AFFECTED ENVIRONMENT

Proposed Project Site

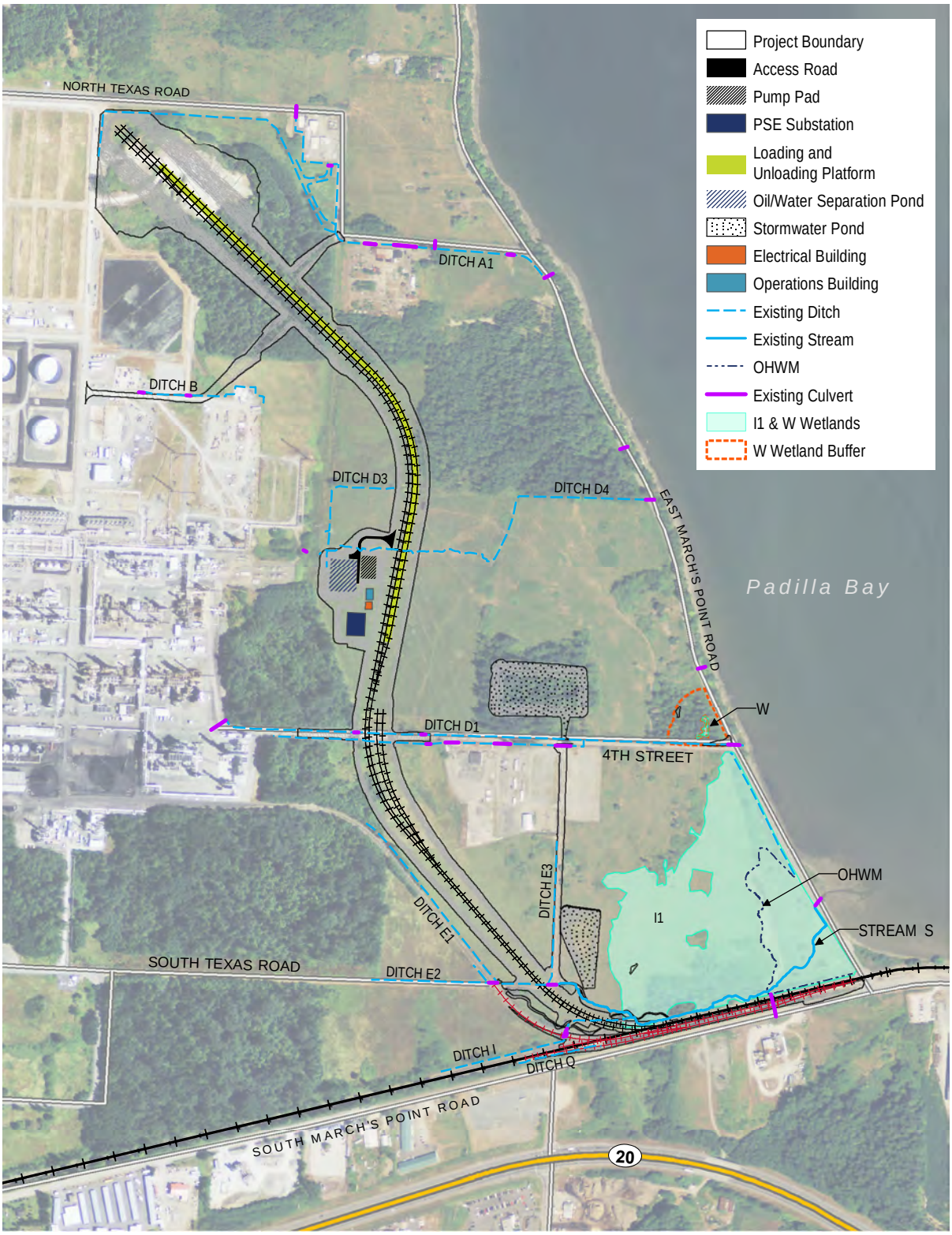
Streams and ditches were delineated within the project site (Figure 3.4-1). To differentiate between streams and ditches, certain watercourse characteristics were used: the origin or source water, the downstream connectivity of a watercourse to a significant watercourse or water body, the presence of characteristics common to natural watercourses such as having a channel with a defined bed and bank, and the presence of historical evidence of a stream (RCW 77.55 and WAC 220-660).

Based on these criteria, one stream (Stream S) and 13 ditch segments were identified in the project site and waterway determinations were confirmed during a field visit with Washington Department of Fish and Wildlife (WDFW) biologists (Thompson, personal communication). These watercourses flow in an easterly direction and drain into Padilla Bay (URS 2013). Stream S flows into Wetland I1 and both features are connected to Padilla Bay by fish-passable culverts under East March's Point Road. The ditches in the project area have seasonal flow; however, these drainage features lack characteristics associated with natural stream systems such as a natural headwaters source, downstream connectivity, and historical evidence of streams. Ditches D-3 and D-4 are the only ditches that are not constructed features designed to provide drainage. These ditches flow into Padilla Bay through perched culverts that cross under East March's Point Road approximately midway between 4th Street and North Texas Road and prevent upstream migration of fish. The ditches have not been mapped historically and receive a portion of their flow from industrial process water ponds.

Stream S (above)

Ditch E3

The southernmost drainage is identified as Stream S. Although unnamed, Stream S is a natural drainage channel that appears on historic maps of the area (Figure 3.4-1; USCGS 1886). Historically, this stream may have extended south of the Anacortes Subdivision and South March's Point Road; however, this area does not appear to be part of the current watershed due to local development patterns.



DATA SOURCE: (AECOM 2015, NAIP 2013, Skagit County 2015, WSDOT 2015)

N

0 200 400 Feet

Proposed Rail Track
BNSF Rail Improvement
Anacortes Subdivision
Local Road
State Highway

Figure 3.4-1

EXISTING WATERCOURSES – PROPOSED PROJECT SITE

Stream S receives surface flows from several ditches, including those that drain areas adjacent to the Anacortes Subdivision (Ditches Q and I), the existing rail spur to the Shell Puget Sound Refinery (PSR) (Ditch E-1), and South Texas Road (Ditches E-2 and E-3). Stream S starts at the outlet of a culvert at South Texas Road where the flow from several ditches joins together. The culvert has collapsed underneath the road and could not support upstream fish movement. Ditches west of South Texas Road are not accessible to fish due to the broken culvert. Also, these channels do not have natural watercourse characteristics meaning that, as man-made roadside ditches, they neither erode, transport, and deposit sediment, nor are they continuations of naturally occurring streams. East of the road, however, the channel has a defined bed and bank that moves and sorts sediments—features that are characteristic of natural watercourses.

What is the difference between a stream and a ditch?

Streams are natural watercourses that convey water from natural headwaters to a receiving waterbody.

Ditches are drainage features constructed to carry water away from built infrastructure.

Stream S extends approximately 1,300 feet until it reaches Wetland I1, and then another 500 feet until it discharges into Padilla Bay. The stream has been affected by the adjacent railroad, historic and present agricultural practices that limit habitat functions due to lack of riparian vegetation, and alterations to bed and bank structure caused by cattle grazing. The stream flows to an estuarine wetland complex that is connected to Padilla Bay through recently upgraded twin culverts. These culverts are fish passable and fish have been observed within the estuarine wetland and lower reaches of Stream S (Walker 2015). Shallow intertidal sampling in Padilla Bay suggests that fish found in the wetland complex and stream are likely to be primarily stickleback with seasonal use by rearing juvenile Chinook salmon (Beamer et al. 2007).

Regional studies suggest that stream systems similar in scale to Stream S and Wetland I1 may contain nonnatal juvenile Chinook fry migrants (Beamer et al. 2013). Nonnatal juvenile Chinook fry migrants are produced from adults that spawn in other stream systems and could be present between January and May. While the extent of upstream migration is unknown, it is presumed that fish have access up to the broken culvert at South Texas Road.

The ordinary high water mark (OHWM) for Padilla Bay extends to the west of East March's Point Road to the upland extent of salt tolerant vegetation associated with the estuarine Wetland I1 (URS 2013). Fish have access to this entire wetland area during high tides through two 62-inch-tall, 102-inch-wide concrete *culverts* that connect the wetland to Padilla Bay under East March's Point Road. These culverts were recently upgraded from a single undersized culvert, therefore, the wetland may continue to adjust to its improved hydrologic connection to Padilla Bay.

Culverts and structures may constrain natural changes to stream channels. Often culverts and structures force streams to change direction at sharp angles that can result in increased streamflow speeds, erosion of sediments, or may cause the structure to be impassable to fish.

Padilla Bay is an "Estuary of National Importance" and the majority of it has been designated as a National Estuarine Research Reserve. It is jointly managed by Washington State Department of Ecology (Ecology) and the National Oceanic and Atmospheric Administration (NOAA) with a focus on conservation, research, and education. Padilla Bay and the eastern shoreline of March Point are part of the post glacial Skagit River delta system that supports extensive eelgrass meadows and associated wildlife. Although the Skagit River contributed to the formation of Padilla Bay, when the Skagit and Samish rivers were diked in the 1880s, the bay lost direct connections to these riverine systems. The 7,400 acres of subtidal and intertidal eelgrass beds are the primary basis for the biological and ecological significance of Padilla Bay (Bulthuis 2013).

Padilla Bay and the eastern shoreline of March Point are part of the post glacial Skagit River delta system that supports extensive eelgrass meadows and associated wildlife. The 7,400 acres of subtidal and intertidal eelgrass beds are the primary basis for the biological and ecological significance of Padilla Bay (Bulthuis 2013).

A wide range of marine animals use the bay, such as invertebrates that provide food for marine mammals, fish, and birds. Specific species that occur in the area include Dungeness crabs, juvenile salmon, surf smelt, Pacific herring, sculpins, and shiner perch. Padilla Bay is dominated by schooling forage fish, including Pacific herring and surf smelt, with lower abundances of shiner perch, Pacific Staghorn, and starry flounder, and seasonal use by Chinook salmon (Beamer et al. 2007; Fresh 1979). A variety of birds also use Padilla Bay as described in Chapter 3.6 – Vegetation and Terrestrial Wildlife. Immediately adjacent to the southern shorelines of March Point is a complex of intertidal habitats that have been modified and disconnected from portions of Padilla Bay by the dredged navigation channel that connects to and includes the Swinomish Channel.

Several nonnative species are widespread in Padilla Bay: smooth cordgrass (*Spartina alterniflora)*, dwarf eelgrass (*Zostera japonica)*, soft-shell clam (*Mya arenaria)*, and purple mahogany clam (*Nuttalia obscurata)*. Two nonnative plants of special concern are cordgrasses and dwarf eelgrasses. Cordgrasses were intentionally introduced to the bay; however, control efforts began in 1994, and the population has since been reduced to scattered seedlings and clones covering less than 1 acre (Bulthuis 2013). Dwarf eelgrass primarily grows at higher elevations than native eelgrass (*Zostera marina)*; however, it may co-occur near the upper elevation boundary of native eelgrass.

Marine mammals such as harbor seals (*Phoca vitulina)* and porpoises may use Padilla Bay during a portion of their life cycle. Several harbor seal haulout sites—locations where seals temporarily leave the water to forage on land—have been recorded. The haulout sites nearest to the proposed project vicinity are approximately 1 mile north of the project site along the dredged channels leading toward Swinomish Channel (Jeffries et al. 2000). Southern Resident Killer Whales, or Orcas (*Orcinus orca*), are unlikely to use the area because of the shallow waters characteristic of Padilla Bay and Swinomish Channel. NMFS (2008) reports one to five observations of Southern Resident Killer Whales occurred in Padilla Bay between 1990 and 2005.

Harbor seal

Southern Resident Killer Whale (Orca)

Padilla Bay was seeded for Pacific oysters in the 1930s; however, high oyster mortality and poor oyster condition resulted in growers abandoning the bay in the 1960s (Bulthuis 2013). No geoduck beds have been identified in the bay, and other bivalves are uncommon. Furthermore, bacterial contamination may restrict recreational collection of shellfish in Padilla Bay with fecal coliform concentrations contributing to closures of recreational beds near Bay View. The Skagit County Marine Resources Committee and partners are leading ongoing efforts to reintroduce Olympia oysters and to enhance habitat in Fidalgo Bay. Natural recruitment of native oysters has been detected near the trestle in Fidalgo Bay and at Crandall Spit, suggesting that seeding efforts may be succeeding and that a population is now established and successfully reproducing in the area (Gabrian-Voorhees et al. 2013).

Padilla Bay supports large numbers of young-of-the-year Dungeness crabs that are found in intertidal eelgrass habitat. Mature crabs move into subtidal eelgrass areas and channel bottoms before moving into deeper channels (Bulthuis 2013).

A portion of Padilla Bay adjacent to the proposed project is included within the reservation boundaries for the Swinomish Tribe. In addition to interests in marine resources within their reservation, several tribes have usual and accustomed fish rights reserved by treaties in Padilla Bay and adjacent waters including Fidalgo Bay and Swinomish Channel. These include rights to a portion of the accessible catch of fisheries for subsistence, as well as ceremonial and commercial purposes. The impacts to tribal fisheries would the same as described for fish and aquatic resources in this chapter. Further discussion on these topics can be found in Chapter 3.8 – Treaty and Traditionally Used Resources.

Special-Status Fish, Marine Mammals and Habitats

Special-status fish, marine mammals and their habitats include the following:

- Federal proposed, candidate, threatened, and endangered species and critical habitat, and species that are managed by the Endangered Species Program of the U.S. Fish and Wildlife Service (USFWS) or National Marine Fisheries Services (NMFS).
- State Endangered, Threatened, Sensitive, and Candidate species.

Table 3.4-2 summarizes special-status species and habitats that may occur in the project study area.

Table 3.4-2 Special-Status Fish and Marine Mammal Species Documented or Potentially Occurring in the Study Area

Species	Status	Occurrence in the Study Area
Federally-Listed Species		
Puget Sound Chinook Salmon (*Onchorhynchus tshawytscha*)	Federal Threatened State Candidate	Puget Sound Chinook salmon are present in Padilla Bay, the Swinomish Channel, Big Indian Slough, Little Indian Slough, and Gages Slough. Fish have access to Wetland I1 and Stream S and are assumed to be present.
Puget Sound Steelhead (*Onchorhynchus mykiss*)	Federal Threatened	Puget Sound Steelhead are present in Padilla Bay, the Swinomish Channel, Big Indian Slough, Little Indian Slough, and Gages Slough. Fish have access to Wetland I1 and Stream S and are assumed to be present.
Coastal/Puget Sound bull trout (*Salvelinus confluentus*)	Federal Threatened State Candidate	Puget Sound bull trout are present in Padilla Bay, the Swinomish Channel, Big Indian Slough, Little Indian Slough, and Gages Slough. Fish have access to Wetland I1 and Stream S and are assumed to be present.
North American green sturgeon - Southern distinct population segment (DPS) (*Acipenser medirostris*)	Federal Threatened	Unlikely to be present in the study area.
Pacific Herring (*Clupea pallasi*)	State Candidate	Pacific herring are common in Padilla Bay and spawning aggregations occur in Fidalgo Bay on the west side of March Point.

Species	Status	Occurrence in the Study Area
Eulachon – Southern DPS (*Thaleichthys pacificus*)	Federal Threatened State Candidate	Eulachon are rarely found in the study area and no natal streams are known in the vicinity.
Bocaccio rockfish (*Sebastes paucispinis*)	Federal Endangered	Bocaccio rockfish are known to occur in Padilla Bay. Juvenile rockfish are found in shallow-water habitats; however, they are not expected to be found within Wetland I1 or Stream S due to low salinity characteristics.
Canary rockfish (*Sebastes pinniger*)	Federal Threatened	Canary rockfish are known to occur in Padilla Bay. Juvenile rockfish are found in shallow-water habitats; however, they are not expected to be found within Wetland I1 or Stream S due to low salinity characteristics.
Yellow rockfish (*Sebastes ruberrimus*)	Federal Threatened	Yellow rockfish are known to occur in Padilla Bay. Juvenile rockfish are found in shallow-water habitats, however, they are not expected to be found within Wetland I1 or Stream S due to low salinity characteristics.
Southern resident killer whale (*Orcinus Orca*)	Federal Endangered	Southern resident killer whales have been observed in Padilla Bay and the Swinomish Channel; however, occurrences are rare in these areas. Shallow waters adjacent to the project site are unlikely to be used by killer whales.
Steller sea lion (*Eumetopias jubatus*)	Federal Threatened	Steller sea lions are generally associated with coastal waters, but could occur in Swinomish Channel or Padilla Bay in small numbers.

Wetland Mitigation Site

The proposed wetland mitigation site is currently a diked and drained area that was historically converted to agriculture and supports hybrid poplar trees. This area was dramatically altered by several types of activities over many decades: the deepening of the Swinomish Channel to support navigation; the construction of dikes and draining of uplands to support agriculture; and the construction of State Route (SR) 20 and the Anacortes Subdivision. These changes converted

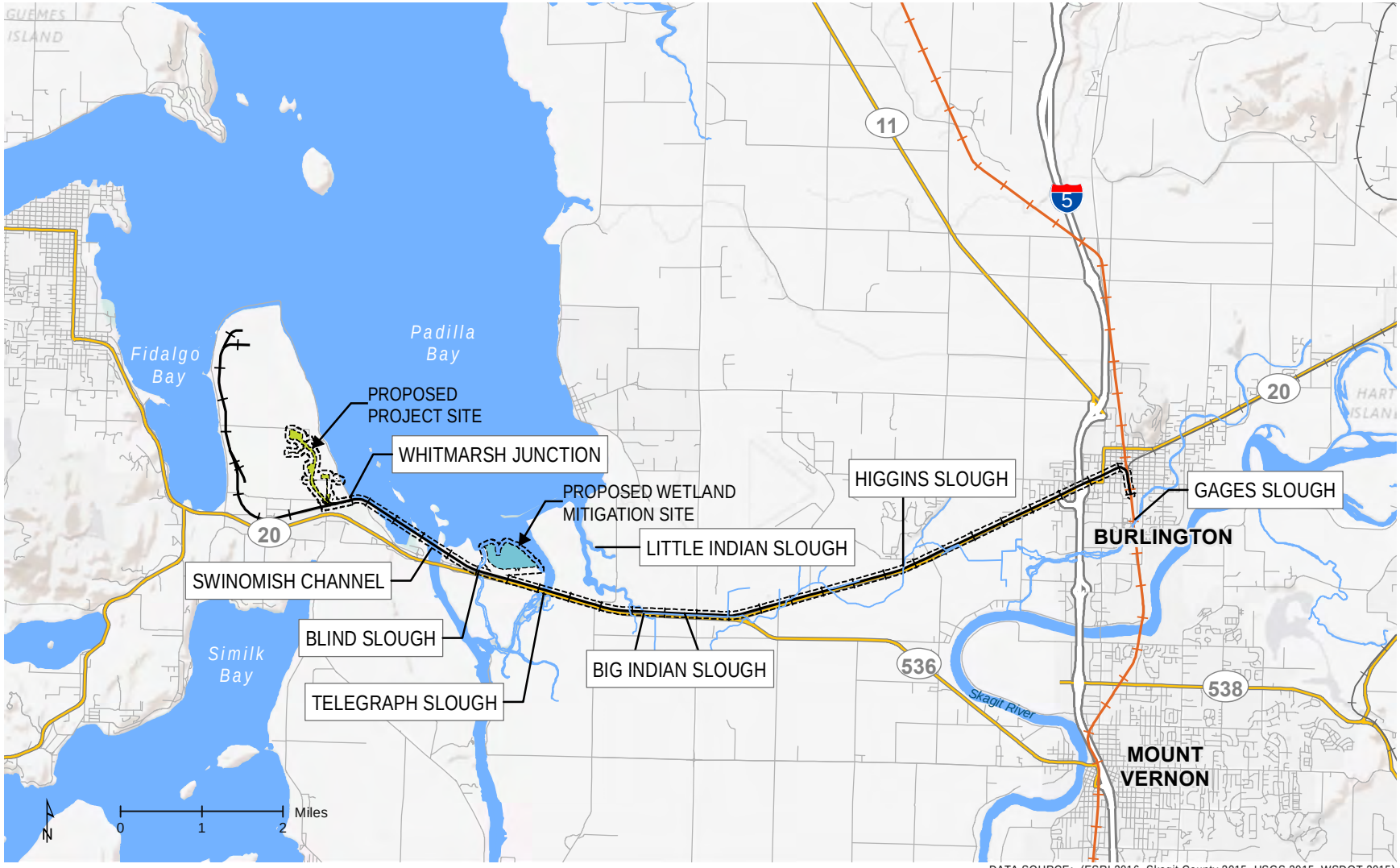
a complex of estuarine wetlands and tidal sloughs into agricultural uses and freshwater wetlands. Fish and aquatic resources in Padilla Bay cannot currently access the area due to a perimeter dike and a pump station that prevent water movement onto the site. Furthermore, current dike maintenance practices have prevented the development of vegetation along the dike, resulting in a lack of riparian vegetation.

Anacortes Subdivision

East of March Point, the Anacortes Subdivision runs for approximately 10.5 miles to Burlington where it joins the Bellingham Subdivision (Figure 3.4-2). Between March Point and Burlington, the Anacortes Subdivision crosses Stream S, the Swinomish Channel, Blind Slough, Telegraph Slough, Unnamed Tributary to Big Indian Slough, Big Indian Slough, and Higgins Slough. The railway fill and tracks form the southwestern shoreline of Padilla Bay near Whitmarsh, which includes a trestle opening at Whitmarsh before crossing the Swinomish Channel. The Anacortes Subdivision crosses Big Indian Slough multiple times and the slough flows between the rail line and SR 20 for approximately 1.5 miles. Portions of Big Indian Slough are being restored by Drainage and Irrigation Improvement District 19 as mitigation for continued maintenance of their flow control structures.

The aquatic habitats in the project vicinity include freshwater, estuarine, and marine ecosystems. Salmonids—steelhead, Chinook, coho, pink, and chum salmon—are documented or predicted to be present in Little Indian Slough, Big Indian Slough, and Gages Slough (WDFW 2016). The portion of Padilla Bay south of the rail trestle between March Point and the Swinomish Channel near Whitmarsh Junction has direct connections to Padilla Bay; therefore, any species present in Padilla Bay may also access these sites.

Gages Slough



DATA SOURCE: (ESRI 2016, Skagit County 2015, USGS 2015, WSDOT 2015)

Project Site Location
Proposed Wetland Mitigation Site
Study Area Boundary
Anacortes Subdivision
Bellingham Subdivision
BNSF Railway
Local Road
State Highway
Interstate Highway
Waterbody

Figure 3.4-2

STREAM AND WATERWAY CROSSINGS – ANACORTES SUBDIVISION

ENVIRONMENTAL IMPACTS

No Action Alternative

Because no construction or operation would take place under the no action alternative, there would be no impacts to fish or aquatic resources. Existing conditions would remain the same unless affected by other projects in the future. Riparian improvements along Stream S would not occur. Upstream movements of fish would continue to be blocked at the broken culvert at South Texas Road. The wetland mitigation site would remain in its current condition and would continue to be separated from Padilla Bay by a dike that prevents tidal flow onto the site.

Proposed Project Site

Direct Impacts

Permanent impacts to fish and aquatic resources would include the loss or reconfiguration of drainage channels and an on-site stream, as well as changes to riparian habitat. The proposed project would result in the reconfiguration of all drainages crossing the project area.

Water from ditches would be captured and conveyed across the rail project in a culvert or intercepted by stormwater systems and directed into one of two proposed stormwater ponds on the east side of the project area. These ponds include pre-treatment oil/water separation systems and provide for detention and controlled release. While stormwater detention ponds can be associated with increases in water temperatures (Jones and Hunt 2010), water from the ponds is discharged through spreaders to upland areas or freshwater wetlands that could allow for infiltration during appropriate levels of inundation. Therefore, water could infiltrate into the groundwater instead of draining through surface ditches to Padilla Bay. When ground is saturated, the flow from discharges is presumed to form sheet flow until reaching a drainage ditch, wetland, or stream. The South Stormwater Pond would discharge into portions of Wetland I1. Although peak flows from the Stormwater system are projected to increase from the current baseline (see Chapter 3.3 – Surface Water), discharges from this system would be to upland discharge points. Therefore, the configuration of the stormwater system is not expected to cause increases in peak flows in the existing drainage ditches, therefore stormwater is not expected to increase erosion within the streams, ditches, or in Padilla Bay. Discussion of potential impacts associated with stormwater can be found in the Chapter 3.3 – Surface Water.

Ditches conveying water to the existing Stream S would be rerouted to enter a newly constructed stream channel (Figure 3.4-3) designed to provide for riparian habitat and stream channel sinuosity. As a result, flow in the existing channel would be reduced or eliminated between South Texas Road and where the new channel would join Stream S near its existing confluence with Ditch I. The dewatered section of Stream S would remain in place and would capture surface flow. Diverted flow would be routed to a new channel segment that would extend from the current origin of Stream S to the downstream confluence with the existing Stream S.

The current channel alignment is constrained as it runs between the existing Anacortes Subdivision rail line embankment and the proposed project's new rail spur. The new channel segment would include a new 75-foot-long culvert under that rail spur (Figure 3.4-3). Although fish have not been observed in this area, they are presumed to have access under both present and future conditions.

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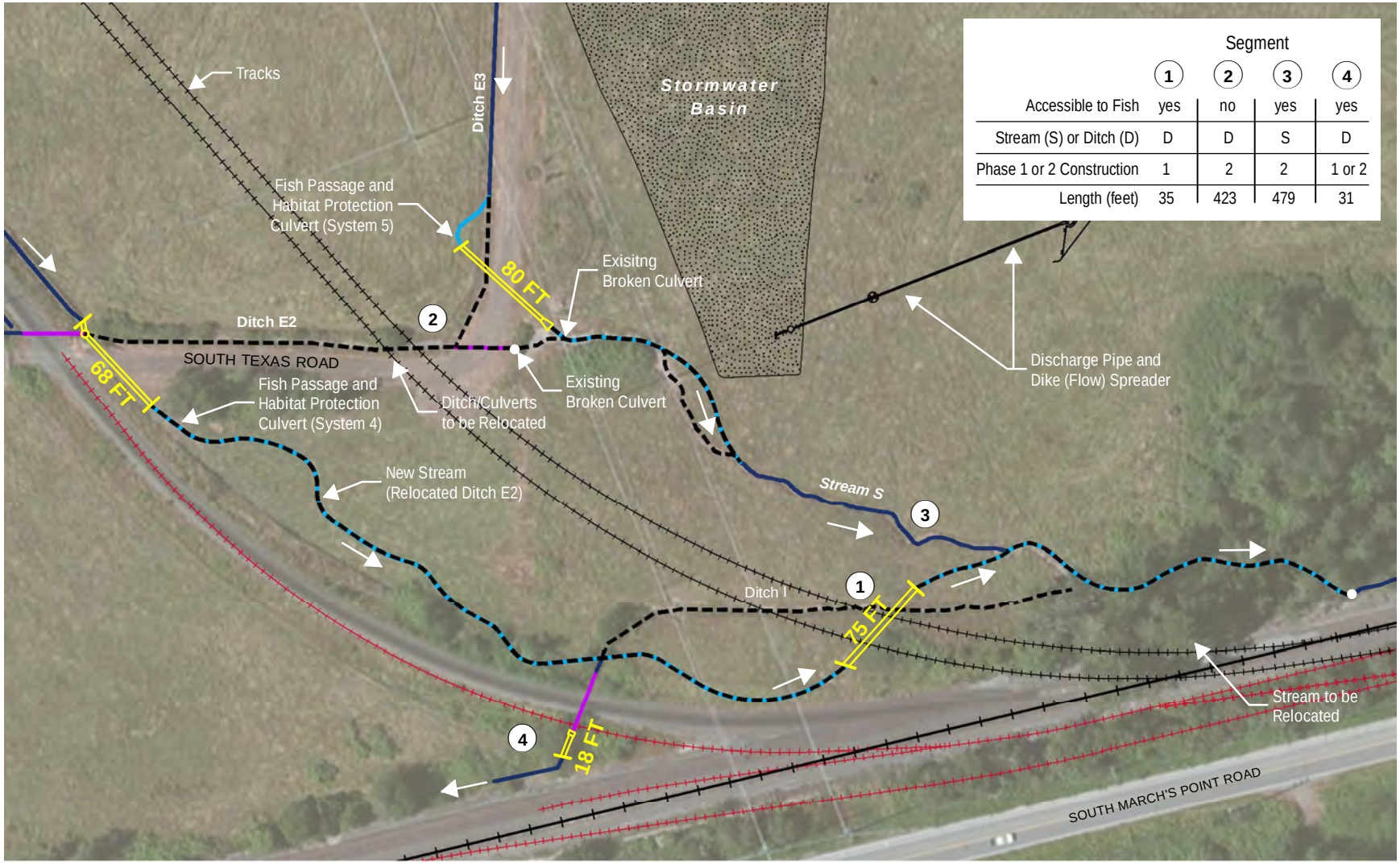


	Segment 1	2	3	4
Accessible to Fish	yes	no	yes	yes
Stream (S) or Ditch (D)	D	D	S	D
Phase 1 or 2 Construction	1	2	2	1 or 2
Length (feet)	35	423	479	31

DATA SOURCE: (AECOM 2015, ESRI 2016, Skagit County 2015, WSDOT 2015)

Existing Stream/Ditch
Existing Culvert
Ditch/Stream/Culvert to be Removed
New Ditch/Stream
New Culvert
Proposed Rail Track
BNSF Rail Improvement
Anacortes Subdivision

N

0 50 100 Feet

Figure 3.4-3
STREAM "S" RECONFIGURATION

A stormwater pollution prevention plan (SWPPP) has been developed by Shell to identify best management practices (BMPs) and institutional controls and responsibilities to limit erosion and prevent water quality degradation (Wilson and Company 2014). Construction activities would occur within streams, ditches, and wetlands.

Shell's SWPPP specifies that sampling would occur at the outlets of existing culverts to ensure discharges do not exceed water quality standards (25 nephelometric turbidity units [NTU]). If samples were to exceed 25 NTU, additional measures could be implemented. Water quality would be maintained through monitoring and, if necessary, remedial actions as required by permits. While turbid conditions reduce the visual ability of fish, young fish can thrive in turbid environments (Gregory and Levings 1998). However, high concentrations of suspended solids can cause physiological and behavioral stress responses in fish (Bruton 1985), likely affecting the biological integrity of the aquatic system (Karr 1991). Further discussion of water quality is provided in Chapter 3.3 – Surface Water.

During construction, a fish barrier would be installed. Fish would be relocated downstream prior to instream work in Stream S. Major earthwork, including construction of the new Stream S, are planned to occur during the dry season between May 1 and September 30 (Wilson and Company 2014). Immediately following construction of the new stream channel, it is likely that some sediment would be mobilized as the bed material is sorted by flow and lighter material is transported downstream.

Changes to available fish habitat, introduction of turbid water to the environment during storm events, and fish handling associated with site isolation and in-water construction activities in Stream S could affect fish. These activities could impact a small number of fish and result in the loss of one or more fish. Species affected are likely to be limited to stickleback based on the timing and locations where in-water work would occur. The number of fish affected is not expected to measurably affect their populations, or other species that feed on fish.

Impacts from stormwater operations are expected to be similar to those described above. However, during operations, stormwater associated with the rail unloading facility would be treated at the existing wastewater treatment plant within the Shell PSR. Stormwater within the rail unloading platform would be collected and routed to the oil/water separation pond system before being routed to the wastewater plant. Following treatment, those waters would be discharged into Fidalgo Bay through an existing National Pollution Discharge Elimination System (NPDES) permitted outfall. Discharges would be monitored to demonstrate continued compliance with NPDES permit conditions for that outfall to prevent impacts to fish and aquatic resources in Fidalgo Bay. Further details of this treatment system are described in Chapter 3.3 – Surface Water.

The proposed project may also result in a reduction of marine vessel traffic to and from the Shell PSR (see Chapter 2 – Proposed Project and Alternatives). This reduction may reduce the potential for adverse impacts to aquatic habitat associated with marine vessel transport, including vessel or unloading accidents.

Anacortes Subdivision

Direct Impacts

Impacts to fish and aquatic resources may result from increased operations and maintenance along the Anacortes Subdivision. Train operations along the rail line would likely contribute to deposition of airborne pollution, vibration and in-air noise, potential for accidents, and require continued maintenance of the rail corridor.

Deposition of particulate matter from diesel train exhaust is described in Chapter 3.10 – Air Quality and Greenhouse Gases. These materials are not at concentrations or levels known to affect aquatic life (Maltby et al. 1995). However, concentrations of particulate matter are expected to increase with the number of trains or from idling trains in the area.

Rail traffic on the Bellingham Subdivision and other subdivisions on the proposed project route travels near or crosses aquatic resources beyond the study area including the Skagit River and Puget Sound. While no impacts to these resources are anticipated during typical operations, a derailment or spill could result in impacts. Potential impacts from a spill during transport of crude oil to Shell PSR are discussed in Chapter 4 – Environmental Health and Risk.

The Anacortes Subdivision contains a trestle and a swing bridge across the Swinomish Channel. Train passage over the trestle takes approximately 5 minutes each direction. Closing and opening the bridge takes an additional 2 to 5 minutes (the bridge is open by default to allow marine vessels to pass freely). Closures of the swing bridge may temporarily block navigation in the Swinomish Channel for approximately 10 to 15 minutes per instance. Such events may cause vessels to hold position or slow travel to accommodate train traffic. Boats queuing for the bridge may increase chances for collisions, as well as create additional air, sound, and water pollution associated with idling vessels. The bridge was built in 1891 with the bridge truss replaced in 1953. Increased use of the bridge may require more frequent inspections and maintenance activities, which could create short-term disturbances of fish or marine mammals in the immediate vicinity. See Chapter 3.15 – Rail Traffic and Transportation, for additional information about bridge inspections. No improvements to the swing bridge or mitigation for its operation are currently planned by BNSF Railway.

Swinomish Channel Swing Bridge

Fish, marine mammals, and diving birds are sensitive to in-water noise and vibration (see Chapter 3.6 – Vegetation and Terrestrial Wildlife). The rail corridor is primarily comprised of ballast and culverts for conveying streams and water bodies. There are five rail bridges in the study area: Whitmarsh, Swinomish Channel, and three that cross Big Indian Slough. Noise and vibration associated with these structures appears to be primarily from train wheels passing over the joints of the bridge at Swinomish Channel. The noise is minimized by moving the trains at low speeds during train crossings.

Existing rail traffic along the Anacortes Subdivision crosses each of these waterbodies. In addition to potentially limiting fish passage, existing bridges and culverts conveying water under the rail line segments may cause small-scale impacts by altering local channel formations and hydraulics (Blanton and Marcus 2009). Train operation associated with the proposed project would not directly affect these structures. Continued use of the railway would involve maintenance of bridges and culverts.

The railway and ballasted areas also affect stormwater runoff when compared with other land uses. Gravel surfaces and railroad yards have runoff coefficients—the proportion of rainfall running off a site—ranging between 0.2 and 0.4, while ballasted tracks are predicted to have higher runoff coefficients of approximately 0.55. These data suggest that runoff is 25 to 35 percent higher than natural land uses (Molinas and Mommandi 2012) within the study area. Ballasted railway tracks are designed to drain rainfall, which is why a greater proportion of rainfall is released as runoff from ballasted tracks than railway yards or gravel areas. Typically, a portion of the initial rainfall infiltrates into the ballast; however, as storm intensity increases, a greater proportion of subsequent rainfall would be released as runoff. Altered runoff characteristics of existing railways may continue to affect fish and aquatic resources in stream systems and receiving waterbodies near the rail line.

Ongoing vegetation maintenance along rail tracks restricts riparian habitat development in areas where the rail corridor is near streams and marine shorelines. The Anacortes Subdivision is within the riparian buffer of aquatic systems. A continued lack of riparian vegetation may affect stream temperatures and recruitment of prey items for aquatic resources. Furthermore, BNSF Railway's vegetation maintenance activities may include the application of herbicides. Some herbicide formulations are toxic to aquatic life; however, herbicide applications are expected to follow label guidance to minimize impacts to aquatic habitats.

Wetland Mitigation Site

Direct Impacts

A tidal channel would be constructed within the wetland mitigation site to support flow and fish access. These restored habitats would contribute prey resources and organic matter to Puget Sound and contribute valuable nursery habitat for juvenile salmon.

Development of the proposed wetland mitigation site is intended to compensate for impacts to onsite wetlands as discussed in Chapter 3.5 – Wetlands. Mitigation actions on this site would also affect fish and aquatic resources. During construction, temporary disturbances of fish habitat would occur. These disturbances are likely to include increased turbidity associated with the removal of vegetation, exposure of soils and increased flow across the site. By removing portions of the perimeter dike and supporting tidal exchange within the site, fish would gain access to habitat previously unavailable to them. The entire extent of habitat that would develop on the wetland mitigation site is presumed to be accessible to fish from Padilla Bay, as well as support a diverse mix of estuarine wetland habitats and vegetation. A tidal channel would be constructed within the site to support flow and fish access. These restored habitats would

contribute prey resources and organic matter to Puget Sound and valuable nursery habitat for juvenile salmon.

As noted above, the wetland mitigation site occurs in an area where a complex of estuarine wetlands and tidal sloughs have been dramatically altered over many years. The large-scale changes in this vicinity have attracted interest in restoration projects. The proposed wetland mitigation effort appears to be compatible with, and provides initial steps toward, restoration of the larger wetland complex identified by the Puget Sound Nearshore Estuary Restoration Project, namely the potential Strategic Restoration Concept for Telegraph Slough (PSNERP 2012). Mitigation sites are protected in perpetuity as compensation for project impacts. They often receive legal protections that prevent or add complexity to future restoration efforts. Appropriate coordination with Washington Department of Fish and Wildlife restoration program staff regarding the Telegraph Slough Restoration project may facilitate future restoration by creating design and mitigation requirements that include sufficient flexibility.

Cumulative Impacts

As described above, construction and operation of the proposed project could result in impacts to fish and aquatic species and habitat. Within the study area, there has been significant agricultural, industrial, commercial, and residential development. It is assumed that with this growth and new construction, fish and aquatic resources have been affected. Construction and operation of the proposed Tesoro Clean Products Upgrade Project (Tesoro 2015) (see Table 3.0-2 in Chapter 3.0 – Introduction, for additional project details) has the potential to impact these resources. The Tesoro project and the proposed project could have cumulative impacts to fish and aquatic species and habitat. These impacts would be minimized by construction BMPs and localized to the Tesoro Anacortes Refinery site and the proposed project and mitigation sites.

MITIGATION MEASURES

Avoidance and Minimization

Shell has incorporated engineering and operational measures into the design of the proposed project to avoid or minimize the potential for impacts on fish and aquatic resources. The upper portion of Stream S would be moved away from the existing rail embankment and approximately 700-linear-feet channel would incorporate sinuosity and in-channel habitat. This new channel segment would include a 75-foot-long fish-passable culvert that would allow the stream segment to cross under the new rail spur. The current channel would not be filled; however, most of the flow would be diverted to the newly constructed stream segment.

Specific design measures would also minimize the potential for impacts from a release of oil at the proposed rail unloading facility. They are described in further detail in Chapter 3.3 – Surface Water.

Impacts to fish and aquatic species and habitat would also be minimized by the implementation of the BMPs required as part of the NPDES Construction Stormwater Permit, CWA Section 404 Individual Permit, CWA Section 401 Water Quality Certification, Skagit County Grading Permit,

Hydraulic Project Approval, and Shoreline Substantial Development Permit. For example, stormwater and erosion control BMPs would be implemented to reduce sediments discharging into surface waters. The measures would also be implemented at the proposed restoration site to reduce sediments discharging into ditches and wetlands. Stockpiled soils would be covered to reduce erosion during precipitation events.

Mitigation

No additional mitigation measures are proposed beyond the avoidance and minimization measures that would be developed and enforced as part of the permitting processes.

3.5 WETLANDS

Wetlands are defined as areas that are saturated or inundated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation adapted for life in saturated soil conditions. Wetlands are biologically diverse and dynamic ecosystems; they can perform a variety of unique physical, chemical, and biological functions that benefit both human and biological environments. These functions can include flood storage and retention, stream base flow maintenance and groundwater support, water quality improvement, shoreline protection, and biological support for fish and wildlife habitat (Hruby et al. 1999). Wetland areas are also used for a broad range of recreational, educational, and aesthetic activities including bird watching and hunting. Many factors can affect a wetland's capacity to perform specific functions, such as the size of the wetland, the landscape and basin location, vegetation diversity, and the level of disturbance.

STUDY AREA AND METHODOLOGY

The study area for the evaluation of potential impacts on wetlands includes the 166-acre proposed project site and the 100-acre wetland mitigation site. Potential impacts to wetlands were also studied for the area within 300 feet of the Anacortes Subdivision. This distance was determined based on the wetland site assessment requirements in the Skagit County Code (SCC). Other select laws, regulations, and guidance applicable to wetlands associated with the proposed project are summarized in Table 3.5-1. The cumulative impacts study area is Water Resource Inventory Area (WRIA) 3, Lower Skagit Samish (Figure 3.5-1). WRIA 3 is the watershed that provides water quality functions to Padilla Bay and Fidalgo Bay.

Figure 3.5-1 Wetland Study Area for Cumulative Impacts

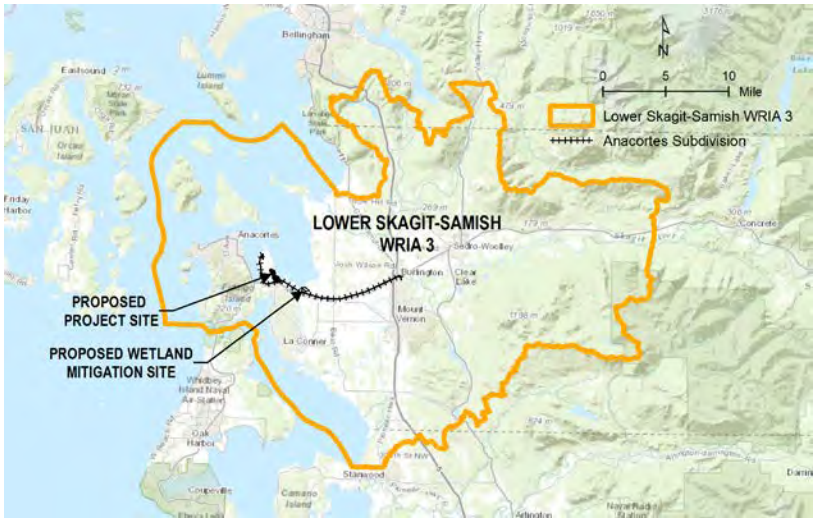


Table 3.5-1 Laws, Regulations, and Guidance for Project-Related Wetlands

Laws, Regulations, and Guidance	Description
Federal	
Clean Water Act (CWA) (33 USC 1251 et seq.)	Establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulates quality standards for surface water. Section 401(33 USC 1251) Water Quality Certifications are required for any activity that requires a federal permit or license to discharge any pollutant into waters of the United States. This certification attests that the responsible agency has reasonable assurance the proposed activity will meet its water quality standards. Section 404 (33 USC 1344) established a program to regulate the discharge of dredged and fill material into waters of the United States, including wetlands.
The Federal Coastal Zone Management Act	Through the Federal Coastal Zone Management Act, coastal states with approved Coastal Zone Management Programs (CZMP) require projects operating under a federal permit or license to demonstrate consistency with the CZMPs. Federal Consistency allows states to review those projects that are likely to affect state coastal resources or uses.
State	
State Environmental Policy Act (SEPA) (RCW 43.21c; WAC 197-11)	Helps state and local agencies in Washington identify possible environmental impacts that could result from a proposed action, alternatives to the proposed action, and potential impact minimization and mitigation measures. Information learned through the review process can be used to change a proposal to reduce likely impacts and inform permitting decisions at the state and local levels.
Washington State Coastal Zone Management Program	Under Washington's Coastal Zone Management Program (WCZMP), projects that are likely to affect state coastal resources or uses must be consistent with the WCZMP's enforceable policies found in the Shoreline Management Act, the Ocean Resource Management Act, the Water Pollution Control Act, and the Clean Air Act and all state regulations that implement those Acts.

Laws, Regulations, and Guidance	Description
Washington State Shoreline Management Act (RCW 90.58)	Provides a statewide framework for managing, accessing and protecting shorelines of the state and reflects the strong interest of the public in shorelines and waterways for recreation, protection of natural areas, aesthetics and commerce.
Washington State Hydraulic Code (WAC 220-660)	A hydraulic project is the construction or performance of work that will use, divert, obstruct, or change the natural flow or bed of any of the salt or fresh waters of the state. Unless otherwise provided, any person who wishes to conduct a hydraulic project must get a construction permit called the hydraulic project approval (HPA) from the Washington Department of Fish and Wildlife (WDFW). The purpose of the HPA is to ensure that construction or performance of work is done in a manner that protects fish life.
Local	
Skagit County Critical Areas Ordinance (SCC 14.24)	This ordinance was developed under the directives of the Growth Management Act to designate and protect critical areas and to assist in conserving the value of property, safeguarding the public welfare and providing protection for these areas. Critical areas are defined as wetlands, aquifer recharge areas, frequently flooded areas, geologically hazardous areas, and fish and wildlife habitat conservation areas.
Skagit County Shoreline Master Program (SCC 14.26)	The Shoreline Master Program (SMP) is comprised of local land use policies and regulations designed to manage shoreline use. The SMP protects natural resources for future generations, provides for public access to public waters and shores, and plans for water dependent uses. It was created in partnership with the local community and Ecology and must comply with the Shoreline Management Act and Shoreline Master Program Guidelines.
Skagit County Grading Permit	A Fill and Grade Permit may be required for any grading work involving substantial ground disturbing activity (either fill or excavation) or any additional activity that affects drainage in the area.

Impacts on wetlands at the proposed project site were evaluated by overlaying the project footprint onto previously delineated wetland boundaries and wetland buffers (URS 2013). Wetland buffers are based on SCC 14.24.230. Potential impacts on wetlands at the proposed mitigation site and along the Anacortes Subdivision rail line were qualitatively evaluated using existing available information, including the Draft Mitigation Plan (AECOM 2016) and the National Wetland Inventory (NWI) database (USFWS 2016).

According to Skagit County, a critical area buffer (including wetland) is defined as "an area that is contiguous to and protects a critical area which is required for the continued maintenance, functioning, and/or structural stability of a critical area" (SCC 14.04.020).

How were wetland functions assessed at the proposed project and mitigation sites?

- Functions of individual wetlands at the proposed project and mitigation sites were assessed using the state wetland rating system developed by the Washington State Department of Ecology (Ecology).
- Wetland delineations conducted after January 1, 2015, must be assessed using the Washington State Rating System for Western Washington: 2014 Update (Hruby 2014).
- For wetland delineations conducted prior to January 1, 2015, Ecology accepts the 2004 rating system, the Washington State Wetland Rating System for Western Washington - Revised, Washington State Department of Ecology Publication # 04-06-025 (Hruby 2004).
- As of July 1, 2016, Skagit County requires the 2014 rating system to categorize wetlands for establishing wetland buffer widths and replacement ratios for wetlands (SCC 14.24.200).
- Both systems score wetlands based on a wetland's capacity to perform water quality treatment, hydrologic, and habitat support functions. These function scores provide a baseline measurement of wetland functions.
- Wetlands at the proposed project site were delineated in 2013; therefore, their functions were assessed using the 2004 rating system.
- The functional assessment at the proposed wetland mitigation site was conducted in the fall of 2013 and the summer of 2015. Therefore the wetlands at the mitigation site were assessed using both the 2004 and 2014 rating systems.
- The 2014 rating system includes a new scoring range that is based on a qualitative scale of functions ranging from high, medium, and low. The new system also assesses the landscape potential and value.

An evaluation of potential impacts on wetland functions and values at the proposed project and wetland mitigation sites was conducted by reviewing Shell's impact assessment (AECOM 2016). Wetland delineations and functional assessments at these sites are still preliminary and would be subject to review and verification by the Washington State Department of Ecology (Ecology) and the U.S. Army Corps of Engineers (USACE) as part of the Section 401 and 404 permitting process. Shell is required to work with both agencies to verify that wetlands were characterized and assessed appropriately. Potential impacts on wetlands along the Anacortes Subdivision (i.e., within 300 feet) were not based on formal wetland delineations or functional assessments.

AFFECTED ENVIRONMENT

See Appendix B for detailed descriptions of individual wetlands.

Proposed Project Site

Shell evaluated all areas within the proposed project site for the presence of wetlands in 2013 and identified a total of 23 wetlands (Appendix B, URS 2013). The locations of these wetlands and their buffers are shown on Figure 3.5-2; details are provided in Table 3.5-2.

The identified wetlands vary in size from less than 0.1 acre to more than 45 acres. Wetland D is the largest at the proposed project site. Ten wetlands (Wetlands E3, E4, E5, E6, O, Q, R, T, U, and W) are located in topographic depressions; three wetlands (Wetlands I2, BB, and CC) are associated with slopes. Eight wetlands (Wetlands A, D, E, J, S, V, Y, and Z) contain both depressional and slope HGM classes (*see sidebar*) but are primarily depressional wetlands and are rated as such. These wetlands receive direct precipitation and surface runoff from the surrounding grazed or developed land, and some receive channelized flow from ditches located on the proposed project site.

Approximately 7.45 acres of Wetland D contain numerous small depressions that are within upland areas and can remain inundated for more than two weeks. This portion of Wetland D is characterized as a mosaic wetland, or a "patchwork" of smaller wetlands that is typically considered one unit. The remaining two wetlands (Wetlands I1 and N) are intertidal estuarine wetlands that are either completely or partially influenced by tides. One stream (Stream S) flows into Wetland I1 at the southern end of the project site.

Wetland vegetation classes consist of palustrine emergent (PEM), palustrine scrub-shrub (PSS), palustrine forested (PFO), and estuarine emergent (EEM) classes (*see sidebar*). Fifteen wetlands (Wetlands A, E3, E4, E5, E6, I2, J, O, R, U, V, Y, Z, BB, and CC) are classified as PEM, and seven (Wetlands D, E, I1, Q, S, T, and W) are PFO. Five of the forested wetlands (Wetlands D, E, I1, Q, and S) also include scrub-shrub, emergent, forested mosaic, and/or estuarine components. Wetland N is comprised of an EEM class and is located adjacent to Padilla Bay, north of the Anacortes Subdivision rail line.

What wetland classes occur at the project site?

Cowardin Classification
(physical characteristics within)

Palustrine emergent (PEM)
Areas dominated by sedges, rushes, grasses, cattails, and bulrushes.

Palustrine scrub-shrub (PSS)
Areas dominated by woody vegetation less than 20 feet tall.

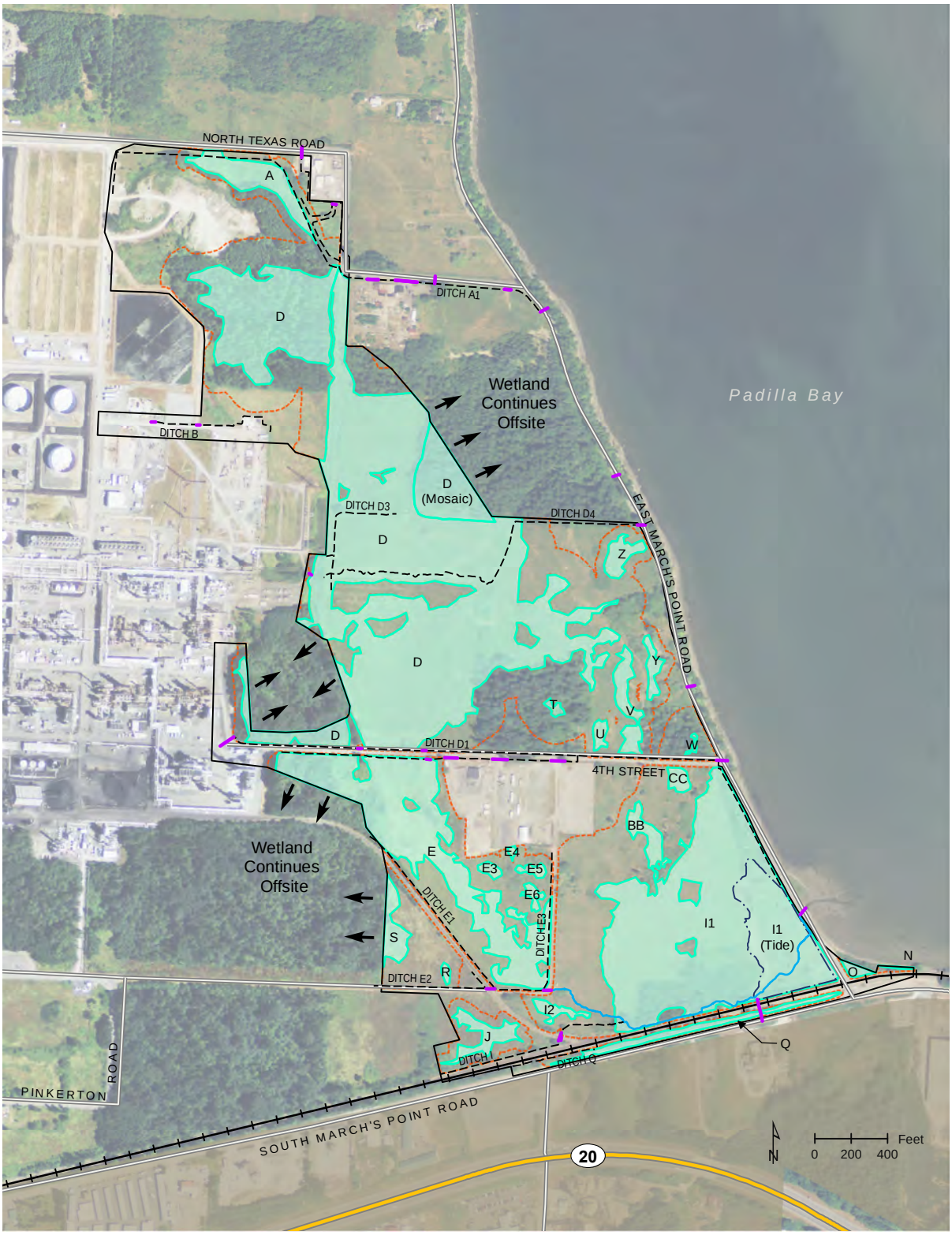
Palustrine forested (PFO)
Areas dominated by woody vegetation that is 20 feet or taller.

Estuarine emergent (EEM)
Areas characterized by erect, rooted, herbaceous hydrophytes (plants adapted to living in submerged water), excluding mosses and lichens.

Hydrogeomorphic (HGM) Classification
(function and position)

Depressional
Wetlands that occur in topographic depressions and allow surface water to accumulate. Depression wetlands may have any combination of inlets and outlets or lack them completely.

Slope
Slope wetlands are associated with groundwater discharge to the surface lands or sites with saturated overflow with no channel formation. They normally occur on sloping land ranging from slight to steep.



DATA SOURCE: (AECOM 2015, NAIP 2013, Skagit County 2015, WSDOT 2015)

Wetland Study Area Boundary
Wetland Buffer
Tidal Marsh
Wetland
Existing Ditch
Existing Stream
Existing Culvert
Anacortes Subdivision
Local Road
State Highway

Figure 3.5-2
EXISTING WETLANDS AND BUFFERS – PROPOSED PROJECT SITE

Table 3.5-2 Wetlands in the Proposed Project Site

Wetland Name	Wetland Rating Ecology[1] /Local	Hydrogeomorphic Classification[2]	Cowardin Classification[3]	Approx. Size (acres)	Buffer Width (feet)[4]	Dominant Species[5]
A	IV	Depressional/Slope	Palustrine emergent	2.02	50	Tall fescue (*Festuca arundinacea*), soft rush (*Juncus effusus*), and reed canarygrass (*Phalaris arundinacea*)
D	III	Depressional/Slope	Palustrine forested/ Palustrine scrub-shrub/Palustrine emergent/ Forested Mosaic	45.86	150	Red alder (*Alnus rubra*), black cottonwood (*Populus balsamifera*), western red cedar (*Thuja plicata*), Nootka rose (*Rosa nutkana*), salmonberry (*Rubus spectabilis*), Douglas spirea (*Spiraea douglasii*), Sitka willow (*Salix sitchensis*), colonial bentgrass (*Agrostis capillaris*), crested dogtail (*Cynosurus cristatus*), tall fescue, meadow foxtail (*Alopecurus pratensis*),and slough sedge (*Carex obnupta*)
E	III	Depressional/Slope	Palustrine forested/ Palustrine emergent	10.75	150	Red alder, black cottonwood, Pacific crabapple (*Malus fusca*), velvetgrass (*Holcus lanatus*), colonial bentgrass, tall fescue, crested dogtail, meadow foxtail, softrush (*Juncus effusus*), and white clover (*Trifolium repens*)
E3	IV	Depressional	Palustrine emergent	0.17	50	Velvetgrass, colonial bentgrass, tall fescue, meadow foxtail, white clover, Kentucky bluegrass (*Poa pratensis*), and crested dogtail
E4	IV	Depressional	Palustrine emergent	0.05	50	Velvetgrass, colonial bentgrass, tall fescue, meadow foxtail, white clover, Kentucky bluegrass, and crested dogtail
E5	IV	Depressional	Palustrine emergent	0.18	50	Velvetgrass, colonial bentgrass, tall fescue, meadow foxtail, white clover, Kentucky bluegrass, crested dogtail

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Wetland Name	Wetland Rating Ecology[1] /Local	Hydrogeomorphic Classification[2]	Cowardin Classification[3]	Approx. Size (acres)	Buffer Width (feet)[4]	Dominant Species[5]
E6	IV	Depressional	Palustrine emergent	0.2	50	Velvetgrass, colonial bentgrass, tall fescue, meadow foxtail, white clover, Kentucky bluegrass, crested dogtail
I1	II	Depressional/Slope/ Tidal Fringe	Palustrine forested/ Palustrine scrub-shrub / Palustrine emergent/ Estuarine intertidal emergent wetland	22.17	300	Black cottonwood, red alder, Pacific crabapple, Douglas spirea, Nootka rose, Sitka willow, velvetgrass, colonial bentgrass, creeping bentgrass (*Agrostis stolonifera*), tall fescue, crested dogtail, meadow foxtail, and softrush
I2	IV	Slope	Palustrine emergent	0.35	50	Velvetgrass, colonial bentgrass, creeping bentgrass, tall fescue, crested dogtail, meadow foxtail, softrush, and white clover
J	IV	Depressional/Slope	Palustrine emergent	0.92	50	Velvetgrass, colonial bentgrass, creeping bentgrass, tall fescue, meadow foxtail, and softrush
N	II	Tidal Fringe	Estuarine intertidal emergent wetland	0.04	300	Lyngbye's sedge (*Carex lyngbyei*)
O	III	Depressional	Palustrine emergent	0.18	150	Common cattail (*Typha latifolia*)
Q	III	Depressional	Palustrine forested/ Palustrine scrub-shrub	1.01	150	Pacific willow (*Salix lasiandra*), Sitka willow, Scouler's willow (*Salix scouleriana*), Douglas spiraea, Nootka rose, salmonberry, Pacific crabapple, and black twinberry (*Lonicera involucrata*)

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Wetland Name	Wetland Rating Ecology[1] /Local	Hydrogeomorphic Classification[2]	Cowardin Classification[3]	Approx. Size (acres)	Buffer Width (feet)[4]	Dominant Species[5]
R	IV	Depressional	Palustrine emergent	0.1	50	Velvetgrass, colonial bentgrass, creeping bentgrass, tall fescue, and meadow foxtail
S	II	Depressional/Slope	Palustrine forested/ Palustrine scrub-shrub/ Palustrine emergent	0.86	300	Black cottonwood, quaking aspen (*Populus tremuloides*), western red cedar, red alder, salmonberry, Douglas spirea, Nootka rose, Sitka willow, velvetgrass, tall fescue, meadow foxtail, and sweet vernal grass (*Anthoxanthum odoratum*)
T	III	Depressional	Palustrine forested	0.12	150	Black cottonwood, quaking aspen, western red cedar, red alder, salmonberry, Pacific crabapple, red elderberry (*Sambucus racemosa*), and Indian plum (*Oemleria cerasiformis*)
U	IV	Depressional	Palustrine emergent	0.24	50	Velvetgrass, colonial bentgrass, tall fescue, meadow foxtail, and white clover
V	IV	Depressional/Slope	Palustrine emergent	1.07	50	Velvetgrass, colonial bentgrass, tall fescue, meadow foxtail, white clover, and Kentucky bluegrass
W	III	Depressional	Palustrine forested	0.06	150	Black cottonwood, quaking aspen, Scouler's willow, salmonberry, Pacific crabapple, black twinberry, Indian plum, lady fern (*Athyrium filix-femina*), and fringe cup (*Tellima grandiflora*)
Y	IV	Depressional/Slope	Palustrine emergent	0.42	50	Velvetgrass, colonial bentgrass, tall fescue, meadow foxtail, white clover, and Kentucky bluegrass

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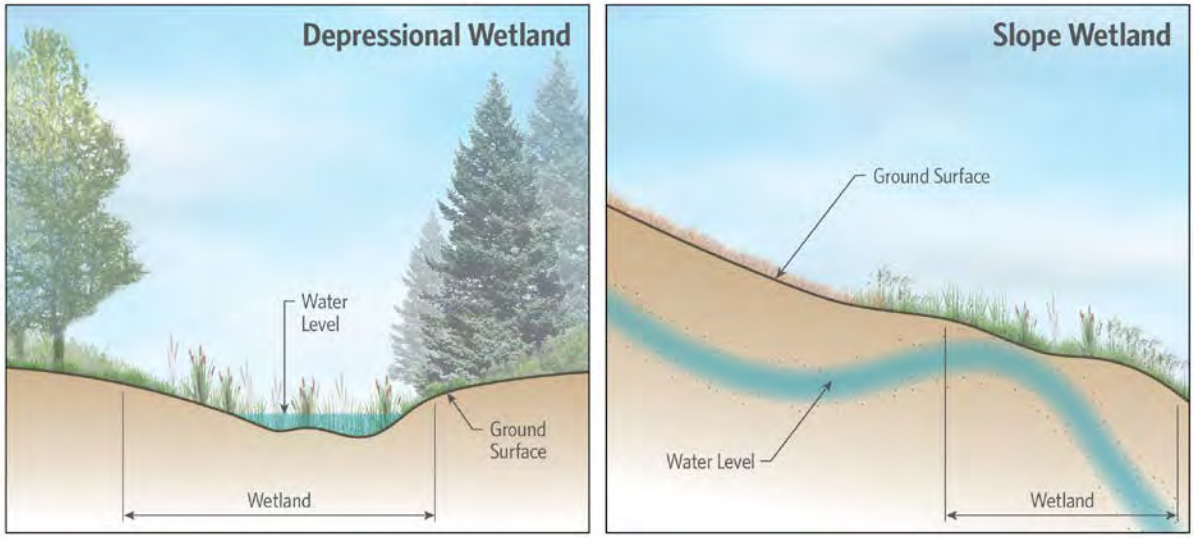
Wetland Name	Wetland Rating Ecology[1] /Local	Hydrogeomorphic Classification[2]	Cowardin Classification[3]	Approx. Size (acres)	Buffer Width (feet)[4]	Dominant Species[5]
Z	IV	Depressional/Slope	Palustrine emergent	0.64	50	Meadow foxtail, colonial bentgrass, tall fescue, white clover, and Kentucky bluegrass
BB	IV	Slope	Palustrine emergent	0.74	50	Velvet grass, colonial bentgrass, creeping bentgrass, tall fescue, white clover, and crested dogtail
CC	IV	Slope	Palustrine emergent	0.31	50	Velvet grass, colonial bentgrass, creeping bentgrass, tall fescue, white clover, and crested dogtail

Notes:
1. Ecology rating based on the 2004 rating system (Hruby 2004).
2. Hydrogeomorphic classifications are based on *A Hydrogeomorphic Classification of Wetlands* (Brinson 1993).
3. Source: Cowardin et al. 1979.
4. Buffer widths are based on SCC 14.24.230.
5. Source: AECOM 2016.

Figure 3.5-3 Hydrogeomorphic Classification System Features



Emergent wetlands on the project site are pastures that have been grazed by cattle. They are dominated by nonnative pasture grasses and forbs. Invasive species such as reed canarygrass (*Phalaris arundinacea*) and Canada thistle (*Cirsium arvense*) are also present in the pastures. As a result, species diversity in these emergent wetlands is low.

Forested wetlands on the project site consist of mixed coniferous and deciduous forests with shrub and herbaceous understory layers. Dominant trees in the wetlands include red alder (*Alnus rubra*), black cottonwood (*Populus balsamifera*), western red cedar (*Thuja plicata*), and quaking aspen (*Populus tremuloides*). The understory shrub and herbaceous species present in the forested wetlands consist of Nootka rose (*Rosa nutkana*), salmonberry (*Rubus spectabilis*), Douglas spirea (*Spiraea douglasii*), Sitka willow (*Salix sitchensis*), Pacific crabapple (*Malus fusca*), black twinberry (*Lonicera involucrata*), slough sedge (*Carex obnupta*), lady fern (*Athyrium filix-femina*), and fringe cup (*Tellima grandiflora*). Mosaic wetlands are present in the forested community of Wetland D, and the mosaic area contains Himalayan blackberry (*Rubus armeniacus*) and evergreen blackberry (*Rubus laciniatus*) that are rooted in the upland hummocks.

Small areas of scrub-shrub community are also present in Wetlands D, I1, and S. These areas are primarily dominated by Nootka rose, salmonberry, Douglas spirea, and Sitka willow. The estuarine community in Wetland N is dominated by Lyngbye's sedge (*Carex lyngbyei*).

Wetlands can provide water quality, hydrologic, and wildlife support functions. Using the 2004 rating system (Hruby 2004), water quality, hydrologic, and wildlife support functions were assessed for all palustrine wetlands on the project site. The Ecology rating system does not rate functions of estuarine wetlands; therefore, functions of Wetland N and a tidal fringe portion of Wetland I1 were not assessed. Table 3.5-3 summarizes the level of functions that each palustrine wetland provides.

Table 3.5-3 Palustrine Wetland Functions in the Project Site[1]

Wetlands by HGM Class	Water Quality Function	Hydrologic Function	Habitat Function
Depressional Wetlands			
A	Low	Low	Low
D	Moderate	Low	Moderate
E	Low	Low	Moderate
E3	Low	Low	Low
E4	Low	Low	Low
E5	Low	Low	Low
E6	Low	Low	Low
I1[2]	Moderate	Low	Moderate
J	Low	Low	Low
O	High	Moderate	Low
Q	Moderate	Low	Low
R	Low	Low	Low
S	Moderate	Low	Moderate
T	High	Low	Low
U	Low	Low	Low
V	Low	Low	Low
W	Moderate	Low	Low
Y	Low	Low	Low
Z	Low	Low	Low

Wetlands by HGM Class	Water Quality Function	Hydrologic Function	Habitat Function
Slope Wetlands			
BB	Low	Low	Low
CC	Low	Low	Low
I2	Low	Low	Low

Notes:
1. Low, moderate, and high functional categories are based the wetland assessment conducted by URS (2013).
2. Applies only to the palustrine portion of Wetland I1.
3. Source: AECOM 2016.

All these wetlands have the opportunity to provide a water quality improvement function. However, this function is limited because grazing reduces or eliminates the opportunity for wetlands to slow down surface flows and trap pollutants. The project site has been used as grazing pasture for the last several decades (AECOM 2016). As a result, 15 wetlands are rated low for this function. Wetlands with moderate and high water quality functions (Wetlands D, I1, Q, S, W, and T) have a relatively smaller portion of grazed vegetation and/or a larger seasonal ponding area.

Wetlands in the project site have the potential to reduce flooding and erosion as they include some ponding areas and smaller contributing basins. However, because most of these wetlands have shallow depths of ponding with outlets, the majority of the wetlands provide reduced functions in this regard. Almost all the wetlands are rated low for hydrologic support functions, except for Wetland O. Wetland O scores moderate for this function because it lacks an outlet and has a capacity to retain surface water. Additionally, wetlands at the project site are not known to provide groundwater recharge into an underlying aquifer or freshwater seepage into Padilla Bay. A previous study documented that the vertical hydraulic conductivity is very slow at the project site due to the presence of a thick, dense clay layer (Landau Associates 1988, as cited in AECOM 2016). A geotechnical study and on-site shallow groundwater monitoring studies for this project also confirmed the presence of the clay layer (AECOM 2016).

Most wetlands in the project site provide habitat for wetland-associated species. Vegetation types, water regime, plant species diversity, habitat interspersion, connectivity to other habitats, presence of dense emergent and shrub vegetation, large downed woody debris, and snags contribute to the overall habitat function of wetlands. Eighteen wetlands provide low habitat functions because of their small size and disturbance from grazing and adjacent land use. Wetlands D, E, I1, and S provide a moderate level of habitat function due to their relatively large size, presence of multiple vegetation types, and multiple water regimes. Most of these wetlands have low opportunity to provide habitat for wildlife. The wetland buffers have been disturbed and livestock grazing has limited habitat connectivity.

Wetland Mitigation Site

Wetland information presented below is based on site reconnaissance conducted at the wetland mitigation site in the fall of 2013 and summer of 2015. Based on the site reconnaissance, the mitigation site has been determined to have hydric soils and hydrology. The entire area is considered a wetland with the exception of the existing gravel access road and dike (AECOM 2016).

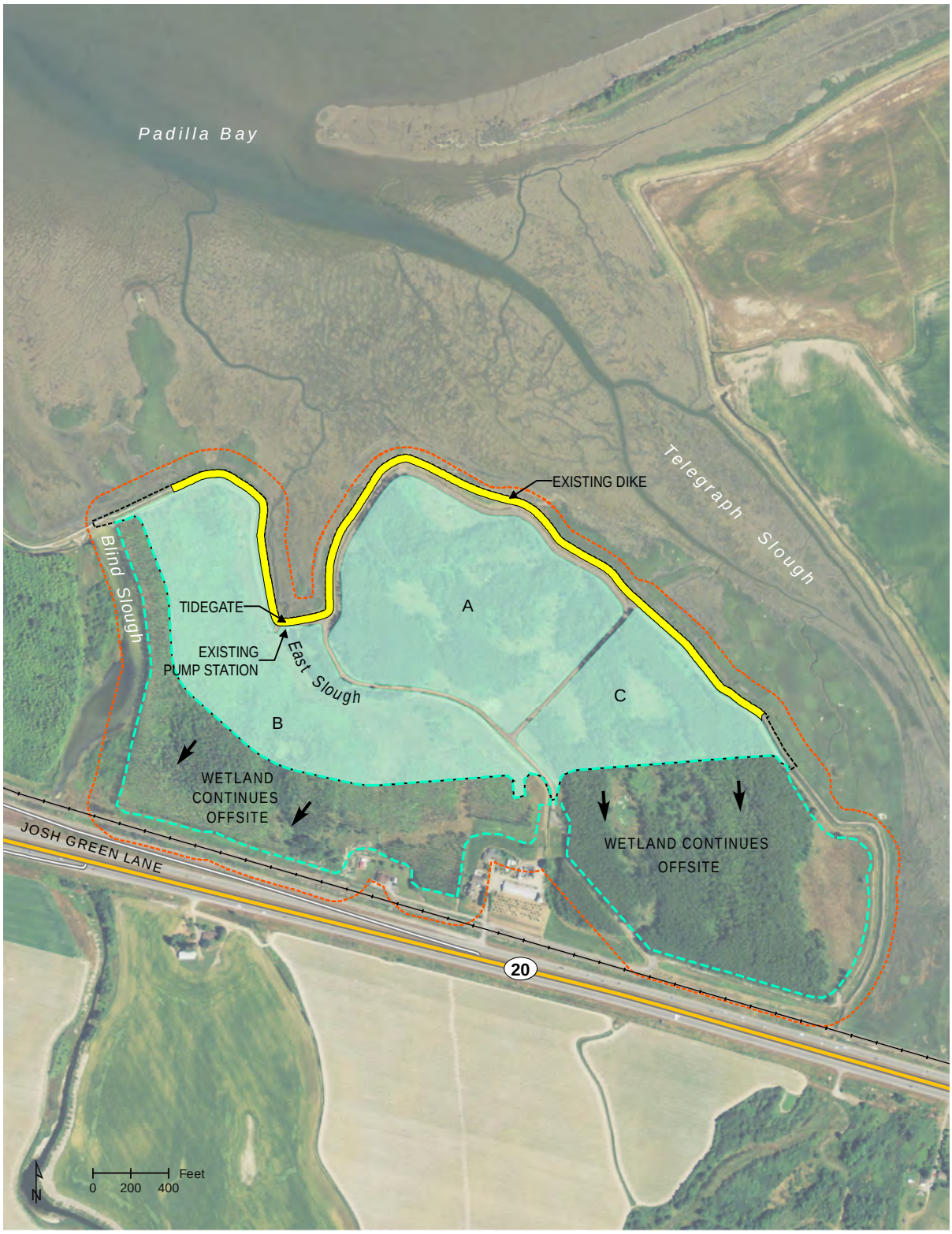
Three wetlands (Wetlands A, B, and C) were identified within the mitigation site. These wetlands and their buffers are presented in Figure 3.5-4. These wetlands are bisected by gravel access roads but have similar characteristics; therefore, they were rated as one wetland unit (AECOM 2016). Table 3.5-4 summarizes the size, rating, and classification of wetlands. This wetland unit was rated using the 2004 and 2014 rating systems and categorized as Category III under both systems. Functions of this wetland unit are described below with the 2004 rating system to compare with the affected functions at the project site.

Table 3.5-4 Wetlands on the Mitigation Site

Wetland Name	Wetland Rating Ecology[1]/Local[2]	Hydrogeomorphic Classification[3]	Cowardin Classification[4]	Approx. Size (acres)[5]	Buffer Width (feet)[6]
A	III	Depressional	PEM/PSS/PFO	29.6	150
B	III	Depressional	PEM/PSS/PFO	58.3	150
C	III	Depressional	PEM/PSS/PFO	49.3	150

Notes:
1. Ecology rating based on the 2004 rating system (Hruby 2004).
2. Local ratings based on SCC 14.24.210.
3. Hydrogeomorphic classifications are based on *A Hydrogeomorphic Classification of Wetlands* (Brinson 1993).
4. Source: Cowardin et al. 1979.
5. Wetland size is estimated based on the exhibits prepared for the Draft Mitigation Plan (AECOM 2016) and aerial photographs.
6. Buffer widths based on SCC 14.24.230.

All three are depressional wetlands surrounded by an existing dike that separates the wetlands from Telegraph Slough and Padilla Bay. The land at the mitigation site has subsided since it was diked and farmed more than 100 years ago. As a result, all wetlands at the site are approximately 2 to 3 feet below the elevation of the top of the salt marsh that is present waterward of the dike. A remnant tidal channel, commonly known as East Slough, is located within the mitigation site. Because of the dike, this channel is no longer connected to the bay, and it largely serves as a drainage ditch. East Slough flows north along the access road, and the northern edge of Wetland B drains into a small ponded area at the base of the dike where a pump house and a tidegate are located. At low tide, water is pumped across the dike into Padilla Bay (AECOM 2016). Another small ditch is located on the northern end of the mitigation site that runs parallel to the dike and the access road. East Slough and the small drainage ditch do not appear to effectively drain the mitigation site, as evidenced by high groundwater levels.



DATA SOURCE: (AECOM 2016, NAIP 2013, Skagit County 2015, WSDOT 2015)

Proposed Wetland Mitigation Site
Wetlands
Off-site Wetland
Wetland Buffer (150')
Existing Dike
Anacortes Subdivision
Local Road
State Highway

Figure 3.5-4
EXISTING WETLANDS AND BUFFERS - WETLAND MITIGATION SITE

All three are depressional wetlands surrounded by an existing dike that separates the wetlands from Telegraph Slough and Padilla Bay. The land at the mitigation site has subsided since it was diked and farmed more than 100 years ago. As a result, all wetlands at the site are approximately 2 to 3 feet below the elevation of the top of the salt marsh that is present waterward of the dike. A remnant tidal channel, commonly known as East Slough, is located within the mitigation site. Because of the dike, this channel is no longer connected to the bay, and it largely serves as a drainage ditch. East Slough flows north along the access road, and the northern edge of Wetland B drains into a small ponded area at the base of the dike where a pump house and a tidegate are located. At low tide, water is pumped across the dike into Padilla Bay (AECOM 2016). Another small ditch is located on the northern end of the mitigation site that runs parallel to the dike and the access road. East Slough and the small drainage ditch do not appear to effectively drain the mitigation site, as evidenced by high groundwater levels.

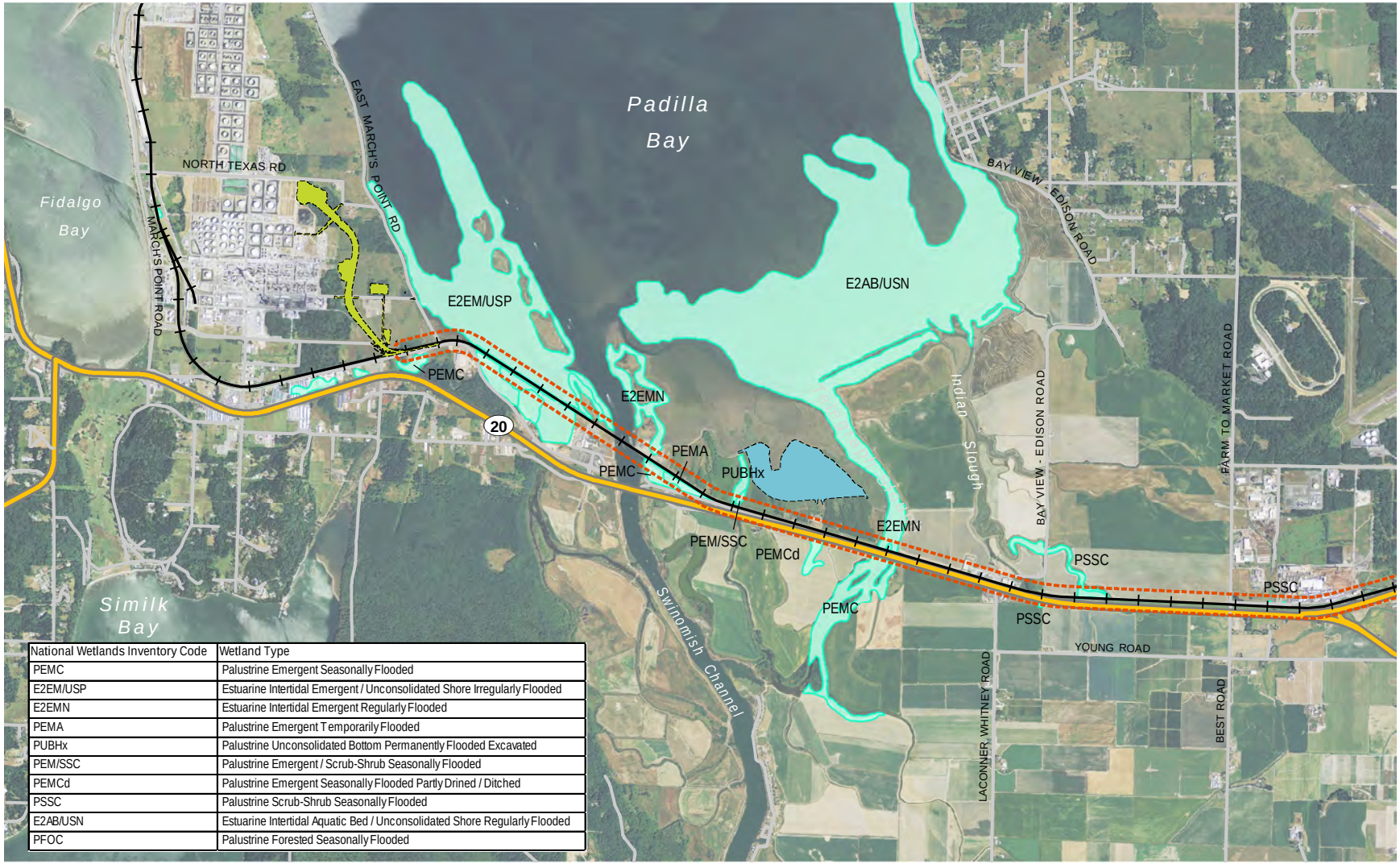
Wetland vegetation classes on the mitigation site consist of PEM, PSS, and PFO. The forested and scrub-shrub communities are primarily dominated by hybrid poplars (*Populus trichocarpa x P. deltoides*) and Himalayan blackberry. The understory of the poplar trees consists of black twinberry (*Lonicera involucrata*), paper birch (*Betula papyrifera*), and evergreen blackberry (*Rubus laciniatus*). The poplars were planted between 1997 and 1998, spaced 8 feet apart and in rows 11 feet apart. Willowherb (*Epilobium ciliatum*), velvetgrass (*Holcus lanatus*), colonial bentgrass (*Agrostis capillaris*), and sword ferns (*Polystichum munitum*) are also present in the wetlands.

Wetlands A, B, and C have a moderate potential to improve water quality due to the presence of dense vegetation and seasonal ponding areas. However, these wetlands do not provide this function because there are no significant sources of pollutants entering the wetlands. Also, Wetlands A, B, and C have some potential to store surface water because of their confined outlets and the subsidence. Wetlands A, B, and C, however, lack opportunity to reduce flooding and erosion downstream for two reasons: 1) flow coming into the wetlands is mostly controlled by a tidegate and, 2) they are located lower in the watershed. The presence of multiple vegetation classes and water regimes contributes to a moderate potential for habitat functions of Wetlands A, B, and C, though they contain few habitat features and have low native species diversity. Habitat support functions of these wetlands are limited by the presence of the flood control dikes and the access roads.

No wetland delineations have been conducted waterward of the existing dike. Based on the NWI database, the waterward portion of the existing dike is classified as an estuarine intertidal aquatic bed/unconsolidated shore (USFWS 2016). Estuarine wetlands according to the Cowardin system include intertidal areas of high marsh with rooted emergent vegetation and rocky intertidal areas. Based on the aerial photo interpretations, most of this area is likely tidal mudflats as there appears to be no vegetation. Estuarine wetlands would likely be limited to the vegetated area between tidal mudflats and the existing dike. This type of wetland likely provides foraging habitat for juvenile salmonids and shorebirds.

Anacortes Subdivision

The NWI database identified 15 wetlands along the Anacortes Subdivision rail line (Figures 3.5-5 and 3.5-6). Of the 15 wetlands, three are classified as estuarine wetlands. Those wetlands are associated with Padilla Bay, Swinomish Channel, Telegraph Slough, or Indian Slough, and contain salt-tolerant emergent vegetation. Only one wetland along the alignment consists of forested vegetation and five are dominated by scrub-shrub. The remaining six freshwater wetlands are dominated by herbaceous vegetation.



National Wetlands Inventory Code	Wetland Type
PEMC	Palustrine Emergent Seasonally Flooded
E2EM/USP	Estuarine Intertidal Emergent / Unconsolidated Shore Irregularly Flooded
E2EMN	Estuarine Intertidal Emergent Regularly Flooded
PEMA	Palustrine Emergent Temporarily Flooded
PUBHx	Palustrine Unconsolidated Bottom Permanently Flooded Excavated
PEM/SSC	Palustrine Emergent / Scrub-Shrub Seasonally Flooded
PEMCd	Palustrine Emergent Seasonally Flooded Partly Drined / Ditched
PSSC	Palustrine Scrub-Shrub Seasonally Flooded
E2AB/USN	Estuarine Intertidal Aquatic Bed / Unconsolidated Shore Regularly Flooded
PFOC	Palustrine Forested Seasonally Flooded

DATA SOURCE: (NAIP 2013, NWI 2015, Skagit County 2015, USGS 2015, WSDOT 2015)

Proposed Project Site
Proposed Wetland Mitigation Site
300-Foot-Wide Study Area
Wetland (NWI)
Anacortes Subdivision
Local Road
State Highway

N
0 2,000 4,000 Feet

Figure 3.5-5
ANACORTES SUBDIVISION (WEST)

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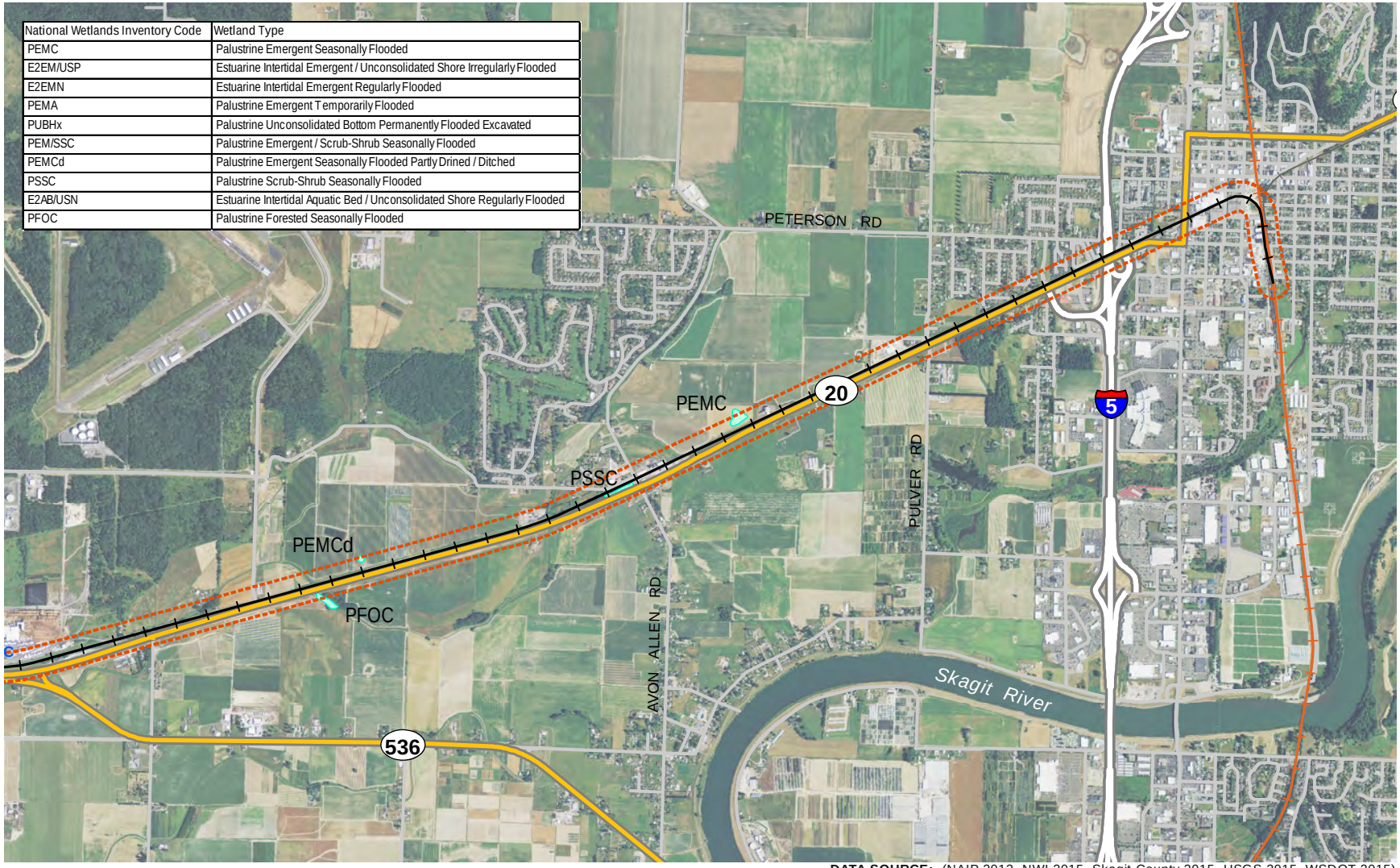

National Wetlands Inventory Code	Wetland Type
PEMC	Palustrine Emergent Seasonally Flooded
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PUBHx	Palustrine Unconsolidated Bottom Permanently Flooded Excavated
PEM/SSC	Palustrine Emergent / Scrub-Shrub Seasonally Flooded
PEMCd	Palustrine Emergent Seasonally Flooded Partly Drined / Ditched
PSSC	Palustrine Scrub-Shrub Seasonally Flooded
E2AB/USN	Estuarine Intertidal Aquatic Bed / Unconsolidated Shore Regularly Flooded
PFOC	Palustrine Forested Seasonally Flooded

DATA SOURCE: (NAIP 2013, NWI 2015, Skagit County 2015, USGS 2015, WSDOT 2015)

300-Foot-Wide Study Area
Wetland (NWI)
Anacortes Subdivision
Bellingham Subdivision
BNSF Railway
Local Road
State Highway
Interstate Highway

N
0 2,000 4,000 Feet

Figure 3.5-6
ANACORTES SUBDIVISION (EAST)

ENVIRONMENTAL IMPACTS

No Action Alternative

Because no construction or operation would take place under the no action alternative, there would be no impacts to wetlands or wetland buffers. Wetland conditions in the study area would remain the same unless affected by other projects in the future. Planting riparian buffers along Stream S and in Wetland I1 would not occur. The wetland mitigation site would remain in its current condition and would continue to be separated from Padilla Bay by a dike that prevents tidal flow onto the site.

Proposed Project

Direct Impacts

Permanent impacts to wetlands (and their buffers) include the loss of wetland and/or buffer areas as a result of filling or excavation; and diminished wetland functions through the loss of area or changes to surface or subsurface water flows, or through permanent changes to vegetation (e.g., ongoing clearing activities or shading). Permanent changes to wetlands and their buffers would result from construction of the new rail spur and associated facilities. After being filled, these wetlands could not perform particular functions such as storing stormwater, filtering pollutants, protecting stream banks and shorelines, or providing habitat for wildlife.

The term "temporary impacts" is used in this chapter because it has a specific definition with regard to wetland impacts. Temporary impacts are direct impacts that do not result in permanent changes to wetland areas or functions. For example, temporary grading and clearing, staging areas, temporary work areas, or temporary structures necessary to complete construction of permanent facilities, may cause temporary loss of wetland (or buffer) areas. These types of activities can result in loss or changes to wetland area, hydrology, vegetation, or structure. While temporary impacts are not of the same magnitude as permanent impacts, they may result in the short-term loss of wetland functions. Following construction, temporary impact areas would be restored to pre-construction conditions. Functions performed by affected wetland areas are expected to recover within a year.

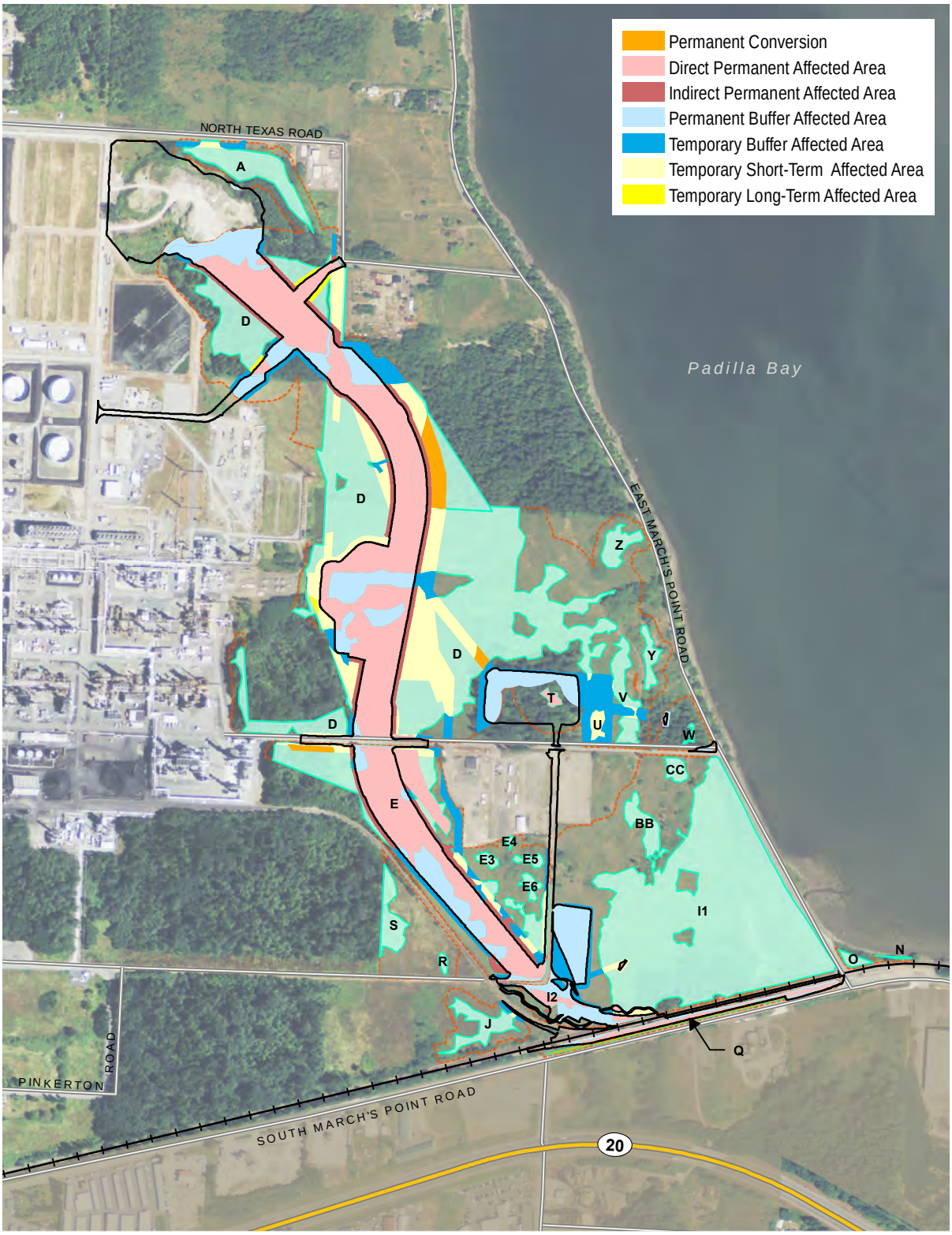
> **Temporary impacts** in the context of wetlands are direct impacts that do not result in the permanent filling of wetlands or in the permanent loss of wetland function. These impacts can be further divided into short term and long term. Typically, short-term temporary impacts are restored within a year following construction. Long-term impacts can be restored over some period of time, but not within a year (Ecology et al. 2006a).

The proposed project would permanently fill and/or excavate six of the 23 identified wetlands. Wetland T would be excavated to construct a proposed stormwater pond. Filling and grading portions of Wetlands D, E, I1, I2, and Q for the proposed rail tracks and associated facilities would also occur. Impacts on each wetland are shown on Figure 3.5-7 and listed in Table 3.5-5. In total, approximately 21.21 acres of wetlands would be filled. This would include 0.19 acre of

Category II wetlands, 20.71 acres of Category III wetlands, and 0.31 acre of Category IV wetlands. Nine depressional wetlands and one slope wetland would be affected.

In addition to the direct impacts associated with wetland filling, the project would also convert approximately 1.22 acres of the forested and scrub-shrub portions of Wetlands D, E, and Q into emergent habitats. The conversions would occur due to the relocation and construction of underground natural gas and water pipelines and be considered permanent impacts. These areas would have a permanent loss of habitat function due to the loss of forested and scrub-shrub vegetation communities. However, after the new emergent habitats are established, the capacity of these areas to treat runoff would likely be increased from their previous functions (Ecology et al. 2006a).

Both short-term and long-term temporary impacts would result from clearing or filling for construction access, constructing temporary access roads, and rerouting the existing power lines and pipelines. Short-term impacts would occur in portions of seven wetlands (Wetlands A, D, E, I1, J, U, and V), totaling 8.1 acres. The affected areas in the wetlands would consist mostly of pasture grasses. Following construction, these areas would be restored to pre-construction contours and reseeded with pasture species. Long-term temporary impacts would occur in approximately 0.23 acre of Wetland D. This area would be restored with native woody vegetation; however, there would be a temporal loss (over a year) of wetland functions until planted woody vegetation became established. Long-term temporary impacts would be compensated at the proposed wetland mitigation site.



DATA SOURCE: (AECOM 2015, NAIP 2013, Skagit County 2015, WSDOT 2015)

Project Site Location
Wetland
Wetland Buffer
Anacortes Subdivision
Local Road
State Highway

N
0 200 400 Feet

Figure 3.5-7
IMPACTS TO WETLANDS AND BUFFERS – PROPOSED PROJECT SITE

Table 3.5-5 Wetland Impacts Summary

					Permanent Impact				Temporary Impact	
Wetland	Rating[1]	Cowardin[2]	HGM[3]	Wetland Size (acres)	Direct Permanent (acres)	Indirect Permanent (acres)	Percent Affected	Conversion (acres)	Long-term Temporary (acres)	Short-term Temporary (acres)
A	IV	Emergent	Depressional/Slope	2.02	--	--	--	--	--	0.09
D	III	Emergent	Depressional/Slope	38.41	10.43	1.75	42%	--	--	6.7
		Forested	Depressional/Slope		3.24	0.54		0.59	0.23	--
		Scrub-shrub	Depressional/Slope		--	--		0.13	--	--
E	III	Emergent	Depressional/Slope	7.45	5.86	0.93	98%	--	--	0.71
		Forested	Depressional/Slope		--	--		0.18	--	--
		Scrub-shrub	Depressional/Slope		0.37	0.14		--	--	--
I1	II	Emergent	Depressional/Slope	22.17	0.17	--	1%	--	--	0.28
		Forested	Depressional/Slope		0.02	--		--	--	--
I2	IV	Emergent	Slope	0.35	0.31	0.04	100%	--	--	--
J	IV	Emergent	Depressional/Slope	0.92	--	--	--	--	--	0.02
Q	III	Scrub-shrub	Depressional	1.01	0.69		68%	0.32	--	--
T	III	Forested	Depressional	0.12	0.12	--	100%	--	--	--

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					Permanent Impact				Temporary Impact	
U	IV	Emergent	Depressional	0.24	--	--	--	--	--	0.24
V	IV	Emergent	Depressional/Slope	1.07	--	--	--	--	--	0.06
Total				**73.76**	**21.21**	**3.4**	**34%**	**1.22**	**0.23**	**8.1**

1. Ecology rating based on the 2004 rating system (Hruby 2004).
2. Cowardin et al. 1979.
3. Hydrogeomorphic classifications are based on *A Hydrogeomorphic Classification of Wetlands* (Brinson 1993).
4. AECOM 2016.

Indirect Impacts

Indirect impacts result from activities inside or outside the wetland that do not cause direct loss of wetland area but affect wetland functions. Examples of indirect impacts include changes in surface or subsurface water movement, changes in wildlife movement patterns, loss of forested buffers, or loss of so much of an affected wetland area that the remaining portions no longer provide the same level of wetland function (Ecology et al. 2006a).

The proposed project would indirectly affect three wetlands (Wetlands D, E, and I2), totaling 3.4 acres. Small portions of Wetlands D and E would be isolated into smaller fragments, and these areas are not anticipated to provide the same functional levels after the proposed project is constructed. Deep excavation in Wetlands D and E are also expected to indirectly affect wetland hydrology in the remaining portions of these wetlands. The excavations would intercept surface and subsurface water, and drainage would be collected in new ditches and directed away from the remaining wetlands.

To determine the extent of wetland functional disturbance caused by these excavations, site soils and local hydrology were evaluated in a series of shallow groundwater monitoring wells. The wetland hydrology for Wetlands D and E is primarily supported by direct precipitation, surface runoff from adjacent areas, flow from channelized ditches, and shallow subsurface flow over restrictive or less permeable soil layers (AECOM 2016). Field observations and three years of shallow groundwater monitoring data (AECOM 2015) suggest that direct precipitation is the major source of hydrology for these wetlands, and that water input from surface runoff and lateral subsurface flow are considered relatively minor. Because of limited lateral drainage and the presence of a thick layer of soils above the less permeable soil layers, wetland hydrology in the early part of the growing season is considered to be sustained by a relatively small catchment area (AECOM 2016). For the impact analysis, approximately 25 feet upslope and downslope of the rail cut in Wetlands D and E were estimated to have indirect impacts.

Existing ditches (Ditch D3 and D4) also contribute hydrology for Wetland D, especially in the southern part of the forested mosaic area (Figure 3.5-2). Flow from these ditches would be redirected into a new ditch along the railroad tracks. However, this portion of Wetland D is expected to sustain wetland hydrology due to the presence of topographic depressions and a restrictive or less permeable soil layer; therefore, no indirect impacts are anticipated.

Because there is uncertainty about the extent of hydrology impacts, Shell would continue to monitor shallow groundwater wells before and after the construction in Wetlands D and E, including the forested mosaic area of Wetland D. Shell would be expected to adjust compensatory mitigation requirements if the indirect impact area is larger than anticipated.

More than 80 percent of Wetland I2 is proposed to be filled, and the remaining area of Wetland I2 is so small that it is not expected to retain wetland hydrology. As a result, the remaining 0.04 acre of Wetland I2 would be indirectly affected by filling.

Wetland Buffer Impacts

Regulatory buffers are intended to protect and maintain the wide variety of functions and values provided by wetlands, including sediment removal, phosphorus and nitrogen removal, toxic contaminants removal, microclimate influence, habitat maintenance, screening adjacent disturbances, and habitat connectivity. Factors that affect the performance of buffer functions include vegetation characteristics, slopes, soils, and buffer widths and lengths (Sheldon et al. 2005).

Permanent impacts to buffers generally result from the loss of vegetated buffer areas. The proposed project would permanently remove 5.2 acres of forested buffers in five wetlands (Wetlands A, D, T, U, and W) and 7.38 acres of grazed pasture wetland buffers at eight wetlands (Wetlands A, D, E, E5, E6, I1, J, and Q). Affected buffers are listed in Table 3.5-6 and shown in Figure 3.5-7. Affected forested buffers typically consist of red alder, black cottonwood, paper birch, bigleaf maple (*Acer macrophyllum*), Douglas fir (*Pseudotsuga menziesii*), and western red cedar. Wetlands I2 and T would be completely filled; therefore, construction activities in these areas would not have buffer impacts.

Temporary buffer impacts would occur in 11 wetlands (Wetlands A, D, E, E5, E6, I1, I2, J, T, U, and V) as a result of clearing to allow construction access and the rerouting and installation of underground gas and water pipelines (Table 3.5-6). The temporary affected area totals 6.76 acres, which includes 1.88 acres of forested and shrub buffers, and 4.88 acres of grazed pasture dominated by nonnative grasses. These temporary cleared areas would be restored to pre-construction contours and planted with native species to comply with permit requirements.

Table 3.5-6 Wetland Buffer Impact Summary

Wetland	Rating[1]	Vegetation	Permanent Impacts (acres)	Temporary Impacts (acres)
A	IV	Pasture	0.02	0.15
		Forest	0.02	0.05
D	III	Pasture	2.49	1.26
		Shrub	0	0.05
		Forest	5.06	1.64
E	III	Pasture	2.11	1.37
E5/E6		Pasture	0.03	0.07
I1	II	Pasture	2.32	0.76
J	IV	Pasture	0.02	0.09
Q	III	Pasture	0.39	0

Wetland	Rating[1]	Vegetation	Permanent Impacts (acres)	Temporary Impacts (acres)
U	IV	Pasture	0	0.77
		Forest	0	0.14
V	IV	Pasture	0	0.41
W	III	Forest	0.12	0
	Total		**12.58**	**6.76**

1. Ecology rating based on the 2004 rating system (Hruby 2004).

Affected Wetland Functions

The functions and values of identified wetlands within the project site were qualitatively evaluated using the 2004 rating system (Hruby 2004). Most wetlands in the project site scored low to moderate for water quality, hydrologic, and habitat support functions (Table 3.5-3), except for Wetland T. Wetland T scored high for water quality functions due to the presence of vegetation that can trap pollutants and lack of an outlet.

The depressional wetlands in the project site have the potential to improve water quality due to the presence of pollution sources such as grazing in or adjacent to the wetlands. The project would fill approximately 20.9 acres of depressional wetlands that can trap and retain sediments as well as remove nitrogen and pathogens. Temporary clearing would also result in a reduction of water quality functions. Filling depressional wetlands on the proposed project site also has the potential to reduce hydrologic functions by removing the storage capacity of the affected wetlands. However, these depressional wetlands already have a limited ability to reduce flooding because of their size, shallow depths of ponding, and locations in the watershed. The loss of water quality and hydraulic functions in the affected areas would be compensated for at the wetland mitigation site.

The proposed project would construct new stormwater facilities within the project site to provide water quality treatment and flow control. Stormwater facilities have been designed in accordance with local regulations and current guidance from Ecology. Rail operations could contribute petroleum-based by-products and heavy metals to adjacent wetlands. The proposed stormwater facilities would replace the storage and infiltration functions currently provided by the impacted wetlands. . Best management practices (BMPs) would also be used during construction-related activities to minimize water quality impacts. As a result, water quality and hydrologic functions of the remaining wetlands are not expected to be affected.

The affected depressional wetlands scored low to moderate for habitat functions because they all have varying water depths, a mixture of habitat types, and a variety of plant species. Filling activities associated with the project would result in a permanent loss of 20.9 acres of wetland habitat areas. Temporary clearing would result in a change of habitat and species interspersion

in the affected area; however, this habitat function is expected to recover after restoration. Additionally, fragmentation of Wetlands D and E into smaller wetlands would affect habitat connectivity.

Wetland I2 is the only slope wetland that would be affected by the project. Because slope wetlands do not retain large amounts of water, Wetland I2 has limited potential to provide water quality and hydrologic functions. Wetland I2 scored low for water quality functions because its sloped configuration provides limited potential to trap sediments and pollutants. Lack of dense vegetation and capacity to retain surface water also contribute to low hydrologic performance. Wetland I2 scored low for habitat functions due to its low habitat diversity and limited number of habitat features. The majority of Wetland I2 would be filled as a result of the project, and the remaining portion of Wetland I2 would not likely provide the functions that it currently provides.

Most of the wetlands in the project site have been grazed for decades, which has likely contributed to the low habitat diversity, water quality degradation, and soil compaction that currently exists. Estuarine wetland (I1) would be fenced off to protect from human disturbance. Removing cattle from the project site has relieved these systems from chronic degradation and would result in benefits to wetland functions for the remaining portions of Wetlands A, D, I1, J, and V, as well as the unaffected wetlands at other portions of the project site (Wetlands R, S, Y, and Z). These wetlands would be expected to develop more diverse plant communities and habitat conditions over time. Water quality within the wetlands and nearby receiving waters may also improve. Such water quality improvements may help these wetlands support a more diverse assemblage of invertebrates and wetland-dependent wildlife. For impacts on wildlife use within wetlands, please refer to Chapter 3.6 – Vegetation and Terrestrial Wildlife.

Wetland Mitigation Site

Direct Impacts

The proposed mitigation site is located approximately 2 miles east of the project site at the south end of Padilla Bay.

Wetlands in the proposed mitigation site would be converted from depressional wetlands to tidal salt marsh wetlands by breaching and removing the existing dike. Prior to dike removal, poplar trees and Himalayan blackberries would be cut and removed, and the surface elevation of the subsided area inside the existing dike would be raised to match elevations of the adjacent salt marsh area. Appropriate fill would be imported from the project site to raise the site elevation by approximately 2 feet to create a marsh plain. After the dike is removed, increased salinity is expected to alter the plant community of the mitigation site. This conversion is expected to result in an increase of ecological function for the wetlands by restoring estuarine processes including tidal flow, channel formation, connection to existing channels, and sediment and detritus transport and accretion.

Construction of a setback dike would be required to protect the existing structures such as buildings, natural gas pipelines, roads, and the Anacortes Subdivision located south of the proposed wetland mitigation site. The new setback dike would be larger than the existing dike to meet current design standards, and it would cover approximately 7.4 acres, which is 2.6 acres larger than the existing dike (AECOM 2016). The partial or full removal of the existing dike would restore approximately 4.8 acres to tidal influence. It is anticipated that temporary impacts to the wetlands at the wetland mitigation site would be minimal and short term.

Over time, the establishment of tidal processes is expected to increase hydrologic and habitat functions within the mitigation site by restoring tidal regime and establishing salt-tolerant species.

Indirect Impacts

Over time, the establishment of tidal processes is expected to increase hydrologic and habitat functions within the mitigation site by restoring tidal regime and establishing salt-tolerant species. Hydrologic functions would be greatly improved by reconnecting the wetland mitigation site with Padilla Bay, and restoring natural hydrology and tidal exchange. Conversion from a palustrine system to an estuarine emergent system, and connecting to mudflats and adjacent subtidal estuarine habitats, would increase foraging habitat for shorebirds and juvenile fish that use Padilla Bay. As a result, the mitigation site would have beneficial impacts on wetlands.

Anacortes Subdivision

Wetlands adjacent to the Anacortes Subdivision could be exposed to pollutants from accidental drips and leaks of crude oil due to additional rail operations. However, the rail line is currently managed with BNSF Railway standard operation and maintenance measures, which include inspections and spill response plans. Proper implementation of these procedures would minimize the potential for impacts to wetlands along the Anacortes Subdivision.

Cumulative Impacts

As described above, the proposed project would have a direct impact on 21.2 acres of wetlands. In the cumulative impacts study area (Figure 3.5-1), there are two reasonably foreseeable future actions (see Table 3.0-2 in chapter 3.0 for additional project details) with the potential to impact wetlands: the Tesoro Clean Products Upgrade Project which, would impact about 0.0105 acres (Tesoro 2015), and the Old Highway 99N overpass of BNSF Railway, which would impact about 0.071 acre (Skagit County 2016). Together, the proposed project and these reasonably foreseeable future actions would contribute to a cumulative impact on wetlands due to filling of wetlands and the permanent loss of wetland functions.

Historically, there has also been significant agricultural, industrial, commercial, and residential development in the study area. It is assumed that with this growth and construction, wetlands have been affected. As described below, the impacts from the proposed project would be mitigated by the creation of an approximately 73-acre wetland mitigation site. Mitigation would also be required for the impacts from the reasonably foreseeable future actions through

mitigation plans. Because the mitigations plans are required to achieve the goal of no net loss of wetlands, the potential cumulative impacts would be minimized.

MITIGATION MEASURES

Avoidance and Minimization

Shell has incorporated engineering and operational measures into the design of the proposed project to avoid and minimize wetland impacts including:

- The proposed project has been designed to avoid direct impacts to Padilla Bay and its adjacent wetlands by shifting the alignment of the rail spur to the south. The original design for the facility would have impacted Padilla Bay and the adjacent salt marsh. However, the project has been redesigned for the remaining unavoidable impacts to occur to Category 4 (low quality, grazed pasture) wetlands. Seventy-nine percent of permanent impacts and 97 percent of temporary impacts would occur in 27.6 acres of pastured and grazed wetlands.
- Upon completion of construction at the proposed project site, herbaceous wetland and upland areas would be replanted with native grass and forb species. To accommodate rerouted pipelines and retaining walls, approximately 1.22 acres of temporarily affected forested and scrub-shrub wetlands would be converted to emergent wetlands. Approximately 0.23 acre of forested wetland and 2.11 acres of forested wetland buffer would be restored with native trees and shrubs.
- In the buffer surrounding wetland I1 (Figure 3.5-2), where Stream S flows into a salt marsh, the fence below the ordinary high water mark would be moved to provide protection from future disturbance and to create a 200-foot-wide buffer. Within that new buffer, approximately four acres would be planted with native trees and shrubs. Buffer plantings are anticipated to improve water quality by reducing erosion and water temperatures, and by providing food inputs for organisms in the wetland.
- Access roads planned to serve the unloading tracks would be located, where possible, to coincide with existing access roads to minimize soil disturbance, avoid wetlands, and minimize impacts to terrestrial wildlife. The original design for the facility included additional impacts to these resources that were avoided through design revisions.
- Rail track spacing at the facility has been minimized and the facility has been designed with an overhead platform to minimize soil disturbance, avoid wetlands, and minimize impacts to terrestrial wildlife.

Specific design measures that would minimize the potential for impacts from a release of oil at the proposed rail unloading facility are described in further detail in Chapter 3.3 – Surface Water.

Impacts to wetlands would also be minimized by the implementation of the BMPs required as part of the NPDES Construction Stormwater Permit, CWA Section 404 Individual Permit, CWA Section 401 Water Quality Certification, Hydraulic Project Approval, Skagit County Grading Permit, Hydraulic Project Approval, and Shoreline Substantial Development Permit. For

example, erosion control mats, silt fences, and straw bales would be installed as part of the NPDES Construction Stormwater Permit. They will help to stabilize exposed soils to prevent sediment runoff into adjacent wetlands.

Mitigation

Construction of the proposed project would require compensatory mitigation to offset the permanent loss of wetland functions. The overall goal of the proposed mitigation is to achieve no net loss of wetland functions and values resulting from the project.

Shell would provide compensatory mitigation for 25.83 acres of permanent wetland impacts, 0.23 acre of long-term temporary impacts, and 12.58 acres of permanent wetland buffer impacts at the proposed wetland mitigation site located at the south end of Padilla Bay.

Water quality within the project site is anticipated to improve since the elimination of cattle grazing, enhancing stormwater infrastructure, and planting along the riparian area of Stream S/Wetland I1. On-site mitigation for other affected wetland functions was not possible as available areas for wetland mitigation are extremely limited on the peninsula because of refinery development and proximity to Padilla Bay. Shell conducted an extensive search for mitigation candidate sites within the Skagit Delta/Padilla Bay watershed using the relevant federal, state, and local regulations and guidelines, including the *Compensatory Mitigation for Losses of Aquatic Resources* (USACE and USEPA 2008a), the *Selecting Wetland Mitigation Sites Using a Watershed Approach* (Hruby et al. 2009), and SCC 14.24.250.

Given the landscape and watershed setting of the project site, compensatory mitigation was determined to be best achieved through off-site and *out-of-kind mitigation*. In 2015, Shell selected the proposed location for compensatory mitigation (AECOM 2016) in an area at the south end of Padilla Bay. The selected site is currently diked off from Padilla Bay, preventing tidal influence to the site. Blind Slough and East Slough are present at the site; however, because of the dike, both sloughs are not tidally connected to the bay. This site is one of the potential restoration areas identified by the Washington Department of Fish and Wildlife (WDFW) and USACE (PSNERP 2012). The proposed mitigation site is located in the same watershed (Water Resource Inventory Area [WRIA] 3: Lower Skagit – Samish) as the impacted wetlands. Both impacted wetlands at the project site and wetlands at the mitigation site drain into Padilla Bay.

Shell proposes to compensate for the loss of wetland functions through off-site and **out-of-kind mitigation**. A joint guidance from Ecology, USACE, and USEPA provides typical mitigation ratios for compensatory mitigation projects, but these ratios are only to be used for in-kind wetlands. Because the proposed mitigation compensates for freshwater wetland impacts with the re-establishment of estuarine wetland (out-of-kind), there are no recommended ratios provided by the guidance. As a result, Shell is proposing mitigation ratios that are specific for this project. These ratios are currently under review by Ecology the USACE.

Shell is proposing to reestablish nearshore ecosystem processes on the site, including tidal hydrology, erosion and accretion of sediments, tidal channel formation and maintenance, and detritus import and deposition. Over time, the site is expected to develop estuarine, intertidal habitats including mudflat, salt marsh, tidal and dendritic channels, and upland riparian areas that resemble the adjacent nearshore habitat. Restoring tidal processes is expected to result in large functional uplift to existing wetland communities and improve habitat for fish and wildlife as well as aquatic organisms.

Concurrent mitigation is a compensatory mitigation that is implemented at approximately the same time as the authorized activities that result in wetland impacts (Ecology et al. 2006a).

The wetland mitigation site is approximately 100 acres, and Shell is proposing to restore approximately 73 acres of the site to tidal estuary by lowering the existing dike down to approximately 8 feet and breaching the dike at the existing pump station. The site is expected to reestablish a range of estuarine habitats from salt marsh to marine riparian zone. Out of 73 acres, approximately 40.06 acres of the site would be used for compensatory mitigation, and the remaining 32.94 acres would be reserved for unanticipated wetland or buffer impacts during or after construction of the project (AECOM 2016). Figure 3.5-8 shows the extent of the *concurrent mitigation* area and reserve mitigation area. Any unaccounted impacts would be compensated within the reserved area.

All unavoidable, permanent impacts to wetlands and buffers would be compensated for at the wetland mitigation site. Unavoidable impacts include 25.83 acres of permanent wetland impacts, 0.23 acre of long-term temporary impacts, and 12.58 acres of permanent wetland buffer impacts. Although permanent buffer impacts would not be mitigated at the project site due to limited opportunity for buffer enhancement on-site, the wetland mitigation site would create transitional habitat buffer areas between the restored marsh plain and the new setback dike (Figure 3.5-8). The transitional buffer area habitat would be approximately 40 to 60 feet wide. Because USACE and Skagit County Dike District 12 require any dikes to remain vegetation free, the 15-foot setback dike would be seeded with native grass and is prohibited from having woody vegetation. The proposed buffer widths at the mitigation site have been reviewed by Ecology and Skagit County.

To reestablish approximately 73 acres of estuarine wetland habitats, fill material would be imported from undisturbed areas including soils from forested wetlands and upland forest areas at the project site. Fill material to be used at the mitigation site would be limited to freshly excavated soils. All soils would be tested for physical and chemical properties prior to use; contaminated material would not be used. Based on the Hazardous Materials Discipline Report prepared by Shell, no soil contamination is anticipated to be present in the project site (AECOM 2016). If soil contamination were found, soils would be removed and handled in accordance with applicable regulations. Until construction of the setback dike is complete and the existing dike is breached, the clean fill material would be seeded with leguminous plants such as clovers and lupines.

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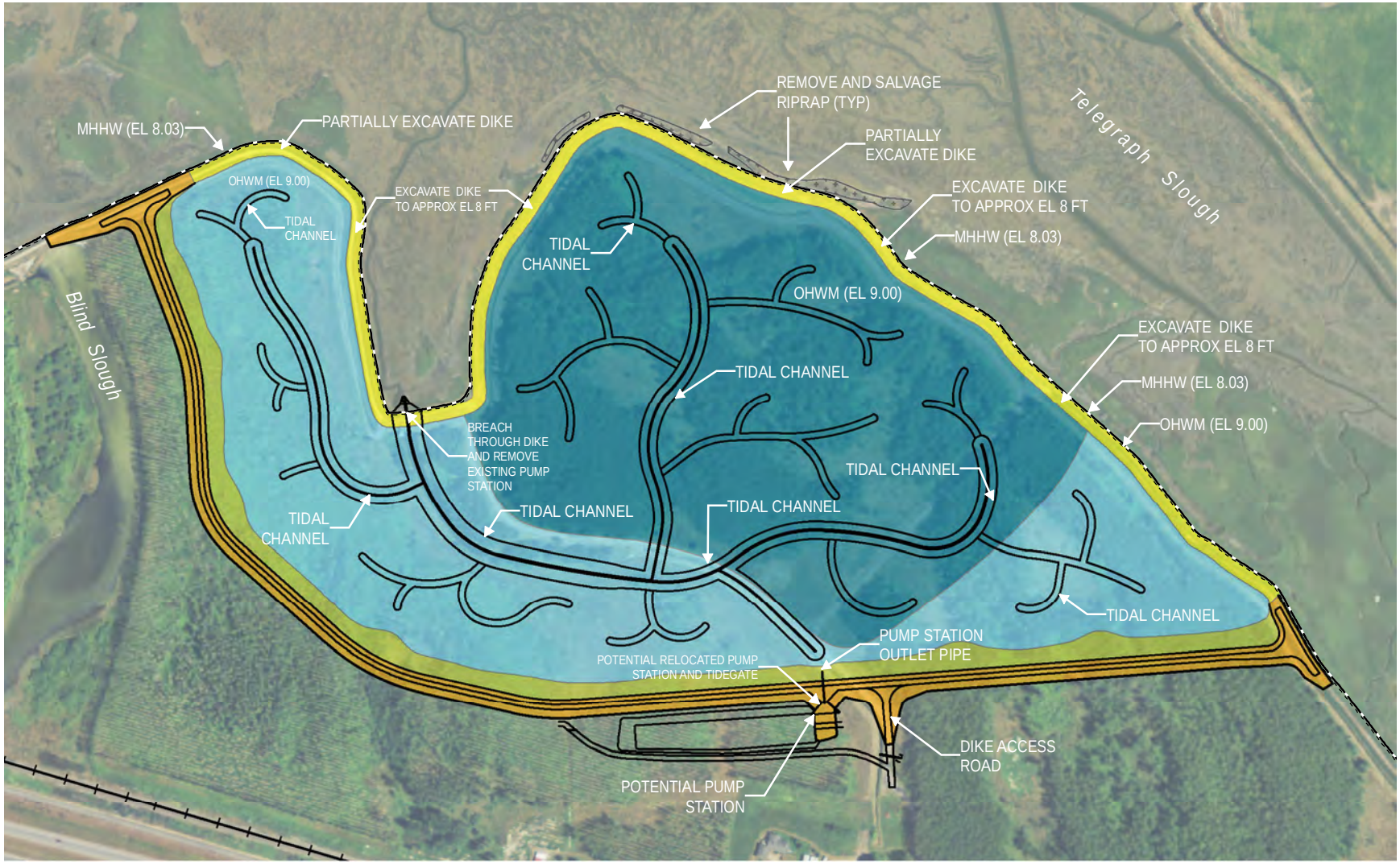


DATA SOURCE: (AECOM 2016, NAIP 2013)

Existing Dike
New Setback Dike
Transitional Habitat Slope/Buffer Area
Concurrent Mitigation Area
Reserve Mitigation Area
MHHW
OHWM

N
0 200 400 Feet

Figure 3.5-8
DRAFT MITIGATION SITE PLAN

The Draft Mitigation Plan proposes to establish a range of estuarine wetland habitat including mudflat, low marsh, mid marsh, high marsh, transitional habitat slope/buffer, and upland areas. Each habitat type is corrected with a specific range of elevations. The mitigation site would be graded to match these established elevations for the habitat types. Grading of the filled areas would be sloped gently toward new channels throughout the site to provide natural drainage. New channels would be excavated to support tidal hydrology and fish access. The mitigation site would add over 11,000 feet of new channels that range from 15 to 77 feet wide (AECOM 2016).

After the clean fill material is exposed to tidal hydrology, natural recolonization with native plant species is expected to occur in the marsh plain area, which could take several years. The high marsh plain and transitional habitat slope/buffer areas would be seeded with a mix of native grass and rush species. The transitional habitat slope/buffer area would also be planted with native woody and herbaceous plants.

The existing dike would be lowered along its entire length, except at the dike breach location. The majority of the existing dike would be lowered to approximately 8 feet (mean higher high water) to match the existing bayside marsh plain. Portions of the existing north-facing dikes would be only partially removed to protect against wave erosion. Breaching of the dike would occur during the last phase of construction. The new 16-foot setback dike would be built approximately 500 to 1,000 feet south of the existing dike to protect adjacent properties.

Construction at the mitigation site would begin concurrently with that of the rail unloading facility and is expected to take approximately four years to complete. The mitigation site would be monitored and maintained by Shell for at least 15 years after construction is complete. Monitoring, maintenance, and contingency plans are provided in the Draft Mitigation Plan (AECOM 2016), and these plans would be described in a final mitigation report and submitted with the appropriate permits for the proposed project.

The site would be protected through a license agreement between Shell and Triton America that would be approved by the permitting agencies so that no building construction or other activities that may interfere with proposed mitigation would occur. The license would also place the mitigation site into a conservation easement in perpetuity. Ownership of the site would be retained by Triton America, and Shell would work with Triton America and regulatory agencies to establish appropriate long-term protective measures for the wetland functions established at the site. For installation of the new dike, Triton America would execute an easement or other legal documents for access and maintenance rights to Skagit County Dike District #12.

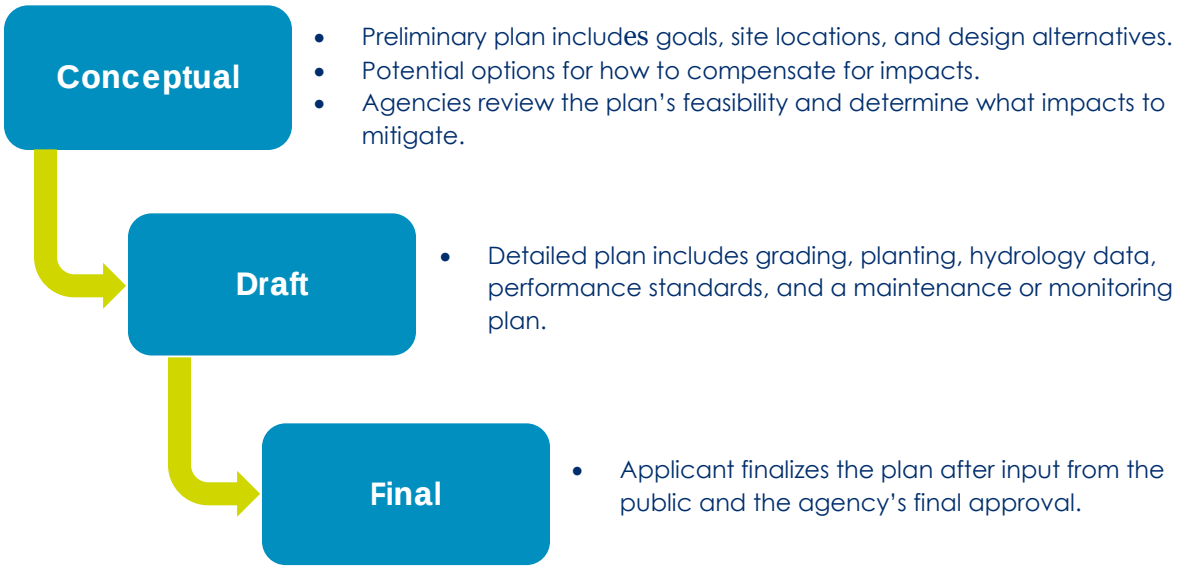
Developing a mitigation plan has several phases before it can be approved by regulatory agencies (Figure 3.5-9). Details are as follows:

- **Phase 1**: Develop a **conceptual mitigation plan** that would include wetland impact areas, wetland functions being affected, mitigation requirements and goals, site locations, and design alternatives. The conceptual mitigation plan would provide agencies an opportunity to understand the project impacts and compensation requirements, and assist them in identifying the feasibility of the proposal. After submitting the conceptual mitigation report,

regulatory agencies would provide feedback to the applicant to help develop a detailed mitigation plan.

- **Phase 2**: Revise the conceptual mitigation report and develop a **draft mitigation plan** based on agency comments. The draft would typically include the completed wetland mitigation site design such as grading, planting, hydrology data, proposed functional assessment, performance standards, and a maintenance or monitoring plan. The Draft Mitigation Plan for the proposed project is available on the project website: www.shellraileis.com (AECOM 2016).
- **Phase 3**: Develop a **final mitigation plan** after input from the public and agency approval and submit with appropriate permits (Ecology et al. 2006b).

Figure 3.5-9 Developing a Mitigation Plan



Shell has prepared a Draft Mitigation Plan (AECOM 2016) and is currently working with Ecology and USACE to finalize it. Additional analysis and surveys, including a topographic survey, a geotechnical investigation to finalize the design of the setback dike, excavation of the pilot channel waterward of the dike, and groundwater monitoring for the mitigation site to determine water levels and salinity would be necessary to further develop and finalize the mitigation plan.

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3.6 VEGETATION AND TERRESTRIAL WILDLIFE

Natural vegetation provides habitat for wildlife, aesthetic amenities for people, and soil stabilization. Vegetation may also hold cultural value and helps provide a buffer between competing land uses. Wildlife species rely on vegetation and habitat resources for survival and to assist in migration. They also bring commercial, recreational, and tribal assets to the community by providing resources for hunters and fishermen as well as birders or nature enthusiasts. Padilla Bay is an important wildlife habitat resource for the Pacific Flyway and it supports an enormous variety of migratory wildlife.

STUDY AREA AND METHODOLOGY

The study area used to conduct an analysis of potential impacts to vegetation and terrestrial wildlife was defined to include:

- The proposed project site and lands within 1,045 feet (Figure 3.6-1). This area was used in the biological evaluation prepared for the proposed project and accounts for the greatest distance that atmospheric noise anticipated to be produced by construction and operation of the proposed project could affect terrestrial species (AECOM 2016a).
- The proposed wetland mitigation site and lands within 1,045 feet (Figure 3.6-2) to account for the greatest distance that atmospheric noise anticipated to be produced by construction of the mitigation site could affect terrestrial species.
- The Anacortes Subdivision and lands within 0.25 mile of the rail line (Figure 3.6-3 and 3.6-4). This area accounts for the limits of potential noise impacts resulting from operation of the proposed project compared with existing conditions (see Chapter 3.9 – Noise and Vibration).

Select laws, regulations, and guidance applicable to vegetation and terrestrial wildlife associated with the proposed project are summarized in Table 3.6-1.

Because the potential impacts associated with vegetation and terrestrial wildlife are localized, the cumulative impacts study area would be the same as that described above for direct and indirect impacts.

Table 3.6-1 Laws, Regulations, and Guidance for Project-Related Vegetation and Terrestrial Wildlife

Laws, Regulations, and Guidance	Description
Federal	
Clean Water Act (33 USC 1251 et seq.)	Establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulates quality standards for surface water. Section 401(33 USC 1251) Water Quality Certifications are required for any activity that requires a federal permit or license to discharge any pollutant into waters of the United States. This certification attests that the responsible agency has reasonable assurance the proposed activity will meet its water quality standards. Section 404 (33 USC 1344) established a program to regulate the discharge of dredged and fill material into waters of the United States, including wetlands.
Endangered Species Act (ESA) (16 USC 1531 et seq.)	Requires that applicants seeking a federal action undergo consultation with U.S. Fish and Wildlife Service (USFWS) and/or National Marine Fisheries Services (NMFS). This ensures the federal action is not likely to jeopardize the continued existence of any listed threatened or endangered animal species or result in the destruction or adverse modification of designated critical habitat. The USFWS and the NMFS share responsibility for implementing the ESA. The USFWS is responsible for terrestrial and freshwater species. The NMFS is responsible for marine species. Both NMFS and USFWS are responsible for designating critical habitat for ESA-listed species.
Migratory Bird Treaty Act of 1918, as amended (16 USC 703–713)	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. The USFWS has statutory authority and responsibility for enforcing the Migratory Bird Treaty Act (MBTA). The MBTA implements conventions between the United States and four countries (Canada, Mexico, Japan, and Russia) for the protection of migratory birds.

Laws, Regulations, and Guidance	Description
Bald and Golden Eagle Protection Act of 1940, as amended (16 USC 668–668c)	Prohibits anyone without a permit issued by the Secretary of the Interior from "taking" bald eagles, including their parts, nests, or eggs. The Act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." In addition to immediate impacts, this definition also covers impacts that result from human-induced alterations initiated around a previously used nest site during a time when eagles are not present, if, upon the eagle's return, such alterations agitate or bother an eagle to a degree that interferes with or interrupts normal breeding, feeding, or sheltering habits, and causes injury, death, or nest abandonment.
State	
State Environmental Policy Act (SEPA) (RCW 43.21c; WAC 197-11)	Helps state and local agencies in Washington identify possible environmental impacts that could result from a proposed action, alternatives to the proposed action and potential impact minimization and mitigation measures. Information learned through the review process can be used to change a proposal to reduce likely impacts and inform permitting decisions at the state and local levels.
Washington State Growth Management Act (RCW 36.70A)	Requires state and local governments to manage Washington's growth by identifying and protecting critical areas and natural resource lands, designating urban growth areas, and preparing comprehensive plans and implementing them through capital investments and development regulations.
Washington State Shoreline Management Act (RCW 90.58)	Provides a statewide framework for managing, accessing, and protecting shorelines of the state and reflects the strong interest of the public in shorelines and waterways for recreation, protection of natural areas, aesthetics, and commerce.
Washington Natural Area Preserves Act, amended 1981 (RCW 79.70)	Established the Washington Natural Heritage Program within the Washington State Department of Natural Resources to identify which species and ecosystems are priorities for conservation effort, build and maintain a database for priority species and ecosystems, and share the information with others so that it can be used for environmental assessments and conservation planning.

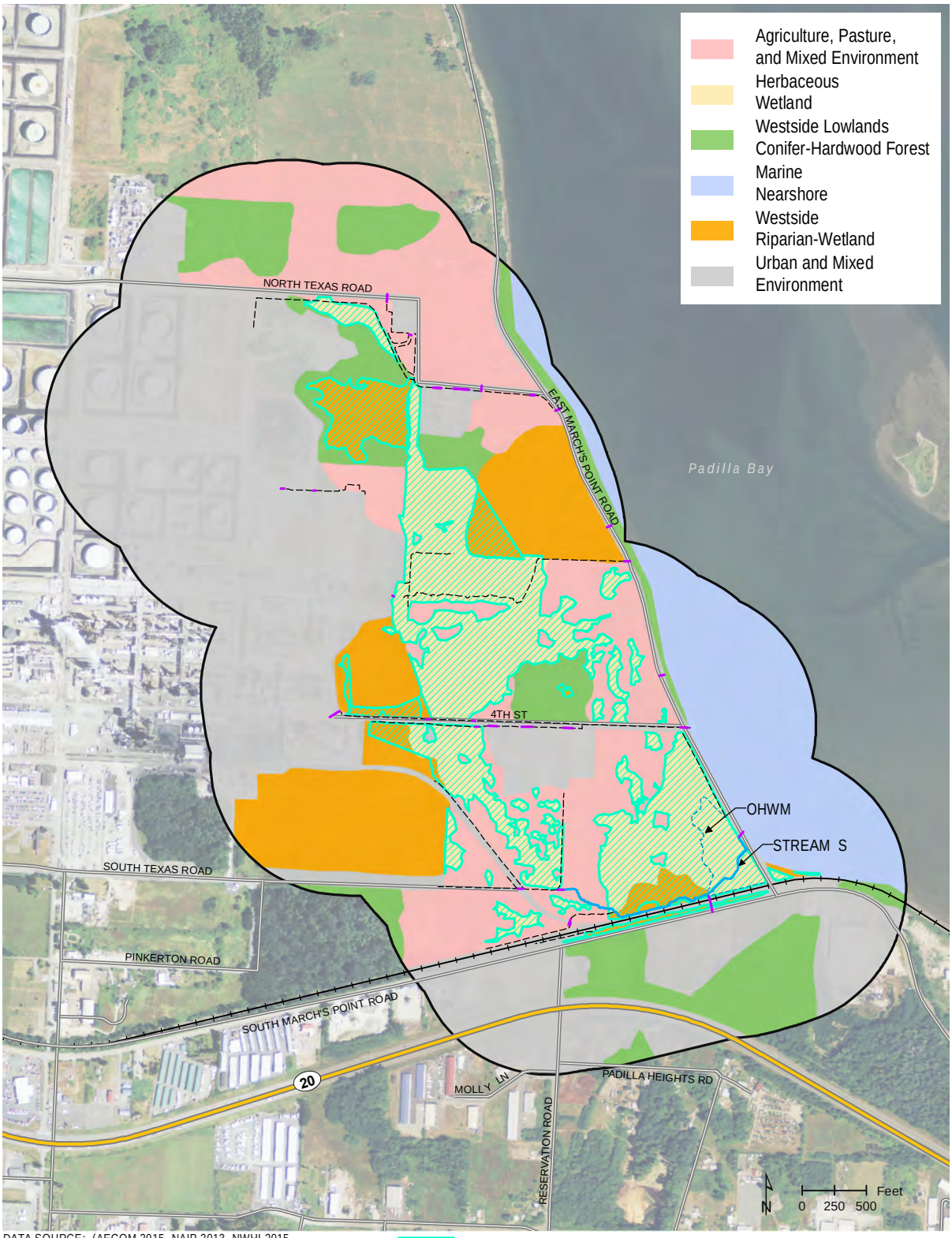
Laws, Regulations, and Guidance	Description
Washington State Noxious Weed Control Boards and State Noxious Weed List (RCW 17.10, WAC 16-750)	To limit economic loss and adverse effects to Washington's agricultural, natural, and human resources due to the presence and spread of noxious weeds on all terrestrial and aquatic areas in the state, the Noxious Weed Control Board advises the Washington State Department of Agriculture (WSDA) about noxious weed control in Washington State. Through its actions and policy decisions, the Board helps coordinate and supports the activities of the 48 county noxious weed control boards and weed districts of Washington. The Board also works with neighboring states and British Columbia, and provides leadership on regional or statewide noxious weed projects. The Board maintains the state's official list of noxious weeds that landowners may be required to control.
Washington State Hydraulic Code (WAC 220-660)	A hydraulic project is the construction or performance of work that will use, divert, obstruct, or change the natural flow or bed of any of the salt or fresh waters of the state. Unless otherwise provided, any person who wishes to conduct a hydraulic project must get a construction permit called the hydraulic project approval (HPA) from the Washington Department of Fish and Wildlife (WDFW). The purpose of the HPA is to ensure that construction or performance of work is done in a manner that protects fish life.
Washington State Forest Practices Rules (WAC 222)	Establishes standards for forest practices such as timber harvest, pre-commercial thinning, road construction, fertilization, and forest chemical application. The rules are designed to protect public resources such as water quality and fish habitat while maintaining a viable timber industry.
Local	
Skagit County Critical Areas Ordinance (SCC 14.24)	This ordinance was developed under the directives of the Growth Management Act to designate and protect critical areas and to assist in conserving the value of property, safeguarding the public welfare and providing protection for these areas. Critical areas are defined as wetlands, aquifer recharge areas, frequently flooded areas, geologically hazardous areas, and fish and wildlife habitat conservation areas.

Laws, Regulations, and Guidance	Description
Skagit County Shoreline Master Program (SCC 14.26)	The Shoreline Master Program (SMP) is comprised of local land use policies and regulations designed to manage shoreline use. The SMP protects natural resources for future generations, provides for public access to public waters and shores, and plans for water dependent uses. It was created in partnership with the local community and Ecology and must comply with the Shoreline Management Act and Shoreline Master Program Guidelines.

A quantitative analysis was conducted for direct impacts to vegetation and terrestrial wildlife on the proposed project and wetland mitigation sites. Potential impacts to vegetation and wildlife resources along the Anacortes Subdivision were qualitatively analyzed. The following existing documents and data were reviewed to provide a description of the extent and condition of existing vegetation communities, occurrence of listed plants and terrestrial wildlife species, and potential suitable terrestrial habitat:

- U.S. Fish and Wildlife Service (USFWS 2015) National Wetland Inventory Wetlands Mapper.
- Natural Vegetation of Oregon and Washington (Franklin and Dyrness 1988).
- Washington State Gap Analysis Program (WDFW 2016b).
- Wildlife–Habitat Relationships in Oregon and Washington (Johnson and O'Neil 2001).
- Washington Department of Fish and Wildlife (WDFW 2016a) Priority Habitat and Species database.
- WDFW Priority Habitat and Species Management Recommendations, Volumes I, III, and IV (Larsen 1997, Larsen et al. 1995, Larsen et al. 2004).
- Washington State Department of Natural Resources Natural Heritage Information(WNHP 2015).
- Washington State Department of Transportation (WSDOT 2015) Biological Assessment (BA) Preparation for Transportation Projects.
- University of Washington NatureMapper (2016).
- Skagit County (2016a) iMAP.
- Skagit County (2016b) Noxious Weed List.
- Project aerial photography.

A site visit was conducted on December 8, 2015, to review existing conditions at the proposed project and wetland mitigation sites. No species-specific surveys were conducted for this analysis.

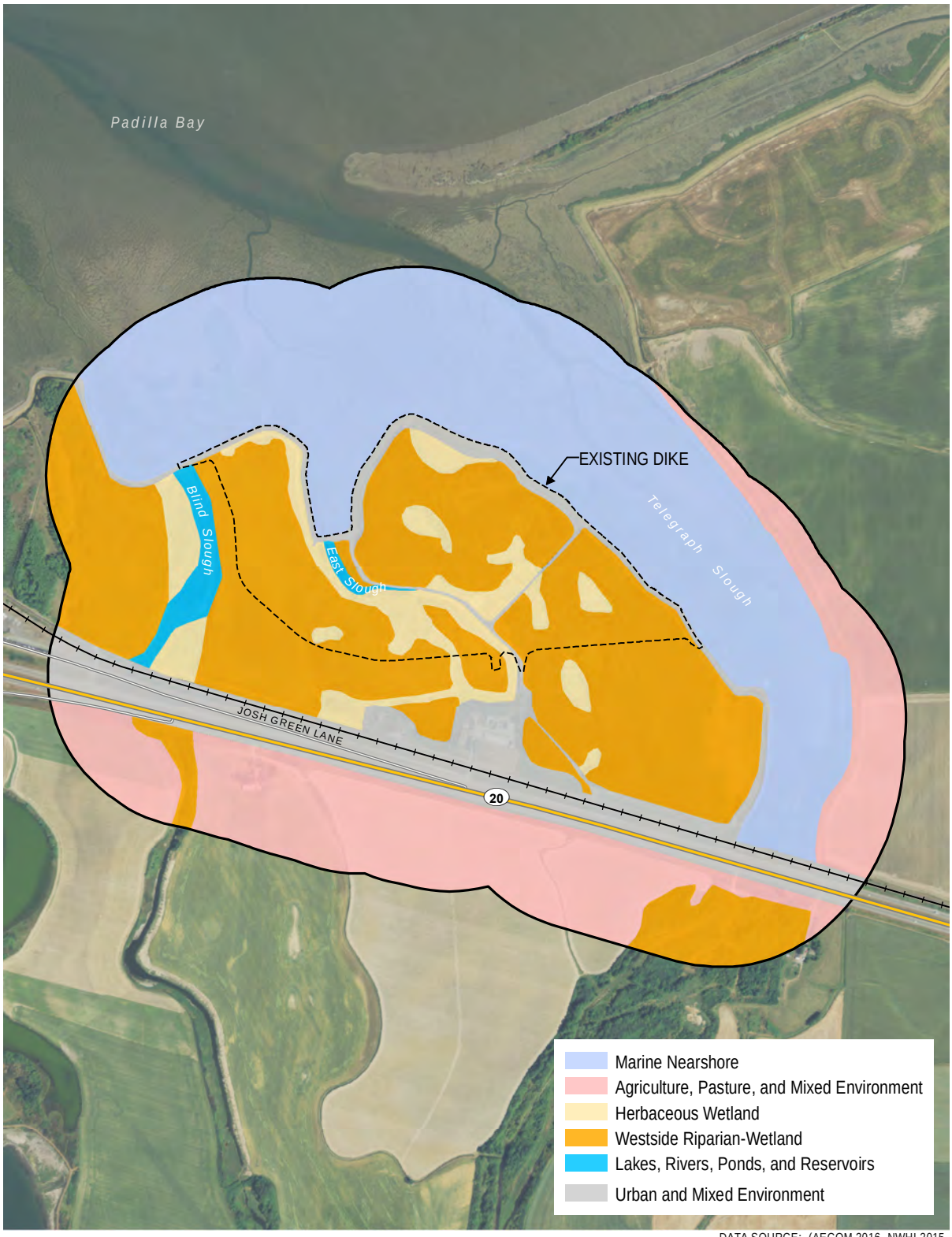


DATA SOURCE: (AECOM 2015, NAIP 2013, NWHI 2015, Skagit County 2015, WSDOT 2015)

Wetland
Study Area
Existing Ditch
Existing Stream
OHWM
Existing Culvert
Anacortes Subdivision
Local Road
State Highway

Figure 3.6-1

EXISTING VEGETATION COMMUNITIES – PROPOSED PROJECT SITE



Proposed Wetland Mitigation Site
Study Area
Anacortes Subdivision
Local Road
State Highway

N
0 250 500 Feet

DATA SOURCE: (AECOM 2016, NWHI 2015, Skagit County 2015, WSDOT 2015, NAIP 2013)

Figure 3.6-2
EXISTING VEGETATION COMMUNITIES – WETLAND MITIGATION SITE

Existing vegetation communities were mapped using a Geographic Information System (GIS)-based land cover analysis of the study area, available literature and inventories, project-specific studies, and observations from a site visit. Vegetation communities were categorized into land cover types based on similarities in landscape features (for example, types of vegetation and level of vegetation disturbance and management).

Terrestrial wildlife species and habitat were evaluated using the results of the vegetation community analysis identified in Johnson and O'Neil (2001). Information provided by Shell (URS 2013; AECOM 2016a and 2016b) and additional information from Washington Department of Fish and Wildlife (WDFW), U.S. Fish and Wildlife Service (USFWS), and other sources were incorporated into the analysis to determine potential habitat use by wildlife in the study area.

Potential impacts of project construction and operation on vegetation and terrestrial wildlife were evaluated relative to the no action alternative. Impacts can be either adverse or beneficial.

Direct impacts affect vegetation communities and wildlife habitat, special-status plants, and terrestrial wildlife species occurrence and habitat, and can result from temporary and permanent construction activities. Direct impacts were calculated using temporary and permanent footprints overlaid on GIS data at both the proposed project and wetland mitigation sites. The analysis also used the results from the noise study (see Chapter 3.9 – Noise and Vibration) to evaluate potential noise impacts associated with construction and operations at the project site on key wildlife species.

Indirect impacts were qualitatively analyzed at the proposed project and wetland mitigation sites. The analysis considered such factors as the potential impacts of the train operations on species and habitat, the regional significance of the resource, wildlife habitat value, degree of fragmentation and loss of the habitat following project implementation, and impacts to overall habitat quality. Temporary and long-term indirect impacts due to disturbances from increases in human access, noise, and light were also assessed.

Criteria for determining the significance of impacts were developed by considering the context and magnitude, duration, and degree of potential environmental impacts as specified in the State Environmental Policy Act (SEPA). Washington Administrative Code (WAC 197-11-794) defines "significant" as "a reasonable likelihood of more than a moderate adverse impact on environmental quality."

Significant negative impacts to vegetation are defined for this project as:

- Loss of native vegetation that results in a substantial and permanent decrease in extent, connectivity, or integrity of upland or vegetated wetland habitat in the contributing watershed and that would impair the function of impacted vegetative communities.
- Establishment of invasive plant species that results in a decrease in extent, connectivity, or integrity of native vegetation communities.

- Loss of sensitive plant communities or suitable habitat.

Significant negative impacts to terrestrial species and habitat from project-related construction, operations, or human activity are defined as:

- Loss of breeding habitat that would adversely affect the population viability of a species.
- Loss of nonbreeding wildlife habitat that results in a significant decrease in extent, connectivity, or integrity of habitat in the watershed.
- Injury, death, or harassment of wildlife that would adversely affect the population viability of a species.

Impact significance criteria for federally-listed threatened and endangered species were based upon findings in the biological evaluation prepared for the proposed project (AECOM 2016a), the WSDOT (2015) BA manual, and potential direct and indirect impacts of the proposed project identified during the preparation of this environmental impact statement (EIS). The analysis also identified any mitigation measures, commitments, and monitoring procedures associated with project impacts on plants and terrestrial species and habitat.

AFFECTED ENVIRONMENT

Proposed Project and Wetland Mitigation Sites

The study area is located in the western hemlock forest vegetation zone of the Puget Lowland physiographic province (Franklin and Dyrness 1988) and within the watersheds of Telegraph Slough-Frontal Padilla Bay, Padilla Bay-Strait of Georgia, and Skagit River-Frontal Skagit Bay (Hydrologic Unit Code 1711000203, 171100020303, and 171100010500). The wetland mitigation site and Anacortes Subdivision are located in extensive floodplains associated with the post-glacial Skagit River delta system. The Swinomish Channel is the main remnant distributary channel in the study area. Telegraph Slough and several other remnant distributary channels are also present but are mostly cut off from Padilla Bay by roads, levees, or dikes. The Shell Puget Sound Refinery (PSR) site on March Point peninsula is located on a raised marine terrace at least 160 feet above the Skagit River floodplain (Bulthius 2013).

Native vegetation communities and wildlife habitat have been substantially altered and fragmented since the early 19th century due to land clearing, dredging, and diking of tidelands for agriculture and maritime navigation, and development of rail and road transportation systems.

Portions of the proposed project site on March Point were cleared for agricultural land use starting in the mid-1800s (City of Anacortes 2016). The existing rail line in the southern portion of the proposed project site (i.e., the Anacortes Subdivision) was originally built in 1890 (Skagit County 2015), and roads in the study area were built starting in the early 20th century. The March Point peninsula was dominated by deciduous and coniferous forest prior to the development of the Shell and Texaco (now Tesoro) refineries in the 1950s (Skagit County 2016a, Historylink 2016).

The wetland mitigation site was a tidal marsh before it was diked and drained for agriculture in the late 1800s. It was used for grain and vegetable crop production until it was converted to a hybrid poplar tree farm in 1997 (AECOM 2016b).

The Anacortes Subdivision is located within the Skagit Valley, which was converted from a large delta system with extensive sloughs, salt marshes, and mud flats to agricultural land starting in the 19th century.

Vegetation

Table 3.6-2 summarizes the locations of existing vegetation communities and land cover types identified within the study area following descriptions in Johnson and O'Neil (2001).

Table 3.6-2 Vegetation Communities and Land Cover Type Descriptions

Vegetation Community/Land Cover Type	Description
Urban and mixed environs	Man-made transportation corridors, buildings, impermeable surfaces, bridges, dams, devoid of native vegetation
Agricultural, pasture, and mixed environs	Cultivated croplands, modified grasslands, and mowed, hayed, or grazed pastures
Lowland conifer-hardwood forest	Upland tree stands dominated by evergreen conifers and/ or deciduous trees
Westside riparian-wetland	Freshwater forested and scrub-shrub wetlands and forested/shrub vegetation associated with rivers and streams
Herbaceous wetlands	Freshwater emergent wetlands
Lakes, rivers, ponds, and reservoirs	Freshwater aquatic habitat; vegetation may occur at the margins but features are mostly unvegetated
Bays and estuaries	Lower reaches of rivers, estuarine wetlands, intertidal sand and mud flats, estuarine wetlands
Marine nearshore	Marine water areas along shorelines not significantly affected by freshwater inputs with unvegetated or submerged vegetated habitat

Proposed Project Site

Vegetation that currently occurs at the project site is predominantly pasture that has been used for cattle grazing, with remnant isolated patches of mixed deciduous-coniferous, second-growth forests. The west side of the project site is comprised of developed industrial land associated with the existing Shell PSR facilities. Estuarine habitat is located in the southeast corner of the Shell PSR property, and nearshore marine habitat in Padilla Bay is found to the east of the project site.

Nootka rose

Vegetation Communities

Table 3.6-3 summarizes vegetation communities and land cover type composition and prevalence within the project site and surrounding study area. Please refer to Chapter 3.5 – Wetlands, for a detailed description of freshwater wetlands within the project site, and Chapter 3.4 – Fish and Aquatic Species and Habitat, for details on freshwater, tidal, and nearshore aquatic habitat in the project vicinity.

Table 3.6-3 Vegetation Communities and Land Cover Type Prevalence – Project Site

Vegetation Community/ Land Cover Type	Occurrence in the Project Site and Surrounding Study Area and Dominant Vegetation[1]	Prevalence in this Portion of the Study Area (approximate)
Urban and mixed environs	This is the predominant cover type in this portion of the study area and encompasses developed portions of the Shell PSR site, Anacortes Subdivision, roads, and businesses south of the proposed project site. Vegetation is sparse and consists of introduced plant species near the edge of rail and road rights of way and facility perimeters.	39% (249 acres)
Agricultural, pasture and mixed environs	Undeveloped portions of the Shell PSR site mainly consist of pasture that has been heavily grazed by cattle. Dominant native and introduced plant species include velvetgrass (*Holcus lanatus*), bentgrasses (*Agrostis spp.*), fescues (*Festuca spp.*), crested dogtail (*Cynosurus cristatus*), Kentucky bluegrass (*Poa pratensis*), meadow foxtail (*Alopecurus pratensis*), clovers (*Trifolium spp.*), dandelion (*Taraxacum officinale*), birds-foot trefoil (*Lotus corniculatus*), garden vetch (*Vicia sativa*), hairy vetch (*Vicia hirsuta*), mouse-ear chickweed (*Cerastium glomeratum*), wheatgrass (*Agropyron sp.*), Coastal wormwood (*Artemisia suksdorfii*), Fuller's teasel (*Dipsacus fullonum*), and lesser hawkbit(*Leontodon saxatilis*). Noxious weeds found in the pastures are discussed in the "Noxious Weeds" subsection in this chapter.	18% (112 acres)

Vegetation Community/ Land Cover Type	Occurrence in the Project Site and Surrounding Study Area and Dominant Vegetation[1]	Prevalence in this Portion of the Study Area (approximate)
Herbaceous wetlands	Emergent wetlands are the predominant wetland vegetation community in this portion of the study area, and mainly occur in grazed pastures. These wetlands are temporarily or occasionally flooded to seasonally saturated. Plant species composition is similar to agricultural/pasture vegetation described above.	12% (74 acres)
Westside riparian-wetland	Forested and scrub-shrub wetlands occur in fragmented patches throughout the proposed project site and surrounding study area. These are depressional wetlands with seasonal inundation and slope wetlands that are temporarily flooded or seasonally saturated. Dominant tree species are red alder (*Alnus rubra*), black cottonwood (*Populus balsamifera*) and Pacific willow (*Salix lasiandra*); scattered quaking aspen (*Populus tremuloides*) and western red cedar (*Thuja plicata*) also occur. Common understory shrub and emergent species in these wetlands include salmonberry (*Rubus spectabilis*), Nootka rose (*Rosa nutkana*), Douglas spirea (*Spiraea douglasii*), black twinberry (*Lonicera involucrata*), Sitka willow (*Salix sitchensis*), lady fern (*Athyrium filix-femina*), and fringecup (*Tellima grandiflora*). One patch of riparian vegetation associated with Stream S occurs in the southern portion of the Shell PSR site. Native vegetation consists of black cottonwood and red alder, Douglas spirea, Nootka rose, Sitka willow, and snowberry (*Symphoricarpos albus*). However, it is a small, isolated vegetation community with no connectivity to larger riparian corridors. No other riparian vegetation occurs in this portion of the study area.	11% (73 acres)
Lowland conifer-hardwood forest	Remnant patches of upland coniferous and deciduous forest are found throughout the proposed project site and surrounding area. Dominant tree species are red alder, black cottonwood, paper birch (*Betula papyrifera*), western red cedar, Douglas fir (*Pseudotsuga menziesii*), bigleaf maple (*Acer macrophyllum*), quaking aspen, and grand fir (*Abies grandis*). Common native and introduced understory shrubs include salmonberry, trailing blackberry (*Rubus ursinus*), snowberry, Indian plum (*Oemleria cerasiformis*), tall Oregon grape (*Mahonia aquifolium*), red elderberry (*Sambucus racemosa*), Pacific crabapple (*Malus fusca*), red huckleberry (*Vaccinium parvifolium*), vine maple (*Acer circinatum*), oceanspray (*Holodiscus discolor*), and coast black gooseberry (*Ribes divaricatum*). Herbaceous species in the understory include sword fern (*Polystichum munitum*), northern woodfern (*Dryopteris expansa*), bracken fern (*Pteridium aquilinum*), stinging nettle (*Urticadioica*), fringecup, Siberian miner's lettuce (*Claytonia sibirica*), common bedstraw (*Galium aparine*), and bittercress (*Cardamine sp.*).	10% (66 acres)

Vegetation Community/ Land Cover Type	Occurrence in the Project Site and Surrounding Study Area and Dominant Vegetation[1]	Prevalence in this Portion of the Study Area (approximate)
Marine nearshore	Padilla Bay is a broad, flat embayment filled with sediment from the Skagit River, creating a shallow, flat, and muddy landform. The bay is so shallow that it is almost entirely intertidal, exposing miles of mud flats. Large eelgrass (*Zostera*) meadows thrive in this intertidal habitat. See Chapter 3.4 – Fish and Aquatic Species and Habitat for more detail on nearshore habitat.	10% (61 acres)
Bays and estuaries	Estuarine wetlands connected to Padilla Bay occur in the southeast corner of the Shell PSR site. This area is fenced off from cattle grazing. Dominant plant species include salt grass (*Distichlis spicata*), woody saltwort (*Salicornia virginiana*), Baltic rush (*Juncus balticus*), spear saltbush (*Atriplex patula*), arrow-grass (*Triglochin maritima*), and Lyngbye's sedge (*Carex lyngbyei*).	<1% (3 acres)

1. Source: URS 2013, AECOM 2016a, Audubon Society 2016.

Wetland Mitigation Site

The proposed wetland mitigation site is predominantly stands of hybrid poplar trees. The site has not been in active agricultural production since it was planted in 1997 and 1998 (AECOM 2016b). Blind Slough and East Slough, remnant tidal channels that have been isolated from daily tidal input, are located here. Nearshore marine habitat in Padilla Bay and Telegraph Slough is found on the north and east sides of the site.

Vegetation Communities

Table 3.6-4 summarizes vegetation community and land cover type composition and prevalence within the proposed wetland mitigation site and surrounding study area.

Table 3.6-4 Vegetation Community and Land Cover Type Prevalence – Wetland Mitigation Site

Vegetation Community/Land Cover Type	Occurrence in the Wetland Mitigation Site and Surrounding Study Area and Dominant Vegetation[1]	Prevalence in this Portion of the Study Area
Marine nearshore	Padilla Bay and Telegraph Slough adjoin the north and east sides of the wetland mitigation site, respectively. Salt marsh habitat is located immediately waterward of the levees, transitioning into mudflats farther into the bay. Pickleweed (*Sarcocornia perennis*), salt grass, and atriplex occur in the low salt marsh habitat; eelgrass beds occur waterward of the levees. See Chapter 3.4 – Fish and Aquatic Species and Habitat, for more details on nearshore habitat.	31% (160 acres)

Vegetation Community/Land Cover Type	Occurrence in the Wetland Mitigation Site and Surrounding Study Area and Dominant Vegetation[1]	Prevalence in this Portion of the Study Area
Westside riparian-wetland	This is the predominant terrestrial community in the wetland mitigation site and surrounding study area and is comprised of hybrid poplar (*Populus trichocarpa* x *P. Deltoides*) trees planted in 1997. Many of the trees throughout the site are dead or dying due to waterlogged roots and contact with interstitial saltwater from Padilla Bay. Dense Himalayan blackberry, a noxious weed, is the dominant understory species throughout the wetland mitigation site. Scattered black twinberry, paper birch, willowherb (*Epilobium ciliatum*), velvetgrass, colonial bentgrass (*Agrostis capillaris*) and sword fern (*Polystichum munitum*) are also present. South of the wetland mitigation site, woody wetland and riparian vegetation associated with Blind and Telegraph sloughs are present.	31% (159 acres)
Agriculture, Pasture, and Mixed Environs	Located south of State Route (SR) 20 in this portion of the study area, intensively farmed croplands, and modified grasslands support a wide variety of commercial crops and feed for livestock production. Fallow fields frequently flood in the winter.	18% (92 acres)
Urban and mixed environs	This cover type includes the dikes, residences and associated structures located on the mitigation site, SR 20, and the Anacortes Subdivision. Vegetation mainly occurs on the dikes and is comprised of tall fescue (*Festuca arundinacea*), bentgrass, velvetgrass, and white clover (*Trifolium repens*).	13% (64 acres)
Herbaceous wetlands	Patches of emergent wetlands are located in low areas too wet for hybrid poplars to establish. Colonial bentgrass is dominant; scattered salt-tolerant species including salt grass, pickleweed, Canadian sandspurry (*Spergularia canadensis*), brass buttons (*Cotula coronopifolia*), and atriplex (*Atriplex sp.*) are also present.	6% (29 acres)
Lakes, rivers, ponds, and reservoirs	Blind Slough and East Slough are included in this land cover type. They are relic tidal channels that no longer have surface connections to Padilla Bay. They contain shallow, brackish water. East Slough currently functions as a drainage ditch that drains north into Padilla Bay via a pump station; Blind Slough is a brackish pond that outflows mainly to the south. Salt-tolerant forbs and grasses grow along the margins of the sloughs.	1% (6 acres)

1. Source: AECOM 2016a.

Special Status Plants

Special status plants are vascular and non-vascular plant species that are classified at the federal or state level as endangered, threatened, a species of concern, sensitive species, or candidate species (Washington Native Plant Society 2016). Washington Natural Heritage Program (WNHP 2015) does not depict any special status plants on the proposed project or wetland mitigation sites. The nearest documented occurrence of a special-status plant is black lily (*Fritillaria camschatcensis*) located more than 5 miles to the southwest of these sites.

Special status plants are vascular and non-vascular plant species that are classified at the federal or state level as endangered, threatened, a species of concern, sensitive species, or candidate species (Washington Native Plant Society 2016; WNHP 2015).

Noxious Weeds

Noxious weeds are invasive, nonnative plants that are highly destructive, competitive, or difficult to control by cultural or chemical practices (WAC 16-750-001). The Washington State Weed Board and the Washington State Department of Agriculture (WSDA) county noxious weed control boards implement the state's noxious weed law (Chapter 17.10 RCW), which identifies three classes of noxious weeds (WAC 16-750-003):

- **Class A noxious weeds** are not native to the state, are of limited distribution or are unrecorded in the state, and pose a serious threat to the state.
- **Class B noxious weeds** are not native to the state, are of limited distribution or are unrecorded in a region of the state, and pose a serious threat to that region.
- **Class C noxious weeds** refer to any other noxious weeds not identified in Class A or Class B.

The Skagit County Noxious Weed Control Board has adopted the State's County Weed List to include all Class A weeds, Class B-Designate weeds, and those Class B and Class C weeds selected for control (Skagit County 2016b). Table 3.6-5 lists the Skagit County noxious weeds that are documented to occur on both the proposed project and wetland mitigation sites, respectively (URS 2013; AECOM 2016a; Riggs 2011).

Table 3.6-5 Documented Noxious Weeds – Proposed Project and Wetland Mitigation Sites

Scientific Name	Common Name	Skagit County Noxious Weed Class[1]	Location[2]
Cytisus scoparius	Scot's broom	B	P
Daphne laureola	Spurge laurel	B	P
Hypochaeris radicata	Hairy cat's-ear	B	P, M
Lepidium latifolium	Perennial pepperweed	B	M
Leucanthemum vulgare	Ox-eye daisy	B	P

Scientific Name	Common Name	Skagit County Noxious Weed Class[1]	Location[2]
Sonchus arvensis ssp. arvensis	Field sow-thistle	B	M
Cirsium arvense	Canada thistle	C	P, M
Cirsium vulgare	Bull thistle	C	P, M
Hypericum perforatum	Common St. John's wort	C	P
Linaria vulgaris	Butter-and-eggs	C	M
Phalaris arundinacea	Reed canarygrass	C	P, M
Rubus armeniacus	Himalayan blackberry	C	P, M
Rubus laciniatus	Evergreen blackberry	C	P, M
Senecio vulgaris	Common groundsel	C	P, M
Tanacetum vulgare	Common tansy	C	P, M

1. Source: Skagit County 2016b.
2. P= Project Site; M= Wetland Mitigation Site.

In addition to the species detected on the proposed project and wetland mitigation sites, several other Class A, B, and C noxious weeds are known to occur in Skagit County (2016b), and could also occur in the study area if suitable habitat or a dispersal source were present. Aquatic invasive species are discussed in Chapter 3.4 – Fish and Aquatic Species and Habitat.

Anacortes Subdivision

The Anacortes Subdivision is located in the expansive farmlands of the Skagit Valley, with areas of residential, industrial and commercial development. The western portion of the rail line and surrounding study area crosses estuarine and nearshore tidal habitat associated with the Swinomish Channel and relict sloughs and distributary channels. The eastern portion is located in the City of Burlington.

Vegetation Communities

Table 3.6-6 and Figures 3.6-3 and 3.6-4 summarize and illustrate the vegetation communities and their dominant vegetation and prevalence within the Anacortes Subdivision and surrounding study area.

Table 3.6-6 Vegetation Communities and Land Cover Types – Anacortes Subdivision

Vegetation Community/Land Cover Type	Occurrence along the Anacortes Subdivision and in the Surrounding Study Area and Dominant Vegetation[1]	Prevalence in this Portion of the Study Area (approximate)
Agricultural, pasture and mixed environs	This is the predominant vegetation community in this portion of the study area. Intensively farmed croplands, and modified grasslands support a wide variety of commercial crops and feed for livestock production. Fallow fields frequently flood in the winter.	70% (2,431 acres)
Urban and mixed environs	This cover type includes the Anacortes Subdivision, SR 20, roads, industrial, commercial and residential sites, and the City of Burlington. Sparse vegetation occurs near the edge of rail and road rights of way. Residential and commercial landscaping in the City of Burlington likely consists of non-native and introduced ornamental plant species.	15% (539 acres)
Marine nearshore	This cover type includes Swinomish Channel at the mouth of Padilla Bay and Telegraph Slough on the north side of SR 20. Patches of eelgrass are also present in deeper waters of the channel and bay. See Chapter 3.4 – Fish and Aquatic Species and Habitat, for more detail.	9% (320 acres)
Herbaceous wetlands	Large patches of emergent wetlands are associated with Telegraph Slough and Blind Slough in the western portion of the Anacortes Subdivision. Patches of non-farmed emergent wetlands are scattered throughout croplands in this area. Salt-tolerant grasses and forbs are expected to be predominant near the relict sloughs, whereas invasive species such as reed canarygrass are expected to be predominant in wetlands adjoining croplands.	2% (75 acres)
Bays and estuaries	Includes estuarine wetlands fringing the Swinomish Channel. Salt-tolerant grasses and forbs occur in this land cover type.	2% (58 acres)
Westside lowlands conifer-hardwood forest	One block of second-growth mixed deciduous and coniferous forest is located south of the Skagit Regional airport. Portions of the vegetation community have been recently logged.	1% (46 acres)
Westside riparian-wetland	Patches of deciduous forest and shrub vegetation are scattered throughout the area, and are mainly associated with relict distributary channels in the Skagit Valley.	<1% (12 acres)
Lakes, rivers, ponds and reservoirs	Blind Slough, East Slough and other relict tidal channels occur in the western portion of the study area. They do not receive daily tidal input, but still contain shallow, brackish water and support salt-tolerant forbs and grasses at the margins.	<1% (7 acres)

1. Sources: Skagit County 2016a, Mitchell et al. 2005.

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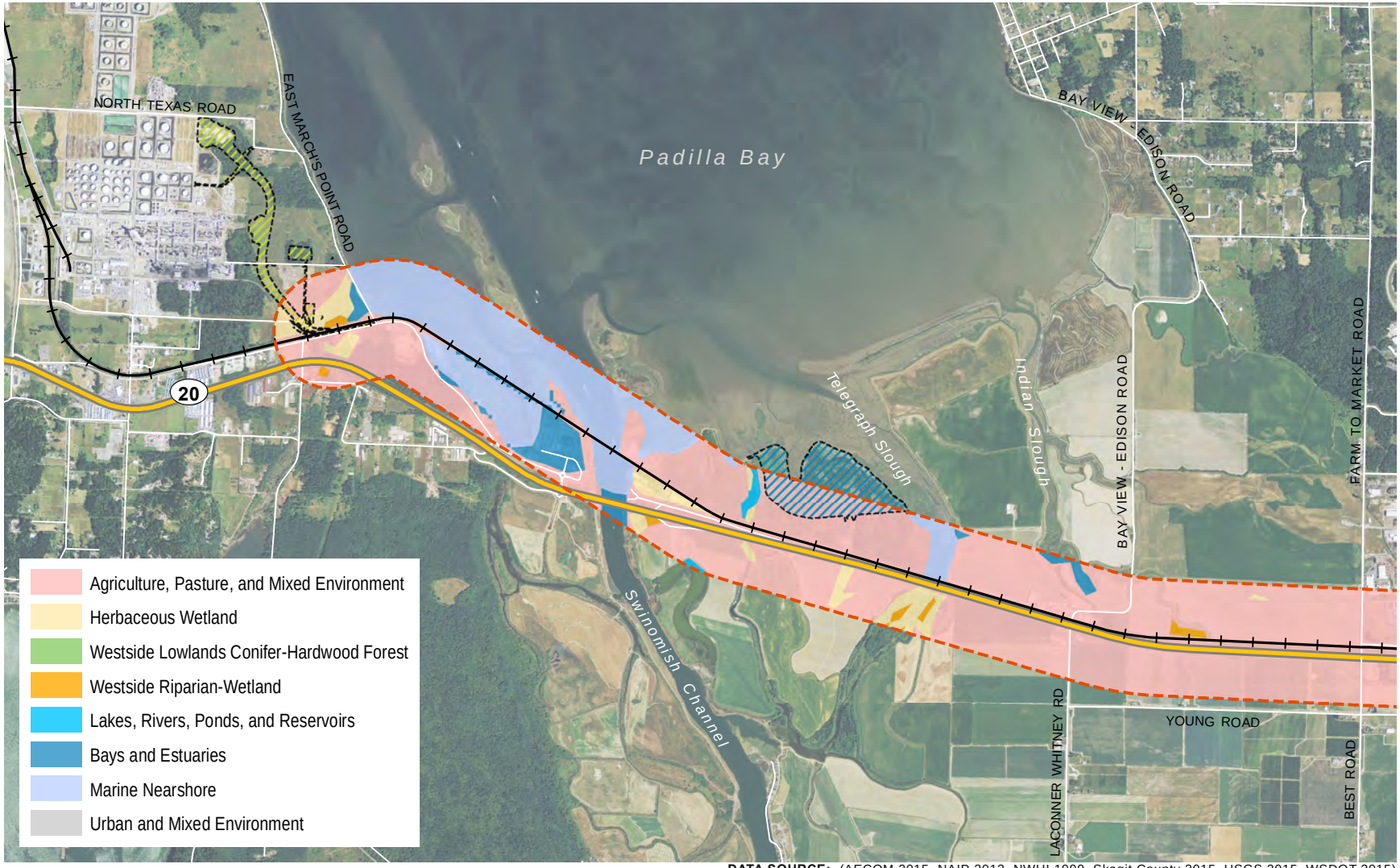

DATA SOURCE: (AECOM 2015, NAIP 2013, NWHI 1999, Skagit County 2015, USGS 2015, WSDOT 2015)

Proposed Project Site
Proposed Wetland Mitigation Site
Quarter Mile Study Area
Anacortes Subdivision

N

0 1,000 2,000 Feet

Figure 3.6-3
EXISTING VEGETATION COMMUNITIES – ANACORTES SUBDIVISION (WEST)

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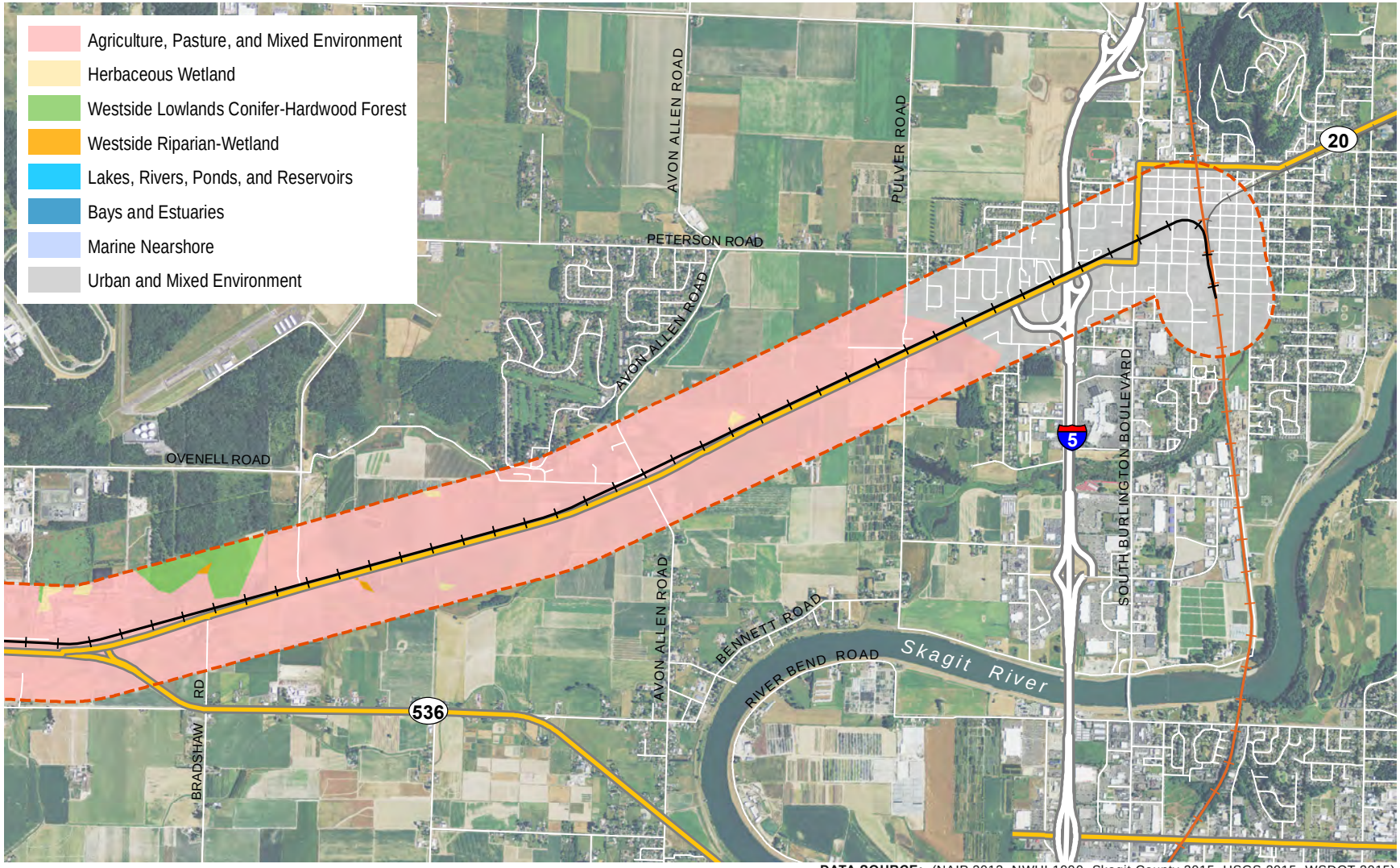


DATA SOURCE: (NAIP 2013, NWHI 1999, Skagit County 2015, USGS 2015, WSDOT 2015)

Quarter Mile Study Area
Anacortes Subdivision
Bellingham Subdivision
BNSF Railway

N

0 1,000 2,000 Feet

Figure 3.6-4
EXISTING VEGETATION COMMUNITIES – ANACORTES SUBDIVISION (EAST)

Special Status Plants

The Washington Natural Heritage Program (WNHP 2015) does not depict any special status plants in the Anacortes Subdivision or surrounding study area. The nearest documented occurrence of a special-status plant is of soft-leaved willow (*Salix sessifolia*), a State Sensitive species, located more than 3 miles southeast of the rail line. Most of the special-status plant species that potentially occur in the study area require undisturbed habitat ranging from open grasslands to moist meadows, ponds, and lakes (WNHP 2016).

Noxious Weeds

Smooth cordgrass (*Spartina alterniflora*), a Skagit County Class A weed, occurs at Swinomish Spit near the mouth of Padilla Bay (Riggs 2011). Other noxious weeds in the study area likely originate from agricultural sources such as hay, feed, grain, and crops (Skagit County 2016b). Noxious weeds in the City of Burlington may originate from wildflower seeds, bird seed, ornamentals, and accidentally planted noxious species in residential and commercial landscapes.

Terrestrial Wildlife Species and Habitat

Terrestrial species and habitat evaluated include general wildlife habitat and common species occurrences. This section also presents potential habitat for and occurrence of local, state, and federal lists of terrestrial threatened and endangered species and species of concern, migratory birds, and invasive terrestrial wildlife species.

Proposed Project Site

Wildlife Habitat and Common Species Occurrences

Urban and mixed environs is the primary vegetation community in this portion of the study area, comprising 39 percent of the proposed project site and its surrounding study area (Table 3.6-3), followed by agricultural, pasture, and mixed environs (18 percent); herbaceous wetlands (12 percent); westside riparian-wetlands (11 percent); lowland conifer-hardwood forest (10 percent); marine nearshore (10 percent); and bays and estuaries (<1 percent).

Agriculture, pasture, and mixed environs at the proposed project site

Table 3.6-7 summarizes wildlife habitat and associations for each vegetation community and land cover type (Johnson and O'Neil 2001; URS 2013, AECOM 2016a, Bulthius 2013; WDFW 2016b; Skagit Audubon Society 2014). Habitat for and occurrence of marine mammals in Padilla Bay is discussed in Chapter 3.4 – Fish and Aquatic Species and Habitat.

See Appendix C for a full list of wildlife species documented to occur or likely to occur in the study area.

Table 3.6-7 Wildlife Associations with Vegetation Communities and Land Cover Types – Proposed Project Site

Vegetation Community/Land Cover Type	Description
Urban and mixed environs	Wildlife use near the Shell PSR and other commercial and industrial sites in the area is likely minimal due to disturbance caused by noise, lights, and other human activity. Smaller mammal species may find shelter or breeding habitat in sheds or out-lying buildings with less human activity. Roads and railroads with more frequent human disturbance limit habitat availability and connectivity. Road kill provides a source of food for some bird and mammal species in the study area. Wildlife expected to occur in this habitat include species adapted to urbanized settings such as raccoons, crows, nonnative songbirds, and rodent species.
Agricultural, pasture, and mixed environs	Wildlife primarily use pastures on the proposed project site for foraging and movement between habitats. Woody vegetation communities located next to pastures may provide nesting sites for some bird and small mammal species, and shelter for mammals, reptiles, and amphibians. Wildlife detected or expected to occur in this habitat include foraging raptors, migratory songbirds, foraging waterfowl, shrews, moles, and rodents, and some native frog and lizard species.
Herbaceous wetlands	Herbaceous wetland habitat is comparable to agricultural, pasture, and mixed environs in the area. The presence of ponded areas provides potential habitat for amphibians, such as Pacific tree frogs, and some bird species that rely on water bodies for breeding. Wildlife species expected to occur in agricultural lands also are likely in this habitat.
Westside riparian-wetland	Wetlands and riparian corridors provide foraging, overwintering, and migration opportunities and a source of water for nearly all the terrestrial species expected to occur in the study area. Most mammals have the potential to breed in this habitat. Dead and downed wood provides foraging, cover, and refuge opportunities. Migratory and resident landbirds and waterfowl that may be found in the study area are wetland/riparian breeders. Certain bat species may have roosting sites in larger blocks of deciduous trees. Amphibians, reptiles, and mammal species associated with this cover type are expected to use, and also may breed in this habitat. However, this habitat is relatively fragmented and nearby disturbances from existing Shell PSR facilities may limit their opportunities.

Vegetation Community/Land Cover Type	Description
Lowland conifer-hardwood forest	Dead and downed wood provides foraging, cover, and refuge opportunities for amphibian, reptile, and mammal species associated with this cover type. Certain bird species also use downed wood for perching, foraging, cover, and nesting. Snags provide potential resting, roosting and nesting, and refugia habitat. Some mammals and reptiles may use forest stands for breeding. Live trees and shrubs provide food and cover for mammals and nesting sites for birds. Cavity-nesting birds, bats, songbirds, salamanders, and mammals such as deer, raccoons, and smaller mammals may use this habitat for a range of life history needs.
Marine nearshore	The portion of Padilla Bay nearest to the Shell PSR site provides key habitat for migrating and overwintering shorebirds. Eelgrass beds in deeper portions of the bay provide habitat for dozens of species of migrating and overwintering dabbling and diving ducks, piscivorous birds, and offer a key stopover site for the black brant, also known as Pacific brent goose (*Branta bernicla nigricans*). This area also serves as key winter habitat for a unique population of Western High Artic Brant, also known as Grey-belly Brant (*Branta bernicula*). This WDFW priority habitat is discussed in Special Status Species and Habitat later in this analysis.
Bays and estuaries	Estuarine wetlands and bays adjoining the Shell PSR facility provide stopover sites for migrating shorebirds, waterfowl, and other waterbirds. This habitat is also a food source for resident and overwintering waterfowl, birds of prey, and gulls that occur in the study area. The vegetated estuarine wetlands have potential nesting habitat for herons and heron-like birds, rails, and other water-associated birds that breed in the Puget Lowlands. Bats may forage over open water. Amphibians generally are not associated with this habitat, although northern red-legged frogs may breed in brackish water.

Wetland Mitigation Site

Wildlife Habitat and Common Species Occurrences

Marine nearshore and westside riparian-wetland are the primary vegetation communities at the wetland mitigation site and surrounding study area, each comprising 31 percent of the area (Table 3.6-4). These communities are followed in dominance by agricultural, pasture, and mixed environs (18 percent); urban and mixed environs (13 percent); herbaceous wetlands (6 percent); and lakes, rivers, and ponds (1 percent).

Table 3.6-8 summarizes wildlife habitat and species associations for each vegetation community and land cover type (URS 2013, AECOM 2016a, Bulthius 2013; WDFW 2016b; Skagit Audubon Society 2014). Appendix C provides a full list of wildlife species documented to occur or likely to occur in the study area.

Table 3.6-8 Wildlife Associations with Vegetation Communities and Land Cover Types – Wetland Mitigation Site

Vegetation Community/Land Cover Type	Description
Marine Nearshore	Padilla Bay provides key habitat for bird species comparable to those described for the proposed project site; the bay is also designated as WDFW priority habitat. Telegraph Slough is part of WDFW's Skagit Wildlife Area and provides opportunities for bird watching, waterfowl hunting, and wildlife viewing. A private hunting club uses the nearshore habitat of Padilla Bay waterward of the existing dikes. River otters have been observed near tidal flats.
Westside riparian-wetland	The wetland mitigation site has larger contiguous, relatively undisturbed blocks of habitat and is generally surrounded by less development. There is greater opportunity for landbirds, waterfowl, amphibians, reptiles, and mammals associated with this cover type to use and breed in this habitat compared with the proposed project site.
Agricultural, pasture, and mixed environs	Foraging is likely the most common activity of wildlife in intensely farmed croplands located to the south of the wetland mitigation site. Breeding habitat is minimal due to the ephemeral nature of potential nesting structures. Some species may breed in adjoining windbreaks, fence rows, and field borders that are not actively managed. Agricultural fields are key stopover habitat for Neotropical migratory birds, geese, and swans. Foraging raptors and large-to-small-stature mammals also use this habitat.
Urban and mixed environs	Wildlife that use undisturbed areas in the poplar farm may traverse residences and roads. State Route (SR) 20 and the Anacortes Subdivision have fragmented habitat and may limit wildlife movement between habitats. However, some mammals likely have adapted to using the Anacortes Subdivision as a corridor because rail traffic is less frequent than vehicular traffic on SR 20. Road kill provides a source of food for some bird and mammal species that occur in the study area.
Herbaceous wetlands	Herbaceous wetland habitat interspersed within the hybrid poplar stands provide opportunity for amphibian breeding and for a variety of birds to forage and rest.

Vegetation Community/Land Cover Type	Description
Lakes, rivers, ponds, and reservoirs	The permanently ponded Blind Slough and East Slough provide breeding, foraging, and movement opportunities for reptiles and amphibians that can tolerate brackish water, as no fish are known to occur in these sloughs. A range of birds and mammals may also use these areas for general life history needs as they are connected to relatively undisturbed lands. The sloughs are used by waterfowl; Blind Slough is used by a private club for hunting.

Anacortes Subdivision

Wildlife Habitat and Common Species Occurrences

Agricultural, pasture, and mixed environs is the primary vegetation community along the Anacortes Subdivision and surrounding study area, comprising 70 percent of the area (Table 3.6-6). This community is followed in dominance by urban and mixed environs (15 percent), marine nearshore (9 percent), herbaceous wetlands (2 percent); bays and estuaries (2 percent), and westside riparian-wetlands and lakes, rivers, ponds, and reservoirs (<1 percent each). Table 3.6-9 summarizes wildlife habitat and associations for each vegetation and land cover type. Appendix C provides a full list of wildlife species documented to occur or likely to occur in the study area. Habitat for and occurrence of marine mammals in Padilla Bay is discussed in Chapter 3.4 – Fish and Aquatic Species and Habitat.

Table 3.6-9 Wildlife Associations with Vegetation Communities and Land Cover Types – Anacortes Subdivision

Vegetation Community/Land Cover Type	Description
Agricultural, pasture, and mixed environs	Intensely farmed croplands along the Anacortes Subdivision provide similar habitat as those within the wetland mitigation site. Northern harriers, red-tailed hawks, and other raptors and swans were observed foraging in fields in December 2015.
Urban and mixed environs	Wildlife use in the Anacortes Subdivision is comparable to the urban and mixed environment in the wetland mitigation site. Wildlife movement is likely more common among less dense residences and less-traveled farm roads.

Vegetation Community/Land Cover Type	Description
Marine nearshore	Wildlife species that use this habitat at the mouth of the Swinomish Channel in Padilla Bay and at Telegraph Slough are comparable to those found at the wetland mitigation site. The study area includes the Swinomish Spit Game Reserve, which has restricted hunting to allow brant populations enhanced access to graveling sites, eelgrass beds, and resting and preening habitat (Kraege 2014; WAC 232-16-700).
Herbaceous wetlands	The large patches of wetland habitat adjoining relict tidal channels near Swinomish Channel likely support a greater diversity of bird, mammal, and amphibian species. Fragmented wetlands interspersed among croplands may provide foraging habitat for some birds and mammals, and breeding habitat for amphibians if sufficient inundation is present.
Bays and estuaries	Wildlife use habitat at estuarine wetlands fringing the Swinomish Channel are comparable to those near the Shell PSR site. Wildlife use is likely higher in this area because the estuaries are greater in size, extent, and connectivity to other undisturbed habitat.
Westside lowlands conifer-hardwood forest	One isolated block of second-growth mixed forest supports some wildlife normally expected for this habitat, particularly if they have a smaller range and limited need for other habitats. Surrounding roads and development limit wildlife movement through this habitat. Songbirds, small mammals, and some terrestrial salamanders and reptiles may breed here.
Westside riparian wetland	Habitat adjoining Telegraph Slough and other relict tidal channels in the west side of the study area provide foraging, breeding, and migrating habitat for a range of bird and mammal species. Fragmented patches in the Skagit Valley may still provide foraging and migratory habitat, particularly for birds.
Lakes, rivers, ponds, and estuaries	Wildlife use in Blind Slough and another relict channel on the south side of SR 20 is comparable to the wetland mitigation site.

Special Status Wildlife and Habitats – Study Area

Special-Status wildlife and habitats include the following:

- Federal proposed, candidate, threatened, and endangered species and critical habitat, and species that are managed by the Endangered Species Program of the USFWS.
- State Endangered, Threatened, Sensitive, and Candidate species; animal aggregations (e.g., heron colonies, bat colonies) considered vulnerable; and species of recreational, commercial, or tribal importance that are vulnerable.

Table 3.6-10 summarizes special status species that are known to occur or potentially occur in the study area. No federally designated or proposed critical habitat for terrestrial species is documented in the study area. Although it is noted that the Biological Evaluation prepared for the project (AECOM 2016a) does not include the Anacortes Subdivision as part of its action area. Several state-sensitive species (WDFW 2016a) and/or priority areas associated with those species are found in the study area. Species with documented occurrences in the study area are discussed below.

Table 3.6-10 Special Status Wildlife Species Documented or Potentially Occurring in the Study Area

Species	Status	Occurrence in the Study Area[1]
Federally-listed Species and Critical Habitat		
Marbled Murrelet (*Brachyramphus marmoratus*)	Federal Threatened State Threatened	No breeding habitat but potential foraging habitat is documented in the study area. Critical habitat is designated but not within study area.
Streaked Horned Lark (*Eremophila alpestris strigata*)	Federal Threatened State Endangered	Not documented in the study area. Inhabits sparsely vegetated grasslands, beaches, islands, and agricultural fields. Currently breeds in south Puget lowlands, coastal sites, and Columbia River sites. Critical habitat is designated but not within study area.
Yellow-billed Cuckoo Western Distinct Population Segment (DPS) (*Coccyzus americanus*)	Federal Threatened State Candidate	Not documented in the study area. Prefers large contiguous riparian zones for breeding. Smaller patches of woody vegetation may provide migratory habitat. Not documented in Puget lowlands since the 1940s. Critical habitat is proposed but not within study area.

Species	Status	Occurrence in the Study Area[1]
Canada lynx (*Lynx canadensis*)	Federal Threatened State Threatened	Not documented in the study area. Lynx are typically found in high-elevation forests of northeastern Washington. Critical habitat is designated but not within study area.
Oregon spotted frog (*Rana pretiosa*)	Federal Threatened State Endangered	Not documented within the study area, but the east end of the Anacortes Subdivision study area lies within a potentially occupied watershed. Historically occurred throughout the Skagit Valley; however, currently known to only occur in the Samish River drainage basin. Require large emergent wetlands with prolonged or permanent inundation for breeding. Critical habitat is proposed but not within the study area.
State-listed Species and Priority Habitats[2]		
Bald Eagle (*Haliaeetus leucocephalus*)	State Sensitive - breeding areas, communal roosts, regular concentrations	A total of four active nests are currently known to occur in the project study area: two nests are located on the Shell PSR site and two nests occur off-site to the southeast. One active bald eagle nest occurs in the wetland mitigation site area, and Padilla Bay is prime foraging habitat for the species. One active nest is documented near the SR 20/SR 536 junction on the Anacortes Subdivision. The study area also intersects the 660-foot buffer of a nest located in Burlington.
Great blue heron (*Ardea herodias*)	State Monitor - breeding areas	The March Point Heronry is documented on the periphery of the study area southeast of the Shell PSR site.
Shorebird concentrations	Regular concentrations	Padilla Bay is documented as key habitat for numerous migrating and overwintering shorebird species within the study area.

Species	Status	Occurrence in the Study Area[1]
Waterfowl concentrations	Regular concentrations	Padilla Bay is documented as key habitat for migrating and overwintering waterfowl species within the study area.

1. Sources: AECOM 2016a, USFWS 2016a,b, WDFW 2016a, WDFW 2015, URS unpublished undated data, Padilla Bay NERR 2016, WSDOT 2015, Danilson et al. 2013.
2. WDFW (2008) regulates most species as priority only within areas with known limiting habitats (e.g., breeding areas) or within areas that support a relatively high number of individuals (e.g., regular large concentrations). If limiting habitats are not known, or if a species is so rare that any occurrence is important in land use decisions, then the priority area for a species is described as "any occurrence."

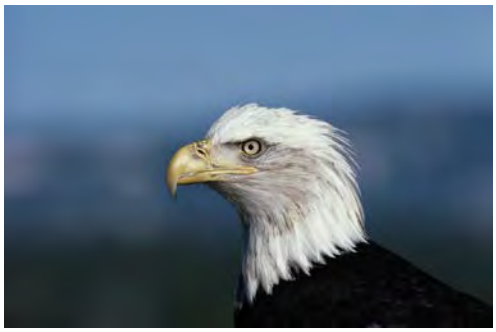
Federally-Listed Species

Marbled Murrelet

Marbled murrelets primarily nest in old growth forests, which are absent from the rail project area; however, they forage in waters up to 55 miles from their nesting habitat (AECOM 2016a). Padilla Bay is within the foraging range of potential marbled murrelet nesting habitat; the bay also provides a source of nearshore forage fish such as Pacific sand lance, Pacific herring, northern anchovy, and capelin. Marbled murrelets are noted to occur in Padilla Bay, in which they are considered uncommon (may be seen or heard in primary habitat) in fall, winter, and spring, and occasional-to-rare (unlikely to be seen or heard, but may be in the area) in summer (Padilla Bay NERR no date).

State-Listed Species and Priority Habitats

Bald Eagle



Bald eagle

Two active bald eagle nests occur on the Shell PSR site. One nest adjoins the Anacortes Subdivision rail line, and the other is in a patch of remnant deciduous/coniferous forest located mid-peninsula. Another bald eagle nest documented by WDFW on the Shell PSR site fell out of the nest tree in 2013. Two additional nests occur to the southeast of the project site and were documented as active in 2013. These nests are in proximity to the March Point great blue heron colony (discussed below). The last activity recorded by Shell was in the winter of 2014, at the nest along the Anacortes Subdivision. A pair of eagles was observed in the same nest on the rail line in December 2015, and one eagle was observed at the mid-peninsula nest. One bald eagle nest was discovered in 2016 at the wetland mitigation site, and there was evidence that a pair of eagles attempted to use the nest in May 2016 (Walker 2016). Under federal guidelines, the nest would be considered an active eagle nest, even if the pair was not successful.

One bald eagle nest is documented near the junction of SR 20 and SR 536 within the study area along the Anacortes Subdivision. WDFW (2016c) last surveyed the nest in 2012 and confirmed

that it was active, with two young nestlings detected. The east end of the study area intersects the edge of a 660-foot buffer of an additional eagle nest located outside of the study area. The 660-foot buffer is a protection zone established to minimize human disturbance to active nests (USFWS 2007). WDFW (2016d) last surveyed the nest in 2009 and confirmed that it was active; two young nestlings were also detected.

In western Washington, territorial eagles generally engage in courtship behavior in January and February. Most eagles begin to incubate their eggs by the third week in March and young hatch by late April (Watson 2006); however, the start of the nesting period for individual pairs can vary considerably year to year (Stinson et al. 2007). Incubation lasts for about 35 days and most young eagles fledge at 11 to 13 weeks, usually during early to mid-July (Watson 2006). Padilla Bay is prime foraging habitat for bald eagles who feed on fish, waterfowl, gull and seabird roosts, as well as the eggs and young of colony-nesting birds, including great blue heron.

Great Blue Heron

The March Point Heronry is a highly productive colony that is considered one of the largest in western North America (Skagit Land Trust 2016). It is located in a stand of mixed coniferous/deciduous forest surrounded by industrial businesses, SR 20, the Anacortes Subdivision rail line, and other roads. Skagit Land Trust (2016) counted 300 nests on accessible land in 2014. The total number of nests is likely higher considering nests that were not counted on private properties (Skagit Land Trust 2016). The heronry is typically occupied from March to August. Egg laying generally occurs in April, although 2015 observations indicate egg laying started as early as March (Eissinger 2007; Padilla Bay NERR 2016). Young are hatched, reared, and fledged from May to July-August (Eissinger 2007).

Herons forage for fish, frogs, and small mammals in Fidalgo and Padilla bays and farmlands in the Skagit Valley. Bald eagles are the primary natural predator of heron eggs and young, particularly in denser eagle nest territories in coastal areas, and are the cause of nest failure in some colonies (Eissinger 2007). However, nearby nesting bald eagles may provide herons and their young some protection from other predators including crows, ravens, and raccoons (Padilla Bay NERR 2009). There is no known published data for bald eagle predation in the March Point Heronry.

Shorebird and Waterfowl Concentrations

Padilla Bay is an extensive shallow bay with associated mudflats and sloughs and contains some of the most extensive eelgrass beds on the West Coast (WDFW 2016; Audubon Society 2016). These sheltered bays and sloughs serve as a critical wintering area for seabirds, ducks, and geese, and provide shelter and food for the large concentrations of waterfowl. Wintering waterfowl use the bay for loafing habitat and graveling sites. Padilla Bay is one of the remaining important overwintering sites for migrating brants, although they also use Padilla Bay as a staging area during autumn and spring migrations (Bulthius 2013). Herbivorous brants feed almost exclusively on eelgrass in the bay. Other large concentrations of birds documented in the bay include mallards, pintails, green-winged teal, wigeons, dunlins, western sandpipers, and black-bellied plovers (Bulthius 2013; WDFW 2016a).

Other Protected Wildlife Species

Other species of special interest include those that receive protection but are neither federally- or state-listed, nor considered state priority species. The federal Migratory Bird Treaty Act protects migratory birds including raptors, some species of gulls, waterfowl, swallows, and owls, as well as their eggs, parts, and nests (WSDOT 2006). Skagit County (Chapter 14.24.500 SCC) also designates Fish and Wildlife Habitat Conservation Areas on a site-specific basis according to the official Habitats and Species of Local Importance Map.

Invasive Terrestrial Wildlife

The Washington Invasive Species Council (2011) identifies two priority invasive terrestrial animal species that have the potential to affect native plants, animals, and ecosystems in Washington State—feral swine (*Sus scrofa*) and nutria (*Myocastor coypu*). Neither species has been detected in or near the proposed project or wetland mitigation sites. However, nutria are reported in Skagit County, particularly in canals and ditches, dikes and levees, and reservoirs (EDDMapS 2016; Washington Invasive Species Council 2011) and may occur in canals and ditches in agricultural lands along the Anacortes Subdivision. Agricultural pests regulated under the Washington Administrative Code (WAC, Title 16) are not addressed in this document.

ENVIRONMENTAL IMPACTS

No Action Alternative

Because no construction or operation would take place under the no action alternative, there would be no impacts to terrestrial vegetation or wildlife habitat. The no action alternative includes continued maintenance and repair activities necessary to keep the Anacortes Subdivision rail line operational; therefore, existing land uses would remain the same. Any significant changes to vegetation and wildlife habitat and species occurrences would be driven by trends not related to this project. The proposed wetland mitigation would not be implemented, which would preclude restoration of estuarine and nearshore habitat that historically occurred at the wetland mitigation site.

Proposed Project Site

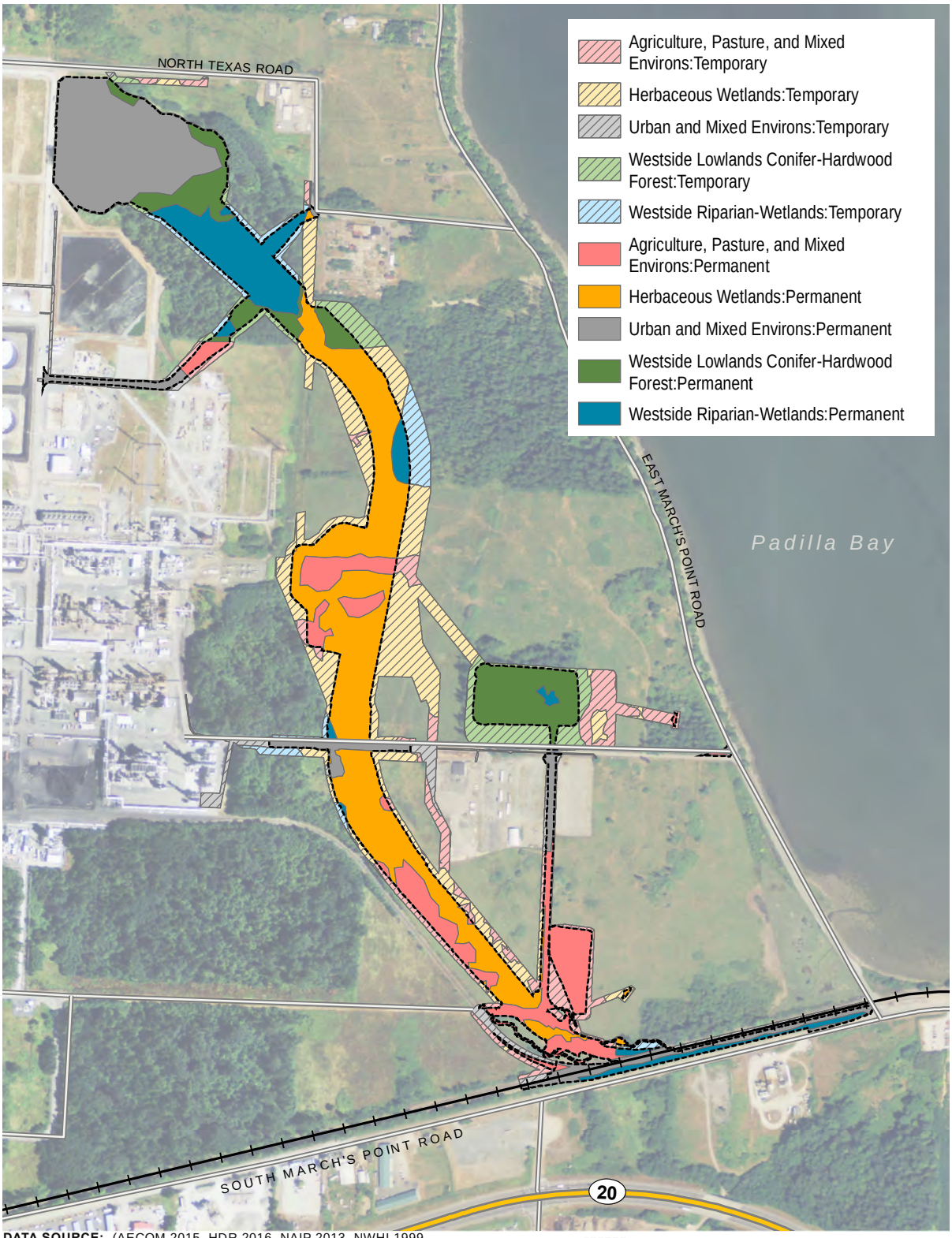
Direct Impacts to Vegetation

Construction

Removal of vegetation would be required to construct the project. The cleared areas would be necessary to accommodate the proposed facility features described in Chapter 2 – Proposed Project and Alternatives. Table 3.6-11 identifies the area of temporary and permanent clearing and the dominant vegetation type. Figure 3.6-5 illustrates the overall impacts the proposed project could have on vegetation communities.

Table 3.6-11 Vegetation Disturbance Areas Associated with the Proposed Project

Vegetation Community/ Land Cover Type	Permanent Impacts (acres)	Temporary Impacts (acres)
Agricultural, pasture and mixed environs	7.4	5.4
Herbaceous wetlands	15.9	10.8
Westside riparian-wetland	5.7	2.5
Lowland conifer-hardwood forest	6.4	3.5
Marine nearshore	0	0
Bays and estuaries	0	0
TOTAL	**35.4**	**22.2**



DATA SOURCE: (AECOM 2015, HDR 2016, NAIP 2013, NWHI 1999, Skagit County 2015, WSDOT 2015)

Project Site Location
State Highway
Anacortes Subdivision
Local Road

N

0 200 400 Feet

Figure 3.6-5

IMPACTS TO VEGETATION COMMUNITIES – PROPOSED PROJECT SITE

Most of this affected acreage consists of heavily grazed wetland and upland pasture. To the extent feasible, Shell would minimize disturbance to vegetation communities by using existing roads, and cleared areas for staging and access to construction sites.

Construction impacts would be temporary (approximately two years in duration), and would be limited to the period during and immediately following construction. Upon completion of construction, herbaceous wetland and upland areas would be replanted with native grass and forb species. To accommodate rerouted pipelines and retaining walls, approximately 1.22 acres of temporarily affected forested and scrub-shrub wetlands would be converted to emergent wetlands comprised of native herbaceous vegetation. Approximately 0.23 acre of forested wetlands and 2.11 acres of forested wetland buffers would be restored with native trees and shrubs.

The overall permanent impacts of construction on vegetation are not anticipated to be significant because the primary impacts to pasture vegetation are small-scale in the context of the larger contributing Telegraph Slough-Padilla Bay watershed, which is predominantly agriculture and pasture. Forest stands that would be permanently affected comprise approximately 9 percent of forest habitat identified in the study area. The remainder of the forested vegetation communities would not be affected. The project would have negligible impacts on the extent and connectivity, and overall integrity of forest habitat used by wildlife including migratory birds in the immediate Telegraph Slough-Padilla Bay watershed.

Construction of the proposed project is not expected to affect special-status plant species because no plant species or potentially suitable habitat were identified (WNHP 2016). If special-status plant species were present in the construction area, construction activities could affect them through trampling, removal of individuals, habitat degradation, potential spread and colonization of noxious weeds, or erosion and sedimentation. The overall impact of the proposed project on special-status plants is expected to be insignificant. Disturbance to vegetated areas would be mainly within heavily grazed pastures that are unlikely to provide suitable habitat for special-status plant species. Construction may increase the risk of introducing or contributing to the spread of noxious weed species.

Operation

Following construction of the proposed project, operation of the facility is not anticipated to disturb vegetation communities. Ongoing maintenance activities for other facilities are not anticipated to require additional clearing or grading outside the final facility footprint.

Indirect Impacts to Vegetation

Indirect, long-term impacts to vegetation could result from the impacts identified above, such as modification of vegetation, partial shading of wetland vegetation, water quality degradation, and alteration of wetland hydrology sources. The proposed project could also indirectly affect vegetation through the potential spread of nonnative plants and noxious weeds from ground-disturbing activities and dispersal from construction equipment and personnel. The indirect

impacts from the temporary and permanent footprint of the proposed project are expected to be localized and insignificant with the implementation of minimization measures and BMPs.

Additional trains entering the Shell PSR that are proposed under this project are unlikely to contribute substantially to the dispersal of invasive plant species because the unit trains would not carry cargo such as agricultural or food products that could be a source for invasive plant species.

Direct Impacts to Wildlife

Construction Impacts to General Wildlife and Habitat

Construction of the proposed project would temporarily disturb and permanently alter wildlife habitat in the vegetation communities described above. Removing trees, snags, and understory vegetation for the project would result in the loss of potential nesting and foraging sites for many species of birds, as well as reduce the availability of hiding cover for small mammals, and roosting and foraging sites for bats. Earthwork on the site may result in mortality of individual ground-dwelling species such as amphibians and small mammals that cannot flee a construction area.

Construction-related water quality impacts may alter foraging opportunities for waterfowl and other aquatic birds because of disturbances to sediments through in-water work, which could cause water clouding and obscure prey for waterfowl and other aquatic birds. Sedimentation may also affect amphibian breeding habitat due to deposition and settling of sediment particles on eggs. Spills of oil, gasoline, concrete, or other toxic substances have the potential to poison or injure waterfowl, and other wildlife.

Noise and light associated with construction activity can disturb wildlife by causing stress and altering behavior patterns, thereby interfering with activities such as reproduction and feeding. Construction would occur for a period of up to two years and take place during daytime hours. Habitat within 1,045 feet of the construction area could be disturbed from noise. Loud activities could cause some wildlife to move elsewhere, or discourage them from using adjacent habitats. The degree of disturbance would depend on noise level, timing, and duration of construction activities, as well as the sensitivity of the individual species. In the spring and summer months, nesting and rearing activities may be disrupted for amphibians and songbirds whose breeding habitat is more likely to occur near the proposed construction activities. However, this disturbance would be temporary and would not result in a long-term impact to breeding animals after construction is complete.

Nighttime construction is not anticipated at this time; however, lighting associated with potential nighttime construction activities and security operations could be a disturbance, particularly to nocturnal species. In general, most wildlife species found in developed areas are expected to be more adapted to urban conditions, highway noise, and other human disruptions. Wildlife associated with less developed or undeveloped habitat is expected to be less adapted to construction activities. Construction impacts from vegetation removal and earthwork are not anticipated to be significant. Although these activities could result in mortality of some

individual animals and permanent loss of breeding habitat such as freshwater wetlands, the overall impact is not anticipated to adversely affect the population viability of any one species in the immediate project vicinity.

Construction Impacts to Special Status Wildlife and Habitat

Construction would not directly alter marbled murrelet habitat. Noise from construction of the proposed project may reach the nearshore marine environment in Padilla Bay, which marbled murrelets use for foraging. Marbled murrelets may detect noise from construction, in particular asphalt cutting equipment, which could disrupt foraging behavior. Shell would limit asphalt cutting to coincide with low tides, when murrelets would not be foraging in Padilla Bay (AECOM 2016a). Implementation of this measure would minimize such disturbances during construction; therefore, the project would likely have a negligible impact on murrelets in the project vicinity.

Construction of the proposed project would permanently remove the active bald eagle nest near the Anacortes Subdivision in the southern portion of the project site. Shell would mitigate for this loss through design and development of two new bald eagle nesting platforms at least 400 feet from the new rail unloading facility. These platforms are expected to maintain or increase overall nesting opportunities on the project site (Shell Oil Products US 2014).

Vegetation clearing associated with construction work for one of the proposed stormwater facilities would clear overstory trees that provide potential perching and alternate nest sites within 400 feet of the mid-peninsula nest site that would be retained.

Active bald eagle nest that would be retained on the project site.

Because other special-status species or habitat are not known to occur on the project site, it is unlikely that construction would directly affect these species or habitat. Avoidance and minimization measures would further reduce the likelihood of direct impacts to special-status species.

Operational Impacts to General Wildlife and Habitat

Operation of the facility may result in direct, long-term disturbance to wildlife. Such impacts could include increased degradation of habitat quality, increased animal-train collisions, light and glare impacts, disruption of species' social structures, avoidance or abandonment of previously occupied areas adjacent to the facility, and obstructions to wildlife movement. The new rail unloading facility would also create a new barrier to formerly contiguous blocks of undeveloped habitat. This has the potential to divide wildlife populations into smaller, more isolated and less stable units, which may reduce access to vital habitats for a variety of wildlife species (FHWA 2010; Jackson 2000). The proposed additional unit trains would operate at up to 10 mph into and out of the Shell PSR facility, which may result in wildlife mortality due to train strikes of animals that are not acclimated to avoiding the new rail line.

Operational noise from the project may result in wildlife avoidance in the immediate vicinity of the new facility (Kaseloo and Tyson 2004); however, this impact is anticipated to be negligible, given the noise from existing operations on the Shell PSR site and other surrounding development. The noise impact analysis presented in Chapter 3.9 – Noise and Vibration, determined that noise resulting from the proposed addition of six train trips per week, on average, which includes intermittent, short horn blasts that may be required on the rail spur for safety reasons, would attenuate to background noise levels within 100 feet of either side of the new tracks. Operational noise may cause short-term species avoidance of the rail line when trains are present, and long-term avoidance of the site by certain species within 100 feet of the rail line. However, wildlife behavior is not anticipated to be significantly altered by operational noise. Potential impacts from an accidental oil spill to surface water are addressed in Chapter 3.3 – Surface Water.

Operational Impacts to Special-Status Species

Operation of the proposed project has the potential to affect behavior of bald eagles. Operation and maintenance of stormwater facilities near the retained bald eagle nest would increase human activity within 200 feet of the existing nest. Forested vegetation surrounding the nest would be permanently removed, making human activity visible from the nest.

Generally, human activity within 660 feet of an active nest may cause eagles to become agitated, which could result in inadequate nest repair, expenditure of energy defending the nest rather than tending to their young, or abandonment of the nest altogether (USFWS 2007). Operation of the proposed facility could have a significant impact on bald eagles if there is a net loss of nesting habitat on the project site. However, in accordance with the conditions of the USFWS bald eagle take permit that authorizes Shell to clear vegetation within 660 feet of the nest, Shell is required to monitor the nest for eagle use during critical months and report activity to the USFWS.

Noise from train operation is not anticipated to affect bald eagles. As described above, noise from train operations is expected to attenuate to background noise levels within 100 feet of the proposed rail spur. The retained bald eagle nest and proposed nest platforms would be at least 400 feet away from the rail spur, and are not anticipated to be significantly affected by noise from project operations.

Operation of the proposed project may also affect behavior of great blue herons at the March Point Heronry, particularly light pollution. However, lights in the proposed facility would be shielded and directed downward. The photometric analysis conducted by Shell (Shell Oil Products U.S. 2014) shows that light from the nearest facility fixture to the March Point Heronry would dissipate to zero approximately 50 feet from the source. Therefore, impacts to herons from additional light pollution are expected to be negligible; any additional light impacts generated from the project would be over 1,950 feet from the nearest corner of the March Point Heronry.

Noise from operation of six trains per week, on average, has the potential to affect heron behavior at the March Point Heronry. The loudest operational noise anticipated to be generated near the heronry would come from train horn blasts at the at-grade crossing at East March's Point Road.

The FRA requires the sounding of locomotive horns at public highway rail grade crossings, starting 0.25 mile from each at-grade crossing. Using WSDOT (2015) linear noise attenuation calculations, train horn blasts would attenuate to background noise levels in the vicinity of the heronry approximately 2,700 feet from the track. Herons may detect the horn blasts in the colony, which at its closest point is 700 feet away from the rail line. Although train horn blasts would be detectable by herons in the colony, the heronry is already surrounded by industrial and transportation development and herons can detect horn blast noise from existing train traffic. Regardless, the colony has demonstrated tolerance to existing noise from up to two trains per day as evidenced by the sustained productivity of the colony.

During heron breeding and rearing season (February to September) Azezerrad (2012) recommends a seasonal buffer to minimize noise disturbance activities that generate sound exceeding 92 dBA when the sound reaches the outer boundary of the nesting colony. Train horn blasts would attenuate to 92 dBA approximately 400 feet from the rail line, which would not reach the outer boundary of the colony located approximately 700 feet from the rail line. Thus noise levels that may be disruptive to breeding herons would not reach the colony during the breeding and rearing season. Operational impacts are anticipated to be insignificant to great blue herons because additional horn blasts would not result in injury, death, or harassment of wildlife that would adversely affect the population viability of this species.

Indirect Impacts

Operation of the proposed project may result in habitat degradation from stormwater discharges, alterations in stream hydrology, and air emissions causing indirect impacts to wildlife. Also, the introduction of exotic plants can degrade habitats (Jackson 2000). Loss of habitat for species that use these areas for breeding may also result in reduced breeding activity. Indirect impacts from new barriers to wildlife movement may include local population declines or, at worst, local extirpation due to predators or natural causes; smaller populations may also be more susceptible to inbreeding and to genetic defects (FHWA 2010; Jackson 2000).

Wetland Mitigation Site

Direct Impacts to Vegetation

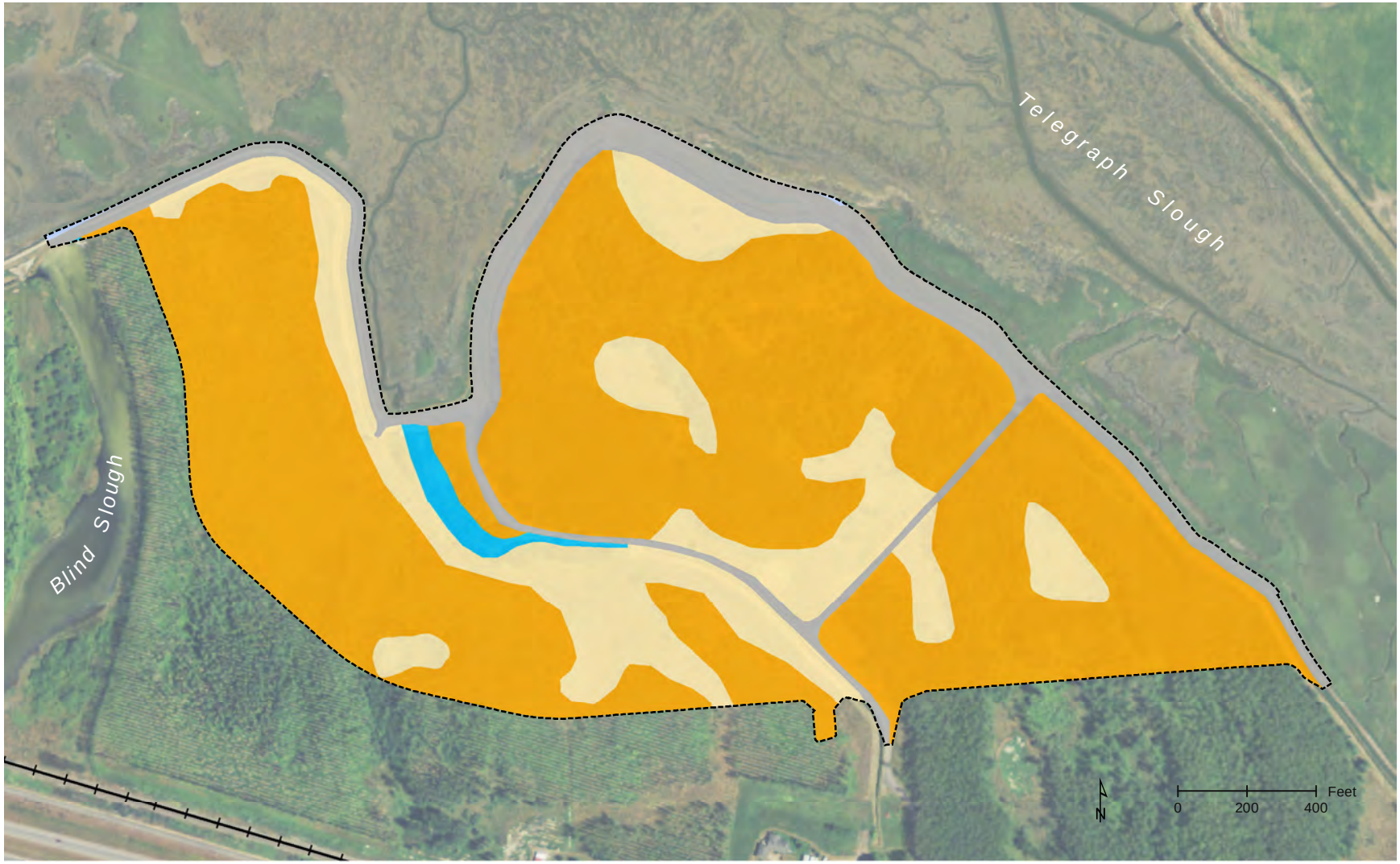
Construction

Construction of the mitigation features would require removal of vegetation at the wetland mitigation site. Table 3.6-12 identifies the areas of permanent clearing by vegetation community.

Table 3.6-12 Vegetation Disturbance Areas Associated – Wetland Mitigation Site

Vegetation Community/ Land Cover Type	Permanent Impacts (approximate acres)
Herbaceous wetlands	16.8
Westside riparian-wetland	58.8
Lakes, rivers, ponds, and reservoirs	1.0
Marine nearshore	0.1
TOTAL	**76.7**

A total of 76.7 acres of forested, scrub-shrub, and emergent wetland vegetation, as well as the East Slough, would be permanently cleared and regraded, and the dikes would be breached. The proposed wetland mitigation would reestablish nearshore ecosystem processes that are anticipated to develop into nearshore habitats over time (mudflats, salt marshes, tidal channels, and upland transition zones) (AECOM 2016b). Figure 3.6-6 illustrates the impacts to vegetation communities at the wetland mitigation site. If the mitigation site successfully establishes nearshore ecosystem processes, suitable habitat for native estuarine vegetation would persist in perpetuity, allowing native vegetation communities to increase in species abundance and resilience over time.



DATA SOURCE: (AECOM 2016, HDR 2016, NAIP 2013, NWHI 1999, WSDOT 2015)

Proposed Wetland Mitigation Site
Herbaceous Wetlands: Permanent
Lakes, Rivers, Ponds, and Reservoirs: Permanent
Marine Nearshore: Permanent
Urban and Mixed Environs: Permanent
Westside Riparian-Wetlands: Permanent
Anacortes Subdivision

Figure 3.6-6

IMPACTS TO VEGETATION COMMUNITIES – PROPOSED WETLAND MITIGATION SITE

Operation

Operation and maintenance would be designed to meet the goals and objectives of the wetland mitigation site, which are to restore nearshore habitats and establish upland vegetation on the new setback dike. After grading is completed, disturbed areas would be revegetated with native species. The site would be monitored for plant species cover and vigor, species diversity, and invasive species. Therefore, if successful, beneficial impacts associated with the operation of the wetland mitigation site would be significant because the site would increase the extent, connectivity, and integrity of native vegetation communities and land cover in the watershed.

Direct Impacts to Wildlife

Construction

Construction of the proposed mitigation site would permanently remove the active bald eagle nest discovered on the site this year. Shell would mitigate for this loss through design and development of two new bald eagle nesting platforms, which are expected to maintain or increase overall nesting opportunities on the project site. No significant impacts to other special-status species are anticipated as there is no breeding or other core habitat for any other species on the mitigation site. Special-status species such as herons that may forage on the site would be able to avoid the area during construction.

Construction impacts to nonsensitive wildlife species are anticipated to be similar to the proposed project site. These impacts are not expected to be significant. Although activities would likely result in individual animal mortality and permanent loss of deciduous forest habitat used by certain species for breeding, the impacts are not expected to adversely affect the overall viability of local populations of nonsensitive wildlife species.

Operation

Following construction of the wetland mitigation site, beneficial impacts associated with its operation could be significant for species dependent on nearshore habitats for life history stages, such as shorebirds and waterfowl.

Indirect Impacts

Over time, the wetland mitigation site is anticipated to reestablish nearshore habitat that could be used by bird species found in Padilla Bay. Some bald eagle perch trees would be lost and there may be temporary disturbance to nearshore habitat used by herons for foraging. However, successful implementation of the mitigation plan would increase food sources for both species in perpetuity because nearshore habitat and access for fish and aquatic species that eagles and herons prey upon would be re-established. Therefore, an overall net beneficial impact to wildlife is anticipated with construction and operation of the proposed project

Anacortes Subdivision

Direct Impacts to Vegetation

The proposed project would add, on average, six one-way train trips per week to the Anacortes Subdivision. Currently approximately two BNSF Railway trains travel daily on the Anacortes Subdivision to serve the Shell PSR, Tesoro Anacortes Refinery, and other neighboring industries.

There would be no change to ongoing vegetation maintenance along the rail line; therefore, the additional trains are not expected to affect vegetation. Unit trains entering the Shell PSR would be unlikely to contribute substantially to the dispersal of noxious weeds because they would not carry freight that could be a source for invasive plant species. Potential impacts from an accidental oil spill or explosion are addressed in Chapter 4 – Environmental Health and Risk.

Direct Impacts to Wildlife

The proposed project would add, on average, six one-way train trips per week to the Anacortes Subdivision rail line. Currently, four freight trains of varying types and lengths operate on an average day, in both directions, on the Anacortes Subdivision to serve the Shell PSR, Tesoro Anacortes Refinery, and other neighboring industries. The proposed addition of six trains per week would travel at speeds consistent with existing trains traveling on the Anacortes Subdivision.

Wildlife-train collisions are the most common cause of wildlife mortality along railways (Dorsey et al. 2015). Wildlife-train collisions are more common where higher quality wildlife habitat adjoins or intersects railways, or where moderate train traffic occurs (Dorsey et al. 2015). Slower-moving animal species that are unable to flee oncoming trains are more likely to be struck by trains. Carrion on the railway may attract scavenging mammals and birds that could subsequently be killed by a train strike.

The proposed additional trains have the potential to contribute a minor increase in wildlife-train collisions along the Anacortes Subdivision; however, the impacts are not likely to be significant. The developed landscape surrounding the rail line precludes the presence of higher quality habitat that may be used by wildlife. In addition, most of the rail line is not obscured by dense vegetation, which means that wildlife should be able to detect and evade oncoming trains. Noise from train operations on the Anacortes Subdivision is anticipated to have similar general impacts to wildlife as those described for the proposed project site. Shorebirds foraging in areas immediately adjoining the Swinomish Channel swing bridge may temporarily avoid the area during train operations, but the impact is anticipated to be negligible with no long-term avoidance or abandonment of nearshore habitat.

Cumulative Impacts

As described above, construction and operation of the proposed project could result in impacts to vegetation and terrestrial wildlife. Within the study area, there has been significant agricultural, industrial, commercial, and residential development. It is assumed that with this growth and construction, vegetation and terrestrial wildlife resources have been affected

The Tesoro Clean Products Upgrade Project (Tesoro 2015) (see Table 3.0-2 in Chapter 3.0 – Introduction, for additional project details) is anticipated to have minimal impacts on vegetation and terrestrial wildlife as the project would be constructed within a previously developed area of the refinery. The proposed project, and to a minimal extent, the Tesoro project, could contribute to a cumulative impact on vegetation and terrestrial wildlife. These impacts would be minimized by construction BMPs and localized to the Tesoro Anacortes Refinery site and the proposed project and mitigation sites.

MITIGATION MEASURES

Avoidance and Minimization

Shell has incorporated engineering and operational measures into the design of the proposed project to avoid and minimize vegetation and terrestrial wildlife impacts including:

- The North Stormwater Pond would be located away from the mid-peninsula eagle nest that would be retained.
- Most of the fish-accessible mid-to-lower reaches of Stream S, which parallels the existing BNSF Railway tracks, would be avoided. All of the wooded riparian area and the salt marsh portion of a Wetland I1 adjacent to Stream S would be avoided.
- Retaining walls would be used rather than sloped sides for the bridge on 4th Street to span the tracks to minimize permanent wetland impacts.
- Although not statutorily required, the lights at the proposed facility would be shielded and directed downward to minimize light pollution that could affect wildlife.
- Shell would restrict asphalt cutting near Padilla Bay to occur during low tides (5-foot tidal elevation or less) to reduce noise disturbance in potential marbled murrelet foraging habitat.

In addition, impacts to vegetation and terrestrial wildlife would be minimized by the implementation of the BMPs required as part of the NPDES Construction Stormwater Permit, CWA Section 404 Individual Permit, CWA Section 401 Water Quality Certification, Hydraulic Project Approval, Skagit County Grading Permit, and Shoreline Substantial Development Permit. For example, BMPs could include confining construction activities to daylight hours to minimize potential light and noise impacts to wildlife, implementing stormwater and erosion control BMPs, and restoring all temporarily disturbed areas with native vegetation appropriate to site conditions.

Mitigation

Construction of the proposed project would permanently remove two active bald eagle nests: one near the Anacortes Subdivision in the southern portion of the proposed project site, and a second found within the wetland mitigation site. In accordance with the conditions of the USFWS bald eagle take permit, Shell would mitigate for the loss of the bald eagle nests through design and development of two new bald eagle nesting platforms at least 400 feet from the new rail unloading facility, and two new bald eagle nesting platforms within the wetland mitigation site. These platforms are expected to maintain or increase overall nesting opportunities on the project site and wetland mitigation site. One existing bald eagle nest on the project site would be retained. Per the permit conditions, Shell would monitor the nest for eagle use during critical months and report activity to USFWS.

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3.7 CULTURAL RESOURCES

Cultural resources, (archaeological deposits, historic-era buildings, structures, and objects) are important components of the environment because they illustrate how humans have used and modified the natural world. They offer a window into a shared heritage that may not otherwise be visible, especially where archaeological sites are concerned. The proposed project and wetland mitigation sites sit in a location of special importance for Native American groups in part because of ready access to fish and intertidal resources. Historically, the region was an important agricultural area and rail corridor after Euro-American settlement in Skagit County.

STUDY AREA AND METHODOLOGY

Cultural resources inventory work for the proposed project and wetland mitigation sites was performed by Shell in 2013 (Stegner et al. 2013a, 2013b), 2015 (Stegner and Jones 2015), and 2016 (Stegner 2016a). This work was conducted in compliance with Section 106 of the National Historic Preservation Act because permits issued by the U.S. Army Corps of Engineers (USACE) are required and the project was defined as a federal undertaking.

The Area of Potential Effects (APE) was defined by the USACE for the 2013 inventory (Stegner and Jones 2015; Stegner et al. 2013a, 2013b). However, under the State Environmental Policy Act (SEPA), a slightly revised and somewhat smaller study area was used in this environmental impact statement (EIS) analysis because portions of the USACE-defined APE are no longer needed for the project. The portions that are no longer needed represent alternatives that would have impacted cultural resources near the southern extent of the proposed project. The USACE APE/EIS study areas used for this EIS are shown on Figures 3.7-1 and 3.7-3. Impacts on cultural resources were analyzed based on the footprints of the proposed project and wetland mitigation sites, and the spoils disposal sites (Chapter 2, Figure 2-11). Because the potential impacts associated with cultural resources are localized, the cumulative impacts study area would be the same as that described above for direct and indirect impacts.

Select laws, regulations, and guidance applicable to cultural resources in the study area are summarized in Table3.7-1.

Table 3.7-1 Laws, Regulations, and Guidance for Project-Related Cultural Resources

Laws, Regulations, and Guidance	Description
Federal	
Section 106 of the National Historic Preservation Act (NHPA) (16 USC 470a)	Requires federal agencies to take into account the effects of their undertakings on historic properties, and afford the Advisory Council on Historic Preservation a reasonable opportunity to comment. If the agency's undertaking could affect historic properties, the agency determines the scope of appropriate identification efforts and then proceeds to identify historic properties in the area of potential effects (APE). If the agency finds that no historic properties are present or affected, it provides documentation to the State and/or Tribal Preservation Office and, barring any objection within 30 days, proceeds with its undertaking.
State	
State Environmental Policy Act (SEPA) (RCW 43.21c; WAC 197-11)	Helps state and local agencies in Washington identify possible environmental impacts that could result from a proposed action, alternatives to the proposed action, and potential impact minimization and mitigation measures. Information learned through the review process can be used to change a proposal to reduce likely impacts and inform permitting decisions at the state and local levels.
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 conservation, preservation and protection of archaeological resources and the knowledge to be derived and gained from the scientific study of these resources. Establishes the Washington Department of Archaeology and Historic Preservation (DAHP) as the administering agency for these regulations.
Governor's Executive Order 05-05	Washington Governor Chris Gregoire signed Executive Order 0505 (GEO 05-05) into action in November of 2005. This order requires that all state agencies with capital improvement projects to integrate the DAHP, the Governor's Office of Indian Affairs (GOIA), and concerned tribes into their capital project planning process.
Abandoned and Historic Cemeteries and Historic Graves (RCW 68.60)	Protects and preserves abandoned and historic cemeteries and historic graves.

Laws, Regulations, and Guidance	Description
Washington State Shoreline Management Act (RCW 90.58)	Provides a statewide framework for managing, accessing and protecting shorelines of the state and reflects the strong interest of the public in shorelines and waterways for recreation, protection of natural areas, aesthetics, and commerce.

Background research for archaeological sites and cultural resource studies was conducted in December 2015 and early January 2016, using an approximate 0.5-mile research radius from these sites. This research area search of the online database of the Washington Department of Archaeology and Historic Preservation (DAHP), and the Washington Information System for Architectural and Archaeological Records Data (WISAARD), was performed for previous cultural resource studies, reports, archaeological site records, cemetery records, and National Register of Historic Places (NRHP) and Washington Heritage Register (WHR)-listed or eligible resources. In addition, DAHP's statewide predictive model layer was reviewed for probability estimates of prehistoric cultural resources. There are, at this time, no anticipated above-ground impacts associated with the project; therefore, no historic-era buildings, structures, or objects (other than NRHP- and WHR-listed properties) were included in this record search. However, four historic-era buildings, structures, or objects were recorded during cultural resource inventories conducted for the proposed project, and these are discussed below.

Historic-era buildings, structures, and objects are known to occur along the Anacortes Subdivision (e.g., historic-era rail bridges). These resources have not been included in this analysis because the proposed project is anticipated to have few, if any, impacts on them and they are generally outside the USACE-defined APE.

AFFECTED ENVIRONMENT

This section presents information covered in previous cultural resource studies conducted for the proposed project, but also correlates how those studies pertain directly to the project. A brief consideration of the precontact, ethnographic, and historic-era setting of the project is also included below. This context provides a high-level understanding of the history of the landscape in the vicinity of the proposed project.

Precontact – generally the time period of Native American history prior to initial contact with Euro-American goods and peoples.

Ethnographic – the time period when Native American cultures were in contact with Euro-Americans but still followed the majority of precontact lifeways.

Historic era – the period when Euro-American development and lifeways spread and grew in the region.

Proposed Project

Cultural Context

Precontact

Researchers have created several chronological sequences that describe the timing and nature of cultural change in the Pacific Northwest. Ames and Maschner (1999:66) provide

one of the most generalized and useful chronologies; theirs divides the chronology of prehistoric occupation into five developmental periods: Paleo-Indian, Archaic, Early Pacific, Middle Pacific, and Late Pacific. They suggest a gradual shift from small nomadic groups relying on generalized hunting and gathering, to larger sedentary groups with increasing social complexity and specialized reliance on marine and riverine resources.

Most archaeologists agree that human occupation and use of western Washington has been continuous since the late Pleistocene epoch (the geological period dating from about 2,588,000 to 11,700 years ago); archaeological evidence from sites like Manis (Waters et al. 2011) and Bear Creek (Kopperl et al. 2015) reinforce this notion. Archaeological sites from this time period are rare and suggest humans that occupied the region were familiar with the landscape and used a wide variety of resources including mega-fauna, game, fish, and plants.

Archaeological evidence of early to mid-Holocene (the epoch following the Pleistocene that dates from about 11,700 years to the present day) occupation is also not common and sites from this period are enigmatic (Chatters et al. 2011). Often these sites consist of a few pieces of flaked stone, some formed tools (e.g., leaf-shaped projectile points called Cascade points), and little else. Recently, archaeological evidence has demonstrated perishable materials were also used in everyday life (Stevenson et al. 2016). Commonly, sites from this period are identified as having an Olcott component, (flaked stone including cobble tools and lanceolate-shaped projectile points with few faunal remains) and are most probably the remnants of camps used by hunter-gatherer groups who moved in small groups and exploited a wide variety of resources.

Archaeologists believe that through the mid- to late Holocene, occupants in the region began to gather into larger groups and adopted more restricted, or specialized diets (Ames and Maschner 1999). As groups grew and economic specialization became a reality, social stratification developed as well. The emerging social stratification is indicated by increasing numbers of items of personal adornment (e.g., West Point [Larson and Lewarch 1995]). Sometime during this period, the foundation for the ethnographically observed cultural pattern was established.

Ethnographic

The proposed project lies within a region traditionally considered part of the Coast Salish cultural area within Swinomish territory (Haeberlin and Gunther 1930; Sampson 1972; Suttles and Lane 1990). The Swinomish are neighbored by the Samish and Skagit, each of whom used the general area prior to Euro-American incursion (Gibbs 1855; Smith 1940). Coast Salish groups are a Lushootseed-speaking people who share a number of cultural traits that are thought to have developed during the late Holocene, although the timing and nature of cultural development is a matter of some debate.

Orange honeysuckle

Traditionally, Coast Salish groups spent much of the summer and fall in small family groups gathering and storing resources for winter (Gibbs 1855; Smith 1940). Hunting parties may have ranged far for terrestrial game while other groups stayed closer to home to gather available geophytes, such as camas and other plants that could be eaten (e.g., berries), used as medicine (e.g., *orange honeysuckle*), or served as raw material for tools (Gunther 1945). Fishing was an important component of subsistence for most Coast Salish groups and according to Lane (1974) the Swinomish relied on the marine and freshwater fisheries. Shell fish would have undoubtedly served as an important component of Native Americans' subsistence in the region. Winters were spent in large cedar longhouses that were shared with extended family groups (Waterman and Grenier 1921).

Ethnogeography

Lane (1974) did not identify any important fishing locations near the proposed project and wetland mitigation sites; however, Waterman (Hilbert et al. 2001: 349–354) recorded at least five ethnographically important place names in the immediate vicinity including places associated with fishing (Table 3.7-2). Hilbert et al.'s Location 23 is described as "a village site on a small peninsula amid the water courses at the north end of the Swinomish Slough. [The] village was strongly stockade" (Hilbert et al. 2001:351).

Just north of this village site, Waterman recorded a location (No. 24) that translates as "scraped throat" and was an important fishing location. Other important places are known and recorded in the vicinity (Hilbert et al. 2001:351) of the spoils disposal sites identified in Chapter 2, Figure 2-11; however, as those locations are not finalized, the Ethnogeography is not considered in detail here. The number of recorded names for locations in the immediate vicinity of the proposed project and wetland mitigation sites demonstrates the great importance of this landscape for Native Americans.

Table 3.7-2 Ethnographic Places – Proposed Project and Wetland Mitigation Sites

Waterman Orthography	Waterman Translation	Lushootseed Orthography	Lushootseed Translation
Suksukwillya′al	None	??	??
Suxka′kuik	None	saxʷq̓iyuq̓	scraped throat
Ba′kʷbakwob	Open places among the trees	baqʷ baqʷab	prairies
TsExbE′qsd	None	??	??
Dugwa′ltc	Protected place where there is calm water	dəgʷalč	enclosed water

Source: Hilbert et al. 2001:349-354.

Historic Era

Members of the Swinomish, Lower Skagit, and Samish tribes were signatories of the Point Elliott Treaty, which was signed in 1855 and ratified by Congress in 1859 (Ruby and Brown 1986:166, 256, 331). The treaty came after numerous widespread and deadly epidemics among the Native American population, which were brought by Euro-American settlers (Boyd 1999).

The first European excursion to the region was by Spanish explorer Juan Francisco de Eliza in 1791, and was subsequently part of George Vancouver's expedition (Oakley 2004). The first Euro-American settlers in the vicinity of the proposed project arrived in the area during the middle of the 19th century and soon after began platting towns like LaConner and Mount Vernon (Willis 1973). Since Skagit County, in the vicinity of the proposed project, was such a wet area, diking and draining the land was necessary for settlement.

As the Washington territory grew, so too did the number of Euro-Americans settling in Skagit County. The population of Anacortes itself was approximately 2,000 by 1890 (Carter 2011). By the late 1880s, there was a substantial need for railroad service in the area, and the first line reached Sedro-Woolley, well east of the proposed project, by 1889 (Oakley 2004). In fact, by the turn of the 20th century, three rail lines—The Fairhaven and Southern Railway; The Seattle, Lake Shore and Eastern Railway; and the Seattle and Great Northern Railway—were all located within Skagit County (Carter 2011). These rail lines served the bustling timber and fishing industries that were taking hold in the region. As many as 11 canneries were operating in Anacortes alone by 1915, which also served as an important deep port in the region.

The March Point peninsula was dominated by deciduous and coniferous forest prior to the development of the Shell PSR and Texaco (now Tesoro) refineries in the 1950s (Skagit County 2016, Historylink 2016). These facilities were built on March Point because of the connection to deep water and nearby rail lines (Carter 2011). Since that time, these two facilities have become important to the regional economy and combine with tourism and fishing to serve as the major employing industries around Anacortes.

Previous Cultural Resource Studies

Nine cultural resource studies have been performed wholly or partially within approximately 0.5 mile of the proposed project, wetland mitigation, and potential spoils disposal sites (Table 3.7-3). Three of these studies were conducted for the proposed project by Shell (Stegner and Jones 2015; Stegner et al. 2013a, 2013b). Each of these studies is discussed below; additional, previously unavailable reports (not included in Table 3.7-3) provided by Shell through data requests, supplement the available documents. Additional information was requested because of some apparent data gaps in the initial report (e.g., justification for areas without shovel probe exploration). Shell's supplemental information included photographs and descriptions of demonstrated field conditions not suitable for additional exploration. These new materials provided better documentation of field conditions during that survey and their results (Stegner 2016b, 2016c).

Table 3.7-3 Previous Cultural Resource Studies Within 0.5 Mile of the Proposed Project and Wetland Mitigation Sites

Study Area	NADB	Title	Cultural Resources Identified in Study Area[1]	Citation
Proposed Project and Wetland Mitigation Sites	1349367	Resource Protection Planning Process Identification of Prehistoric Archaeological Resources in the Northern Puget Sound Study Unit	None	Blukis Onat 1987
Proposed Project	1347363	Cultural Resource Investigations for Washington State Department of Transportation's (WSDOT) State Route (SR) 20: Thompson Road Signal and Safety Project, Skagit County, Washington	None	Luttrell 2006

Study Area	NADB	Title	Cultural Resources Identified in Study Area[1]	Citation
Proposed Project	1352459	Archaeological Investigation Report: Turner's Bay Salt Marsh Restoration Project, Skagit County, Washington	None	Bush and Smart 2009
Proposed Project	1682446	March's Point Site Cultural Resource Study: Samish Indian Nation Fee-to-Trust Project	None	AES 2012
Proposed Project	1683920	Cultural Resource Inventory Report – Shell Puget Sound Refinery Crude by Rail East Gate Project, Anacortes, Skagit County, Washington	None	Stegner et al. 2013a
Proposed Project	1687514	Cultural Resource Inventory Addendum Report for the Shell Puget Sound Refinery Crude by Rail East Gate Project, Anacortes, Skagit County, Washington	45SK513; 45SK514	Stegner et al. 2013b
Wetland Mitigation Site		Cultural Resource Inventory Report for the Shell Puget Sound Refinery Poplar Plantation Property Wetland Mitigation Project, Anacortes, Skagit County, Washington	Three Buildings, Structures, or Objects; 45SK537	Stegner and Jones 2015
Wetland Mitigation Site		Archaeological Monitoring of Geotechnical Investigations at the Proposed Setback Dike for the Shell Puget Sound Refinery Poplar Plantation Property Wetland Mitigation Project, Anacortes, Skagit County, Washington	None	Stegner 2016a

Study Area	NADB	Title	Cultural Resources Identified in Study Area[1]	Citation
Proposed Kelleher Road Overflow Pit APE	1681719	Archaeological Assessment of the DeBoer Farm Conservation Reserve Enhancement Program (CREP) Buffer, Burlington, Skagit County, Washington	None	Hovezak and Koziarski 2011
Proposed Kelleher Road Overflow Pit APE	1685667	Summary of the Pedestrian Survey and Construction for the Kara Allen 2012 EQIP Project, Skagit County, Washington (DAHP Log No. 022013-11-NRCS)	None	Randolph 2014

Source data in table available in WISAARD.

1. Archaeological sites are identified by unique Smithsonian trinomials that generally follow the format "State Number in alphabetical order/County Abbreviation/unique sequential number for that county"

Shell (Stegner et al. 2013a, 2013b) conducted the cultural resource inventory for the proposed rail unloading facility (Figure 3.7-1) in March, July, and August of 2013. The inventory work included traditional background research and historic map review, as well as surface and subsurface surveys. The surface survey consisted of pedestrian transects spaced at 20-meter intervals, included 100-percent coverage of the construction footprint, and was conducted in three phases.

A total of 110 shovel probes were excavated to approximately 50 centimeters deep during the subsurface survey. These probes were placed in areas that were identified as high probability for cultural resources and that were neither inundated with water nor previously disturbed. Examples of heavily vegetated and inundated areas that were not excavated can be seen in Figure 3.7-2. Four previously unrecorded archaeological sites (45SK512, 45SK513, 45SK514, 45SK515) were identified, and one historic-era structure (Seattle and Montana/Great Northern Anacortes to Rockport Rail Line) was recorded during this inventory work (see discussion below).

DATA SOURCE: (AECOM 2015, NAIP 2013, Skagit County 2015, Stegner et al. 2013a and 2013b, WSDOT 2015)

Shovel Probes
USACE APE/EIS Study Area
Wetland
Tidal Marsh
Local Road
State Highway
Anacortes Subdivision

0 200 400 Feet

N

Figure 3.7-1

USACE APE/EIS STUDY AREA AND SURVEY – PROPOSED PROJECT SITE

Figure 3.7-2 Examples of Conditions Encountered Where Subsurface Surveys Were Not Conducted at Proposed Project and Wetland Mitigation Sites

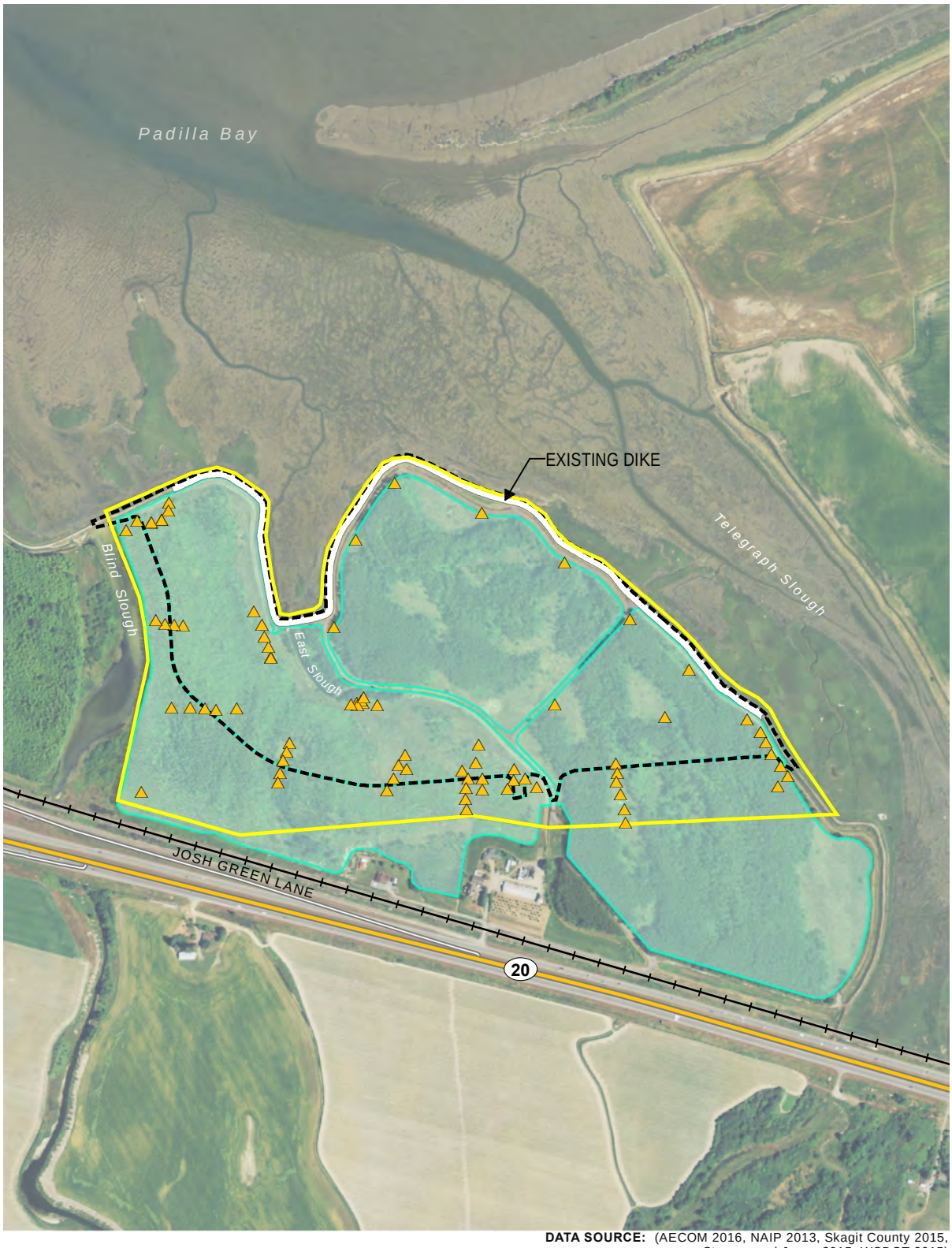
Source: Stegner 2016a.

Shell conducted cultural resource inventory work at the wetland mitigation site, an approximately 100-acre parcel, in July and September 2015 (Figure 3.7-3) (Stegner and Jones 2015). The surface survey consisted of pedestrian transects spaced at 20-meter intervals and included 100-percent coverage of the wetland mitigation area. A total of 77 shovel probes were excavated during the subsurface survey. These probes were placed in areas that were identified as high probability for cultural resources and that were neither inundated with water nor previously disturbed. One archaeological site (45Sk537), one building, one structure, and one object (a ditch, a pump house, and a dike) were recorded during this field effort (see discussion below).

In 2016, Shell conducted geotechnical investigations for a new setback dike on the wetland mitigation site and this effort included archaeological monitoring (Stegner 2016a). Archaeologists monitored 20 geotechnical borings and six groundwater monitoring wells that reached final depths of approximately 45 feet. Geotechnical bores were sampled using split spoon samplers and did not yield evidence of archaeological deposits.

Astrida Blukis Onat (1987) provided a review of the archaeological record in Skagit and other northern Puget Sound counties. This study did not record any archaeological sites within or immediately adjacent to the proposed project and wetland mitigation sites. Luttrell (2006) performed a cultural resource inventory consisting of surface and subsurface surveys along State Route (SR) 20, approximately 0.2 mile from the proposed project. No archaeological sites were recorded during this inventory. AES (2012) conducted a cultural resource inventory, also located approximately 0.2 mile south of the proposed project, and identified two previously unrecorded archaeological sites. These two archaeological resources were given temporary field numbers (CR-1 and CR-2); however, no formal records exist in WISAARD and these sites have not been evaluated for NRHP eligibility. Bush and Smart (2009) identified substantial disturbance but no intact archaeological deposits along Stevenson and Similk Bay roads during their archaeological survey.

In the vicinity of the potential spoils disposal sites, one study was conducted for a Conservation Reserve Enhancement Program (CREP) streamside vegetation buffer planting project (Hovezak and Koziarski 2011) and another report summarized the pedestrian survey and construction monitoring of a stream restoration project (Randolph 2014) (Table 3.7-3). No historic properties identified during fieldwork were included in either report.



DATA SOURCE: (AECOM 2016, NAIP 2013, Skagit County 2015, Stegner and Jones 2015, WSDOT 2015)

Shovel Probes
USACE APE/EIS Study Area
Proposed Wetland Mitigation Site
Wetland
Existing Levee
Anacortes Subdivision
Local Road
State Highway

N
0 200 400 Feet

Figure 3.7-3

USACE APE/EIS STUDY AREA AND SURVEY – WETLAND MITIGATION SITE

Previously Recorded Cultural Resources

Archaeological Sites

A total of 14 archaeological sites have been previously recorded within 0.5 mile of the proposed project and wetland mitigation sites, as well as the potential spoils disposal sites during the cultural resource inventory work conducted for the Section 106 compliance portion of this project (Table 3.7-4). Five of the archaeological sites have been identified as dating to the precontact period. However, none of these is within the boundaries of the proposed project, wetland mitigation, or the potential spoils disposal sites. The remaining sites date to the historic era (these are discussed in greater detail below). The 14 identified archaeological sites within the 0.5-mile study area are noted in Table 3.7-4.

Three historic-era archaeological sites (45SK512, 45SK513, and 45SK514) are within or adjacent to the proposed project boundaries; and a single historic-era archaeological site (45SK537) is within the wetland mitigation area. Sites 45SK512, 45SK513, and 45SK514 were recommended not eligible for listing in the NRHP. Site 45SK512 is adjacent to the project and has not formally been evaluated for NRHP eligibility. Recently, Matthew Sterner (personal communication, January 21, 2016) concurred with the USACE's recommendation that 45SK537, 45SK513, and 45SK514 are not eligible for listing in the NRHP (Stegner 2015d, Sterner 2016).

Table 3.7-4 Previously Recorded Archaeological Sites in Study Area

Location	Resource Number/ Name	Resource Type – Description	Precontact or Historic	Citation	NRHP Status
Within 0.25 mile of Proposed Project Site	45SK140	Lithic Scatter – "Leaf shaped points, large stemmed and corner removed"	Precontact	Mattson 1980	Unevaluated
Adjacent to Proposed Project Site	45SK512	Historic Debris Scatter – domestic debris	Historic era	Stegner 2013a	Unevaluated
Within Proposed Project Site	45SK513	Historic Foundation and Debris Scatter – three foundations and misc. debris	Historic era	Stegner 2013b	Determined Not Eligible (Sterner 2016)
Within Proposed Project Site	45SK514	Historic Agricultural Features – concrete troughs or basins	Historic era	Stegner 2013c	Determined Not Eligible (Sterner 2016)
Within Approx. 500 feet of Proposed Project Site	45SK515	Precontact shell midden and Historic Logging Camp – Shell midden in cut bank and historic debris	Precontact and Historic era	Stegner 2013d	Unevaluated

Location	Resource Number/ Name	Resource Type – Description	Precontact or Historic	Citation	NRHP Status
Within Approx. 750 feet of Proposed Project Site	45SK527	Historic Structure, Agriculture, Homestead, and Debris Scatter/ Concentration – Domestic debris and barn	Historic era	Stegner 2015a	Unevaluated
Within Approx. 750 feet of Proposed Project Site	45SK534	Historic Structure, Agriculture, Debris Scatter/ Concentration – rail car, concrete features	Historic era	Stegner 2015b	Unevaluated
Within Approx. 750 feet of Proposed Project Site	45SK535	Historic Structure, Agriculture, Homestead, and Debris Scatter/ Concentration – domestic debris, well burned wood	Historic era	Stegner 2015c	Unevaluated
Approx. 0.5 mile of Proposed Project Site	CR-1 (temp)*	Historic Structure and Debris Scatter	Historic era	AES 2012	Unevaluated
Approx. 0.5 mile of Proposed Project Site	CR-2 (temp)*	Debris Scatter	Historic era	AES 2012	Unevaluated
Within Wetland Mitigation Site	45SK537	Historic Debris Scatter/ Concentration	Historic era	Stegner 2015d	Not Eligible
Approx. 0.5 mile southeast of Proposed Gibralter Road Pit	45SK17	Shell Midden, Cairn Burials	Precontact	Bryan 1953	Unevaluated
Approx. 0.5 mile southeast of Proposed Wilbur Road Pit	45SK92 Swinomish Channel Midden #2	Shell Midden	Precontact	Munsell 1974a; Conca 1985a	Unevaluated
Approx. 0.5 mile southeast of Proposed Wilbur Road Pit	45SK93	Shell Midden	Precontact	Munsell 1974b; Conca 1985b	Unevaluated

* Indicates sites not formally recorded in WISAARD but identified in cultural resources report.

The general archaeological record in the vicinity of the proposed project and wetland mitigation sites demonstrates the importance of this landscape for Native Americans as well as historic-era settlement and development. Archaeological site 45SK140 is one of the older recorded archaeological sites in the region (Mattson 1980). The shell midden observed by Stegner (2013d) attests to the importance of the March Point area for Native American subsistence and settlement.

Cemeteries

One cemetery has been documented within 0.5 mile of the proposed project, wetland mitigation, and potential spoils disposal sites. Approximately 12 circular cairn burials were recorded with shell midden deposits as part of archaeological site 45SK17 (Bryan 1953). The cairns were on top of a bank above the beach near the alluvial fan and small stream adjacent to the beach (Bryan 1953). The cairn burials are just north of the slight promontory on the west side of Similk Bay. The burials and site 45Sk17 are approximately 0.5 mile southeast of the proposed Gibralter Road Pit spoils disposal site.

Historic-Era Buildings or Structures

There are four previously recorded historic-era buildings, structures, or objects within 0.5 mile of the proposed project and wetland mitigation sites (Table 3.7-5). Three of these resources (dike, pump house, and a ditch) were identified by Stegner and Jones (2015) within the proposed wetland mitigation area. These three resources were recommended not eligible for listing in the NRHP at the time of the 2015 study. Recently, the USACE determined that these resources are not eligible for listing in the NRHP, and DAHP concurred with these determinations (Jenkins 2015; Matthew Sterner, personal communication January 21, 2016).

The fourth historic-era building, structure, or object, is a segment of the Seattle and Montana Rail line constructed in the late 19th century that was recorded during fieldwork conducted by Stegner et al. (2013b) for a portion of the proposed project. That portion of their study has since been removed from the proposed project footprint (Table 3.7-4). The rail line was recommended not eligible for the NRHP; however, the USACE determined it eligible for listing in the NRHP and also determined that the proposed project would have “No Adverse Effect” on the resource. Additionally, DAHP concurred with the USACE’s determinations of eligibility and that the project would have “No Adverse Effect” on the NRHP-eligible rail line or listed historic and cultural resources in the proposed project area (Holter 2014).

Table 3.7-5 Previously Recorded Historic-Era Buildings or Structures in Study Area

Location	Resource Name	Resource Type Description	Precontact or Historic	Citation	National Register of Historic Places Status
Within Wetland Mitigation Site	Poplar Plantation - Dike	Dike	Historic era	Jones 2015a	Not Eligible
Within Wetland Mitigation Site	Poplar Plantation - Pump House	Pump House	Historic era	Jones 2015b	Not Eligible
Within Wetland Mitigation Site	Poplar Planation - Ditch	Ditch	Historic era	Jones 2015c	Not Eligible
Adjacent to Proposed Project Site	Seattle and Montana/Great Northern Anacortes to Rockport Rail Line	Historic Rail Line	Historic era	Stegner 2013e	NRHP Eligible

Historic Map Research

Stegner et al. (2013a, 2013b) and Stegner and Jones (2015) provide a detailed analysis and review of historic maps that include the proposed project and wetland mitigation sites. The maps included electronically available General Land Office (GLO) Plats, U.S. Coast and Geodetic Survey Topographic Sheets (T-sheets), Metsker Maps, aerial photographs, and United States Geographic Survey (USGS) topographic maps that document the history of land use in the vicinity of the proposed project since the last quarter of the 19th century.

In general, the maps analyzed by the two previous studies performed for the proposed project indicate limited development and use of the land for agricultural purposes (Stegner and Jones 2015; Stegner et al. 2013a, 2013b). Prior to the construction of the existing Shell PSR facility, structures, apparently built in the 1940s, existed on the southern portion of the proposed project site, but these were razed in the late 1950s. Analysis of historic-era aerial photographs and maps that cover the wetland mitigation site demonstrates the dynamic nature of that landscape; a number of changes in the shoreline are noted through time (Stegner and Jones 2015). These changes are at least partially a result of a system of dikes and levees that were constructed during the first half of the 20th century.

Impacts to Historic-Era buildings and other cultural resources

During scoping for the EIS, a number of comments were received from individuals and some entities that suggested the proposed project would pose substantial impacts to historic-era buildings, structures, objects, and gathering places with historic use in the form of noise and air pollution. Noise impacts are considered in detail in Chapter 3.9 – Noise and Vibration. Although historic-era buildings, structures, and objects are known within the Anacortes Subdivision (Figure 3.7-1) they already exist within a highly active rail corridor. Rail lines were some of the earliest transportation corridors in the region; with the first rail bridge being built over the Skagit River in 1893 (Caldbick 2010) and a boom in rail line construction in the vicinity of Mount Vernon and Anacortes throughout the first half of the 20th century.

Historic-period 19th century plats from the U.S. Surveyor General (USSG), GLO, and other historic atlases (Metsker) were reviewed for the presence of structures, sites, and features that might be extant within each of the proposed spoils disposal sites (Table 3.7-6). In general, there were privately-owned parcels of land and roadways within the spoils disposal sites, and the surrounding vicinities.

Table 3.7-6 Features Documented on Historic-Period Maps and Plats in Vicinity of the Proposed Spoils Disposal Sites

TRS Location*	Reference	Description
T34N R2E S8 Gibralter Rd. Pit	USSG 1871	Within APE: no features identified.
	Metsker 1941	Within or adjacent to APE: parcels owned by David Tozer, Edson Stevens, Albert Stevens, Rex Stevens, J.R. Stevens, and Myrtle F. Johnson. In vicinity: Pac. Hwy No. 2, State Road No. 14, other privately-owned parcels and residential subdivisions.
	Metsker 1972	Within or adjacent to APE: parcels owned by Grace Turner, Edson Stevens, Legna Stevens, W.C. Palm, J. R. Stevens, and D & G & A Penter. In vicinity: Pac. Hwy No. 2 and other roadways, other privately-owned parcels (including Sch. 103) and residential subdivisions.

TRS Location*	Reference	Description
T34N R2E S23 Wilbur Rd. Pit	USSG 1874	Within APE: no features identified. In vicinity: approximately 0.75 mile to west is the Telegraph Road bearing roughly north-south. On DAHP GLO Overlay, shows a cemetery on the Swinomish Reservation approximately 0.5 mile to the east of the APE.
	Metsker 1941	Within or adjacent to APE: parcels owned by McLeod, Bob Tahtla, and Chas. Seatit. In vicinity: roadways, other privately-owned parcels.
	Metsker 1972	Within or adjacent to APE: parcels owned by Erickson & Svendsen Mill Co. and unidentified parcels. In vicinity: roadways, trails, and other privately-owned parcels (such as by Jack Day).
T35N R4E S9 & 16 Kelleher Rd. Overflow Pit	USSG 1873	Within APE: no features identified.
	Metsker 1925	Within or adjacent to APE: parcels owned by Silas M. Butler, Butler Lbr. Co., J.W. Taylor, E.T. Idgens, J. White, M. Murray (?), Jno. Bloomquist, and state school land, and roadways. In vicinity: roadways and other privately-owned parcels.
	Metsker 1941	Within or adjacent to APE: parcels owned by Silas M. Butler, Butler Bros., Butler Lbr. Co., state school land, J.W. Taylor, F.M. Elliott, C.L. Miller, J. White, roadways, and Olympia Marsh Ext. Ditch. In vicinity: roadways and other privately-owned parcels.
	Metsker 1972	Within or adjacent to APE: parcels owned by Thelma Butler, Fred Butler, S. DeBoer, J.W. Taylor, and state land, and roadways. In vicinity: roadways and other privately-owned parcels.

* TRS refers to Township, Range, and Section.

ENVIRONMENTAL IMPACTS

No Action Alternative

Because no construction or operation would take place under the no action alternative, there would be no impacts to cultural resources. Previously unidentified archaeological deposits would remain unidentified, unless discovered through the development of some other project in the future. Unevaluated and NRHP-eligible archaeological sites and historic buildings, structures, and objects, would not be affected by the proposed project and, therefore, would retain their current levels of integrity.

Proposed Project

While evaluating the impacts of the proposed project on archaeological resource and historic-era buildings, structures, and objects, it is also important to consider the geographic scope of impact assessment. The analysis presented here is generally limited to the APE included for investigation in USACE permit application documentation (e.g., Stegner et al. 2015). A qualitative analysis of possible impacts to historic-era resources is presented below to address potential concerns about these property types. However, these historic-era property types (excluding archaeological sites) are typically outside the APE used for USACE permit applications for the proposed project.

Direct Impacts

Archaeological Resources

The proposed project would disturb previously recorded historic-era archaeological sites (45SK513, and 45SK514) located within or immediately adjacent to the proposed project site boundaries. Stegner et al. (2013) recommended these sites not be eligible for listing in the NRHP. These sites were determined not eligible for listing in the NRHP by the USACE and Sterner (2016) concurred with these determinations.

At the proposed wetland mitigation site, archaeological site 45SK537 would likely be disturbed by project activities; however, DAHP (Matthew Sterner, personal communication, January 21, 2016) has concurred with the USACE recommendation that this site not be eligible for listing in the NRHP.

Since the March Point area is important for Native American land use, as evidenced by the presence of nearby site 45SK140, there is a possibility that archaeological sites exist within the proposed project vicinity but were not observed during cultural resource inventory work. Potential sites may range from occupation locations, to fishing or resource procurement and processing areas. Such resources would be an important discovery and would help to better illustrate Native American subsistence, land use, and settlement practices (for additional information see Chapter 3.8 – Treaty and Traditionally Used Resources).

No archaeological sites or other cultural resources have been documented within, or in the immediate vicinity of, the potential spoils disposal sites. Because these locations are operating pits and no expansion is planned for this project, no cultural resource consequences are anticipated.

Historic-Era Resources

No previously documented historic-era buildings, structures, or objects are located within the footprint of the proposed project site. Although the proposed project includes a relatively new type of train traffic (i.e., crude oil transport) there is no substantial increase in the impact of this type of train on historic-era resources compared with other types of train traffic (e.g., passenger rail).

Three previously documented historic-era buildings, structures, or objects are located within the proposed wetland mitigation site. These were recommended not eligible for listing in the NRHP by Stegner and Jones (2015). The USACE agreed with this recommendation and determined the resources not be eligible for the NRHP; additionally, DAHP concurred with the determination made by the USACE (Matthew Sterner, personal communication January 21, 2016). It is unlikely that these resources would be eligible for listing in the WHR for the same reasons they do not meet NRHP eligibility criteria. As a result, the removal, destruction, or modification of these resources does not constitute a substantial impact, pending the resources determination of ineligibility for listing on the WHR.

The towns and development of the region have, in many ways, hinged on the growth of the rail industry (see discussion above). The proposed project would result in the arrival, on average, of one train per day along the Anacortes Subdivision. These bridges regularly carry train traffic and the proposed project would not substantially increase this traffic (see Chapter 3.15 – Rail Traffic and Transportation). This increase would not likely affect railroad bridges that were constructed during the historic era.

No historic-era resources are noted in the vicinity of the potential spoils disposal sites. As such, no cultural resource consequences are anticipated.

Cumulative Impacts

As described above, the proposed project would not disturb any known NRHP-listed or eligible archaeological sites, historic-era buildings, structures, or objects. Within the study area, there has been significant agricultural, industrial, commercial, and residential development. With this development, there is the potential that NRHP-listed or eligible archaeological sites, historic-era buildings, or objects have been disturbed. However, impacts would have been mitigated. Therefore, no cumulative impacts are anticipated.

MITIGATION MEASURES

Avoidance and Minimization

In the inventory work for both the proposed project and wetland mitigation sites, archaeological monitoring was recommended during construction. Archaeological monitoring would take place where subsurface inventory work does not reach the depth of proposed ground disturbance and where subsurface inventory work cannot be performed. Shell would develop a monitoring plan to be approved by DAHP and the tribes prior to initiation of ground-disturbing activities.

Mitigation

No mitigation is necessary for the impacts that the project would have on the previously recorded archaeological sites or historic-era resources. Resources within the APE, as defined by the USACE, have been determined not eligible for listing in the NRHP by the USACE and DAHP. No NRHP-listed or eligible historic resources were found within the wetland mitigation site; therefore, no mitigation measures are required.

Shell would develop and implement an Unanticipated Discovery Plan during construction when archaeological monitors are not present. If archaeological deposits were encountered during construction, the provisions of the Unanticipated Discovery Plan would be followed. Consultation with local law enforcement authorities, the DAHP, tribes, and other interested stakeholders would be initiated to determine proper treatment and/or mitigation. In such cases, Shell would provide for a site inspection and evaluation by a professional archaeologist to ensure that all possible valuable archaeological data were properly salvaged or mapped.

3.8 TREATY AND TRADITIONALLY USED RESOURCES

Traditionally used resources are important because of the role they play in, and their intrinsic value to, tribal lifeways and culture, and in the exercise of tribal treaty reserved rights. The proposed project and wetland mitigation sites are located in areas of special importance for Native American groups, in part, because of ready access to fish and intertidal resources. This is supported by evidence from archaeological sites in the region that demonstrate the importance of March Point (see Chapter 3.7 – Cultural Resources).

STUDY AREA AND METHODOLOGY

The study area used to analyze direct and indirect impacts on access to treaty and traditionally used resources is comprised of the proposed project site, the proposed wetland mitigation site, and the Anacortes Subdivision. The study area also encompasses the surrounding lands and waters that may have been or are currently used by tribal entities for access to treaty and traditionally used resources. The cumulative impacts study area would be the same as described for direct and indirect impacts.

Although commenters asked for this environmental impact statement (EIS) to review how the increase in train traffic from the proposed project would affect the Columbia River tribes, this analysis is focused on treaty and traditionally used resources in the study area as defined above.

Select laws, regulations, and guidance applicable to treaty and traditionally used resources in the study area are summarized in Table 3.8-1.

Table 3.8-1 Laws, Regulations, and Guidance for Project-Related Treaties and Traditionally Used Resources

Laws, Regulations, and Guidance	Description
Federal	
Stevens Treaties (1854-1855)	A series of eight treaties establishing reservations for the exclusive use of the tribes. The tribes reserved their right to continue traditional activities on lands beyond these reserved areas and reserved the right to hunt, fish, and conduct other traditional activities on lands off of the reservations initiated by then Washington Territorial Governor and superintendent of Indian Affairs, Isaac Stevens. Not all of the tribes signed treaties with the federal government. Several of these tribes have reservations designated by executive order.

Laws, Regulations, and Guidance	Description
United States vs. Washington, 13-35474 (2016)	Ninth Circuit Court of Appeals affirmed the district court's order issuing an injunction directing the State of Washington to correct culverts, which allows streams to flow underneath roads, because they violated, and continued to violate, the Stevens Treaties, between Indian tribes in the Pacific Northwest and the Governor of Washington Territory.
Treaty of Point Elliott (1855)	A lands settlement treaty formed between the U.S. Government and the Native American tribes of the greater Puget Sound Region. Signatories to the Treaty of Point Elliott included Chief Seattle and Territorial Governor Isaac Stevens. Representatives from the Duwamish, Suquamish, Snoqualmie, Snohomish, Lummi, Skagit, Swinomish, and other tribes also signed.
United States v. Washington, 384 F. Supp. 312 (W.D. Wash. 1974) Washington v. Washington State Commercial Passenger Fishing Vessel Association, 443 U.S. 658 (1979) "Boldt Decision" 1979	Federal District Court decision in 1974 upheld by the Supreme Court in 1979 reaffirming the reserved right of American Indian tribes in the State of Washington to act alongside the state as co-managers of salmon and other fish, and to continue harvesting them in accordance with the various treaties that the United States had signed with the tribes. The tribes of Washington had ceded their land to the United States but had reserved the right to fish as they had always done, including fishing at their traditional locations that were off the designated reservations.

In February 2016, a search of online data and ethnographic literature was conducted regarding current and traditional use of plants, fish, and shellfish within the study area as defined above. Research conducted to date included review of the following websites: Department of Archaeology and Historic Preservation (DAHP) Washington Information System for Architectural and Archaeological Records Data (WISAARD), the Swinomish Tribal Community, the Washington State Governor's Office of Indian Affairs, Washington State Department of Ecology (Ecology), and the United States Bureau of Indian Affairs (USBIA). Ethnographic literature includes studies of resources used by tribal members including Gunther (1945), Lane (n.d.), Suttles and Lane (1990), and Suttles (1974).

In an effort to augment these information sources, the co-lead agencies requested input on this EIS from potentially affected tribes. Affected tribes include those with lands in the study area as well as tribes who submitted comments during the EIS scoping process (Skagit County and Ecology 2015). Ecology sent letters to affected tribes on February 24, 2016, and follow up e-mails on March 25, 2016 and July 22, 2016, requesting information about traditional use of resources in the study area. The co-lead agencies offered to meet with affected tribes, if desired. To date, meetings with the potentially affected tribes have not been conducted.

In March 2015, the Swinomish Tribe filed a lawsuit in federal court against BNSF Railway for violating the terms of an easement agreement allowing trains to cross the Swinomish Reservation in Skagit County (Swinomish Indian Tribal Community 2015). At the time of writing this EIS, no decision has been made by the U.S. District Court.

AFFECTED ENVIRONMENT

The study area lies within tribal Ceded Areas established by the *Treaty of Point Elliott in 1855*. That treaty and the *Boldt Decision* (below), which upheld tribal fishing rights in 1979, affirmed that the region and its resources would remain important to the tribes. The study area is adjacent to the Reservation of the Swinomish Indian Tribal Community (Swinomish Tribe), also established by the Treaty of Point Elliott (Goren 2012:3). The U.S. Government has a fiduciary obligation "...to protect tribal treaty rights regarding lands, assets, and resources..." (USBIA 2016). The study area is within the usual and accustomed lands of the Swinomish Tribe, which means the tribe manages tribal access to and use of resources. The co-lead agencies included treaty and traditionally used resources in this EIS to address concerns raised by commenters during the scoping process (Skagit County and Ecology 2015).

Treaty of Point Elliott in 1855

In March 1853, Washington became a Territory, and two years later, a lands settlement treaty was formed between the U.S. Government and the Native American tribes of the greater Puget Sound Region. The Treaty of Point Elliott of 1855 (more commonly, the Point Elliott Treaty), was signed on January 22, 1855, at Point Elliott, now Mukilteo. It was the first of eight treaties between the U.S. and native nations in Washington State.

What are "usual and accustomed lands?"

In the Stevens treaties, the tribes reserved the right to fish at "all usual and accustomed grounds and stations." The court case **U.S. v. State of Washington**, referred to as the **Boldt Decision**, defined "usual and accustomed" as places where the Indians fished, excluding "unfamiliar locations and those used infrequently or at long intervals and extraordinary occasions."

In the treaties, the Indians retained some of their lands as reservations. And, according to the Boldt Decision, the treaties did not grant rights to the Indians but instead were a grant from them. Within the treaties, they reserved the rights, for instance, to fish at "all usual and accustomed grounds and stations" not granted.

—United States v. State of Washington 384 F. Supp. 312 at 331-332 (1974).

As noted above, this area is currently considered the usual and accustomed land of the Swinomish Tribe, but has also been used by others in the past, such as the Sauk-Suiattle Indian Tribe, Upper Skagit Indian Tribe, Lummi Tribe, and Samish Indian Nation. They gathered plant materials for food, manufacturing, medicinal, and ceremonial purposes. These included, but were not limited to, cedar, hemlock, hazelnut, alder, and maple to manufacture canoes, nets, paddles, and basketry, among other things. Fern, grapes, gooseberry, thimbleberry, elderberry, salmonberry, and wild cherry were harvested for food and medicine (Gunther 1945).

These tribes gathered oysters and clams from tidal flats in nearby Fidalgo and Padilla bays (Goren 2012:3; Lane n.d.). Using gill nets made from vine maple, they also trapped crabs and fished for salmon in these bays, as well as in the Swinomish Channel and at the mouth of the Skagit River. They also used spears made of ironwood to gaff cod (Gunther 1945).

The following tribes commented during the scoping process for this EIS:

- Swinomish Indian Tribal Community
- Stillaguamish Tribe of Indians
- Tulalip Tribes
- Suquamish Indian Tribe
- Confederated Tribes of the Umatilla Indian Reservation
- Confederated Tribes of The Warm Springs Reservation of Oregon

In addition, organizations including the Skagit River System Cooperative and the Columbia River Inter-Tribal Fish Commission provided comments during scoping (Skagit County and Ecology 2015).

Today more modern equipment is used; however, members of the tribes still fish in the same areas. For many Native Americans within the region, these resources are a part of their culture and lifeways (Goren 2012). If the environment becomes degraded and inaccessible, the ability of the tribes to continue to be culturally intact and to impart cultural knowledge to their youth for the next seven generations, as is their tradition, could be affected.

As a continuation of Chapter 3.7 – Cultural Resources, this chapter briefly addresses concerns about access to traditionally used resources including Traditional Cultural Properties and Cultural Landscapes; terrestrial and aquatic plants; terrestrial animals; finfish and shellfish. Correspondence has been sent to the tribes to try to identify access issues, more clearly define current tribal uses of these resources, and to determine any other resource issues that might result from the proposed project.

Proposed Project

Traditional Cultural Properties and Cultural Landscapes

Traditional Cultural Properties are properties that are eligible for inclusion in the National Register of Historic Places (NRHP) based on their connections with cultural practices, traditions, beliefs, lifeways, arts, crafts, or social institutions of a living community. Cultural Landscapes illustrate how humans have used and adapted natural resources or traditional Native American cultural practices to daily life. No Traditional Cultural Properties or Cultural Landscapes have been identified within the study area to date. Background research indicates that the Swinomish Tribe and other tribes used the area, so it is possible that specific Traditional Cultural Properties

and/or Cultural Landscapes not previously discovered could be identified during discussions or field visits with the tribes.

Terrestrial and Aquatic Plants

Background research indicates that members of the Swinomish Tribe have been gathering terrestrial and aquatic plants within the study area for food and medicinal purposes since ancient times (Goren 2012). It is possible that specific gathering areas or certain plants not previously identified, but important to the Swinomish or other tribes, could be identified during discussions or field visits with the tribes.

Terrestrial Animals

Background research indicates that members of the Swinomish Tribe have traditionally hunted terrestrial animals in the general area since ancient times (Goren 2012). It is possible that specific hunting areas or certain terrestrial animals not previously identified, but important to the Swinomish or other tribes, could be identified during discussions or field visits with the tribes.

Finfish and Shellfish

As with the plant gathering and hunting practices described above, Swinomish Tribe members have also been harvesting fish and shellfish within the study area since ancient times (Goren 2012). These resources are considered by the Swinomish to be culturally significant and represent their connection with the environment. Finfish species within the study area are described in Chapter 3.4 – Fish and Aquatic Species and Habitat. Several varieties of salmon are individually and commercially harvested by the Swinomish Tribe: coho salmon (*Oncorhynchus kisutch*); pink salmon (*Oncorhynchus gorbuscha*), also known as "humpback"; and chum salmon (*Oncorhynchus keta*). Shellfish traditionally harvested include Dungeness crab (*Metacarcinus magister*), littleneck clams (*Leukoma staminea*), and Manila clams (*Venerupis philippinarum*). All are a traditional mainstay of the Swinomish diet (Campbell and Donatuto 2014). The Tribe also owns and operates a seafood wholesaler, The Swinomish Fish Company at 11455 Moorage Way in LaConner, Washington within approximately 7 miles of the study area (Campbell and Donatuto 2014; Swinomish Tribal Community 2016).

ENVIRONMENTAL IMPACTS

No Action Alternative

Because no construction or operation would take place under the no action alternative, there would be no impacts to treaty and traditionally used resources. Existing conditions would remain the same unless affected by other projects in the future.

Proposed Project

Traditional Cultural Properties and Cultural Landscapes

Because no Traditional Cultural Properties or Cultural Landscapes have been identified in the study area to date, no impacts from the proposed project on Traditional Cultural Properties or

Cultural Landscapes were identified. If Traditional Cultural Properties or Cultural Landscapes were identified through coordination with the tribes, it would be possible to assess impacts.

Terrestrial and Aquatic Plants

Because specific gathering areas or plants important to tribes have not been identified in the study area to date, no impacts from the proposed project were identified. If gathering areas or important plants were identified through coordination with the tribes, it would be possible to assess impacts.

Terrestrial Animals

Because specific hunting areas or certain terrestrial animals important to tribes have not been identified in the study area, no impacts from the proposed project were identified. If hunting areas or important animal species were identified through coordination with the tribes, it would be possible to assess impacts.

Finfish and Shellfish

The study area is located near tribal fisheries. The impacts to tribal fisheries would be the same as those described for fish and aquatic resources in Chapter 3.4 – Fish and Aquatic Species and Habitat. These impacts could include loss of or changes to riparian habitat, or changes in water quality that could impact fish. Depending on the degree of these impacts, treaty resources, traditional lifeways, health, and the culture of the Swinomish and other tribes could be affected due to degradation of their fisheries.

Cumulative Impacts

The proposed project would not disturb any known Traditional Cultural Properties or Cultural Landscapes; specific gathering areas or plants important to tribes, or specific hunting areas or certain terrestrial animals important to tribes; therefore, the proposed project would not contribute to cumulative impacts on these resources. Tribal fisheries are located near the study area. The cumulative impacts would be the same as described for fish and aquatic resources in Chapter 3.4 – Fish and Aquatic Species and Habitat.

MITIGATION MEASURES

Avoidance and Minimization

Measures to avoid or minimize potential impacts to fisheries are described in Chapter 3.4 – Fish and Aquatic Species and Habitat. These avoidance and minimization measures would apply to tribal fisheries, as well.

The identification of specific Traditional Cultural Properties and Cultural Landscapes important to the tribes requires the assistance and knowledge of those tribal governments and members. Receiving additional input from tribes would allow for the identification, proper treatment, and mitigation of impacts from the proposed project. Skagit County and Ecology respect the rights of

tribal sovereigns to engage on their terms with local, state, and federal governments as appropriate.

Mitigation

No additional mitigation measures are proposed at this time beyond the avoidance and minimization measures described in Chapter 3.4 – Fish and Aquatic Species and Habitat. Should any additional tribal resources be made known, Skagit County and Ecology may reassess potential impacts and mitigation.

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3.9 NOISE AND VIBRATION

Noise is defined as sound that is perceived by humans as unpleasant or excessively loud. Noise of sufficient strength may pose health concerns such as hearing loss or sleep disturbances. Noise impacts are somewhat variable and often depend on land uses. For example, areas where people sleep tend to be more sensitive to noise compared with places where people congregate during the day, such as parks or schools.

Vibration occurs continuously at all times but is typically at levels that are imperceptible to humans. When ground-borne vibration becomes problematic, these levels are strong enough to be noticeable. As with noise, vibration impacts can vary based on land uses. For example, a residence is generally more affected by vibration than a commercial building.

STUDY AREA AND METHODOLOGY

The study area used to analyze impacts of noise on *sensitive receptors* (i.e., residences, schools, etc.) encompasses the area within approximately 1,500 feet of the proposed project site, wetland mitigation site, and Anacortes Subdivision, and extends south along the Bellingham Subdivision to the Skagit/Snohomish county line. The Federal Railroad Administration (FRA) screening level assessment identified that noise impacts were unlikely for noise sensitive receptors located beyond this distance. Additionally, this is a distance consistent with other analyses of crude-by-rail projects currently under review with the Washington State Department of Ecology (Ecology).

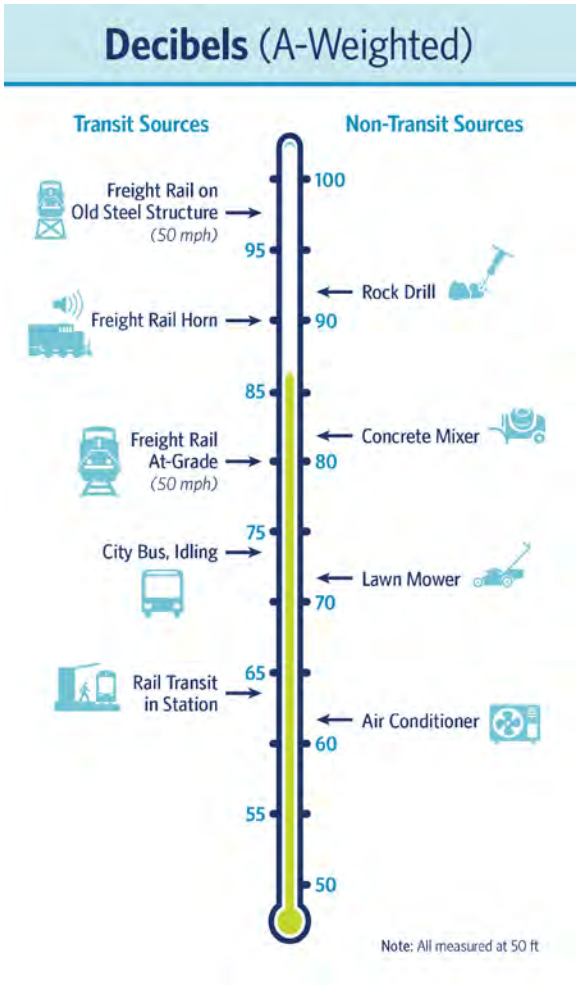
Sensitive receptors represent all land use activity categories where the Federal Transit Administration (FTA) has established noise impact criteria for various types of noise sensitivity. Land use activity categories include residences, recreation areas, hotels, schools, churches, libraries, and hospitals.

The study area for vibration is along the same corridor, but represents a narrower zone of potential impact. It encompasses the area within 500 feet of the proposed project site, wetland mitigation site, Anacortes Subdivision, and Bellingham Subdivision to the Skagit/Snohomish county line. The FRA's screening level assessment identified that vibration impacts were unlikely for sensitive receptors located beyond this distance. This is a distance consistent with other analyses of crude-by-rail projects in Washington currently under review with Ecology. The vibration study area includes vibration-sensitive structures that may be affected by the proposed project. Noise impacts to wildlife are discussed in Chapter 3.6 – Vegetation and Terrestrial Wildlife. Additional information on potential impacts to tribal resources can be found in Chapter 3.7 – Cultural Resources.

The cumulative impacts study area includes the areas adjacent to the Anacortes and Bellingham subdivisions within Skagit County. This is the area where new ambient noise and vibration would most likely increase when compared with existing conditions.

Noise and/or vibration impacts may result from construction and operation of the proposed project. "Noise" is defined as unwanted sound and is measured in decibels (dB) on a logarithmic scale. Because human hearing is not equally sensitive to all sound frequencies, certain frequencies are given more weight. This process is known as "weighting" the frequency, and A-weighting (dBA) the frequency corresponds to the human hearing response. The A-weighted scale is used in most noise ordinances and standards. In this noise and vibration analysis, noise metrics were used to describe noise levels: the average energy level (L_{eq}), and the day-night average sound level (L_{dn}). The L_{eq} is the energy-averaged noise level for a period of time—in this case, hourly. The L_{dn} is the average equivalent sound level over a 24-hour period, with a 10 dBA penalty added for noise during nighttime hours from 10 p.m. to 7 a.m., to reflect the impacts on nighttime activities such as sleeping. Common sound levels are provided in Figure 3.9-1.

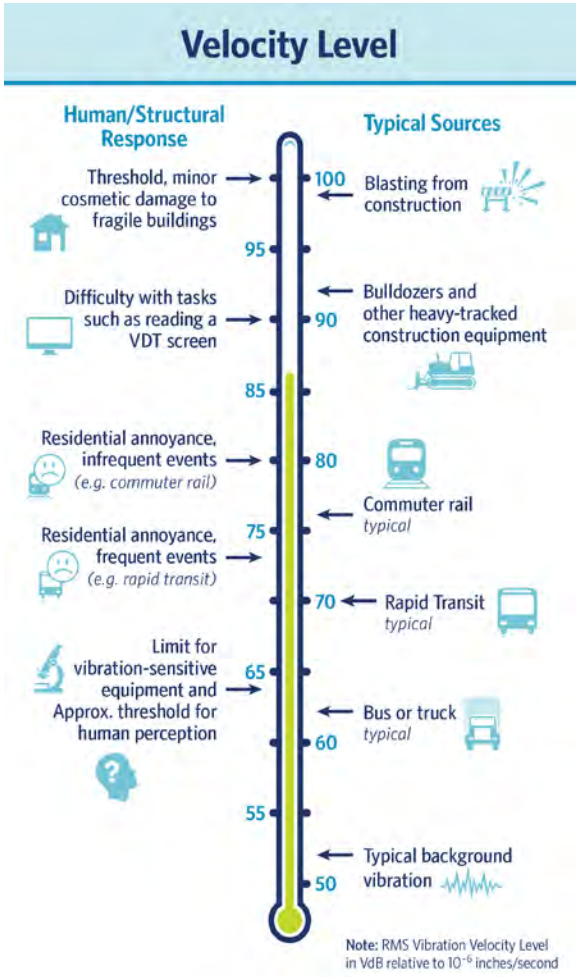
Figure 3.9-1 Typical A-Weighted (dBA) Sound Levels



Construction and operation of the proposed project would produce vibration levels that may be annoying or disturbing to humans and cause damage to nearby structures. Measurements of vibration are expressed in terms of the peak particle velocity (PPV), the maximum velocity experienced by any point in a structure during a vibration event (defined as an event lasting less than 10 seconds, such as vibration associated with a locomotive passing by a specific location). PPV is often used in determining potential damage to buildings due to blasting and other construction activities.

Because the human body takes some time to respond to vibration signals, the root mean square (rms) amplitude is used to describe the "smoothed" vibration amplitude. Decibel notation is used to compress the range of numbers required to describe vibration expressed as VdB. Typical vibration velocity levels experienced from 50 feet away are provided in Figure 3.9-2.

Figure 3.9-2 Typical Vibration Velocity Levels



Regulatory Framework and Methodology

Select laws, regulations, and guidance applicable to proposed project noise and vibration are summarized in Table 3.9-1. This section describes compliance requirements and the methods used to determine the potential impacts from noise and vibration associated with construction and operation of the proposed project.

Table 3.9-1 Laws, Regulations, and Guidance for Project-Related Noise and Vibration

Laws, Regulations, and Guidance	Description
Federal	
Noise Control Act of 1972 (42 USC 4901)	Establishes a national policy to promote an environment for all Americans free from noise that jeopardizes their health and welfare. The Act establishes a means for effective coordination of federal research and activities in noise control, authorizes the establishment of federal noise emission standards for products distributed in commerce, and provides information to the public respecting the noise emission and noise reduction characteristics of such products.
Federal Transit Administration Transit Noise and Vibration Impact Assessment (FTA-VA-90-1003-06, May 2006)	Presents procedures for predicting and assessing noise and vibration impacts of proposed mass transit projects and updated guidance on noise and vibration impact criteria to assess the magnitude of predicted impacts.
U.S. Environmental Protection Agency (USEPA) Railroad Noise Emission Standards (40 CFR 201) and Noise Control Act of 1972 (Section 17)	Establishes final noise emission regulations for carriers engaged in interstate commerce by railroad.
Federal Railroad Administration (FRA) Railroad Noise Emission Compliance Regulations (49 CFR 210)	Sets the maximum sound levels from railroad equipment and for regulating locomotive horns.
FRA Final Rule on the Use of Locomotive Horns at Highway-Rail Grade Crossings and Railroad Locomotive Safety Standards (49 CFR 222 and 229)	Provides for safety at public highway-rail grade crossings by requiring locomotive horn use at public highway-rail grade crossings except in quiet zones established and maintained in accordance with this part. Prescribes minimum federal safety standards for all locomotives except those propelled by steam power.

Laws, Regulations, and Guidance	Description
State	
State Environmental Policy Act (SEPA) (RCW 43.21c; WAC 197-11)	Helps state and local agencies in Washington identify possible environmental impacts that could result from a proposed action, alternatives to the proposed action, and potential impact minimization and mitigation measures. Information learned through the review process can be used to change a proposal to reduce likely impacts and inform permitting decisions at the state and local levels.
Maximum Environmental Noise Levels (WAC 173-60 and 173.60.050)	Establishes maximum environmental noise levels permissible in identified environments. However, sounds from surface carriers engaged in interstate commerce by railroad are exempt from these regulations.
Local	
Skagit County Code Noise Control (SCC 9.50)	Noise is regulated in county code to minimize the exposure of citizens to the harmful nuisance, physiological, and psychological impacts of excessive noise and to control the level of noise in a manner that promotes commerce; the use, value, and enjoyment of property; sleep and repose; and the quality of the environment.
Skagit County Code Performance Standards (SCC 14.16.840)	It is intended that all activities and land uses within Skagit County adhere to a common standard of environmental performance criteria. Criteria are listed for noise and vibration.

Federal Noise Regulations

The federal regulatory framework is generally tied to the Noise Control Act of 1972 (42 United States Code [USC] 4910), which provided the framework for protecting the public from noise pollution. Other applicable federal regulations provide noise emissions standards for the safe operation of railroads including the Federal Railroad Administration (FRA) Railroad Noise Emissions Compliance Regulations (49 Code of Federal Regulations [CFR] 210), and the Final Rule on the Use of Locomotive Horns at Highway Rail Grade Crossings (49 CFR 222 and 229). Additionally, the FRA has adopted the Federal Transit Administration (FTA) regulations that provide the primary framework for regulating noise and vibration from a proposed project. The FTA provides construction and operational noise and vibration level limits that are applicable to the proposed project.

Construction Noise Limits

The FTA provides criteria (Table 3.9-2) to avoid adverse community reaction.

Table 3.9-2 FTA Construction Noise Criteria

Land Use	Daytime one-hour L_{eq}, dBA	Nighttime one-hour L_{eq}, dBA
Residential	90	80
Commercial	100	100
Industrial	100	100

Source: FTA 2006.

Operational Noise Limits

The FTA provides operational noise impact thresholds for three categories of noise-sensitive land uses. Table 3.9-3 gives descriptions of these categories. Categories 1 and 3 are evaluated with the peak hour energy-averaged equivalent hourly sound level ($L_{eq(h)}$); Category 2 is evaluated using the day-night sound level (L_{dn}). The L_{dn} incorporates 24 consecutive $L_{eq(h)}$ values and applies a 10-dB penalty to the $L_{eq(h)}$ values occurring during nighttime hours (10 p.m. to 7 a.m.).

Table 3.9-3 FTA Noise-Sensitive Land Use Categories

Land Use Category	Noise Metric, dBA	Description
1	$L_{eq(h)}$	Quiet is an essential element (for example, outdoor amphitheaters, outdoor pavilions, outdoor historical landmarks, recording studios, and concert halls)
2	L_{dn}	Residences and buildings where people sleep (for example, homes, hospitals, and hotels)
3	$L_{eq(h)}$	Institutional lands used primarily during the day and evening (for example, schools, libraries, theaters, and churches)

Source: FTA 2006.

In general, the FTA's operational noise criteria are based on existing noise exposures. For example, a lower existing sound level has a lower absolute threshold (a.k.a., fixed impact or impact limit), but the allowable increase (a.k.a., relative impact or impact limit) is greater. Conversely, a higher existing sound level has a higher absolute threshold, but the allowable increase is less. Figures 3.9-3 and 3.9-4 provide the FTA moderate and severe impact criteria curves for operational noise.

Common noise and vibration terms

dB – decibels, the standard unit of measure for noise.

dBA – A-weighted dB, or the human perception of sound.

L_{eq} – equivalent energy averaged sound level for a stated period of time (i.e., hourly, 24-hour, etc.)

L_{dn} – day-night noise level with a 10 dB penalty applied to nighttime sounds.

L_{max} – average maximum sound level.

L_v – the velocity level in dB.

PPV – peak particle velocity is the maximum velocity experienced during a vibration event.

rms – root mean square is the smoothed amplitude of vibration over a given vibratory event.

VdB – rms velocity expressed as vibration dB.

Figure 3.9-3 FTA Noise Impact Criteria for Transit Projects

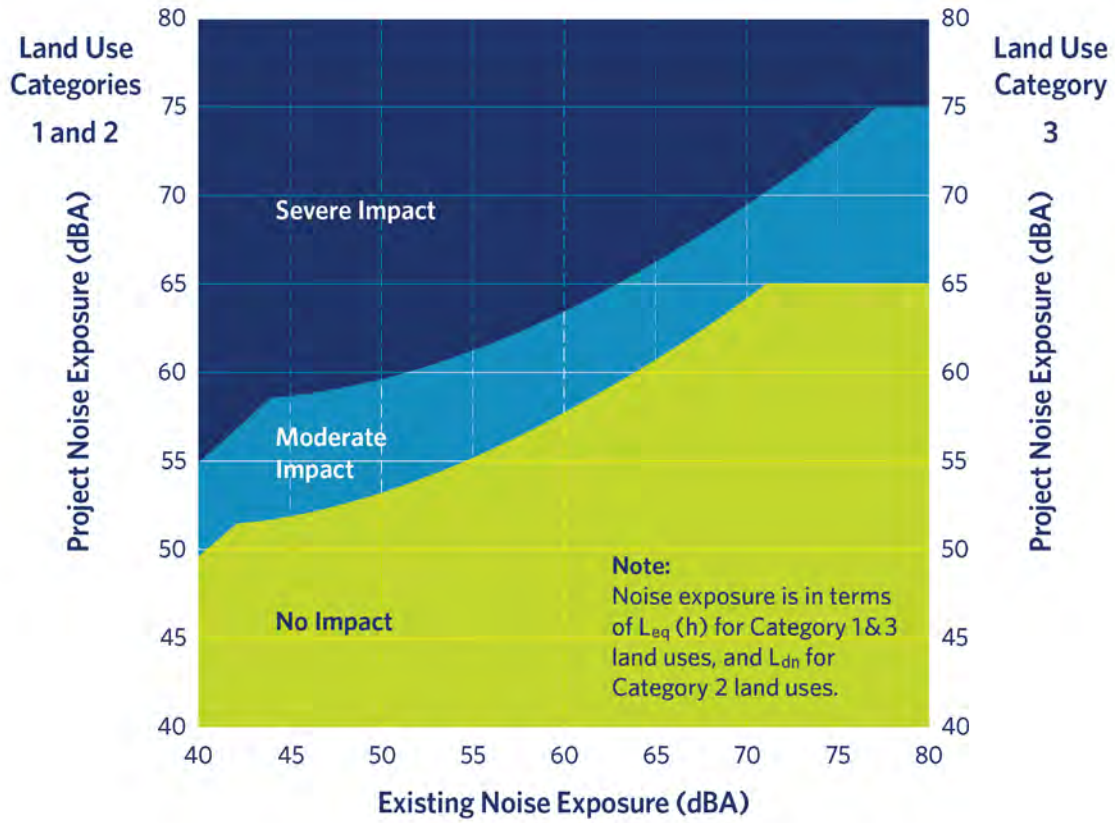
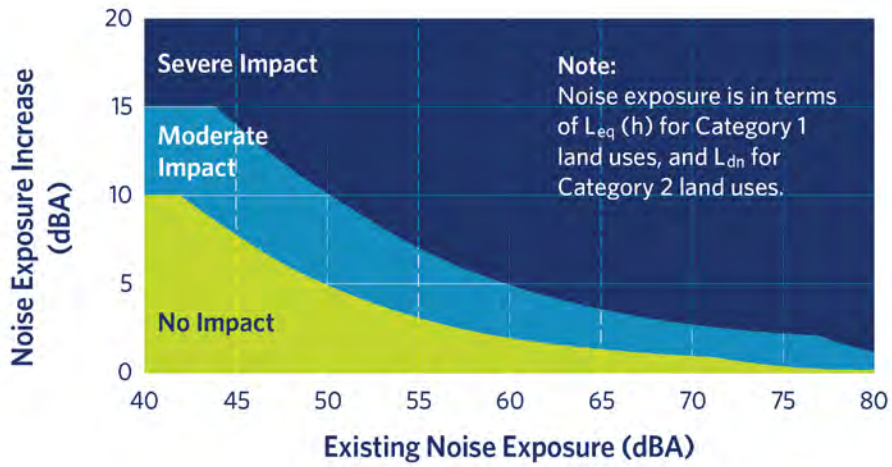


Figure 3.9-4 FTA Increase in Cumulative Noise Levels Allowed by Criteria (Land Use Categories 1 & 2)



Construction Vibration Impact Thresholds

Construction vibration is assessed in terms of building damage and annoyance. Construction damage criteria are provided in Table 3.9-4. The residential construction vibration annoyance criteria limit is 72 VdB according to the FTA.

Table 3.9-4 FTA Construction Vibration Damage Criteria

Building Category	Peak Particle Velocity[1] (inches/second)	Approximate L_v[2]
I. Reinforced concrete, steel or timber (no plaster)	0.5	102
II. Engineered concrete and masonry (no plaster)	0.3	98
III. Nonengineered timber and masonry buildings	0.2	94
IV. Buildings extremely susceptible to vibration damage	0.12	90

Notes:

1. PPV=peak particle velocity.
2. Root mean square (rms) velocity in (VdB) are 1 micro-inch per second.

Source: FTA 2006.

Operational Vibration Impact Thresholds

Operational ground-borne vibration and noise limits are evaluated based on the VdB and A-weighted sound levels, respectively. Ground-borne vibration can be caused by the weight of freight rail operations, such as unit trains traveling on a railway. These vibrations can cause buildings to shake and rumbling sounds to be heard. According to the FTA/FRA, ground-borne vibration is not a common environmental problem. The FTA identifies three vibration land use categories that can be summarized as follows:

- Vibration Category 1 – High Sensitivity: buildings where vibration would interfere with operations such as concert halls.
- Vibration Category 2 – Residential and other uses where people sleep.
- Vibration Category 3 – Institutional uses such as schools and churches.

FTA vibration impact thresholds are also based on how frequent vibration events, such as locomotive pass-bys, would occur, and characterized as follows:

- Frequent Events – More than 70 vibration events per day.
- Occasional Events – Between 30 and 70 vibration events per day.
- Infrequent Events – Fewer than 30 vibration events per day.

Operational ground-borne noise can also be a source of concern for freight rail projects such as the proposed project. The rumbling sound caused by the vibration of room surfaces is sometimes associated with rail operations. Ground-borne noise is focused more in the lower frequencies of the A-weighted spectrum. Because of this, FTA regulatory guidelines for ground-borne noise are lower than those of airborne noise. The FTA regulatory guidelines for ground-borne noise applicable to project area sensitive land uses are 43 dBA for residential lands and 48 dBA for institutional lands.

State of Washington Noise Regulations

The State of Washington regulates noise via the Washington Administrative Code (WAC) 173-60, which provides noise limits for stationary sound sources emanating from one property and received by others. These regulations are not applicable to the proposed project because they do not apply to transportation sound sources such as roadway and railroad noise. Additionally, these regulations exempt construction noise that occurs during daytime hours (7 a.m. to 10 p.m.). If construction is planned for nighttime hours (10 p.m. to 7 a.m.), a noise variance would be required. For operational noise on railroad projects, Washington State defaults to FTA guidelines.

Skagit County Noise and Vibration Regulations

Skagit County provides noise and vibration regulations per the Skagit County Code (SCC 9.50); however, none of these regulations is applicable to railroad operations and will not be discussed further. The County does not provide construction noise limits; therefore, construction noise would be governed by the WAC 173-60 regulation that only applies to nighttime construction noise.

AFFECTED ENVIRONMENT

The affected environment is variable for noise and vibration, with the latter attenuating (weakening) more quickly with distance. Additionally, the affected environment is variable depending on the project component. The following sections describe the affected environment for the proposed project and wetland mitigation site, the Anacortes Subdivision, and the Bellingham Subdivision to the Skagit/Snohomish county line. The noise analysis study area includes noise-sensitive receptors within 1,500 feet; the vibration analysis study area includes vibration-sensitive structures and land uses within 500 feet.

Proposed Project Site

Noise

A variety of land uses occur within the noise analysis study area at the proposed project site, including residential, industrial, commercial, roadways, a railroad, and open space. As a general rule, noise levels tend to be higher in industrial and commercial areas, and near transportation facilities (i.e., roadways and railroads), and lower in rural, open space, or agricultural areas. However, given the proximity of the Anacortes Subdivision, State Route (SR) 20, the Shell Puget Sound Refinery (PSR), and the Tesoro Anacortes Refinery, the existing acoustic environment at the proposed project site, and within 1,500 feet of the site, is generally high. Two baseline noise measurements were conducted to document sound levels in this area: monitoring position (MP) 10 and MP 11 (Table 3.9-5 and Figure 3.9-5). Five residences are within the proposed project site noise analysis study area.

See Appendix D for additional details relating to the field monitoring effort such as field photos, detailed monitoring results, and equipment laboratory calibration sheets.

Table 3.9-5 Baseline Monitoring Results (dBA)

Map ID	FTA Land Use Category	Analysis Area	Baseline Levels		
			L_{eq} (day)	L_{eq} (night)	L_{dn}
MP 1	Category 2	Anacortes Subdivision	63	59	66
MP 2	Category 2	Anacortes Subdivision	67	63	70
MP 3	Category 2	Anacortes Subdivision	58	56	63
MP 4	Category 2	Anacortes Subdivision	57	54	61
MP 5	Category 2	Anacortes /Bellingham Subdivisions	64	61	68
MP 6	Category 2	Bellingham Subdivision	71	72	79
MP 7	Category 2	Bellingham Subdivision	59	60	66

Map ID	FTA Land Use Category	Analysis Area	Baseline Levels		
			L_{eq} (day)	L_{eq} (night)	L_{dn}
MP 8	Category 2	Bellingham Subdivision	63	65	71
MP 9	Category 2	Bellingham Subdivision	67	65	72
MP 10	Category 2	Proposed Project Site	64	60	67
MP 11	Category 2	Proposed Project Site	60	59	66

Existing noise levels at MP 10 and MP 11 were 66 and 67 L_{dn}, with the higher noise level at the residences closer to SR 20 (e.g., MP 10), and the lower noise level at residences located north and adjacent to the Shell PSR (e.g., MP 11).

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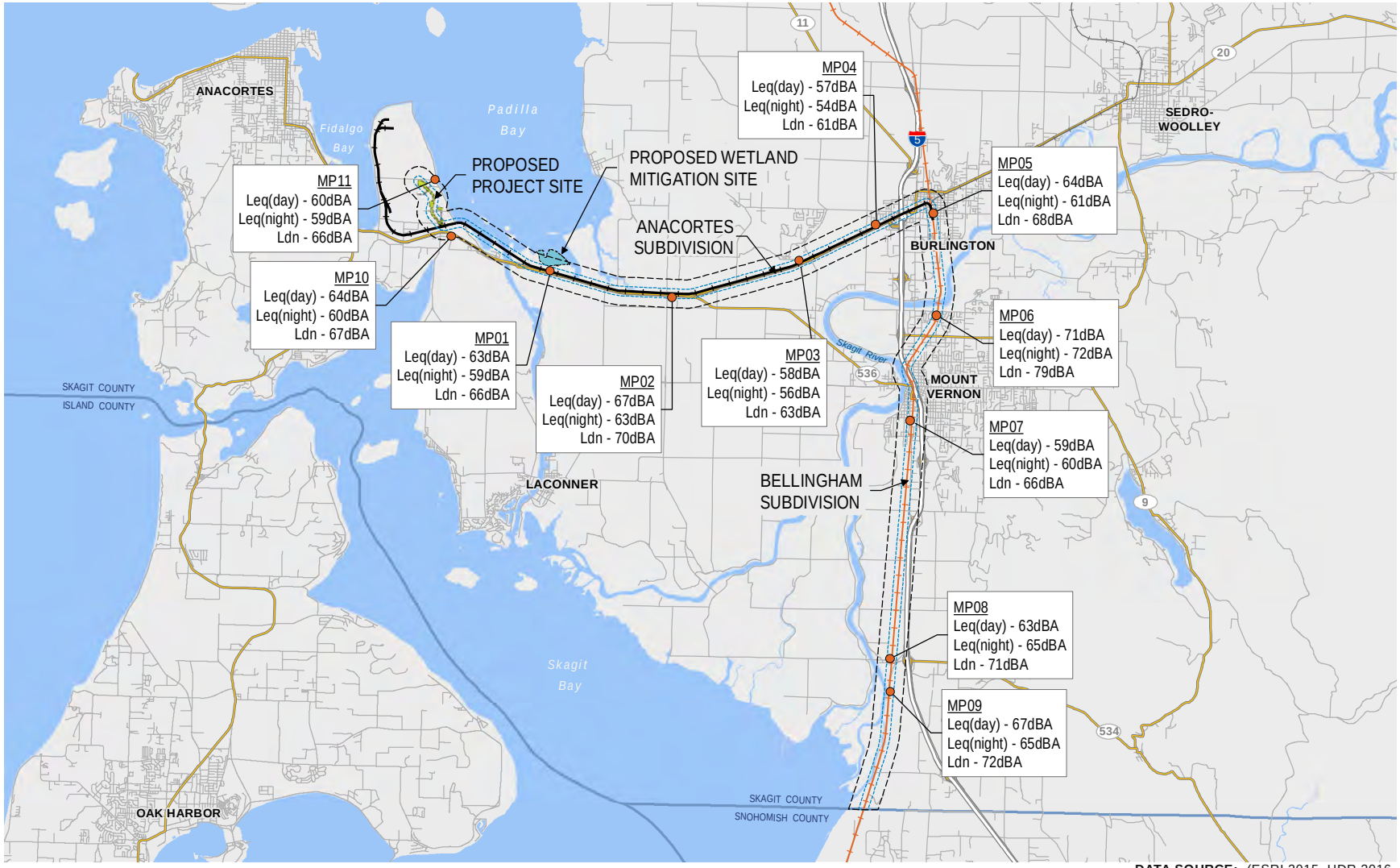


DATA SOURCE: (ESRI 2015, HDR 2016, Skagit County 2015, WSDOT 2015)

Noise Monitoring
Noise Analysis Study Area
Vibration Analysis Study Area
Proposed Project Site
Proposed Wetland Mitigation Site
Anacortes Subdivision
Bellingham Subdivision
BNSF Railway

N

0 1 2 Miles

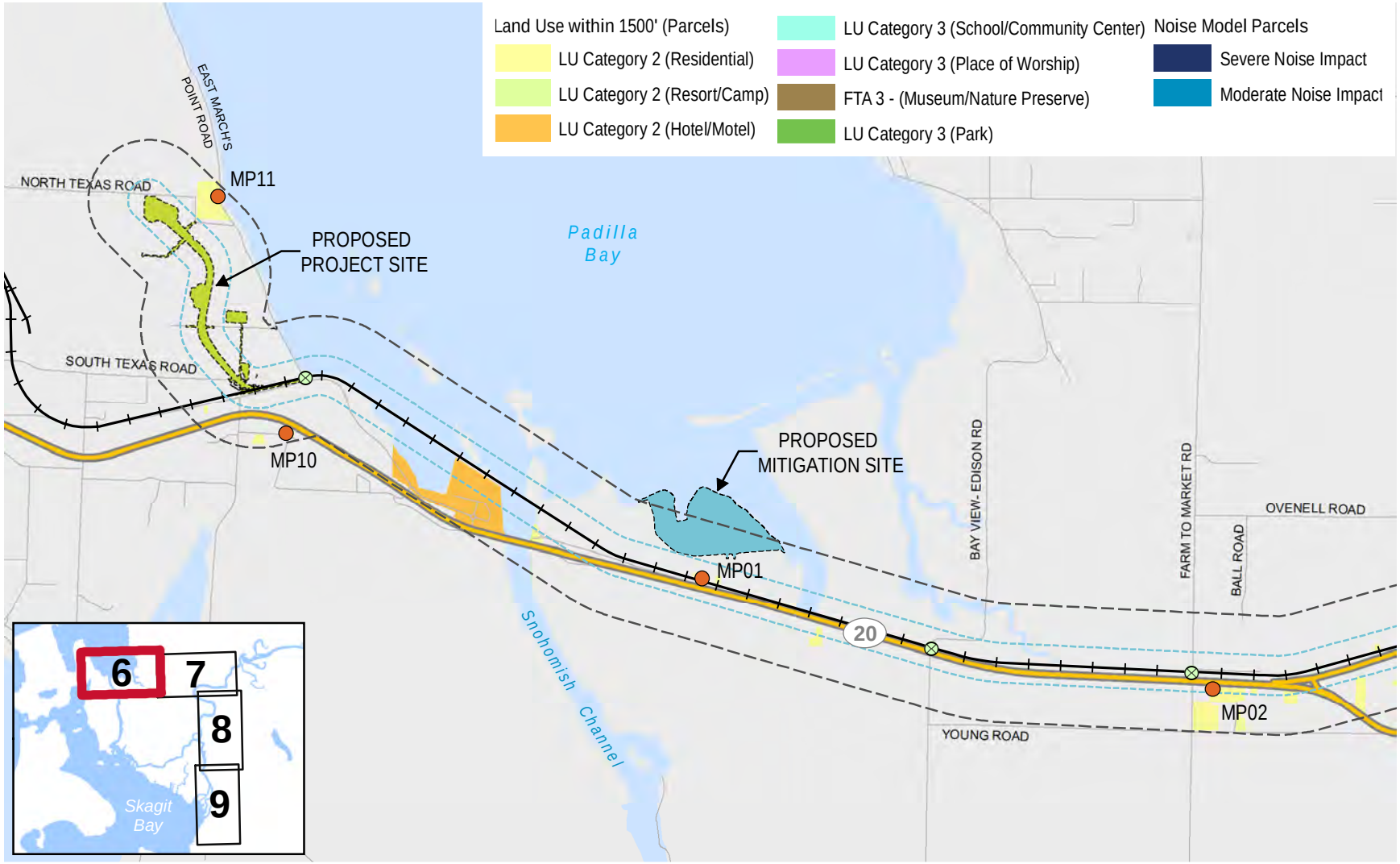
Figure 3.9-5
NOISE AND VIBRATION STUDY AREAS

Figures 3.9-6 through 3.9-10 show land use and noise measurement locations throughout the study area. Figure 3.9-6 shows the locations at the proposed project site. The FTA regulatory limits are based on a sliding scale that is referenced to the existing sound level at a given noise sensitive receptor.

For example, at MP 9 (Figure 3.9-9) the measured baseline sound level was 72 dBA L_{dn}; therefore, referring back to Figure 3.9-3, the fixed limit for identifying moderate impacts to Category 2 land uses (e.g., residential) from the project is 65 dBA L_{dn}; for severe impacts, the fixed limit is 71 dBA L_{dn}. Relative impact thresholds at Category 2 land uses for MP 9 would include a moderate increase of 1 dBA up to the severe increase threshold of 3 dBA or greater. To further illustrate this concept, Table 3.9-6 lists the thresholds for each MP.

Table 3.9-6 Noise Impact Thresholds (Limits) by Monitoring Position

	Category 2 (L_{dn})					Category 3 (L_{eq})		
Map ID	Existing	Absolute Limits		Relative Increase Limits		Existing	Absolute Limits	
		Moderate	Severe	Moderate	Severe		Moderate	Severe
MP 1	66	61	67	1	3	63	65	70
MP 2	70	64	69	1	3	67	67	72
MP 3	63	60	65	2	4	58	62	67
MP 4	61	58	64	2	4	57	61	67
MP 5	68	63	68	1	3	64	65	71
MP 6	79	65	75	0	2	71	70	75
MP 7	66	61	67	1	3	59	62	68
MP 8	71	65	70	1	3	63	65	70
MP 9	72	65	71	1	3	67	67	72
MP 10	67	62	67	1	3	64	65	71
MP 11	66	61	67	1	3	60	63	68



DATA SOURCE: (DNR 2015, HDR 2016, Skagit County 2015, WSDOT 2015)

Noise Monitoring
At-Grade Railroad Crossing
Noise Analysis Study Area
Vibration Analysis Study Area
Proposed Project Site
BNSF Railway
Proposed Wetland Mitigation Site
Anacortes Subdivision
Bellingham Subdivision

N

0 0.25 0.5 Miles

Figure 3.9-6

LAND USE AND NOISE MEASUREMENT LOCATIONS (WESTERN PORTION)

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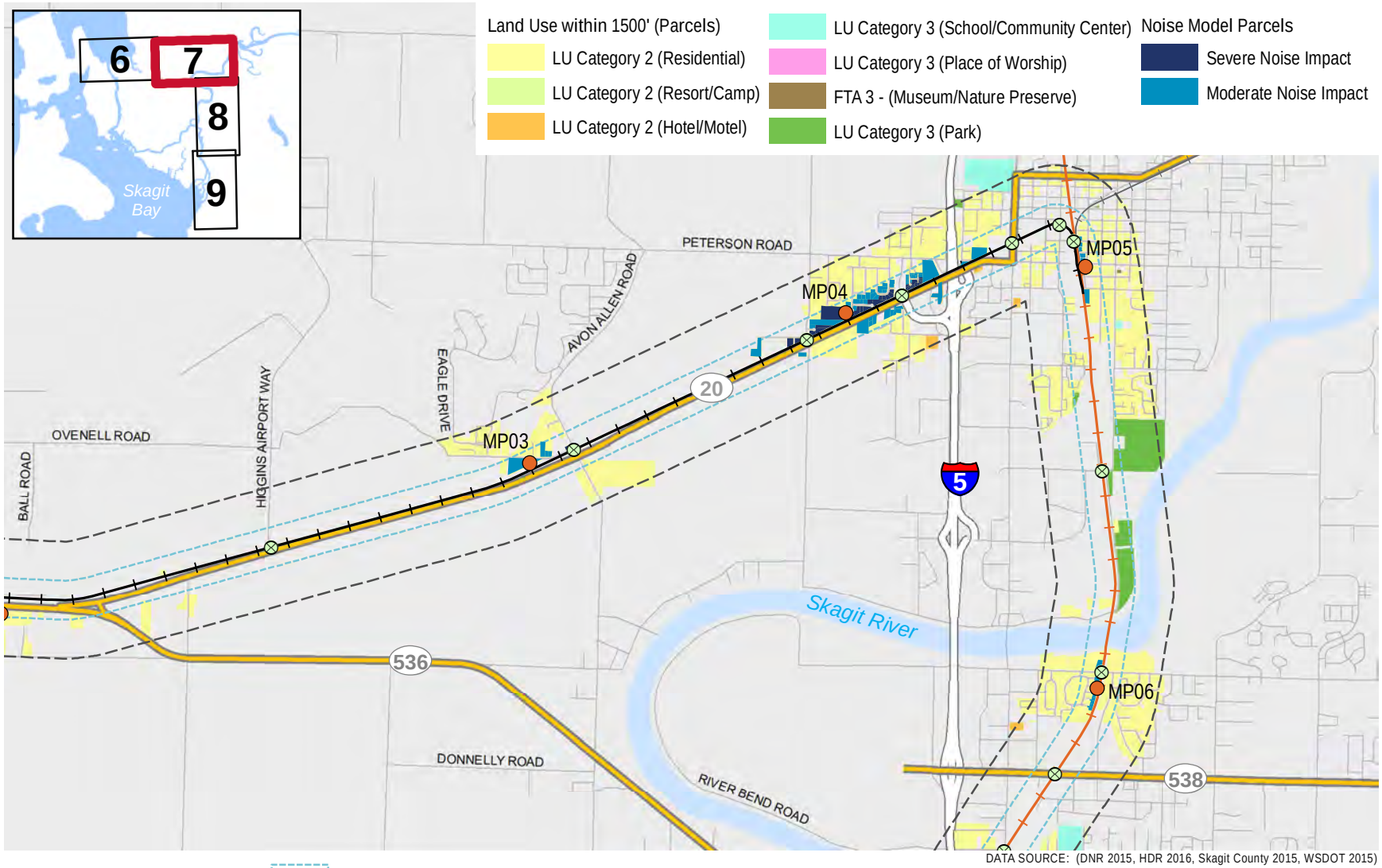

DATA SOURCE: (DNR 2015, HDR 2016, Skagit County 2015, WSDOT 2015)

Noise Monitoring
At-Grade Railroad Crossing
Noise Analysis Study Area
Vibration Analysis Study Area
Proposed Project Site
BNSF Railway
Proposed Wetland Mitigation Site
Anacortes Subdivision
Bellingham Subdivision

N

0 0.25 0.5 Miles

Figure 3.9-7

LAND USE AND NOISE MEASUREMENT LOCATIONS (EASTERN PORTION)

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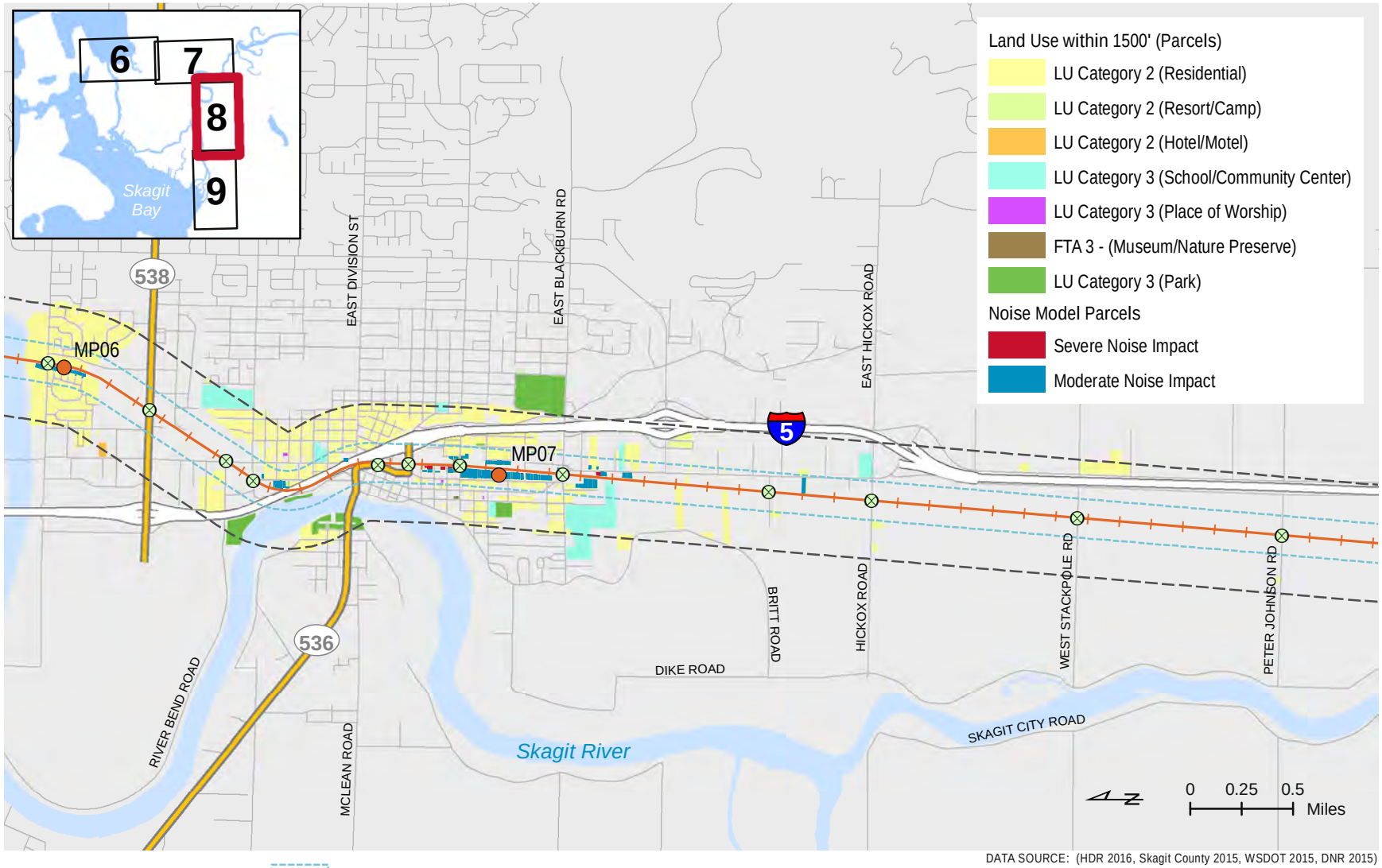

DATA SOURCE: (HDR 2016, Skagit County 2015, WSDOT 2015, DNR 2015)

Noise Monitoring
At-Grade Railroad Crossing
Noise Analysis Study Area
Vibration Analysis Study Area
Proposed Project Site
BNSF Railway
Proposed Wetland Mitigation Site
Anacortes Subdivision
Bellingham Subdivision

Figure 3.9-8

LAND USE AND NOISE MEASUREMENT LOCATIONS (SOUTHCENTRAL PORTION)

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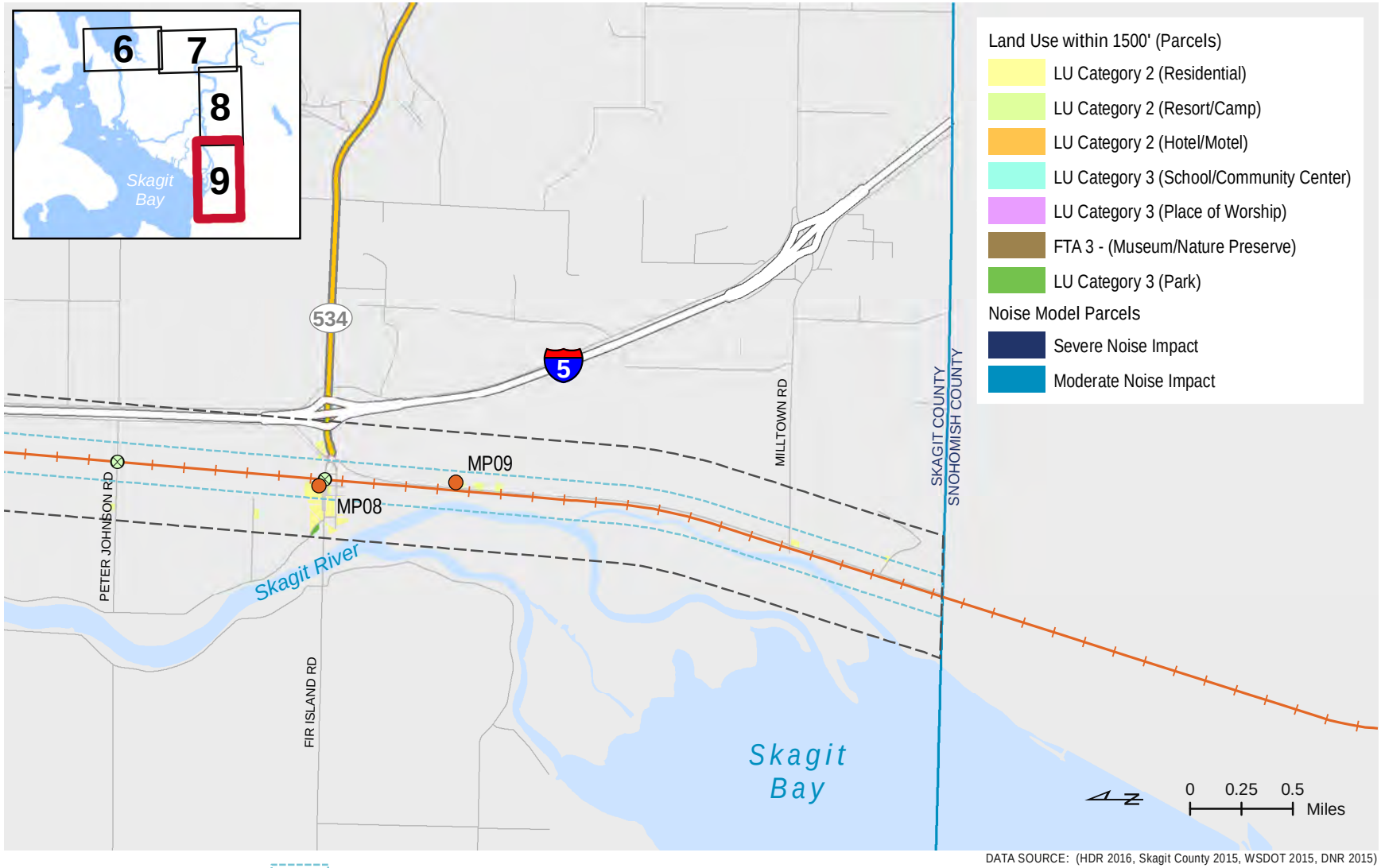

DATA SOURCE: (HDR 2016, Skagit County 2015, WSDOT 2015, DNR 2015)

Noise Monitoring
At-Grade Railroad Crossing
Noise Analysis Study Area
Vibration Analysis Study Area
Proposed Project Site
BNSF Railway
Proposed Wetland Mitigation Site
Anacortes Subdivision
Bellingham Subdivision

Figure 3.9-9

LAND USE AND NOISE MEASUREMENT LOCATIONS (SOUTHERN PORTION)

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Vibration

There are no vibration-sensitive land uses such as residences or historic structures within 500 feet of the proposed project site, although there are some industrial land uses with structures or buildings in this area. None of these structures is a historic site or another type of structure that would be considered vibration sensitive. Regardless, construction and operational vibration impacts were assessed at these industrial facilities to provide context on project vibration. Existing vibration sources consist of rail traffic on the Anacortes Subdivision. Additionally, vibration from the proposed project is not anticipated to result in landslides because there are no areas with the potential for landslides near the project site. Chapter 3.1 – Earth Resources, describes geologic conditions near the project site.

Wetland Mitigation Site

The wetland mitigation site is located about 800 feet north of the Anacortes Subdivision and extends to the north approximately 2,200 feet. The sensitive land uses or structures within the wetland mitigation site noise and vibration study area are already included in the Anacortes Subdivision and Bellingham Subdivision analysis areas (discussed in the next section).

Anacortes and Bellingham Subdivisions

Noise

A variety of land uses occur within the noise analysis study area along the rail corridor, including residential, industrial, commercial, urban, open space, and agriculture. As a general rule, noise levels tend to be higher in industrial, commercial, and urban areas, and lower in rural, open space, or agricultural areas. The existing rail lines are at the center of the study area. Their proximity to major roadway corridors, such as SR 20, SR 536, and I-5, is largely influenced by these sound sources and somewhat elevated. Rail traffic and the use of train horns is experienced throughout Skagit County. Train horn usage in the study area is a result of several at-grade rail crossings on the Anacortes and Bellingham subdivisions. Other common sources of noise include wildlife, such as birds and insects in the warmer months, agricultural equipment used in rural and agricultural areas, and periodic aircraft noise.

Noise monitoring at Monitoring Position 10

There are 3,295 noise-sensitive receptors (i.e., residences, schools, and parks) within 1,500 feet of the Anacortes and Bellingham subdivisions, primarily within the city limits of Mount Vernon and Burlington, or just outside their city limits in the Urban Reserve zoning designation. Most of these receptors are associated with single-family residences (72 percent) or multi-family residences (19 percent), such as apartments and condominiums. In addition, there are some sensitive receptors associated with parks, schools, resorts, hotels, or mobile home parks. A few rural residences are scattered throughout the agricultural areas of unincorporated Skagit County and in the small town of Conway. One casino (Swinomish Casino and Lodge) located near SR 20

outside of Anacortes includes hotel rooms and areas for recreational vehicles that are noise-sensitive.

Existing noise levels were monitored at 11 locations spaced relatively evenly throughout the noise analysis study area. Each monitoring location occurs within, and corresponds to, a cluster of noise-sensitive receptors.

Existing noise levels in the Anacortes and Bellingham subdivisions noise analysis study area (Table 3.9-4) range between 61 and 79 L_{dn}. Noise levels were highest in the northern portion of Mount Vernon (79 L_{dn}), followed by the town of Conway (71–72 L_{dn}), a rural residential area (70 L_{dn}) west of Burlington immediately south of SR 20, and a lumber yard (Sierra-Pacific Industries). Noise levels in the City of Burlington, southern Mount Vernon, and the rural residential communities toward the western end of the study area near Anacortes are intermediate (66–68 L_{dn}) compared with the rest of the study area. Noise levels for the rural residential communities immediately west of Burlington and east of the lumber yard are the lowest (61–63 L_{dn}). Figures 3.9-6, through 3.9-9 are maps that show the measurement locations and noise-sensitive land uses for the Anacortes and Bellingham subdivisions noise analysis study area. These figures also include predicted noise impacts that are described below.

Vibration

Existing vibration sources in the vibration analysis study area consist of rail traffic on the Anacortes and Bellingham subdivisions. There are a number of sensitive vibration uses, with the most sensitive consisting of 660 residences, three hotels, one religious facility, and one school.

ENVIRONMENTAL IMPACTS

No Action Alternative

Because no construction or operation would take place under the no action alternative, there would be no impacts to noise and vibration. Oil suppliers for the refinery would continue using existing delivery methods. Existing sources of noise and vibration in the study area would continue and could evolve over time due to changes in land uses or the regional economy. Regional population growth would also continue with slight increases in sound levels over time. For example, increased regional population would create more vehicles on the road, resulting in higher roadway traffic noise levels.

Proposed Project Site

Noise Impacts

Construction

Construction of the project would be conducted during daytime hours only and be in compliance with the local noise ordinances. As described in Chapter 2 – Proposed Project and Alternatives, the project would be constructed over approximately two years. If it is determined at a later date that nighttime construction is required, a variance to the State's construction noise regulatory limits would be needed.

To evaluate construction noise impacts, the FTA Noise and Vibration Impact Assessment methodology (FTA 2006) suggests combining the two noisiest pieces of equipment and assume that they are operating continuously. Using this approach, the loudest equipment to be used to construct the proposed project would be two scrapers (89 dBA maximum sound level [L_{max}]), which would generate a combined result of 92 dBA at 50 feet. The nearest sensitive structure is a residence located 500 feet from the proposed construction site. The received sound level at this location under the assumed worst-case condition would be 72 dBA, much less than the applicable construction noise impact threshold provided in Table 3.9-2. Construction noise levels at noise-sensitive receptors located farther away would be lower; therefore, there would be no adverse noise impacts from construction of the proposed project.

Operation

The FTA assessment methodology was used to identify operational noise impact conditions associated with the proposed project. Several data sources and assumptions were used in this analysis. The number of train trips to and from the Shell PSR is assumed to be one round trip daily (e.g., six round trips per week, on average) as described in Chapter 2 – Proposed Project and Alternatives. In Chapter 3.15 – Rail Traffic and Transportation, the following inputs were identified as being applicable to the acoustic modeling:

- One daily round trip by unit train.
- Four locomotives per unit train.
- 102 cars per unit train.
- Variable track speeds.
  - Anacortes Subdivision – 10 miles per hour (mph) (although trains could move as fast as 25 mph, the 10 mph is a conservative assumption because it results in sustained train noise for longer periods of time).
  - Shell PSR spur – 5 mph.
  - BNSF main line – 50 mph.

The following default settings were used in the acoustic modeling analysis, consistent with FTA/FRA regulations or guidelines:

- Train horns would be used at all public at-grade railroad crossings.
- Train horns would begin sounding 0.25 mile from each at-grade railroad crossing.
- Standard FTA/FRA freight locomotive, car, and horn noise level would be at 50 feet.

Noise modeling demonstrates that there would be no impacts to the five residential receptors located within 1,500 feet of the proposed project site. Periodically, there would be some noise associated with coupling and decoupling of unit train cars; however, these sounds would be at a lower level than the train itself and would not represent an impact to the nearby receptors. Sound levels are predicted to range from 43 dBA L_{dn} to 52 dBA L_{dn} at the five residences. No increase is expected over existing conditions in this region. This is largely because of the presence of other sound sources in the area including roadway traffic on SR 20, train traffic to the Tesoro Anacortes Refinery and neighboring industries, and industrial noise emanating from the Shell PSR itself.

To implement the FTA/FRA standard for noise modeling, an acoustic model known as DataKustik's CadnaA was used. The noise analysis study area, in total, is large and follows the train route along the Anacortes and Bellingham subdivisions to the Skagit/Snohomish county line.

Vibration Impacts

Construction

Construction vibration was evaluated to assess the potential for damage to nearby structures and annoyance to people. The vibration damage criteria for the nearest structures located 25 feet from the centerline of the nearest track are 0.2 PPV inches per second. The heaviest piece of machinery that would be implemented in constructing the project would be a bulldozer. The source levels for this piece of equipment are 0.089 PPV inches per second at 25 feet. For damage to occur at the nearest structures, the bulldozer would need to be operating within 15 feet of the structure. Operation of these types of equipment would not be allowed this close to a structure; therefore, structural damage from construction vibration is not anticipated.

Annoyance from construction vibration was also evaluated. As with the structural damage assessment, the annoyance assessment is based on the heaviest piece of construction equipment anticipated for the project—a bulldozer. Ground-borne vibration annoyance is related to the rms velocity level expressed in VdB. The vibration level for a bulldozer at 25 feet is 87 VdB. A construction vibration annoyance impact is assumed to occur if the VdB exceeds 72 VdB at the nearest residence to construction. Vibration from construction would attenuate to 72 VdB within approximately 80 feet. The nearest residence is over 500 feet from project construction; therefore, vibration annoyance is not anticipated.

Operation

According to the FTA screening procedure, operational vibration could be a concern for nearby residential land uses (FTA Category 2). For the vibration impact assessment, the FTA base curve for a locomotive-powered freight train traveling at 50 mph was used. The same speeds implemented in the operational noise analysis were used in the operational vibration analysis. Vibration levels were calculated at the nearest residential land uses to the proposed project site. Adjustments were made to the base curve level to account for the slower speeds that trains would travel on the Anacortes Subdivision (10 mph) and the proposed Shell PSR spur (5 mph). Additional adjustments were made for residential structure types. Specifically, it was conservatively assumed that all residences were wood-framed, single-story houses, which resulted in an adjustment factor of -5 VdB. Calculated vibration levels at the nearest residential

structures would be, at most, 65 VdB, which is a level that is much less than the FTA impact threshold for Category 2 land uses of 80 VdB; therefore, no ground-borne vibration impacts are anticipated from operation of the project.

Calculations of ground-borne noise were also conducted. The FTA indicates that ground-borne noise is 35 dB less than ground-borne vibration levels (FTA 2006); therefore, ground-borne noise levels would be, at most, 30 dBA. This is a level that is much less than the FTA impact threshold for Category 2 land uses of 43 dBA; therefore, no ground-borne noise impacts are anticipated from operation of the project.

Wetland Mitigation Site

Noise Impacts

As described in Chapter 2 – Proposed Project and Alternatives, some heavy equipment would be used to grade the wetland mitigation site and construct the setback dike, which means that construction noise could affect nearby noise-sensitive receptors. The nearest noise-sensitive receptor is over 500 feet away from equipment operation; therefore, sound levels would be less than those described in the proposed project construction noise analysis. Because of this, no construction noise impacts would result from creation of the wetland mitigation site.

Trucks hauling material to and from the site would result in some roadway traffic noise at the receptors closest to Josh Green Lane; however, due to the relatively high volume of traffic on SR 20, which is immediately adjacent, this traffic would not result in a perceptible change (e.g., a 3 dB increase) over existing noise levels.

There would be no new noise-generating facilities or activities located at the wetland mitigation site after it is constructed. The existing pump station would be relocated by 25 feet or less and would continue to operate in a similar fashion; therefore, there would be no new operational noise associated with the wetland mitigation site or a change in sound levels.

Anacortes and Bellingham Subdivisions

Noise Impacts

Train speed is a factor in modeling train noise. Proposed project trains were modeled using speeds of 50 mph on the Bellingham Subdivision and 10 mph on the Anacortes Subdivision. While BNSF Railway has indicated unit trains are capable of 50 mph, operational speeds may often be lower, especially in the cities of Mount Vernon and Burlington.

The noise intensity from trains traveling at higher speeds is greater than for slower moving trains; however, slower trains create heightened noise levels for longer periods of time. That means that along the Anacortes Subdivision, sound levels would be sustained for longer periods due to the 10 mph train speeds. By contrast, sound levels along the Bellingham Subdivision would have greater amplitude, but for shorter durations because the train would move through areas faster. Based on noise modeling, operational noise from the proposed project is predicted to result in moderate or severe impacts at residential land uses within the study area (e.g., Category 2 FRA land uses).

See Figures 3.9-7 and 3.9-8. No impacts are predicted at the parks or schools in the study area. The residential impacts are limited to a few locations:

1. Along the Anacortes Subdivision west of Burlington near an at-grade crossing at Avon Allen Road.
2. Along the Anacortes Subdivision in Burlington near the at-grade crossings of Pulver Road and Garrett Road.
3. Along the Bellingham Subdivision in Burlington adjacent to and south of the at-grade crossing of Greenleaf Avenue.
4. Along the Bellingham Subdivision in Mount Vernon near the at-grade crossing of Hoag Road.
5. Along the Bellingham Subdivision in Mount Vernon south of the at-grade crossing of East Fir Street.
6. Along the Bellingham Subdivision in Mount Vernon near at-grade crossings of Kincaid Street, Section Street, and Blackburn Road.

In consideration of the relative impact thresholds, 168 residential receptors are predicted to exceed the moderate impact threshold; 44 would exceed the severe impact threshold.

Regardless of train speed, the main cause of noise impacts would be the use of train horns at the numerous public at-grade crossings throughout the study area (see Chapter 3.15 – Rail Traffic and Transportation). This data is consistent with what field crews observed and noted from conversations with property owners during the baseline monitoring effort. The second most dominant sound source after train horns is the noise emanating from the operation of the train itself.

Noise and vibration impacts beyond Skagit County

During the scoping process, commenters requested noise and vibration analysis for a variety of locations outside of Skagit County. No construction activities would occur outside of Skagit County as part of the proposed project; therefore, only operational noise and vibration have the potential to result in effects outside of Skagit County.

BNSF Railway is one of the busiest railways in Washington State. For noise-sensitive land uses along the proposed project's train route, noise or vibration levels could increase slightly due to operation of the proposed project; however, any perceptible effects would be similar to freight rail movement and associated noise and vibration currently experienced by those noise-sensitive land uses.

The proposed project would add six train trips per week, on average to an already busy rail corridor; therefore, levels of noise and vibration are not anticipated to change appreciably as a result.

It is important to note that the acoustic model predictions may overestimate noise impacts because of a number of conservative assumptions used in the analysis. For example, exact sound source levels for the train that would be used by Shell are not known. It is possible that the default settings in the FTA/FRA analysis procedures are higher than those that would actually be realized. Additionally, the speeds that the trains would travel along the Bellingham Subdivision may be slightly lower than the 50 mph limit. Lastly, the use of train horns is somewhat variable depending on the preference of the locomotive engineer. The train horn sound source level used in this analysis is the FRA default for freight trains but may be overly conservative. For example, the modeling assumed that the trains would be moving at a speed of 10 mph; however, if they are

moving at speeds closer to 25 mph, then sustained train horn noise would result in lower levels because the time horns are used at each crossing would be less.

Another component of rail noise in the area would be attributed to wheel squeal that occurs when trains make relatively sharp turns. During the field reconnaissance effort, only one such curve—located in Burlington where the train would transition from the Bellingham Subdivision to the Anacortes Subdivision—was identified as having the potential for wheel squeal. Although wheel squeal was not observed at this location during the field effort, this location is most likely where such noise could occur. Nevertheless, no specific impacts are predicted at this location.

Vibration Impacts

The same vibration screening procedure was used for analysis of operational vibration in both the Anacortes and Bellingham subdivisions. As with the noise analysis, the vibration analysis assumes that the trains would travel at 50 mph on the Bellingham Subdivision.

Calculated vibration levels at the nearest residential structures would be, at most, 66 VdB, which is a level that is much less than the FTA impact threshold for Category 2 land uses of 80 VdB; therefore, no ground-borne vibration impacts are anticipated from operation of the project.

Calculations of ground-borne noise were also conducted. Generally, ground-borne noise is 35 dB less than ground-borne vibration levels; therefore, ground-borne noise levels would be, at most, 31 dBA. This is a level that is much less than the FTA impact threshold for Category 2 land uses of 43 dBA; therefore, no ground-borne noise impacts are anticipated from operation of the project.

Cumulative Impacts

Past and present actions were considered in the cumulative impacts analysis by evaluating background noise monitoring data performed for this EIS. As described above, noise levels at the proposed project site, and within 1,500 feet of the site, are generally high. Noise levels at the proposed mitigation site and Anacortes and Bellingham subdivisions contain a variety of land uses within the noise analysis study area, including residential, industrial, commercial, urban, open space, and agriculture. As a general rule, noise levels tend to be higher in industrial, commercial, and urban areas, and lower in rural, open space, or agricultural areas.

The Gateway Pacific Terminal project (Gateway Pacific Terminal 2013) would have an additive impact to the average daily noise volumes for receivers along the Bellingham Subdivision when combined with the proposed project and existing train traffic. The Gateway Pacific Terminal project, combined with the proposed project, would add a total of 20 train trips per day on the Bellingham Subdivision. This would increase the number of trains from 21 to 41. According to the FTA *Transit Noise and Vibration and Impact Assessment* (FTA 2006), this doubling of the train traffic would be expected to increase future noise levels on the Bellingham Subdivision by approximately 3 dBA relative to existing L_{dn} sound levels. For context, a 3 dBA increase is considered the minimum amount of change in sound level that is perceptible to humans.

Regardless of train speed, the main cause of noise impacts would be the use of train horns at the numerous public at-grade crossings throughout the study area (see Chapter 3.15 – Rail Traffic

and Transportation). Therefore, the proposed project, combined with past, present, and reasonably foreseeable future actions, would result in a cumulative impact on noise levels.

MITIGATION MEASURES

Avoidance and Minimization

Impacts from noise and vibration would be minimized by the implementation of the best management practices (BMPs) that could be required as part of the Skagit County Grading Permit and the Shoreline Substantial Development Permit. For example, a complaint resolution procedure could be developed to address any noise issues that develop during construction.

Mitigation

Noise mitigation was evaluated to identify potential measures that could be implemented to reduce project-related operational noise along the Anacortes and Bellingham subdivisions. As described in Appendix D of this EIS, a number of specific measures were evaluated to mitigate operational noise, including establishment of Quiet Zones, installation of sound barriers, and a combination of both options. The evaluation indicated that the most reasonable option would be the establishment of Quiet Zones.

Skagit County Planning Department staff considered the possibility of implementing Quiet Zones at three at-grade crossings along the Anacortes Subdivision to mitigate for potential noise impacts. However, upon consultation with Skagit County Public Works Department staff, it was determined that the establishment and implementation of such Quiet Zones would not be feasible or recommended by the County Engineer.

3.10 AIR QUALITY AND GREENHOUSE GASES

In accordance with Federal Clean Air Act (CAA) and Washington Clean Air Act requirements, the air quality in a given region or area is measured by the concentration of various pollutants in the atmosphere. Air quality is a result, not only of the types and quantities of atmospheric pollutants and pollutant sources, but also surface topography, the size of the topological "air basin," and the prevailing meteorological conditions. Air quality can directly and indirectly affect the environment and public health.

Greenhouse gases (GHGs) are emitted from natural sources and are removed from the atmosphere by natural processes. GHGs are also emitted from human processes, which are now outpacing these natural processes. As GHGs increase, the atmosphere's ability to retain heat increases as well. Evidence shows that rising global temperatures accompany changes in weather and climate (USEPA 2016a) and result in sea level rise.

STUDY AREA AND METHODOLOGY

The proposed project could result in air quality impacts during project and wetland mitigation site construction, during operation of the rail unloading facility, from transport of crude oil via train to the facility, and during the return of empty cars to the mid-continent area. This assessment considers the impacts of the proposed activities on emissions of criteria air pollutants and GHGs as a result of the project, and the impacts from delay of motor vehicles near at-grade railroad crossings on the Anacortes Subdivision.

Study areas for proposed project impacts were identified at the regional and global levels, depending on the scale and type of emissions. Regional impacts to air quality were analyzed by calculating criteria air pollutants that would be emitted directly or indirectly as a result of the proposed project.

The Northwest Clean Air Agency (NWCAA) is responsible for protecting air quality within a specific area that includes Island, Skagit, and Whatcom counties. The NWCAA is responsible for enforcing federal, state, and local air quality regulations at stationary sources. Therefore, the study area falls under their jurisdiction. For GHGs, the area of analysis is the rail transport route from North Dakota to the Shell PSR and considers GHG emissions on a global scale. The study area for cumulative impacts would be the same as described for direct and indirect impacts.

Select laws, regulations, and guidance applicable to air quality, including GHG emissions and climate change, are summarized in Table 3.10-1.

Table 3.10-1 Laws, Regulations, and Guidance for Project-Related Air Quality and Greenhouse Gases

Laws, Regulations, and Guidance	Description
Federal	
Clean Air Act of 1963 (42 USC 7401) as amended	The comprehensive federal law that regulates air emissions from stationary and mobile sources and defines U.S. Environmental Protection Agency (USEPA) responsibilities for protecting and improving the nation's air quality and the stratospheric ozone layer. In 2007, the U.S. Supreme Court ruled that greenhouse gases are air pollutants under the Clean Air Act.
National Ambient Air Quality Standards (NAAQS)	Specifies the maximum acceptable ambient concentrations for six criteria air pollutants: carbon monoxide (CO), ground-level ozone (O_3), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), lead (Pb), and both fine inhalable particles with diameters that are generally 2.5 micrometers and smaller ($PM_{2.5}$), and inhalable particles with diameters generally 10 micrometers and smaller (PM_{10}). Primary National Ambient Air Quality Standards (NAAQS) set limits to protect public health, and secondary NAAQS set limits to protect public welfare. Areas of the country where air pollution levels persistently exceed the NAAQS may be designated "nonattainment."
The President's Climate Action Plan (2013)	A broad-based plan to cut carbon pollution in America, prepare the United States for the impacts of climate change, and lead international efforts to combat global climate change and prepare for its impact.
Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act (NEPA) Reviews (8/1/2016)	The Council on Environmental Quality (CEQ) released revised draft guidance that describes how federal departments and agencies should consider the effects of greenhouse gas emissions and climate change in their NEPA reviews.
State	
State Environmental Policy Act (SEPA) (RCW 43.21c; WAC 197-11)	Helps state and local agencies in Washington identify possible environmental impacts that could result from a proposed action, alternatives to the proposed action, and potential impact minimization and mitigation measures. Information learned through the review process can be used to change a proposal to reduce likely impacts and inform permitting decisions at the state and local levels.

Laws, Regulations, and Guidance	Description
Washington State General Regulations For Air Pollution Sources (WAC 173-400) and Washington State Clean Air Act (RCW 70.94)	Establishes technically feasible and reasonably attainable standards and establishes rules generally applicable to the control and/or prevention of the emission of air contaminants and the public policy to preserve, protect, and enhance the air quality for current and future generations.
Washington State Operating Permit Regulation (WAC 173-401)	Establishes the elements of a comprehensive Washington State air operating permit program.
Washington State 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.
Washington State Ambient Air Quality Standards (WAC 173-476)	Establishes maximum acceptable levels in the ambient air for particulate matter, lead, sulfur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3), and carbon monoxide (CO).
Reporting of Green House Gases (WAC 173-441)	Establishes mandatory greenhouse gas (GHG) reporting requirements for owners and operators of certain facilities that directly emit GHG as well as for certain suppliers of liquid motor vehicle fuel, special fuel, or aircraft fuel. For suppliers, the GHGs reported are the quantity that would be emitted from the complete combustion or oxidation of the products supplied.
Clean Air Rule (WAC 173-442)	Establishes GHG emissions standards starting in 2017 for certain stationary sources, petroleum product producers and importers, and natural gas distributors.
Limiting Greenhouse Gas Emissions (RCW 70.235)	Limits and reduces emissions of GHGs consistent with the established emission reductions in RCW 70.235.020, minimizes the potential to export pollution, jobs, and economic opportunities, and reduces emissions at the lowest cost to Washington's economy, consumers, and businesses.
Washington State Clean Air Act (RCW 70.94)	Establishes the public policy to preserve, protect, and enhance the air quality for current and future generations. Establishes rules regarding preservation of air quality and penalties for violations.
Washington Carbon Pollution and Clean Energy Action (Executive Order 14-04, 2014)	In December 2014, Governor Inslee outlined a series of next steps to reduce carbon pollution in Washington State and improve energy independence through use of clean energy. This included the establishment of a Carbon Emissions Reduction Task force that provided recommendations on the design and implementation of a market-based carbon pollution program.

Laws, Regulations, and Guidance	Description
Washington's Leadership on Climate Change (Executive Order 09-05, 2009)	In 2009, Governor Gregoire directed state agencies to take actions to reduce climate-changing GHG emissions, to increase transportation and fuel-conservation options for Washington residents, and protect our state's water supplies and vulnerable coastal areas.
Path to a Low-Carbon Economy: An Interim Plan to Address Washington's Greenhouse Gas Emissions (2010)	In 2008, the Washington State Legislature approved the Climate Change Framework E2SHB 2815, which established state GHG emissions reduction limits in law RCW 70.235.020 and directed the Washington State Department of Ecology (Ecology) to develop a comprehensive plan to reduce the state's GHG emissions. This second edition of that plan focuses on the emissions reductions required by 2020.
Requirements of Strategy—Initial Climate Change Response Strategy (RCW 43.21M.020)	Directs the development of an integrated climate change response strategy that should address the impact of and adaptation to climate change, as well as the regional capacity to undertake actions, existing ecosystem and resource management concerns, and health and economic risks. In addition, the departments of: Ecology; Agriculture; Community, Trade, and Economic Development; Fish and Wildlife; Natural Resources; and Transportation, should include a range of scenarios for the purposes of planning in order to assess project vulnerability and, to the extent feasible, reduce expected risks and increase resiliency to the impacts of climate change.

Criteria air pollutants are those for which a National Ambient Air Quality Standard (NAAQS) has been established, or pollutants that are precursors to the formation of other pollutants regulated by an NAAQS. The criteria air pollutants assessed in this analysis include:

- Nitrogen dioxide (NO_2) (a precursor to ozone [O_3] formation) is one of a group of highly reactive gases referred to as oxides of nitrogen (NO_x). NO_2 is used as the indicator pollutant for the larger group of NO_x.
- Particulate matter in two size ranges; one being smaller than 10 microns in diameter (PM_{10}), and the other being smaller than 2.5 microns in diameter ($PM_{2.5}$).
- Sulfur dioxide (SO_2).
- Volatile organic compounds (VOCs) (a precursor to O_3 formation).
- Carbon monoxide (CO).
- Lead (Pb).

NAAQS and Washington Ambient Air Quality Standards (WAAQS) for criteria air pollutants are summarized in Table 3.10-2. Except for the annual average SO_2 NAAQS where the WAAQS is 0.02 parts per million (ppm), the WAAQS for criteria air pollutants are the same as the NAAQS.

Table 3.10-2 National and Washington Ambient Air Quality Standards

Pollutant	Averaging Period	NAAQS and WAAQS	
		Primary	Secondary
PM_{10}	24-hour	150 µg/m³	150 µg/m³
$PM_{2.5}$	Annual	12 µg/m³	15 µg/m³
	24-hour	35 µg/m³	35 µg/m³
SO_2	Annual	0.030 ppm NAAQS 0.020 ppm WAAQS	
	24-hour	0.14 ppm	-
	3-hour	-	0.05 ppm
	1-hour	75 ppb	-
NO_2	Annual	53 ppb	53 ppb
	1-hour	100 ppb	-
O_3	8-hour	0.070 ppm	0.070 ppm
CO	8-hour	9 ppm	-
	1-hour	35 ppm	-
Lead (Pb)	Rolling 3-month	0.15 µg/m³	0.15 µg/m³

Notes:

1. The 24-hour and annual SO_2 NAAQS are slated for revocation by the U.S. Environmental Protection Agency (USEPA), once the newer 1-hour SO_2 NAAQS is fully implemented in terms of establishing attainment/nonattainment status for a given area.
2. Source: Title 40, Code of Federal Regulations (CFR), Part 50, and Washington Department of Ecology (Ecology) rules under the Washington Administrative Code (WAC), 173-476. Refer to the respective regulations for details on how attainment with each standard is determined.

Direct Emissions Analysis

The study area to assess air quality impacts from construction of the proposed project and wetland mitigation sites includes activities at those sites as well as use of the proposed haul routes for spoils disposal and the proposed routes for delivery of construction materials (Chapter 2, Figure 2-11). Direct emissions of criteria pollutants from on-site project construction

activities were estimated based on equipment data and the proposed construction schedule, together with nonroad equipment emissions factors (i.e., the quantity of pollutant per a given unit of measure such as miles) generated by the U.S. Environmental Protection Act (USEPA) MOVES2014b (MOVES) model (USEPA 2016b). Fugitive dust from ground-disturbing activities and movement of materials over paved and unpaved roads was calculated by implementing methodologies as outlined in the USEPA AP-42, Fifth Edition, Volume 1, Chapter 13.2.2 and Chapter 13.2.3. On-road emission factors from MOVES were used to estimate emissions associated with trucks removing spoils materials and delivering construction materials. Rail unloading facility temporary construction activity emissions are expected to occur over approximately two years and wetland mitigation site temporary construction activity emissions are expected to occur over four years.

Direct criteria pollutant emissions from operations, by comparison, would occur over a longer time period commensurate with ongoing refinery operations and the large geographical area required for train transport of crude oil to the Shell PSR. Refinery site emissions (i.e., slow moving and idling locomotives on site) would be insignificant compared with the criteria pollutant emissions resulting from train transport of crude oil to and from the proposed project from the mid-continent area, and were assessed qualitatively.

Emissions from proposed locomotive activity along the rail corridor were estimated using BNSF Railway's 2014 system-wide average fuel efficiency identified in their latest annual report filed with the Surface Transportation Board (STB) (BNSF 2014). The report to the STB includes total system fuel use for line haul locomotives and the gross (freight plus empty train weight) ton miles of mass moved along the BNSF Railway system. This allows calculation of an average gross-ton-miles/gallon of diesel fuel (GTM/gallon), which is one measure of rail system efficiency.

In this analysis, the study area includes the rail corridor in Washington State for the transport of crude from the mid-continent area to the Shell PSR, and the return of empty rail cars that may follow a separate rail route (Chapter 2, Figure 2-9). This analysis considers the total weight of full and empty unit trains, together with the BNSF Railway system-wide efficiency in 2014 (954 GTM/gallon), to estimate the total annual fuel use for round-trip transport of 312 trains per year, both within Washington State and for the entire rail route to the mid-continent area.

The proposed fuel usage was then multiplied by pollutant-specific emission factors, based on USEPA guidance (USEPA-420-F-09-025 for criteria air pollutants, and 40 CFR 98 for GHGs). The emission factors for each pollutant, and the basis/inputs for the estimates are summarized in Table 3.10-3. For NO_x, PM_{10}, and VOCs, projected 2018 emission factors were used to represent ongoing emissions. This is a conservative estimate because, after 2018, USEPA suggests the use of lower emission factors (USEPA-420-F-09-025).

Table 3.10-3 Emissions Factors for Locomotives

Pollutant	Emission Factor (grams/gallon)	Emission Factor Basis
NO_x	108	Calendar year 2018, Table 5, USEPA-420-F-09-025
PM_{10}	2.7	Calendar year 2018, Table 6, USEPA-420-F-09-025
VOC	4.4	Calendar year 2018, Table 7, USEPA-420-F-09-025
CO	26.6	Tables 1 and 3, USEPA-420-F-09-025
SO_2	0.096	Mass balance, assuming 15 ppm sulfur in fuel
CO_2	10,206	40 CFR 98, Table C-1, for Dist. Fuel Oil No. 2
$PM_{2.5}$	2.6	Calendar year 2018, 0.97 times PM_{10} emissions factor per USEPA-420-F-09-025

The assumptions used for the fuel use calculations and the resulting fuel use quantities are shown in Table 3.10-4. The fuel totals at the bottom are for both full and empty train transport within Washington State only. Empty train fuel consumption is substantially lower than for full trains because of the lighter train weight and the shorter distance travelled.

Table 3.10-4 Calculation of Annual Locomotive Fuel Use in Washington

Parameter and Units	Full	Empty
Weight of oil in tank car (assumes 700 barrels per car) (pounds)	205,800	0
Weight of tank car (pounds)	285,300	79,500
Weight of one train (102 cars)(tons)	14,550	4,055
Locomotives weight (4 * 200 tons/locomotive)	800	800
Total weight per train (102 cars + 4 locomotives) (tons)	15,350	4,855
Fuel use per train mile (gallons)[1]	16.1	5.1
Washington one-way trip distance (miles)	649	502[2]
Fuel use per one-way Washington trip (gallons)	10,441	2,554
Total yearly fuel use for one-way trips (gallons)	3,257,558	796,854

Notes:

1. Calculated by dividing total train weight (gross tons) by 954 GTM/gallon.
2. Return trips would take a more direct route across the Cascade Mountains near the Snoqualmie Pass.

A small amount of additional hydrocarbon vapor emissions at the facility are expected during processing because of the higher volatility of Bakken crude, and the need to safely dispose of vapors. The resulting emissions are expected to be minimal and would be addressed through a Notice of Construction Permit (Notice of Construction Order of Approval), which would allow for increased emissions. This permit must be acquired before construction of the facility begins. These minor changes in facility emissions are not being quantitatively analyzed in this EIS. They would be addressed in the related permit application with NWCAA.

Indirect Emissions Analysis

The indirect operation-related emissions from implementation of the proposed project would include criteria air pollutant emissions from motor vehicles delayed along at-grade railroad crossings. The study area for the indirect emissions analysis is the Anacortes Subdivision from Burlington, Washington, to the Shell PSR, a distance of approximately 10 miles, and the Bellingham Subdivision from Burlington to the Skagit/Snohomish county line.

The analysis considers the emissions that would result from idling motor vehicles sitting in traffic due to delays caused by additional train traffic on the Anacortes and Bellingham subdivisions in Skagit County. This study area is consistent with the area used to study traffic delays in Chapter 3.16 – Vehicle Traffic and Transportation. The traffic delay analysis presented in that chapter for 24 at-grade railroad crossings within Skagit County was used for this assessment. The emissions factors for the idling motor vehicles were based on outputs from the MOVES2014a model for Skagit County for calendar year 2018. GHG emissions were calculated assuming a fuel consumption rate of 0.5 gallons per hour.

Indirect *life-cycle greenhouse gas emissions* of criteria pollutants were not assessed given the nature (replacement product) and scale of this project. Regardless of the alternatives analyzed in this EIS, life-cycle emissions that would result would be roughly the same given that the crude oil would continue to be refined at the Shell PSR regardless of the transport mechanism (i.e., marine vessel or unit train). The Shell PSR typically operates at capacity and this project does not propose an expansion of operations. As such, there is no anticipated difference in life-cycle emissions between either of the alternatives analyzed.

Life-cycle greenhouse gas emissions are measured by calculating the global-warming potential of electrical energy sources. A life-cycle assessment is performed on each energy source and the findings are presented in units of global warming potential per unit of electrical energy generated by that source.

Greenhouse Gas Emissions Analysis

Evidence shows that GHGs contribute to rising global temperatures that can lead to changes in weather and climate patterns (USEPA 2016a). The Washington State Department of Ecology (Ecology) has proposed a new rule and proposes to amend another (WAC 173-442, Clean Air Rule, and WAC 173-441, Reporting of Emissions of Greenhouse Gases) to regulate GHG emissions in response

See Appendix E for additional details relating to the GHG emissions estimate methodology.

to the Governor's Executive Order (E.O. 14-04, 2014). WAC 173-442 establishes emission reduction requirements for GHGs from stationary sources located in Washington State, petroleum fuel producers or importers distributing fuel in Washington State, and natural gas distributors within the state.

Ecology stipulates that parties covered under this rule will have an obligation to reduce their GHG emissions over time and can use a wide variety of options to do so. Ecology will also amend WAC 173-441 to change the emissions covered by the reporting program, modify reporting requirements, and update administrative procedures. Based on current GHG reporting from the Shell PSR, Ecology anticipates that the Clean Air Rule will apply.

An analysis has been conducted, based on estimates of GHG emissions likely to be caused by the proposed project, expressed as carbon dioxide equivalents (CO_2e). The analysis also assessed the potential impact of such emissions on the attainment of GHG goals established in RCW 70.235. In this chapter, GHGs and CO_2e are synonymous.

To assess GHGs associated with transportation, the analysis considers the increase in GHG emissions from trains assumed to originate in the mid-continent region (Williston, North Dakota), and the estimated decrease in marine vessel emissions currently used to transport Alaska North Slope crude oil from Valdez, Alaska, to the Shell PSR. Roundtrip emissions were calculated based on estimated fuel use for the transport of oil by rail or marine vessel.

Williston is the heart of production for crude oil from the Bakken region, the predominant formation from which the majority of oil is now being extracted in the Williston Basin. Currently, multiple tank car oil loading facilities exist along the rail line just west and east of Williston, which makes it a reasonable endpoint for estimation of GHG emissions associated with the proposed project. The factors listed in Table 3.10-3 were used to estimate the emissions from the 800-mile (full train) and 650-mile (empty train) one-way trips, assuming 312 trains per year. The analysis assumes that BNSF Railway would choose to use the shorter, 650-mile (empty-train) return trip route to save fuel and costs; however, this route could vary depending on operational conditions (Figure 3.10-2).

For comparison purposes, the marine vessel GHG emissions associated with the existing transport method of crude to the Shell PSR were calculated. The approach for this analysis is consistent with the USEPA guidance detailed in its publication, *Analysis of Commercial Marine Vessels Emissions and Fuel Consumption Data* (USEPA 2000). This analysis assumes that each ship would travel from Valdez, Alaska to the Shell PSR (1,408 miles one way). Twenty-seven tankers would be roughly equivalent to 312 proposed project trains annually.

The Washington State Climate Change Policy Laws and Executive Orders (Ecology 2016a) requires reduction of GHG emissions and tracking of emissions progress in a number of sectors. Locomotive emissions are not directly covered under Washington State law or policies for emissions tracking or reduction; therefore, no "significant" emission threshold for mitigation purposes is proposed for locomotive emissions. However, Washington State law requires that the GHG emissions will be reduced to:

- 1990 levels (88.4 million metric tons [MMT]) by 2020.
- 25 percent by 2035 (66.3 MMT).
- 50 percent by 2050 (44.2 MMT).

GHG emissions from the proposed transport of crude oil by rail to the Shell PSR relative to existing GHG emissions from transport of oil via marine vessel were calculated to determine the net change.

Climate

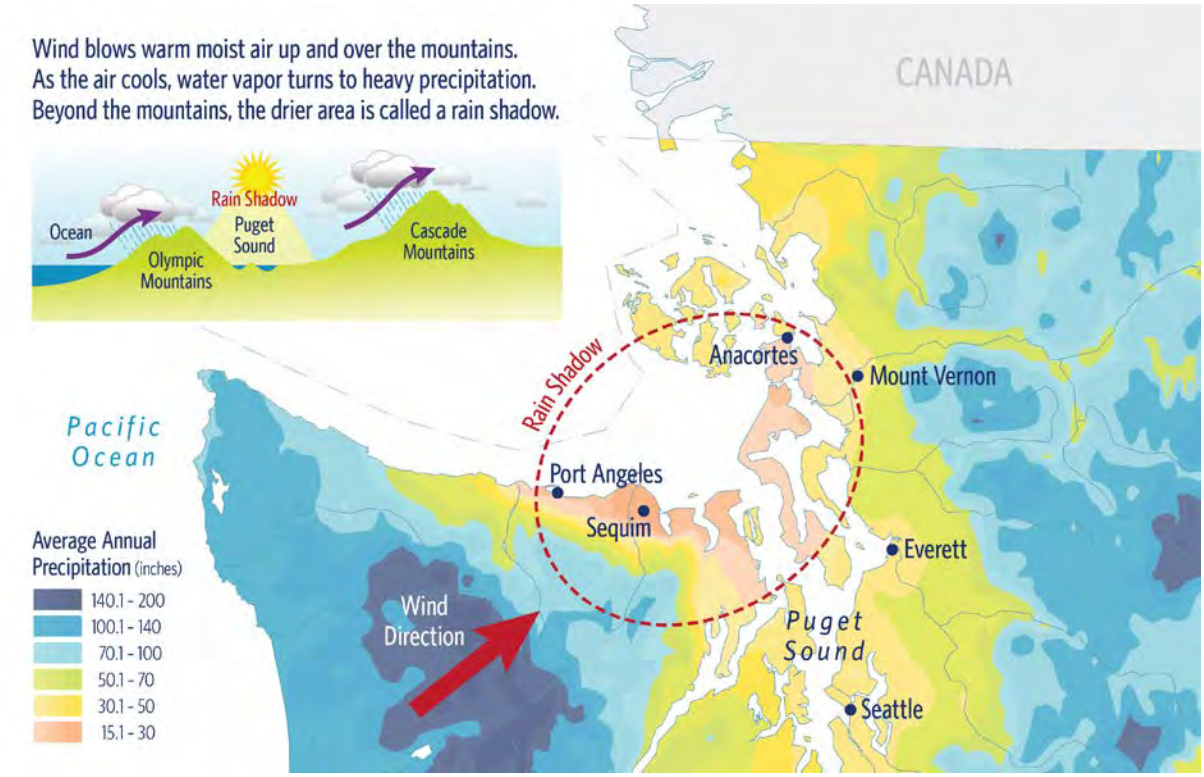
The climate in the 17 Washington State counties crossed by trains associated with the proposed project is variable, largely dependent on the proximity to the Pacific Ocean and presence of mountainous areas such as the Cascade Mountains. Portions of the extended study area west of the Cascades are greatly influenced by marine effects from the Pacific Ocean, which is characterized as a marine-type climate.

East of the Cascades, the climate possesses both continental and marine characteristics (Figure 3.10-1). In the mountainous regions of these counties, temperatures are coldest, generally coinciding with the winter months. The warmest temperatures in the extended study area are experienced east of the Cascade Mountains in the summer months. The study area west of the Cascade Mountains receives more rain than the east, as the mountains provide a rain shadow that creates a relatively arid climate in the east.

The significant terrain relief across the state, ranging from sea level to mountains and ridges that are thousands of feet higher, can contribute to elevated pollutant concentrations during periods of stable air and light winds, when pollutants tend to become trapped in valleys and low areas.

The proposed project site, wetland mitigation site, and Anacortes Subdivision are in a maritime environment that is subject to the temperature-moderating effects of the Pacific Ocean and its connected waterways. Precipitation follows an annual pattern common to the Pacific Northwest coastal region, with most of the annual precipitation falling in the autumn through winter months, followed by a relatively dry late spring and summer period. Figure 3.10-1 is a climate graphic for the Pacific Northwest.

Figure 3.10-1 Climate Patterns in the Pacific Northwest



Over the period of record from 1892 through 2014, the average annual precipitation for Anacortes is approximately 27 inches of liquid equivalent, with an average of about 5 inches of snow. For context, 10 inches of snow is roughly equivalent to one inch of rain. Average daily high temperatures in the summer months of July and August get as high as 72 F; in January, daily highs average 45 F. Average low temperatures for the months of July and August are 52 F; in January, the monthly average low is 34 F (Western Regional Climate Center 2016).

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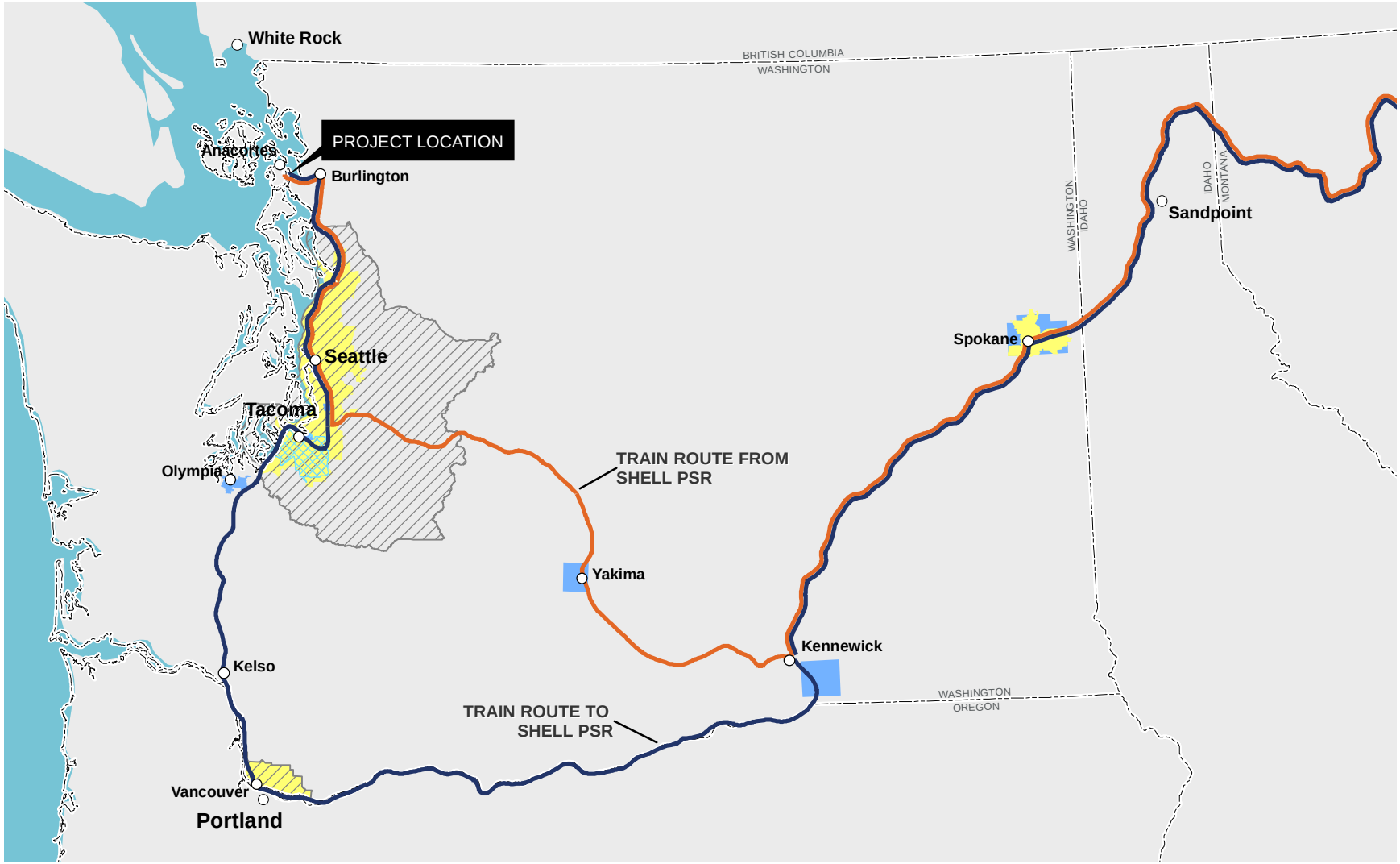

DATA SOURCE: (Ecology 2016, ESRI 2016, WSDOT 2015)

Maintenance - PM 2.5
Maintenance - PM 10
Maintenance - Ozone
Maintenance - Carbon Monoxide
Representative Train Route to Shell PSR
Representative Train Route from Shell PSR
State/Provincial/International Boundary

N

0 25 50 Miles

Figure 3.10-2
WASHINGTON STATE NAAQS DESIGNATION

AFFECTED ENVIRONMENT

Proposed Project Site, Wetland Mitigation Site, and Anacortes Subdivision

Monitoring data for pollutants subject to the NAAQS and WAAQS are collected throughout the region. Monitors for some pollutants (NO_2 and O_3) in Anacortes are relatively close to the proposed project site, wetland mitigation site, and Anacortes Subdivision. Other regional monitors are more distant, for example, in Marysville and in the Seattle-Tacoma metropolitan area. Table 3.10-5 summarizes the most recent three years of quality-checked criteria air pollutant monitoring data (2012–2014) for the monitor closest to the proposed project site (USEPA 2016a). Although more recent data has yet to be quality checked, it does appear to coincide with the trends from 2012–2014.

The USEPA uses three-year averages of the measured concentrations to make determinations of whether a given location is in attainment or *nonattainment* with the NAAQS.

According to U.S. environmental law, a **nonattainment** area is an area considered to have air quality worse than the National Ambient Air Quality Standards as defined in the Clean Air Act Amendments of 1970. Maintenance areas are former nonattainment areas that are now consistently meeting the NAAQS.

Table 3.10-5 Monitored Air Pollutant Concentrations in the Region

Pollutant	Averaging Period	Monitoring Site	Monitored Concentration				NAAQS
			2012	2013	2014	Average	
PM_{10} (µg/m³)	24-hour	Beacon Hill, Seattle	27	28	23	26	150
$PM_{2.5}$ (µg/m³)	Annual	Marysville (Anacortes)[2]	7.4	8.3 (7.7)	7.9 (5.9)	7.9 (6.8)	12
	24-hour		23	29 (13.9)	27 (13.7)	26 (13.8)	35
SO_2 (ppb)	Annual	Beacon Hill, Seattle (Anacortes)[3]	1.0	0.8 (1.7)	0.3 (1.7)	0.8 (1.7)	30
	24-hour		4.6	2.6 (5)	0.6 (5)	2.5 (5)	140
	1-hour		19	9 (13)	3 (16)	8 (15)	75
NO_2 (ppb)	Annual	Anacortes	5.0	5.7	5.4	5.6	53
	1-hour		22	23	26	25	100

Pollutant	Averaging Period	Monitoring Site	Monitored Concentration				NAAQS
			2012	2013	2014	Average	
O_3 (ppb)	8-hour	Anacortes	45	42	41	42	70
CO (ppm)	8-hour	Beacon Hill	0.9	1.5	1.0	1.3	9
	1-hour		0.7	1.3	0.8	1.1	35

Notes:

1. The 3-hour SO2 concentration data are not summarized because the 3-hour values were not provided in the monitor value query results from USEPA's on-line database. However, 3-hour average SO2 concentrations would be well below the NAAQS of 0.5 parts per million (ppm) (500 parts per billion [ppb]) for the 3-hour period, given they would be even lower than the 1-hour concentrations listed.
2. The PM2.5 monitor in Anacortes does not have three years of quality-checked data so the data have been provided in parentheses for this pollutant.
3. The Anacortes SO2 monitor began monitoring SO2 in January 2013; therefore, Beacon Hill data from 2012 to 2014 has been added to provide additional context on this pollutant.

These concentrations are below the NAAQS for all pollutants. The highest monitored concentration, in comparison to the corresponding NAAQS, is the 24-hour $PM_{2.5}$ concentration of 26 micrograms per cubic meter (µg/m³), which is 74 percent of the NAAQS of 35 µg/m³.

Sulfur dioxide (SO_2) concentrations, while already well below the NAAQS for each averaging period, appear to be decreasing significantly over the three-year period. The reduction is likely due to the fact that after 2012, USEPA rules required nonroad diesel engines, including locomotives, to begin using ultra low sulfur diesel (ULSD) fuel. The ULSD fuel has a maximum sulfur limit of 15 parts per million (ppm) by weight, compared with a limit of 500 ppm sulfur by weight prior to the ULSD requirement.

Measured pollutant concentrations in Anacortes and at regional monitors nearest the project area are less than NAAQS and WAAQS limits. Figure 3.10-2 shows areas along the probable rail routes to/from the proposed project site that are designated by USEPA as "maintenance" for NAAQS purposes. This means these areas have at some time in the past 20 years been in nonattainment status, but have since attained the NAAQS. It also means that delegated state and local air pollution control agencies have received USEPA approval of a maintenance plan that helps ensure these areas do not revert back into nonattainment for the specific NAAQS.

Extended Study Area

The rail corridor study area encompasses portions of 17 counties in Washington State. Table 3.10-6 lists the existing air pollutant levels for NO_x and PM_{10} in each county. USEPA's National Emissions Inventory (NEI) database for calendar year 2011, which is the latest quality-checked, three-year inventory available. Only NO_x and PM_{10} concentrations are provided because NO_x is the primary air pollutant associated with locomotive operations and PM_{10} analysis is a pollutant of concern for Ecology and Skagit County. All counties in Washington are in attainment for NO_x and PM_{10}. Though there is no federal standard for diesel particulate matter (DPM), $PM_{2.5}$ emitted from railroads is assumed to consist entirely of DPM, as per Ecology's 2011 Air Emissions Inventory (Ecology, 2011). Total $PM_{2.5}$ for the counties where project unit trains would operate were 4,995 tons in 2011.

Table 3.10-6 Project-Related NO_x and PM_{10} Emissions by County (Washington State)

County	Tank Car Status	Distance (miles)	Fuel (gallons/year)	Locomotive NO_x (tons)	2011 National Emissions Inventory NO_x (tons)	Project NO_x % of NEI	Locomotive PM_{10} (tons)	2011 NEI PM_{10} (tons)	Project PM_{10} % of NEI
Adams	Full/Empty	57.3	378,611	45.1	5,102	0.88	1.1	12,718	0.01
Benton	Empty	43.4	68,284	8.2	8,386	0.56	0.2	8,791	0.01
Benton	Full	64.8	323,720	38.7	8,386	0.56	1.0	8,791	0.01
Clark	Full	39.3	197,465	23.5	12,198	0.19	0.6	5,380	0.01
Cowlitz	Full	40.3	202,443	24.1	11,326	0.21	0.6	2,234	0.03
Franklin	Full/Empty	42.5	280,662	33.4	5,024	0.66	0.8	7,042	0.01
King	Empty	92.5	146,853	17.5	60,011	0.07	0.4	28,436	0.00
King	Full	39.7	199,262	23.7	60,011	0.07	0.6	28,436	0.00
Kittitas	Empty	72.4	114,898	13.7	5,772	0.24	0.3	2,362	0.01
Klickitat	Full	91.9	461,258	54.9	3,663	1.50	1.4	5,762	0.02
Lewis	Full	28.3	142,293	16.9	12,825	0.13	0.4	4,383	0.01
Lincoln	Full/Empty	16.4	108,548	12.9	3,555	0.36	0.3	14,891	0.00
Pierce	Full	40.5	203,539	24.2	24,368	0.10	0.6	9,681	0.01
Skagit	Full/Empty	28.4	187,664	22.3	10,409	0.21	0.6	3,470	0.02

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County	Tank Car Status	Distance (miles)	Fuel (gallons/year)	Locomotive NO_x (tons)	2011 National Emissions Inventory NO_x (tons)	Project NO_x % of NEI	Locomotive PM_{10} (tons)	2011 NEI PM_{10} (tons)	Project PM_{10} % of NEI
Skamania	Full	40.6	203,710	24.2	1,390	1.74	0.6	1,136	0.05
Snohomish	Full/Empty	44.9	296,979	35.3	22,232	0.16	0.9	8,580	0.01
Spokane	Full/Empty	48.6	320,797	38.2	16,322	0.23	1.0	19,426	0.00
Thurston	Full	25.3	126,861	15.1	8,852	0.17	0.4	4,061	0.01
Yakima	Empty	55.6	88,308	10.5	8,904	0.12	0.3	9,923	0.00

ENVIRONMENTAL IMPACTS

No Action Alternative

Because no construction or operation would take place under the no action alternative, there would be no new impacts to air quality or GHGs. Oil suppliers for the refinery would continue using existing available delivery methods. Assuming that marine vessels would continue to deliver crude oil from the Alaska North Slope, the volume of diesel fuel used would remain the same. Therefore, no appreciable change in air pollutant emissions would result.

Proposed Project Site, Wetland Mitigation Site, and Anacortes Subdivision

Direct Impacts

Construction

During construction, the primary sources of emissions would be nonroad construction equipment exhaust, fugitive dust from earthmoving operations, and on-road truck exhaust from hauling away spoils materials and delivering construction materials to both the project and wetland mitigation sites. Emissions would also result from workers' motor vehicles traveling to and from the construction site. Air quality emissions from the use of construction equipment, earthmoving operations, and on-road truck exhaust are provided in Tables 3.10-7 and 3.10-8 for the rail unloading facility and wetland mitigation site, respectively. These emissions are characterized as being minimal in the context of the other emissions, such as operational emissions associated with the unit train movements throughout the state and county.

Table 3.10-7 Rail Unloading Facility Annual Construction Emissions (tons per year)

Source	CO	NO_x	SO_2	VOC	PM_{10}	$PM_{2.5}$	GHG
Nonroad Equipment Engines	0.35	0.98	0.00	0.13	0.06	0.03	385.1
On-Road Engines	0.019	0.088	0.000	0.004	0.003	0.003	23.16
Fugitive Dust					24.58	2.46	
Annual Total	**0.37**	**1.06**	**0.00**	**0.13**	**24.64**	**2.49**	**408**

Table 3.10-8 Wetland Mitigation Site Annual Construction Emissions (tons per year)

Source	CO	NO_x	SO_2	VOC	PM_{10}	$PM_{2.5}$	GHG
Nonroad Equipment Engines	0.15	0.40	0.00	0.05	0.03	0.01	170.5
On-Road Engines	0.087	0.009	0.000	0.003	0.000	0.000	0.027
Fugitive Dust					27.74	2.77	
Annual Total	**0.23**	**0.41**	**0.00**	**0.06**	**27.77**	**2.79**	**171**

Operation

The direct emissions associated with operation of the rail unloading facility would include only a small amount of VOCs due to equipment leaks and wastewater treatment; no emissions of other criteria air pollutants are anticipated. Operation of the proposed facility is estimated to result in less than 1 ton per year of total VOC emissions, which is less than the USEPA's 100-ton-per-year significance threshold. Further, in accordance with its air permit for operation of the facility, the Shell PSR would be required to apply a leak detection and repair program to the VOC lines associated with facility operation. These activities would limit the potential VOC emissions. The operational air emissions from the proposed project would not contribute enough air pollutants to result in an exceedance of the NAAQS/WAAQS and, therefore, are not anticipated to result in public health effects.

Additional emissions from minor train movements at the rail unloading facility itself—to reposition cars, for example—were analyzed semi-qualitatively by scaling project emissions relative to other rail projects in the Millennium Bulk Terminals-Longview (MBTL) EIS (Cowlitz County and Ecology 2016a). NO_x emissions for the MBTL project, assuming eight round-trip trains a day, were modeled at being 15 $\mu g/m^3$, which is about 8 percent of the NO_x NAAQS. Assuming this project's locomotive emissions would be similar per unit train to those evaluated for the MBTL project NO_x concentrations would be about 1.8 $\mu g/m^3$, about 1 percent of the NO_x NAAQS, which is a level that does not represent an impact.

The proposed project is not expected to significantly affect GHG emissions from the Shell PSR, given it would not change the throughput capacity of the facility. The most recent quantity of GHG emissions that Shell reported to Ecology of 1,805,933 metric tons (MT) of GHG is not anticipated to change substantially with the switch from Alaskan crude oil to Bakken crude oil (Ecology 2016b). Chapters 1 and 2 of this EIS describe how the proposed project would change operations at the Shell PSR.

Extended Study Area

Direct Impacts

Rail Operation

The air pollutant that would be emitted in the greatest amount from locomotives operating on the rail corridor would be NO_x. Proposed project locomotive NO_x emissions by county are provided in Table 3.10-6 and compared with total county-wide NO_x emissions. In addition to NO_x emissions, $PM_{2.5}$ emissions are also provided in Table 3.10-6 to provide context on how DPM would change with the project for each county.

The calculated percent of county emissions represented by proposed project emissions for all criteria pollutants other than NO_x was less than 0.2 percent. As shown in Table 3.10-6, even for NO_x, the portion of project-related emissions does not exceed 2 percent in any county. For only two counties, Klickitat and Skamania, the NO_x proportion exceeds 1 percent because these are rural, relatively undeveloped areas with very low existing emissions. Given the low portion of

current emissions in all counties traversed by the trains, no significant air quality impacts are expected from the increase in unit train traffic.

The DPM associated with rail operations in the counties that would be crossed by project unit trains is 373 tons of $PM_{2.5}$. Total locomotive $PM_{2.5}$ from the project would be approximately 12 tons, or 3.2 percent of total $PM_{2.5}$ railroad emissions in the counties crossed by project unit trains. The biggest percentage of $PM_{2.5}$ emissions would occur in Kittitas County at 35.2 percent. All other counties would have percentages of $PM_{2.5}$ of 5 percent or less. The DPM amounts per county or statewide represent a negligible change.

Emissions of NO_x, $PM_{2.5}$, and VOCs from the U.S. freight train locomotive fleet are on a downward trend because of the implementation of more restrictive emissions standards (73 FR 25098, USEPA 2008) for new and rebuilt locomotive engines. For example, between calendar year 2018 (which was assessed for this study) and 2040, the USEPA estimates that locomotive NO_x emissions will drop to approximately one-fourth of the 2018 rate.

Lastly, the operational air emissions from the transport of oil by rail in the extended study area would not contribute enough air pollutant emissions to result in an exceedance of the NAAQS/WAAQS and, therefore, is not anticipated to result in public health effects.

Motor Vehicle Delay Emissions at At-Grade Railroad Crossings

The air quality analysis considered the potential for increased emissions from motor vehicles delayed near at-grade railroad crossings in Skagit County due to the increase in train traffic that would be associated with the proposed project. The 24 at-grade railroad crossings studied in the traffic delay analysis presented in Chapter 3.16 – Vehicle Traffic and Transportation, were assessed for this effort. The annual delay hours for these crossings were added together, yielding an estimate of 6,553 vehicle delay hours per year associated with the proposed project. Emissions associated with delays for at-grade railroad crossings would be well below one ton per year for criteria pollutants. This is a relatively small amount in comparison to major source construction permitting thresholds for new stationary emissions sources (100 or 250 tons/year, depending on facility type).

Most of the fuel consumed during these vehicle delays would be gasoline with a small fraction of diesel fuel. The USEPA's emission factors for CO_2 provided in 40 CFR 98, Table C-1, yield a CO_2 emission factor of 19.35 pounds per gallon for gasoline and 22.5 pounds per gallon for diesel fuel, giving an approximate average of 20 pounds per gallon for a weighted average. For 1,638 gallons per year of additional fuel usage, this would equate to 32.8 MT per year of GHG emissions, which is a relatively small amount in comparison to the latest state (92 million MMT GHG), national (6,870 MMT GHG), or global (47,599 MMT GHG) inventories.

Greenhouse Gas Emissions

GHGs trap heat in the atmosphere that increases surface temperatures on Earth. Natural processes, such as volcanic activity, account for some of these emissions; however, emissions from human activities have increased substantially since the advent of the Industrial Age nearly 150 years ago. Climate Change impacts, such as rising sea levels, precipitation pattern changes,

acidification of the oceans, and changes in surface temperatures are experienced locally as a result of increased GHGs in the atmosphere.

The Council on Environmental Quality (CEQ) final guidance on considering GHG emissions and climate change in the National Environmental Policy Act (NEPA) has two main components:

1. The effect of the proposed project GHG emissions in contributing to climate change.
2. The effect of climate change on the project.

Although this is a SEPA document and therefore not covered by the CEQ guidance, climate change effects were analyzed by estimating project GHGs and the potential impacts climate change would have on the project.

The GHG emissions associated with crude-by-rail transport were estimated for the entire rail route. This route is assumed to originate in Williston, North Dakota, with full tank cars proceeding across northern Montana, and entering Washington State just east of Spokane. The remainder of the route to Anacortes within Washington is shown in Chapter 2 (Figure 2-9). The return trip to the mid-continent region with empty tank cars is also shown in the figure. Note that alternate return routes to the mid-continent or locations other than Williston are likely, but the differences in estimated GHG emissions are not of a magnitude that would substantially change those provided in this EIS.

The GHG emissions from the proposed project (nearly all CO_2 from locomotive fuel combustion) would add to the global total GHG emissions and even without the proposed project, Bakken crude oil is likely to be produced and sent by rail to other areas of the country such as the Gulf Coast or East Coast. For that reason, this GHG analysis is conservative, as it treats the proposed project in isolation from the global oil market.

In addition to estimating GHG emissions from locomotive fuel combustion, this analysis considered the GHG reduction that would result from replacing Alaska North Slope crude oil transported by marine vessel for the equivalent amount of oil proposed to be brought to the Shell PSR by unit trains. For the purpose of this analysis, marine vessels are assumed to transport crude oil from Valdez, Alaska, to the Shell PSR, a travel distance by ship of approximately 1,400 miles. More detail on this GHG emissions estimate methodology is provided in Appendix E.

Table 3.10-9 shows the estimated GHG emissions from the proposed transport of crude oil from the mid-continent region, the emissions from transporting the equivalent amount of oil by marine vessel from Alaska, and the net increase due to replacing vessel transport with rail. In the context of other GHG emission sources, the amounts shown in Table 3.10-9 are relatively small, constituting a fraction of a percent of statewide emissions in Washington, and a fraction of global GHG emissions. However, these GHG emissions are part of a larger issue with climate change and this increase would be considered an impact in the context of emissions relative to Washington State's GHG reduction goals. Therefore, this increase in GHGs would need to be offset in other sectors to reach the State's goals. This would be in addition to the reductions that are required via the State's Clean Air Rule.

Table 3.10-9 GHG Emissions from Crude Oil Transport and Net Change

Emissions Source	Affected Route	Annual GHG Emissions (metric tons/year)
Rail Locomotives	Williston, ND, to Anacortes, WA	93,211
Oil Tanker Ships	Valdez, AK, to Anacortes, WA	48,224
Net Change (Increase)	"Global"	44,987

The potential for sea level rise is the main concern for how climate change could affect the proposed project. This could impact the proposed project infrastructure, given the project is located on an inland coastal waterway. Current average rates of global sea level rise based on satellite measurements are approximately 1 foot per century (University of Colorado 2016), and are about 0.5 feet per century based on actual tide gauge data (Houston and Dean 2011). The tide gauge data indicate no substantial acceleration or deceleration in rate of rise in recent decades (Houston and Dean 2011). Given the project would be built several feet above sea level, including the excavated bowl, and the project infrastructure's expected useful life is probably on the order of a 100 years or less, it is not expected that sea level rise would adversely affect the project infrastructure during its expected useful life.

In addition to the GHG emissions that would result from the project, an additional impact would occur from lost carbon sequestration resulting from clearing approximately 16.5 acres of forest on the project site. Annually, the tree stand is estimated to sequester 21.75 MT of GHG that would be lost if removed. The American Forests Organization (American Forests 2016) has identified that each acre of trees holds approximately 186 MT GHG, so displacing 16.5 acres would represent 3,069 MT GHG that would ultimately decay and be released to the atmosphere.

Cumulative Impacts

The operational air emissions from proposed project unit trains would not contribute enough air pollutant emissions to result in an exceedance of the NAAQS/WAAQS. Reasonably foreseeable future actions that would increase rail traffic would increase NO_x emissions for all counties. However, the USEPA's revised emission standards for new and rebuilt locomotives will lower emissions as older locomotives are replaced or rebuilt. USEPA has indicated that these improvements will reduce NO_x emissions by as much as 80 percent when fully implemented. Therefore, relative to existing NO_x levels, emissions will likely be lower as a result. The study area would remain in attainment and requirements for existing or new air operating permits would need to be met that would further minimize cumulative impacts to air quality.

As discussed above, GHG emissions as a result of proposed project operations would relate only to changes in the transport of materials to the facility, as throughput capacity of the Shell PSR is anticipated to remain the same. The change associated with the proposed project would increase

GHG emissions by approximately 44,987 MT per year. Because GHGs are a global issue that are transmitted within and beyond the state line, this increase in GHGs may need to be offset in other sectors to reach the state's goals. Therefore, from both global and state perspectives, the proposed project, combined with past, present, and reasonably foreseeable future actions, would contribute to a cumulative impact on GHG emissions.

MITIGATION MEASURES

Avoidance and Minimization

Impacts to air quality could be minimized by the implementation of the best management practices (BMPs) recommended as part of the Shoreline Substantial Development Permit. For example, during construction haul roads would be sprayed with water during construction to reduce dust and particulate matter emissions.

The VOCs from the direct operational emissions are governed by local, state, and federal regulatory requirements; therefore, no further mitigation is planned. The emissions from construction would be temporary, localized, and mitigated via BMPs. The emissions from individual locomotive operations are decreasing due to the revised USEPA emissions standards. Relative to the addition of trains for the project, these emissions standards would offset some, or all, of the increase in emissions depending on how USEPA finalizes the standards.

Mitigation

Shell would assess and update their facility-wide anti-idling policy, as necessary, to include the rail unloading facility to reduce GHG emissions from construction and operation of the proposed project. Shell would provide equipment operators training on best practices for reducing fuel consumption. The anti-idling policy could include:

- Measures like reduced idling times for older vehicles and effective maintenance programs.
- Various technologies such as idle management systems or automatic shutdown features.
- Alternative fuels and other fluids.

The policy would define any exemptions where idling is permitted for safety or operational reasons, such as when ambient temperatures are below levels required for reliable operation. The plan would be submitted to Ecology's Air Program for review and approval.

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3.11 ENERGY AND NATURAL RESOURCES

Energy is consumed in nearly all aspects of modern life. Energy resources in various forms (e.g., electricity, natural gas, petroleum) are used in the operation of households, businesses and industries, in construction, and for the transportation of goods and services. This chapter presents the estimated energy requirements of the proposed project and the availability of local natural resources (specifically fill material to be used to construct the facility). The use of fuel to transport crude oil to the Shell Puget Sound Refinery (PSR) is discussed, along with the associated changes in fuel consumption from shipment of crude by rail. The environmental impacts of energy use – specifically air quality and greenhouse gas emissions – are described in Chapter 3.10 – Air Quality and Greenhouse Gases.

STUDY AREA AND METHODOLOGY

The study area used to analyze impacts to energy and natural resources included the proposed project site at the Shell Puget Sound Refinery (PSR), the wetland mitigation site, and the areas that comprise the proposed unit train routes, both within Washington State and from the mid-continent region to the Shell PSR. Because energy supplies are provided at a regional scale, the cumulative impacts study area includes western Washington State.

Information was obtained on existing energy supplies and use from local electric and natural gas utilities (see Chapter 3.12 – Land Use and Social Elements). Estimates of construction energy consumption were based on the scope of proposed construction activities (at both the project and wetland mitigation sites) and, in particular, the estimated number of truck trips to transport materials to and from those sites. Operational impacts were assessed by determining the change in energy use between what would be required for the proposed project compared with current energy consumption. The analysis also determined energy use that would be required to transport crude oil by rail from the mid-continent area to the Shell PSR. Those results were compared qualitatively to energy use to transport crude oil to the Shell PSR by marine vessels from Alaska. These analyses estimated use of diesel fuel for construction and operational impacts because diesel is the primary fuel source used for proposed activities. A qualitative analysis was also conducted to determine whether the proposed project would impede development of solar or other renewable energy technologies on adjacent properties.

Select laws, regulations, and guidance applicable to energy and natural resources associated with the proposed project are summarized in Table 3.11-1.

Table 3.11-1 Laws, Regulations, and Guidance for Project-Related Energy and Natural Resources

Laws, Regulations, and Guidance	Description
Federal	
Clean Air Act of 1963 (42 USC 7401) as amended	The comprehensive federal law that regulates air emissions from stationary and mobile sources and defines U.S. Environmental Protection Agency (USEPA) responsibilities for protecting and improving the nation's air quality and the stratospheric ozone layer. In 2007, the U.S. Supreme Court ruled that greenhouse gases are air pollutants under the Clean Air Act.
State	
State Environmental Policy Act (SEPA) (RCW 43.21c; WAC 197-11)	Helps state and local agencies in Washington identify possible environmental impacts that could result from a proposed action, alternatives to the proposed action, and potential impact minimization and mitigation measures. Information learned through the review process can be used to change a proposal to reduce likely impacts and inform permitting decisions at the state and local levels.

Potential impacts on depletable natural resources were based on estimates of material that would be excavated and used for fill in constructing the project. This assessment assumed that construction materials like soil, gravel, and concrete would be from local sources to the extent possible and that quantities of fill material required by the project would be from Skagit County sources.

AFFECTED ENVIRONMENT

Proposed Project Site

The Shell PSR uses electrical power supplied by Puget Sound Energy (PSE). Cascade Natural Gas provides the facility with natural gas.

Currently, the Shell PSR receives about 75 percent of its crude oil from the Alaska North Slope via marine vessel. About 25 percent of its crude oil is delivered from Canada via the Kinder Morgan Puget Sound pipeline. Presently no crude oil is transported to the Shell PSR by rail, and there are no facilities in place to receive crude oil by rail.

No solar energy or other renewable energy generation facilities operate on properties adjacent to the proposed project site.

Why are alternatives to fossil fuels not considered in this EIS?

During the public scoping process, several commenters requested an evaluation of alternative energy sources and support for a move away from fossil fuel dependency. As described in Chapters 1 and 2, this EIS evaluates potential effects of the no action alternative and the proposed project. Neither of these alternatives involves changes to regional or national consumption of fossil fuels, or an increase in fossil fuel production. Therefore, this EIS does not evaluate alternative energy resources.

Wetland Mitigation Site

Existing activities at the wetland mitigation site include operation of pumps (AECOM 2016) and limited vehicle access, so energy use at the site is very low.

Extended Study Area

Diesel fuel is used to power train locomotives operating on the Anacortes Subdivision, Bellingham Subdivision, and BNSF Railway main line that transport large quantities of commodities, raw materials, and other goods. Presently, approximately 21 one-way trains carrying a variety of cargoes travel north or south along the Bellingham Subdivision through Burlington each day. Approximately two BNSF Railway trains travel daily on the Anacortes Subdivision to serve the Shell PSR, the adjacent Tesoro Anacortes Refinery, and other neighboring industries. Transportation use of diesel fuel in Washington (by all modes, e.g., highway, rail) is about 18.5 million barrels, or about 775 million gallons annually (EIA 2016).

ENVIRONMENTAL IMPACTS

No Action Alternative

Because no construction or operation would take place under the no action alternative, there would be no impacts to energy and natural resources. Transport of crude oil would continue by current methods and no fuel or other energy would be used to construct the proposed project. If the Shell PSR were to obtain additional crude from other sources in the future (e.g., marine vessel shipments from the Alaska North Slope or other West Coast ports), diesel fuel would be used to transport that crude oil and energy consumption could change. Oil supplies for the refinery would continue to be delivered using existing available delivery methods.

Proposed Project Site

Direct Impacts

Construction

The proposed project would require fuel consumption for construction activities and to transport materials, equipment, and workers to the project site. Activities would include site preparation, construction of the rail unloading facility and associated infrastructure, and construction of a new railroad spur off the Anacortes Subdivision onto the Shell PSR property. These activities are anticipated to take about two years to complete and would require up to 200 workers at the peak of construction.

Dump trucks, earth moving equipment, cranes, concrete mixers, and generators, which generally run on diesel fuel, would be required during construction. As described in Chapter 2 – Proposed Project and Alternatives, approximately 55,000 truck trips are anticipated to move excavated material to and from the proposed project site. An additional 8,750 truck trips would be required to import fill materials to the site. Operation of diesel-powered equipment and trucks would consume about 161,000 gallons of fuel. The scope of construction at the project site is similar to typical large projects in Skagit County and Washington State (see Table 3.0-1 in Chapter 3.0 – Introduction, for a list of past, present, and reasonably foreseeable future projects) and would not have an adverse impact on energy supplies. Air emissions associated with project-related fuel consumption, including greenhouse gas emissions and their potential contribution to global climate change, are described in Chapter 3.10 – Air Quality and Greenhouse Gases.

About 1.1 million cubic yards (cy) of material is anticipated to be excavated from the proposed project site during construction, about 400,000 cy of that material would be hauled to the proposed wetland mitigation site. The remaining 700,000 cy would be hauled to approved disposal sites. About 175,000 cy of fill material would be imported because the soil characteristics of the project site do not meet the requirements of the facility. The construction of the project would excavate more material than it would import and would therefore not deplete fill resources in Skagit County or surrounding areas.

Operation

After the project is constructed and operating, electrical energy would be used to run the equipment associated with the rail unloading facility. The refining capacity would not be increased by the proposed project; rather, the mode of delivery of a large portion of crude oil to the Shell PSR would gradually shift from marine vessel to rail. Electricity needed for rail unloading activities would essentially replace that for marine vessel unloading. As such, changes in energy consumption from operations at the proposed project site would be minimal. The new rail unloading facility would not affect solar or other renewable energy development adjacent to the site.

Wetland Mitigation Site

Direct Impacts

Construction

Construction of the wetland mitigation site would involve clearing, grading, and filling to restore tidal estuary functions of the area. As described in Chapter 2 – Proposed Project and Alternatives, approximately 20,000 truck trips are expected to haul fill material from the Shell PSR to the wetland mitigation site over a concentrated period of approximately six months, and then periodically over a span of two years. Construction equipment and trucks would consume approximately 53,300 gallons of diesel fuel. The scope of wetland mitigation site construction is comparable to typical infrastructure projects of similar size in Skagit County and Washington State and would not have an adverse impact on energy supplies.

Operation

The wetland mitigation site would require minimal energy use, and be mainly in the form of fuel used by vehicles or equipment for monitoring and maintenance, and for the pump station (if included in final mitigation plan).

Extended Study Area

Direct Impacts

Construction

The proposed project would not involve construction in the rail corridor; therefore, there would be no impact on energy use.

Operation

Operation of the proposed project would continue to use electricity and natural gas from existing suppliers. Project operations would include, on average, six unit trains per week with up to 102 tank cars per train delivering crude oil to the Shell PSR from the mid-continent area. Fuel that would be used to transport this crude oil was estimated by reviewing average system-wide efficiency data for BNSF Railway freight trains (954 gross-ton-miles [GTM] per gallon). Average system efficiency accounts for switching and idling, as well as the higher speeds through train movements and, as such, provides a representative figure for estimating fuel use.

To transport crude oil by rail along the 649-mile route in Washington State, a 102-tank car unit train would use about 10,500 gallons of diesel fuel one way; the estimated 312 trains per year would require 3.3 million gallons. Annual fuel use for the return trip of empty tank cars through the state is estimated to be about 680,000 gallons of diesel fuel. In 2013, annual transportation use of diesel fuel was about 775 million gallons (EIA 2016); estimated fuel use would be equivalent to about 0.5 percent of the 2013 statewide consumption of diesel fuel for transportation.

Transporting crude oil by rail from the mid-continent area to the Shell PSR over a distance of about 1,449 miles and making the return trip with empty cars (including the portions of those

trips through Washington) would require approximately 9.1 million gallons of diesel fuel annually.

As a point of comparison, fuels used to transport the equivalent amount of Alaska North Slope crude oil from Valdez, Alaska to the Shell PSR and back by marine vessel (about 1,400 miles) is estimated to be about 4.8 million gallons annually. Therefore, the proposed project would result in a net increase of fuel use for transport of crude oil to the PSR; however, in the context of overall fuel use for transportation, this change would not have an adverse impact on energy supplies. Air emissions associated with project-related fuel consumption, including greenhouse gas emissions and their potential contribution to global climate change, are described in Chapter 3.10 – Air Quality and Greenhouse Gases.

Cumulative Impacts

As described above, construction and operation of the proposed project would require fuel and electricity use; however, these activities would not have an adverse impact on energy supplies. Construction and operation of all of the reasonably foreseeable future actions would have similar impacts. Together, these projects could have a cumulative impact on energy and natural resources. However, the electricity and fuel requirement for all of the projects combined is not anticipated to have an adverse impact on energy or electricity supplies.

MITIGATION MEASURES

Avoidance and Minimization

Impacts to energy and natural resources could be minimized by the implementation of the best management practices (BMPs) recommended as part of the Shoreline Substantial Development Permit. For example, construction workers would be encouraged to carpool and delivery of construction materials would be scheduled during off-peak hours to allow trucks to travel to the site with less congestion and at fuel-efficient speeds.

Mitigation

No additional mitigation measures are proposed beyond the avoidance and minimization measures that would be developed and enforced as part of the permitting process.

3.12 LAND USE AND SOCIAL ELEMENTS

Land use refers to how areas are developed for various human purposes, including residential, commercial, and industrial. Land use and development patterns, and informed projections, help communities plan for growth. Recreation areas are an important component of land use. They offer opportunities for outdoor activities, promote active lifestyles, and bring people closer to nature. Social elements, which include community services and utilities (public and private), provide daily necessities while improving quality of life through public education, social and religious affiliations, healthcare, and infrastructure.

Proper planning ensures that land is used efficiently, benefits the wider economy and population, and protects the environment. The ability to understand and identify populations more vulnerable to the impacts of planning also plays an essential role. Population information, including minority and low-income status, helps to characterize communities and identify populations who may be more vulnerable to impacts from the proposed project. This chapter examines the impacts of the proposed project on land use, recreation, minority and low-income populations, and social elements.

STUDY AREA AND METHODOLOGY

The study area for determining impacts of the proposed project on land use and social elements includes the proposed project site, the proposed wetland mitigation site, the Anacortes Subdivision, and the surrounding area extending approximately 0.25 mile from these project features. In addition, the area extending approximately 0.25 mile from the Bellingham Subdivision from Burlington to the Skagit/Snohomish County line was considered with regard to potential impacts to minority and low-income populations. The cumulative impacts study area for land use and social elements is the same as described for direct and indirect impacts.

An initial review of minority and low-income populations was conducted at the census tract level and included populations outside the study area. Based on that review, it was determined that data at the block group level would identify populations in closer proximity to the proposed project and strengthen the analysis of potential impacts to minority and low-income populations.

Laws, regulations, and guidance applicable to land use and social elements in the study area are summarized in Table 3.12-1.

Table 3.12-1 Laws, Regulations, and Guidance for Project-Related Land Use and Social Elements

Laws, Regulations, and Guidance	Description
Federal	
Title VI of the Civil Rights Act of 1964	Prohibits discrimination on the basis of race, color, and national origin in programs and activities receiving federal financial assistance.
Americans with Disabilities Act	Prohibits discrimination against people with disabilities in employment, transportation, public accommodation, communications, and governmental activities.
Presidential Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations	Directs federal agencies to identify and address the disproportionately high and adverse human health or environmental effects of their actions on minority and low-income populations. To the greatest extent practicable and permitted by law, directs each agency to develop a strategy for implementing environmental justice and is also intended to promote nondiscrimination in federal programs that affect human health and the environment, as well as provide minority and low-income communities access to public information and public participation.
State	
State Environmental Policy Act (SEPA) (RCW 43.21c; WAC 197-11)	Helps state and local agencies in Washington identify possible environmental impacts that could result from a proposed action, alternatives to the proposed action, and potential impact minimization and mitigation measures. Information learned through the review process can be used to change a proposal to reduce likely impacts and inform permitting decisions at the state and local levels.
Washington State Growth Management Act (RCW 36.70A)	Requires state and local governments to manage Washington's growth by identifying and protecting critical areas and natural resource lands, designating urban growth areas, and preparing comprehensive plans and implementing them through capital investments and development regulations.
Washington State Shoreline Management Act (RCW 90.58)	Provides a statewide framework for managing, accessing, and protecting shorelines of the state and reflects the strong interest of the public in shorelines and waterways for recreation, protection of natural areas, aesthetics, and commerce.

Laws, Regulations, and Guidance	Description
Local	
Skagit County Comprehensive Plan (Skagit County 2007)	The Natural Resource Lands Element establishes the purpose and intent of policies to guide long-range planning, programs, and regulations to conserve agricultural, forest, and mineral natural resource lands.
Skagit County Shoreline Master Program (SCC 14.26)	The Shoreline Master Program (SMP) is comprised of local land use policies and regulations designed to manage shoreline use. The SMP protects natural resources for future generations, provides for public access to public waters and shores, and plans for water dependent uses. It was created in partnership with the local community and the Washington State Department of Ecology (Ecology) and must comply with the Shoreline Management Act and Shoreline Master Program Guidelines.
Skagit County Zoning (SCC 14.16)	Meets the intent of and is consistent with the goals, objectives, and policies of the Comprehensive Plan. Applications for permits and approvals are subject to the provisions of this chapter.
Skagit County Comprehensive Parks and Recreation Plan (Skagit County 2013)	Advances the goals established by the state's Growth Management Act. These goals include the retention of open space, the enhancement of recreational opportunities, the conservation of fish and wildlife habitat, better access to natural resource lands and water, and the development of parks and recreational facilities.
City of Anacortes Comprehensive Plan (City of Anacortes 2016 and AMC 17.15.020)	Serves as the main policy document that guides the City's evolution and growth. The Plan identifies the desired type, configuration, appearance, and intensity of land uses throughout the city, as well as the character and capacity of public facilities and services like streets, trails, and utilities, the designation of open spaces and parks, and the range of housing options. The Comprehensive Plan also serves as a guide in the future drafting of regulations, budget prioritization, capital improvement priorities, and other City actions and investments. AMC 17.15.020 identifies permitted uses in the March Point heavy manufacturing district intended primarily for heavy manufacturing and closely related uses.

A site visit of the study area was conducted in order to characterize existing land use and recreation, including shoreline uses, and to evaluate potential impacts of the proposed project. Available land use information, including comprehensive plans and agricultural data, was reviewed. The recreation impacts analysis considers designated recreation areas, known informal recreation areas, and planned recreation areas within the project vicinity. Available community

services and utilities that serve the study area were also reviewed. Tourism is evaluated in Chapter 3.14 – Economics.

The populations served by the land uses in the study area have been considered as part of the analysis. Data from the U.S. Census and American Community Survey (ACS) were reviewed to identify indicators of minority and low-income populations. Executive Order (EO) 12898, Federal Actions to Address Environmental Justice in Minority and Low Income Populations, applies only to federal actions, and State Environmental Policy Act (SEPA) does not require evaluation of environmental justice. However, the co-lead agencies decided to include consideration of potential impacts to minority, low-income, and limited English proficiency (LEP) populations in response to public concerns raised during scoping for the proposed project (Skagit County and Ecology 2015). Federal guidance from the Council on Environmental Quality (CEQ 1997) served as a framework for analyzing impacts on minority and low-income populations, as SEPA does not have guidelines for such an evaluation and this is widely used for environmental justice analyses under the National Environmental Policy Act.

Similarly, SEPA does not require evaluation of public health. However, based on comments received during scoping from agencies and the public, the co-lead agencies decided to include consideration of potential impacts on public health in this chapter (Skagit County and Ecology 2015). Topics reviewed that relate to public health include air quality and prevalence of asthma in surrounding populations. Chapter 3.10 – Air Quality and Greenhouse Gases, discusses existing conditions and potential impacts on air quality from this project. Additionally, data and information about environmental health hazards, population characteristics, and health outcomes was gathered from the Washington State Department of Health (DOH) through its Washington Tracking Network program (DOH 2016).

Land use impacts could occur if project activities are inconsistent or not in compliance with existing land use designations or zoning, preclude the viability of existing land uses, or are incompatible with adjacent land uses. Recreation impacts could occur if project activities result in direct physical changes (such as construction within recreation areas) or changes to the public's use of or access to recreational resources.

Impacts to the public's use of the resources could result from aesthetic changes in or near the recreational resource or from noise that interferes with visitor experience within the resource. Impacts on minority and low-income populations could result from construction and operation of the project if those impacts would be *disproportionately high and adverse*. This analysis focuses on potential impacts related to air quality, vehicle traffic and transportation, and noise and vibration on nearby populations. Impacts to public health could occur if air quality is degraded by the project. Utility and community service impacts could occur if project activities would require new or expanded utilities or services beyond those that currently exist.

> Impacts that are **disproportionately high and adverse** occur if: adverse effects are significant; effects on minority or low-income populations would exceed the risk or rate to the general population; or if such populations are affected by cumulative exposures from environmental hazards. (CEQ 1997).

AFFECTED ENVIRONMENT

Overview

Skagit County Land Use

The study area is located predominantly within unincorporated Skagit County. The County's Comprehensive Plan, which was updated in 2007 and 2016, governs growth and provides goals, policies, and strategies for managing that growth over a 20-year planning horizon. Land use goals and policies from the Comprehensive Plan are implemented through land use designations and related zoning districts and regulations.

Regulations from Chapter 14.16 Zoning of the Skagit County Code (SCC) are intended to carry out the goals and policies of the Comprehensive Plan (SCC Chapter 14.16.010). Applications for permits and approvals are subject to the provisions of SCC Chapter 14.16.

City of Anacortes Land Use

The City of Anacortes Comprehensive Plan has identified the appropriate city land designation and development regulations that would be applied to areas within the Anacortes *Urban Growth Area* (UGA) upon annexation.

Urban Growth Areas (or UGAs) are areas where growth and higher densities are expected and can be supported by urban services.

Washington State Shoreline Management

Washington's Shoreline Management Act (SMA) was passed by the legislature in 1971 and affirmed by voters in 1972. Shoreline master programs carry out the policies of the SMA at the local level by regulating use and development. Local shoreline programs include policies and regulations based on state laws and rules but are tailored to the unique geographic, economic, and environmental needs of each community.

Under the SMA, each town, city, and county with "*Shorelines of the State*" or "*Shorelines of Statewide Significance*" must develop and adopt its own shoreline master program.

Padilla Bay is designated by Washington State as a Shoreline of Statewide Significance. Lands within shoreline jurisdiction along Padilla Bay are governed under Skagit County's Shoreline Management Master Program (SMP). The SMP includes policies, goals, and regulations designed to protect shoreline areas, provide for public uses of shores and waters, and plan for water-dependent uses.

Shorelines of the State generally refer to rivers, larger lakes, and marine waterfronts along with their associated shore lands, wetlands, and floodplains.

Shorelines of Statewide Significance are shorelines with special economic and environmental value defined by the Shoreline Management Act.

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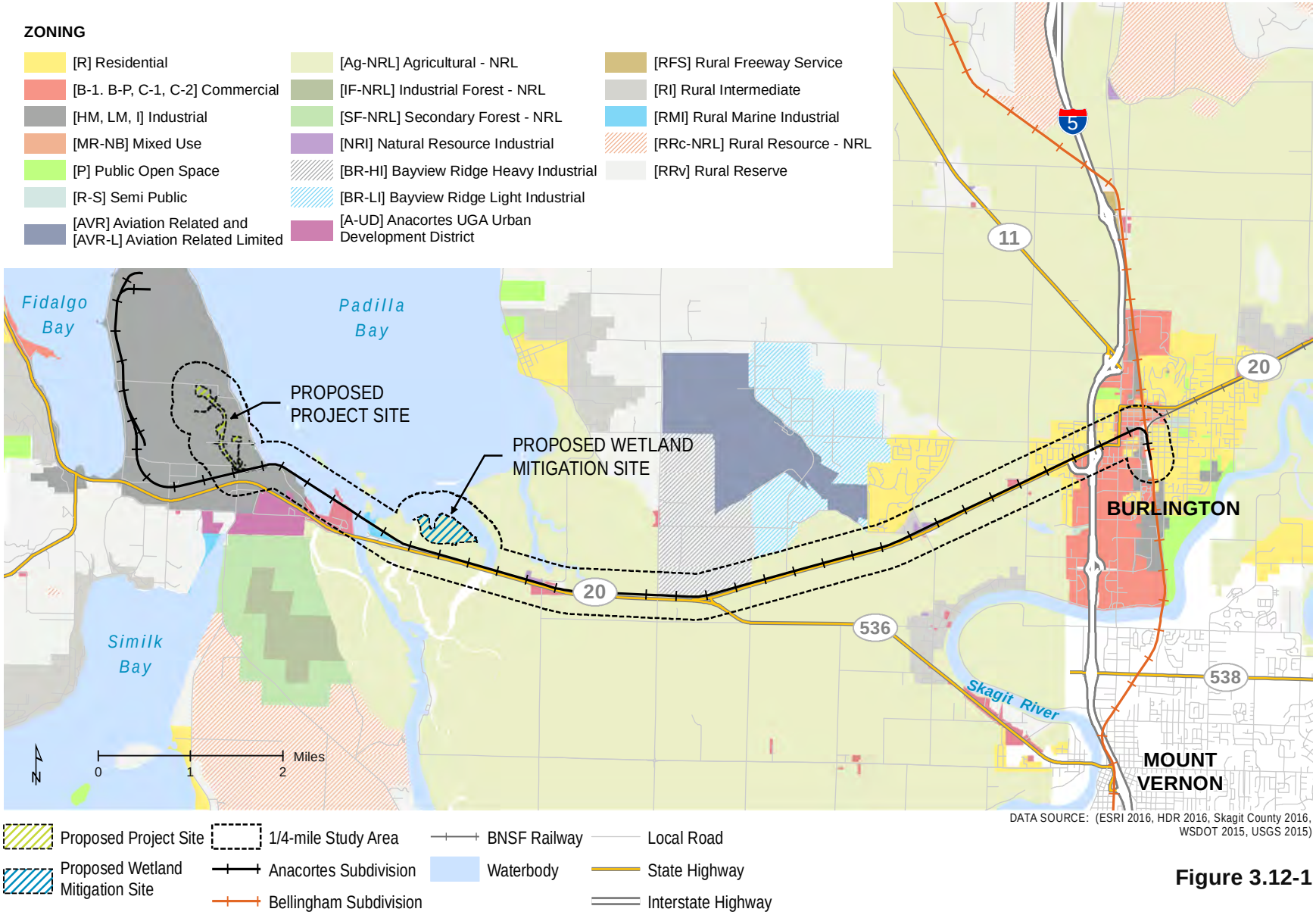


DATA SOURCE: (ESRI 2016, HDR 2016, Skagit County 2016, WSDOT 2015, USGS 2015)

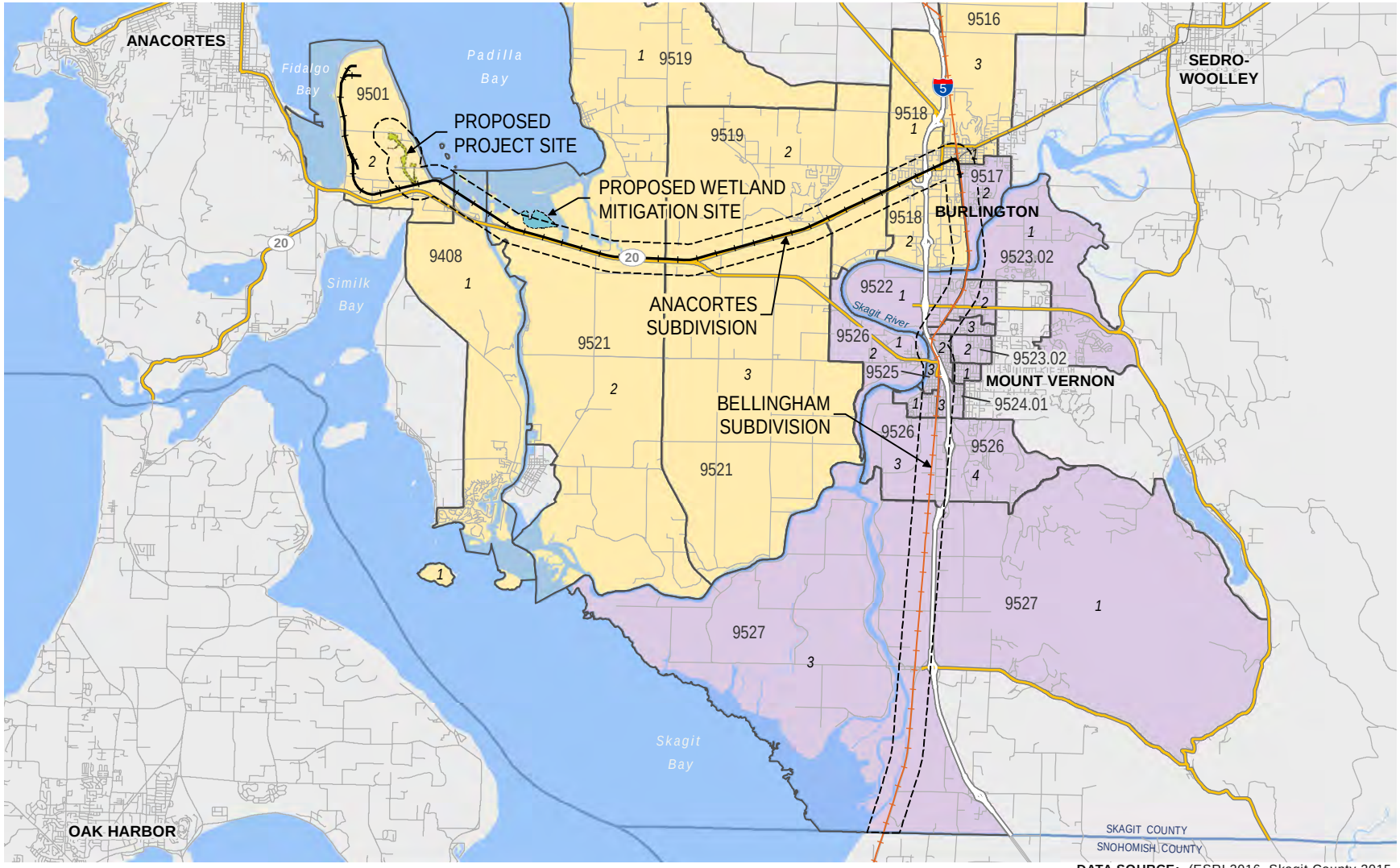
Figure 3.12-1

ZONING WITHIN THE PROJECT VICINITY

Skagit County Population

Block groups were selected as the main *geographic unit* for analysis (Figure 3.12-2), as block groups provide the smallest area for which detailed population data are reported. The study area falls within 27 block groups; 10 block groups intersect the Anacortes Subdivision and the other 17 intersect the Bellingham Subdivision. While the 0.25-mile study area only includes portions of these block groups, population characteristics of entire block groups serve as indicators of the populations present within the study area.

The U.S. Census Bureau collects data in many **geographic units**. The smallest of which is a block – this contains general population data. **Block groups** are a grouping of census blocks, and generally contain between 600 and 3,000 people. Census Tracts are larger units, and are designed to have relatively similar population characteristics.



DATA SOURCE: (ESRI 2016, Skagit County 2015, US Census 2015, WSDOT 2015)

Study Area
Census Block Group
Census Tract
Block Groups Intersecting Bellingham Subdivision
Block Groups Intersecting Anacortes Subdivision
Proposed Project Site
Proposed Wetland Mitigation Site
Anacortes Subdivision
Bellingham Subdivision
BNSF Railway

N

0 1 2 Mile

Figure 3.12-2
BLOCK GROUPS IN THE PROJECT VICINITY

Table 3.12-2 presents the population for Skagit County and the block groups in 2000, 2010, and 2014. Skagit County has seen an approximate 14.9-percent population increase since 2000. Overall, the population of block groups that intersect the Anacortes Subdivision has increased by approximately 14.5 percent since 2000; the population of block groups that intersect the Bellingham Subdivision has increased by approximately 24 percent since 2000.

Table 3.12-2 Population in 2000, 2010, and 2014

Area	2000 Population	2010 Population	Percent Change 2000 to 2010	2014 Population (Estimated)	Percent Change 2010 to 2014
Skagit County	102,979	116,901	13.5	118,364	1.3
Block Groups that intersect Anacortes Subdivision					
Block Group 1, Census Tract 9408[1]	1,997	2,278	--	2,328	2.2
Block Group 2, Census Tract 9501	234	184	-21.4	126	-31.5
Block Group 3, Census Tract 9516	1,438	1,549	7.7	1,757	13.4
Block Group 1, Census Tract 9517	1,168	1,039	-11.04	1,096	5.5
Block Group 1, Census Tract 9518	2,372	3,001	26.5	3,492	16.4
Block Group 2, Census Tract 9518	1,039	1,417	36.4	977	-31.1
Block Group 1, Census Tract 9519	1,012	1,137	12.4	1,117	-1.8
Block Group 2, Census Tract 9519	2,391	2,382	-.4	2,356	-1.1
Block Group 2, Census Tract 9521	564	658	16.7	600	-8.8
Block Group 3, Census Tract 9521	1,765	1,754	-.6	2,198	25.3
Block Groups that intersect Bellingham Subdivision					
Block Group 2, Census Tract 9517	2,161	2,650	22.6	2,563	-3.3
Block Group 1, Census Tract 9522	827	1,079	30.5	1,297	20.2
Block Group 2, Census Tract 9522	1,476	1,706	15.6	2,110	23.7
Block Group 3, Census Tract 9522	1,147	1,359	18.5	1,012	-25.5
Block Group 1, Census Tract 9523.02[1]	2,616	4,713	--	4,855	3.0
Block Group 2, Census Tract 9523.02[1]	2,388	2,310	--	2,607	12.9
Block Group 1, Census Tract 9524.01[1]	758	589	--	743	26.1

Area	2000 Population	2010 Population	Percent Change 2000 to 2010	2014 Population (Estimated)	Percent Change 2010 to 2014
Block Group 3, Census Tract 9524.01[1]	1,093	1,142	--	783	-31.4
Block Group 1, Census Tract 9525	826	1,371	65.9	920	-32.9
Block Group 2, Census Tract 9525	492	1,323	168.9	1,145	-13.5
Block Group 3, Census Tract 9525	540	596	10.4	617	3.5
Block Group 1, Census Tract 9526	663	716	7.9	635	-11.3
Block Group 2, Census Tract 9526	823	896	8.9	1,189	32.7
Block Group 3, Census Tract 9526	586	631	7.7	623	-1.3
Block Group 4, Census Tract 9526	1,196	1,578	31.9	1,290	-18.3
Block Group 1, Census Tract 9527	1,298	1,494	15.1	1,407	-5.8
Block Group 3, Census Tract 9527	925	906	-2.1	1,053	16.2

Notes:

1. Block groups within Census Tracts 9408, 9523.02, and 9524.01 apply to demographic data for 2010 and 2014. In the 2000 Census, these areas were closely approximated by block groups in Census Tracts 9520, 9523, and 9524, respectively. The 2000 Census data are presented for informational purposes, but a percent change is not presented because the geographic areas are not identical.

Source: U.S. Census Bureau 2000 Census, 2010 Census, and 2014 ACS 5-Year Estimates.

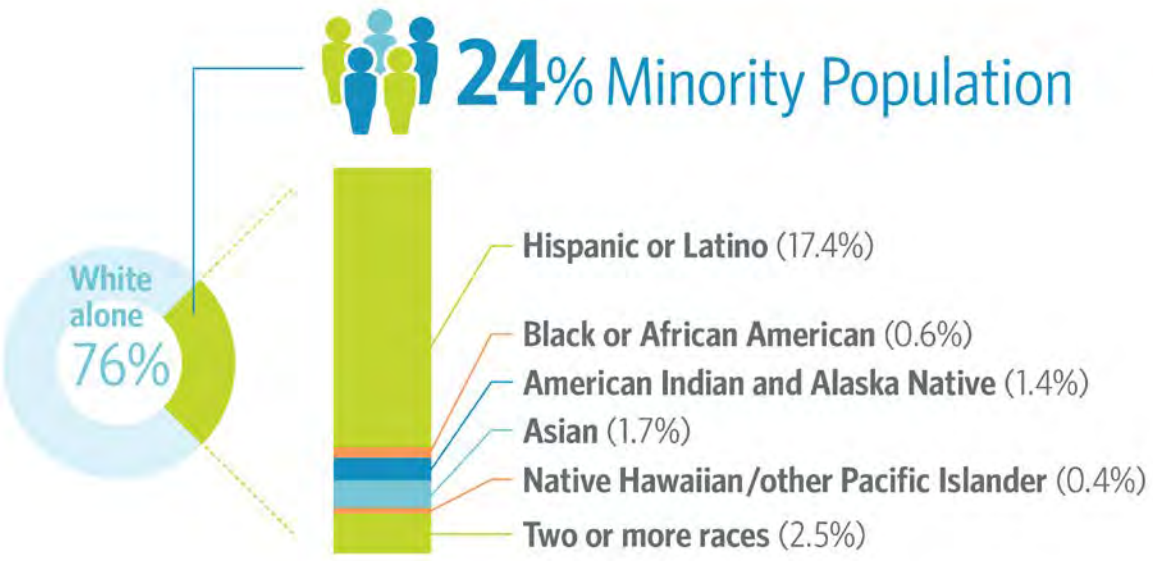
Race, ethnicity, and poverty characteristics were compiled for Skagit County and the study area from the U.S. Census Bureau's 2014 ACS. Based on census data and CEQ guidance, potential minority and low-income populations were identified as follows:

- Minorities include American Indians or Alaska Natives, Asian and Pacific Islanders, African Americans or Black persons, and Hispanic persons. Also included as minority populations are persons who identified themselves as being "two or more races." For this analysis, minority populations in a given block group are considered a minority population if their population percentage is 50-percent greater than Skagit County's minority population percentage. In the county, the minority population was 24 percent (Figure 3.12-3). Therefore, any block group with a minority percentage of greater than 36 percent would be considered a minority population for this assessment.

The Swinomish Indian Tribal Community is located in Block Groups 1 and 2, Census Tract 9408. This community is composed of approximately 900 tribal members with the majority residing on the Swinomish Reservation or nearby in Skagit County (Swinomish 2016). See Chapter 3.8 – Treaty and Traditionally Used Resources, for more information about this tribal community.

- Low-income populations represent the percentage of individuals living below the poverty level, as presented in the 2014 ACS. Any block group with a percentage of low-income individuals at least 50-percent greater than the percentage in Skagit County as a whole was considered a low-income population. In the county, the low-income population was approximately 14.9 percent of the total population. Therefore, a low-income population would include block groups in which individuals living below the poverty level exceed 22.3 percent.

Figure 3.12-3 Minority Populations in Skagit County



Source: U.S. Census Bureau 2010-2014 American Community Survey 5-Year Estimates.

Table 3.12-3 provides the population, percent minority, and percent low-income for each block group in the study area. Of the 27 block groups within the study area, seven have minority populations that exceed the 36 percent threshold, ranging from 36 to 71.6 percent. Seven block groups have low-income populations that exceed the 22.3 percent threshold, ranging from 24 to 54.6 percent. These areas contain a mix of residential, commercial, and industrial uses nearest the study area.

Table 3.12-3 Minority and Low-Income Status

Area	2014 Total Population	Percent Minority[1]	Percent Low-Income[1]
Skagit County	118,364	24.0	14.9
Block Groups that intersect Anacortes Subdivision			
Block Group 1, Census Tract 9408[2]	2,328	**36.6**	17.4
Block Group 2, Census Tract 9501	126	17.5	**34.2**
Block Group 3, Census Tract 9516	1,757	26.7	21.6
Block Group 1, Census Tract 9517	1,096	**36.0**	10.4
Block Group 2, Census Tract 9517	2,563	16.1	6.9
Block Group 1, Census Tract 9518	3,492	**51.6**	**27.8**
Block Group 2, Census Tract 9518	977	**40.4**	11.7
Block Group 1, Census Tract 9519	1,117	12.9	0.7
Block Group 2, Census Tract 9519	2,356	13.3	2.5
Block Group 2, Census Tract 9521	600	27.7	19
Block Group 3, Census Tract 9521	2,198	22.3	9.8
Block Groups that intersect Bellingham Subdivision			
Block Group 1, Census Tract 9522	1,297	19.1	**29.7**
Block Group 2, Census Tract 9522	2,110	**71.6**	**54.6**
Block Group 3, Census Tract 9522	1,012	26.6	20.8
Block Group 1, Census Tract 9523.02	4,855	23.7	2.9
Block Group 2, Census Tract 9523.02	2,607	**64.8**	**35.9**
Block Group 1, Census Tract 9524.01	743	18.7	**40.4**
Block Group 3, Census Tract 9524.01	783	26.7	19.5
Block Group 1, Census Tract 9525	920	**38.3**	13.8
Block Group 2, Census Tract 9525	1,145	20.0	19.3
Block Group 3, Census Tract 9525	617	18.0	**24.0**[1]

Area	2014 Total Population	Percent Minority[1]	Percent Low-Income[1]
Block Group 1, Census Tract 9526	635	15.7	12.1
Block Group 2, Census Tract 9526	1,189	27.8	5.8
Block Group 3, Census Tract 9526	623	16.7	2.1
Block Group 4, Census Tract 9526	1,290	12.1	4.1
Block Group 1, Census Tract 9527	1,407	9.5	8.7
Block Group 3, Census Tract 9527	1,053	23.9	2.3

Notes:

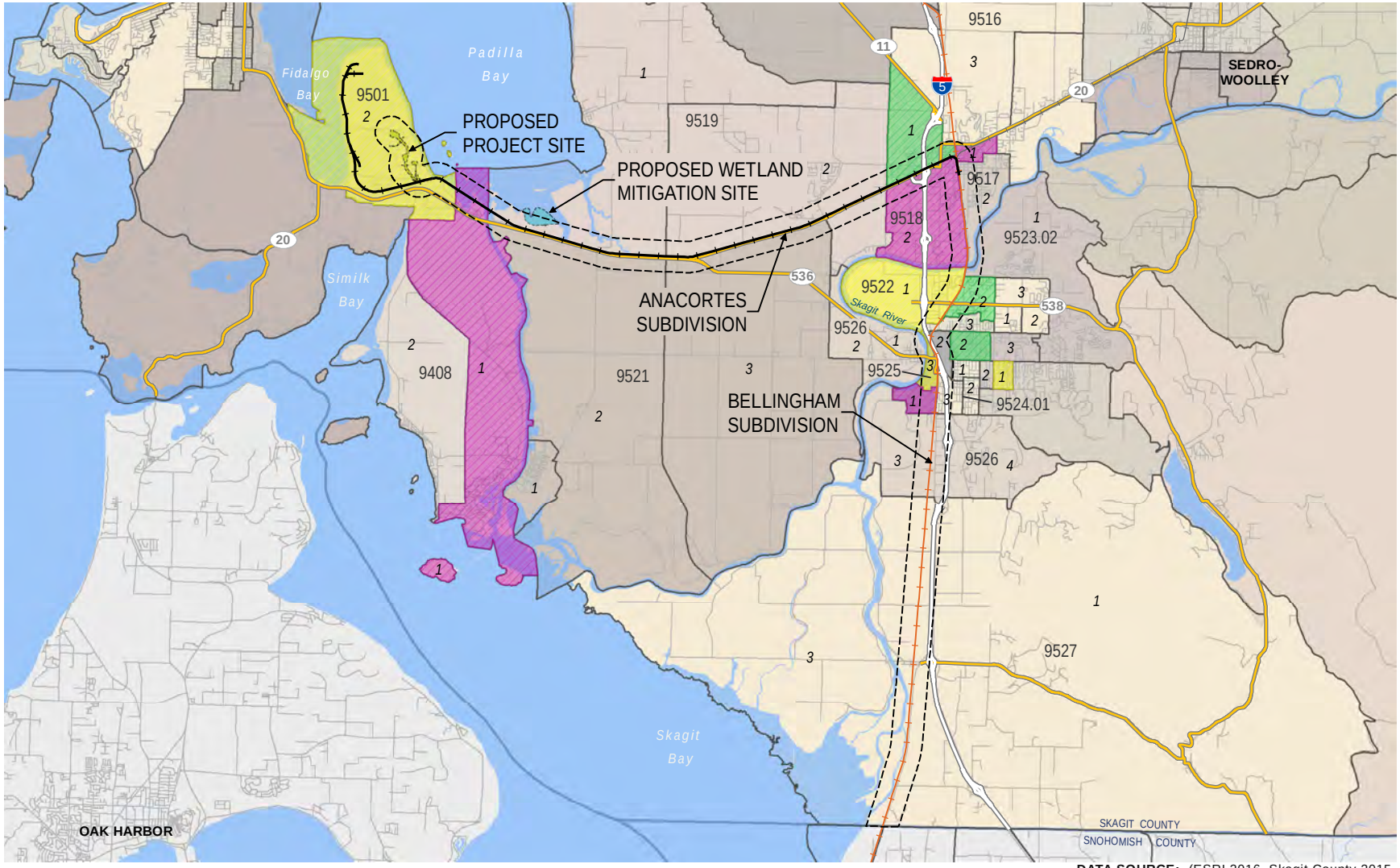
1. Boldface type indicates a minority and/or low-income population. The threshold for a minority community was a percentage of at least 36 percent, and for a low-income community was at least 22.3 percent.
2. Block Group 1, Census Tract 9408, contains a portion of the Swinomish Indian Tribal Community.

Source: U.S. Census Bureau 2010-2014 American Community Survey 5-Year Estimates.

An individual's ability to read, speak, write, or understand English may affect their access to employment, transportation, medical and social services, voting, civic events, and education. It can also affect an individual's engagement with government such as involvement in public participation processes. The ACS includes detailed information on languages spoken and English-speaking ability from surveyed populations. For this analysis, *limited English proficiency (LEP)* includes any person age 5 and older who reported speaking English less than "very well," as classified by the U.S. Census Bureau.

Table 3.12-4 provides an estimate of LEP populations compared with total population. Skagit County has an approximate 5.9 percent LEP population. Ten block groups have a higher estimated LEP population than the county, ranging from 6.3 percent up to 17.7 percent—the most widely spoken language in these block groups other than English is Spanish. This generally corresponds with areas with higher minority populations (Table 3.12-3).

Language accommodations for populations with **limited English proficiency (LEP)** were available during project development. Online open house content was made available during the scoping and draft EIS comment periods in multiple languages. The SEPA EIS Fact Sheet and materials prepared for the draft EIS public hearings are available in English and Spanish formats, and interpretation services will be made available at the draft EIS public hearings upon request. Additional information about accommodations for LEP populations is available at the project website: www.shellraileis.com.



DATA SOURCE: (ESRI 2016, Skagit County 2015, US, Census 2015, WSDOT 2015)

Minority Population
Low-Income Population
Minority and Low-Income Populations
Census Block Group
Census Tract ####
Study Area
Proposed Project Site
Proposed Wetland Mitigation Site
Anacortes Subdivision
Bellingham Subdivision
BNSF Railway

N

0 1 2 Mile

Figure 3.12-4
MINORITY AND LOW INCOME POPULATIONS

Table 3.12-4 Limited English Proficiency (LEP, Estimated)

Area	2014 Population	LEP Population	Percent LEP[1]
Skagit County	110,877	6,487	5.9
Block Groups that intersect Anacortes Subdivision			
Block Group 1, Census Tract 9408	2,223	22	1.0
Block Group 2, Census Tract 9501	126	6	4.8
Block Group 3, Census Tract 9516	1,695	94	5.5
Block Group 1, Census Tract 9517	887	0	0
Block Group 2, Census Tract 9517	2,314	90	3.9
Block Group 1, Census Tract 9518	3,305	366	**11.1**
Block Group 2, Census Tract 9518	940	133	**14.1**
Block Group 1, Census Tract 9519	1,077	0	0
Block Group 2, Census Tract 9519	2,311	43	1.9
Block Group 2, Census Tract 9521	600	50	**8.3**
Block Group 3, Census Tract 9521	2,115	134	**6.3**
Block Groups that intersect Bellingham Subdivision			
Block Group 1, Census Tract 9522	1,261	158	**12.5**
Block Group 2, Census Tract 9522	1,815	342	**18.8**
Block Group 3, Census Tract 9522	969	80	**8.3**
Block Group 1, Census Tract 9523.02	4,355	195	4.5
Block Group 2, Census Tract 9523.02	2,218	392	**17.7**
Block Group 1, Census Tract 9524.01	659	49	**7.4**
Block Group 3, Census Tract 9524.01	746	103	**13.8**
Block Group 1, Census Tract 9525	844	33	3.9
Block Group 2, Census Tract 9525	1,057	0	0
Block Group 3, Census Tract 9525	617	16	2.6
Block Group 1, Census Tract 9526	596	26	4.4

Area	2014 Population	LEP Population	Percent LEP[1]
Block Group 2, Census Tract 9526	1,088	30	2.8
Block Group 3, Census Tract 9526	594	25	4.2
Block Group 4, Census Tract 9526	1,279	49	3.8
Block Group 1, Census Tract 9527	1,344	32	2.4
Block Group 3, Census Tract 9527	1,001	22	2.2

Notes:

1. Boldface type indicates a block group with LEP population percentage greater than Skagit County's LEP population percentage of 5.9.

Source: U.S. Census Bureau 2010-2014 ACS 5-Year Estimates.

Skagit County Housing

There were approximately 52,000 housing units in Skagit County in 2014. Of these, approximately 70 percent are owner-occupied and the remaining 30 percent are occupied by renters. Only 17 percent of Skagit County's housing units are multi-family; the majority is single-family. The median home value between 2009 and 2013 was $261,400 (U.S. Census Bureau 2015).

Public Health

Air pollution from traffic is tracked by the DOH at the census tract level to determine which populations are exposed to air pollutants because of their presence near heavy traffic roadways (defined as populations within 300 meters of roadways with 25,000 or more vehicles per day; WTN 2015). In the study area, both I-5 and State Route (SR) 20 are considered heavy traffic roadways. Air quality is discussed in greater detail in Chapter 3.10 – Air Quality and Greenhouse Gases, of this EIS.

Asthma is a lung disease that inflames and narrows the airways. Outdoor air pollutants, along with other factors such as colds, stress, and exercise, can trigger asthma attacks. The DOH tracks asthma hospitalizations (WTN 2014). Between 2010 and 2014, Skagit County had approximately 300 asthma-related hospitalizations (or a rate of about five hospitalizations per 10,000 people), compared with Washington State as a whole with a rate of about six hospitalizations per 10,000 people.

Recreation

The study area provides opportunities for recreational fishing, hunting, boating, kayaking, and bird watching (Table 3.12-5 and Figure 3.12-5). Recreational facilities near the study area include a mix of community and neighborhood parks and marinas found primarily in the cities of Burlington and Anacortes; conservation areas managed by the Washington State Department of Natural Resources (DNR) and the Washington State Department of Ecology (Ecology); parks

managed by Washington State Parks; and wildlife areas managed by the Washington Department of Fish and Wildlife (WDFW). There is also a golf course near the study area.

Table 3.12-5 Recreation Facilities Within and Near the Study Area

Recreation Facility	Map ID	Managed By	Description
Fidalgo Bay Resort	1	Samish Indian Nation	Fidalgo Bay Resort is located in Anacortes on Fidalgo Bay, and contains 141 full hook-up RV sites, five model cottages, BBQ pits, a bath house, and a clubhouse.
Fidalgo Bay Aquatic Reserve	2	Washington State Department of Natural Resources (DNR)	A 780-acre aquatic reserve in Fidalgo Bay established for the conservation of native habitats and associated plant and wildlife species. The reserve provides public access with educational signage. Recreational fishing is managed in the reserve by WDFW.
Swinomish Golf Links	3	Swinomish Indian Tribal Community	An 18-hole public golf course on the south side of Fidalgo Bay.
Swinomish Channel Boat Launch	4	Skagit County	A 3-acre park with picnic area, restrooms, parking, and a concrete ramp boat launch providing access to Puget Sound. Boat moorage is available at the privately-owned nearby Twin Bridges Marina.
Twin Bridges Marina	5	Privately-owned	An indoor dry-stack marina with boat launch adjacent to the Swinomish Channel for access to Padilla Bay.
Telegraph Slough Unit of the Skagit Wildlife Area	6	Washington Department of Fish and Wildlife (WDFW)	A 30-acre isolated wetland south of Padilla Bay. WDFW manages it for waterfowl hunting and wildlife observation. A parking area on the south side of State Route (SR) 20 provides access.
Padilla Bay Shore Trail	7	Skagit County	A 2.2-mile interpretive trail from Bay View State Park along the dikes of Padilla Bay. Trail is limited to hiking, biking, and nonmotorized use.

Recreation Facility	Map ID	Managed By	Description
South Padilla Bay Unit of the Skagit Wildlife Area	8	WDFW	WDFW owns and manages approximately 240 acres of agricultural lands along Padilla Bay. WDFW is currently leasing the land back to local farmers for agricultural use. A restricted access waterfowl hunting program is administered at three sites on the property.
Padilla Bay National Estuarine Research Reserve	9	Washington State Department of Ecology (Ecology)	A 12,000-acre estuarine reserve in Padilla Bay established for long-term research and training. The reserve owns, manages or has easements for a wide variety of public access sites within its boundary for the purposes of education, research, monitoring, interpretation, and recreation.
Jason Boerner Memorial Park	10	City of Burlington	A 1.4-acre day use park in Burlington with playground, picnic area, and open space.
Burlington-Edison Park	11	City of Burlington	A 25-acre park outside of Burlington with athletic fields, fitness trail, shelters, picnic areas, playgrounds, and restrooms.
Railroad Park	12	City of Burlington	A 1.7-acre park in Burlington that houses the Burlington-Skagit County Regional Byway Center, which is a replica of Burlington's original rail station.
Alpha Park	13	City of Burlington	A 0.3-acre city park in Burlington with picnic facilities.
Lions Club Park	14	City of Burlington	A 1.6-acre park in Burlington with picnic tables, barbeques, and open space.
Maiben City Park	15	City of Burlington	A 6.7-acre park in Burlington with covered picnic shelter, tennis and basketball courts, water park, community and senior center, and playground.
Jack Doyle Memorial Park	16	City of Burlington	A 1.2-acre neighborhood park in Burlington with open space and picnic benches.

Recreation Facility	Map ID	Managed By	Description
Rotary Park	17	City of Burlington	A 10-acre park in Burlington with baseball fields, picnic shelter, playground, volleyball court, and skate park.
Roger "Gus" Tjeerdsma Boat Launch	18	City of Burlington	A concrete ramp boat launch in the City of Burlington that provides access to the Skagit River.
Skagit River Park Playfields	19	City of Burlington	A 51-acre complex with 22 soccer fields, eight baseball diamonds, 24 horseshoe pits, open space, restrooms, concessions building, and children's playground.
San Juan Islands Marine Area (Fidalgo and Padilla Bay)	20	WDFW	Consists of marine waters south of the Canadian border that contains the San Juan Islands and Bellingham Bay area; provides fishing during summer and winter.
Tommy Thompson Trail	21	City of Anacortes	A 3.3-mile trail from Port of Anacortes to March Point which crosses Fidalgo Bay.

Sources: Anacortes 2006; City of Burlington 2016; Skagit County 2013; DNR 2008; Ecology 2016a; Padilla Bay National Estuarine Research Reserve (NERR) 2008; WDFW 2016a; WDFW 2016b; WDFW 2016c.

Fishing

The study area lies adjacent to the WDFW San Juan Islands Marine Area, which consists of marine waters south of the Canadian border and includes the San Juan Islands and Bellingham Bay. This area provides scenic fishing opportunities during the summer. However, none of the major fishing areas identified is within the study area. Recreational fishing opportunities exist in Padilla Bay and Fidalgo Bay, but they are limited (WDFW 2016d). The Swinomish Channel Boat Launch provides public access to the water for recreational fishing and crabbing. WDFW manages one public clam and oyster beach in the study area along the west coast of March Point. Harvesting at that location is permitted year-round (WDFW 2016e). Additionally, a number of tribes use Padilla Bay, Fidalgo Bay, and adjacent areas for commercial fishing, shellfishing, and harvesting of other natural resources for traditional cultural uses; see Chapter 3.8 – Treaty and Traditionally Used Resources.

Swinomish Channel Boat Launch

Bird Watching

There are many opportunities for bird watching in the study area. The Padilla Bay National Estuarine Research Reserve provides opportunities to view waterfowl. The northern tip of March Point also provides waterfowl viewing opportunities (Ecology 2016b). Heron and wintering water birds can also be seen on March Point (Skagit Audubon Society 2016). The Telegraph Slough Unit of the Skagit Wildlife Area offers opportunities for viewing birds of prey, including bald eagles, as well as diverse species of songbirds and shorebirds (WDFW 2016a). Other areas near Fidalgo and Padilla Bays may provide opportunities for birdwatching, including the Tommy Thompson Trail.

Skagit Wildlife Area

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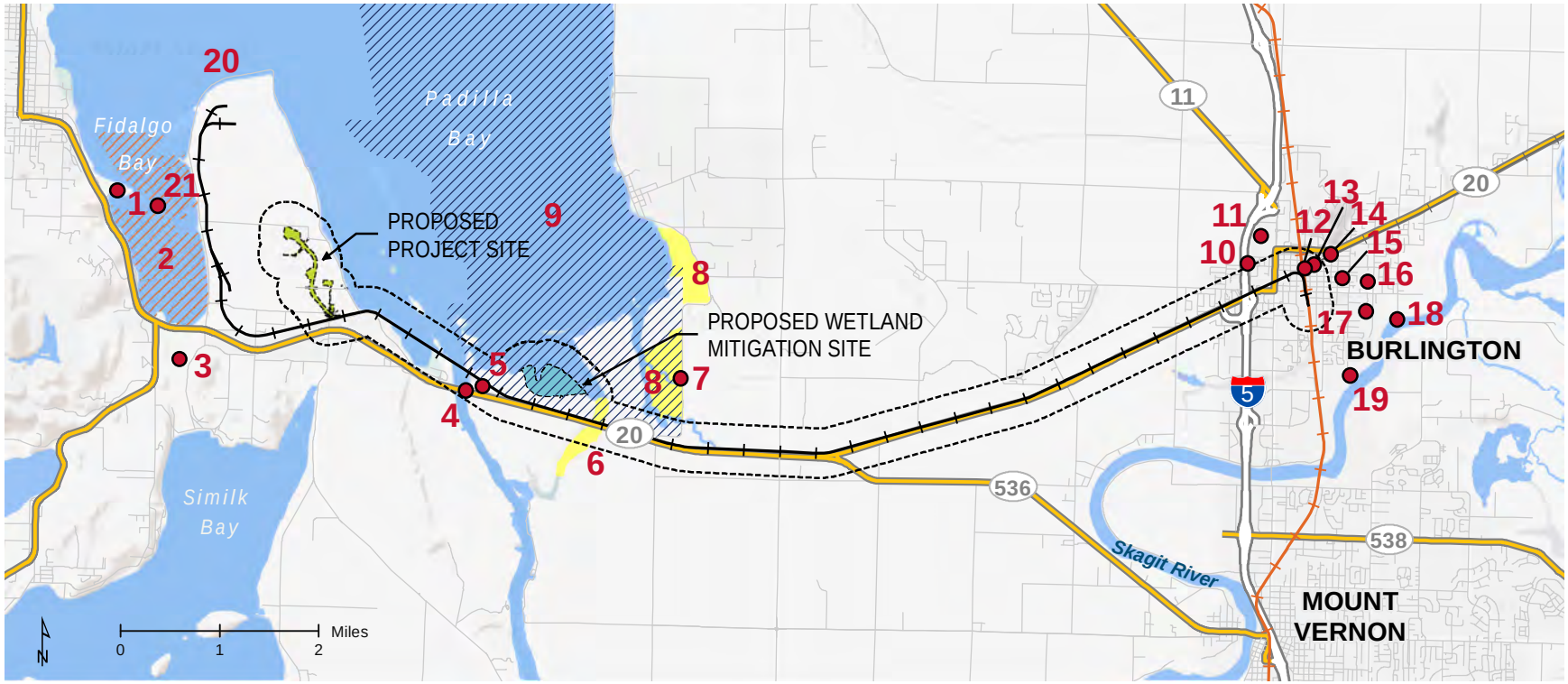
RECREATION FACILITIES

1 Fidalgo Bay Resort
2 Fidalgo Bay Aquatic Reserve
3 Swinomish Golf Links
4 Swinomish Channel Boat Launch
5 Twin Bridges Marina
6 Telegraph Slough Unit of the Skagit Wildlife Area
7 Padilla Bay Shore Trail - South Trailhead
8 South Padilla Bay Unit of the Skagit Wildlife Area
9 Padilla Bay National Estuarine Research Reserve
10 Jason Boerner Memorial Park
11 Burlington-Edison Park
12 Railroad Park
13 Alpha Park
14 Lions Club Park
15 Maiben City Park
16 Jack Doyle Memorial Park
17 Rotary Park
18 Roger "Gus" Tjeerdsma Boat Launch
19 Skagit River Park Playfields
20 San Juan Islands Marine Area (Fidalgo and Padilla bays)
21 Tommy Thompson Trail



DATA SOURCE: (DOE 2010, DNR 2016, ESRI 2016, HDR 2016, NERRS 2015, Skagit County 2016, USGS 2015, WDFW 2014, WSDOT 2015)

Recreation Facility
Aquatic Reserve
Estuarine Research Reserve
Skagit Wildlife Area
1/4-mile Study Area
Proposed Project Site
Proposed Wetland Mitigation Site
Anacortes Subdivision
Bellingham Subdivision
BNSF Railway
Local Road
State Highway
Interstate Highway

Figure 3-12.5

RECREATION FACILITIES NEAR THE STUDY AREA

Proposed Project Site

While the proposed project site is in unincorporated Skagit County, it is located within the UGA for Anacortes. The City of Anacortes has designated the proposed project site and greater March Point area as Heavy Manufacturing. Industrial developments, including refineries, are considered a permitted use in this zone pursuant to Anacortes Municipal Code Chapter 17.15.020. The proposed project site is mostly undeveloped pasture and forest land owned by Shell, with areas that had previously been leased to a nearby property owner for cattle grazing. A portion of the proposed rail spur associated with the project is within an area designated as Rural in the Skagit County SMP. In the Rural designation, transportation facilities including rail are considered a permitted use.

The proposed project site is located on Shell PSR property, adjacent to the existing refinery (Chapter 2, Figure 2-1). The Shell PSR was constructed in 1957, and began operations in 1958. The Tesoro Anacortes Refinery is located north of the proposed project site on March Point (Chapter 2, Figure 2-4). The Tesoro refinery was originally constructed by Shell and began operations in 1955, and was sold to Tesoro in the late 1990s (Smith 2015). The Tesoro Anacortes Refinery processes crude oil (including Bakken crude oil received by rail) and transports refined products via pipeline, marine vessel, truck, and barge.

Land uses to the east of the project site include recreation in Padilla Bay. Land uses to the south, across the Anacortes Subdivision and South March's Point Road, are located within the City of Anacortes (zoned as Heavy Manufacturing) and include the following: warehouse/office buildings, outdoor petroleum tanks, landscaping companies, commercial sales, gravel parking, and a single-family residence.

Recreation

Padilla Bay is located adjacent to the proposed project site, which includes recreational activities such as fishing, boating, and birding. Other nearby recreation sites are Fidalgo Bay, Fidalgo Bay Resort, the Swinomish Casino, Swinomish Golf Links., and the Tommy Thompson Trail.

Minority, Low-Income, and LEP Populations

The proposed project site is located within Block Group 2, Census Tract 9501. Total population has decreased in this block group by approximately 31.5 percent between 2010 and 2014. Minority and low-income populations are 17.5 percent and 34.2 percent, respectively. The proposed project site is identified as a low-income population, is located adjacent to a low-income population (Block Group 1, Census Tract 9408), and approximately 6 percent of the population is LEP. See Tables 3.12-2 through 3.12-4 for more detailed information on total population, minority, low-income, and LEP populations.

Public Health

Part of Census Tract 9501, where the proposed project site is located, is within 300 meters of SR 20 (a heavy traffic roadway). Approximately 29 people, or 3 percent of the census tract population, are near heavy traffic roadways and could be affected by air pollutants.

Community Services

Hospitals

The closest hospital to the study area is Island Hospital in Anacortes, about 5 miles west of the proposed project site.

Schools

There are no schools within 0.5 mile of the proposed project site. The closest, Fidalgo Elementary, is approximately 1 mile southwest of the proposed project site.

Libraries, Community Centers, and Religious Facilities

No libraries or community centers are within 0.5 mile of the proposed project site. The Summit Park Bible Church is within 0.5 mile of the proposed project site along SR 20.

Utilities

Water Supply

Water to the Shell PSR is supplied by the City of Anacortes under a 2008 agreement. Per the agreement, the City supplies Shell with up to 2,860 million gallons of water annually, or approximately 7.8 million gallons of water per day. The City owns and operates a 43-million-gallon-per-day capacity water treatment plant along the Skagit River near Mount Vernon. Demand projections developed by the City indicate that by 2029, the maximum per day demand on the water supply system will be 39.3 million gallons (City of Anacortes 2011).

Wastewater Collection and Treatment

Wastewater collection and treatment at the Shell PSR is handled on site as authorized by National Pollutant Discharge Elimination System (NPDES) Waste Discharge Permit No. WA-000294-1, issued by Ecology.

The Shell PSR generates wastewater from a number of sources including facility operations, stormwater runoff, ship ballast, and sanitary sewers.

- Facility operations produce wastewater as part of the refining process.
- Stormwater runoff that does not have the potential for oil exposure is collected via surface conduits and conveyed directly to a detention pond. A separate system accommodates oil-contaminated stormwater runoff that originates from containment areas around storage tanks and process units.
- Ballast water and oil-contaminated water are treated together in a series of separators and clarifiers. Oil collected from the separators is returned to the plant for reprocessing; oily sediment is collected for off-site disposal.
- Sanitary sewage generated at the Shell PSR is initially treated in a septic system. From there, it is pumped into a neutralization pond for disinfection with chemical wastewater from facility operations. Next, it enters the biological treatment system, which consists of aeration basins and clarifiers before it is mixed with all other treated wastewater in two final detention ponds and then released into Fidalgo Bay per regulatory standards (Ecology 1995).

Electricity

Electricity is provided to the Shell PSR by Puget Sound Energy (PSE). In 2013, PSE had a total generating capacity of about 3,600 megawatts, which represented 54.6 percent of the total energy it supplied to customers. The remaining 2,990 megawatts was acquired from outside resources, including independent power producers and energy marketers across the western U.S. and Canada (PSE 2016).

Natural Gas

Natural gas is provided to the Shell PSR by Cascade Natural Gas. 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 2016).

Utility Lines

A number of utility corridors are found within the proposed project vicinity. The BP Olympic pipeline, the Kinder Morgan Puget Sound pipeline, and PSE power lines cross the footprint of the proposed rail unloading facility (Chapter 2, Figures 2-5 and 2-6).

Telecommunications

Phone and internet services in the study area are provided by WAVE Broadband and Comcast.

Wetland Mitigation Site

The proposed wetland mitigation site is located north of SR 20, in unincorporated Skagit County (Figure 3.12-1). It is a 100-acre site and is owned by Triton America. Approximately 73 acres is proposed to be restored to tidal estuary. Some of the remaining 27 acres would be used for a setback dike, pump station, and stormwater drainage features. The site was previously diked and is presently planted with hybrid poplars; however, these trees have not been harvested. Current users of the site include members of a private hunting club.

The site is zoned as Agricultural-Natural Resource Land by Skagit County, and is currently in use as commercial agriculture. Habitat enhancement and/or restoration projects are permitted in this zone as a Hearing Examiner Special Use (Chapter 14.16.400(4)(d) SCC). Portions of the wetland mitigation site are also within the County's Rural shoreline designation

There are three single-family residences between the wetland mitigation site and SR 20. Other adjacent land uses include transportation (SR 20 and BNSF Railway), agriculture (south of SR 20 and east and west of the mitigation site), and recreation on Padilla Bay. Property zoning is shown on Figure 3.12-1.

Recreation

The wetland mitigation site is currently used by the Swinomish Duck Club for duck hunting. The club has an agreement with the landowners that permits its members to access the site to set up duck blinds and launch boats in Padilla Bay.

Minority, Low-Income, and LEP Populations

The wetland mitigation site is located within Block Group 1, Census Tract 9519. Total population declined slightly in this block group by approximately 1.8 percent between 2010 and 2014. Minority and low-income populations are 12.9 percent and 0.7 percent, respectively. The wetland mitigation site does not contain a minority or low-income population larger than Skagit County's average, but is adjacent to a minority population (Block Group 1, Census Tract 9408). Block Group 1, Census Tract 9519 does not contain identified LEP populations. See Tables 3.12-2 through 3.12-4 for more detailed information on total population, minority, low-income, and LEP populations.

Public Health

Part of Census Tract 9501, where the proposed project site is located, is within 300 meters of SR 20 (a heavy traffic roadway). Approximately 226 people, or 6 percent of the census tract population, are near heavy traffic roadways and could be affected by air pollutants.

Community Services

There are no hospitals, schools, libraries, community centers, or religious facilities within 0.5 mile of the wetland mitigation site.

Utilities

The wetland mitigation site is currently served by a portable generator that powers the pump house when in operation.

Skagit County Dike, Drainage, and Irrigation Districts

The wetland mitigation site is located within Skagit County Dike, Drainage, and Irrigation District #12, which serves the south side of Padilla Bay east to Burlington.

Anacortes and Bellingham Subdivisions

Skagit County is well known for its annual Tulip Festival, which brings many tourists to the area. The Anacortes Subdivision is operated and maintained by BNSF Railway and is currently used by Shell, Tesoro, and other neighboring industries.

Table 3.12-6 lists the total number of acres by land use within 0.25 mile of the Anacortes Subdivision. Most of the land (51 percent) is agricultural. The next largest category is industrial (24 percent), which reflects the fact that the rail line runs through many diverse areas of Skagit County, including refineries, light industrial areas, marine industries, and natural resource industries.

The main crops grown in Skagit County, by acreage, include field crops (such as alfalfa and barley; 35,000 acres), potatoes (14,000 acres), vegetable seed (beet, cabbage, Swiss chard and spinach; 2,600 acres), and blueberries (2,220 acres) (WSU Skagit County Extension 2014).

Table 3.12-6 Land Use Within 0.25 mile of the Anacortes Subdivision

Land Use	Acres Within 0.25 Mile	Percent
Agricultural	2,191	51
Commercial	167	4
Industrial	1,030	24
Residential	375	9
Rural	43	1
Waterbody	505	12

Tulip fields in Skagit County

Recreation

There are five recreation facilities in the study area surrounding the Anacortes Subdivision (Nos. 4, 5, 6, 12, and 13 on Figure 3.12-5).

Minority, Low-Income, and LEP Populations

The Anacortes Subdivision intersects 11 block groups. Overall, the population has increased by approximately 14.5 percent since 2000. Four block groups are identified as minority and/or low-income populations (see Figure 3.12-4). Approximately 938 LEP persons, or 5.3 percent of the population within these block groups are LEP. See Tables 3.12-2 through 3.12-4 for more detailed information on total population, minority, low-income, and LEP populations.

Public Health

Of the seven census tracts intersected by the Anacortes Subdivision, populations near heavy traffic roadways, which could be affected by air emissions, range from approximately 1 percent to 37 percent. The highest concentration is found in Census Tract 9518 near Burlington.

Community Services

Hospitals

Hospitals near the Anacortes Subdivision include Island Hospital in Anacortes, Skagit Valley Hospital in Mount Vernon, and PeaceHealth United General Hospital between Burlington and Sedro-Woolley.

Schools

There are several schools within 0.5 mile of the Anacortes Subdivision in Burlington, including West View Elementary School, Cascade Early Learning Center, Burlington-Edison High School, Skagit Adventist School, Lucille Umbarger Elementary School, and Wee Care Early Learning Center. In addition, there are several schools within 0.5 mile of the Bellingham Subdivision in Mount Vernon, including Jefferson Elementary School, Madison Elementary School,

Washington Elementary School, Mount Vernon Christian School, Lincoln Elementary School, Immaculate Conception Regional School, Mount Vernon High School, Emerson High School, and Mount Vernon Special Education School.

Libraries, Community Centers, and Religious Facilities

The Burlington Public Library is within 0.5 mile of the Anacortes Subdivision in Burlington.

The Burlington Community Center is within 0.5 mile of the Anacortes Subdivision in Burlington.

There are several religious organizations within 0.5 mile of the Anacortes Subdivision in Burlington, including Burlington Alliance Church, Burlington Lutheran Church, Calvary Baptist Church, Valley Community Church, Tierra Nueva, First Baptist Church, Faith Baptist Church, St. Charles Catholic Church, and Hub City Church.

Utilities

Utilities serving the region include Skagit Public Utility District (water), Skagit County Sewer Districts and City of Burlington (wastewater), Puget Sound Energy (electricity), Cascade Natural Gas, and several telecommunication companies (such as Frontier and Comcast). Solid waste disposal and recycling services in unincorporated Skagit County are managed by the Skagit County Public Works Department.

Skagit County Recycling and Transfer Station

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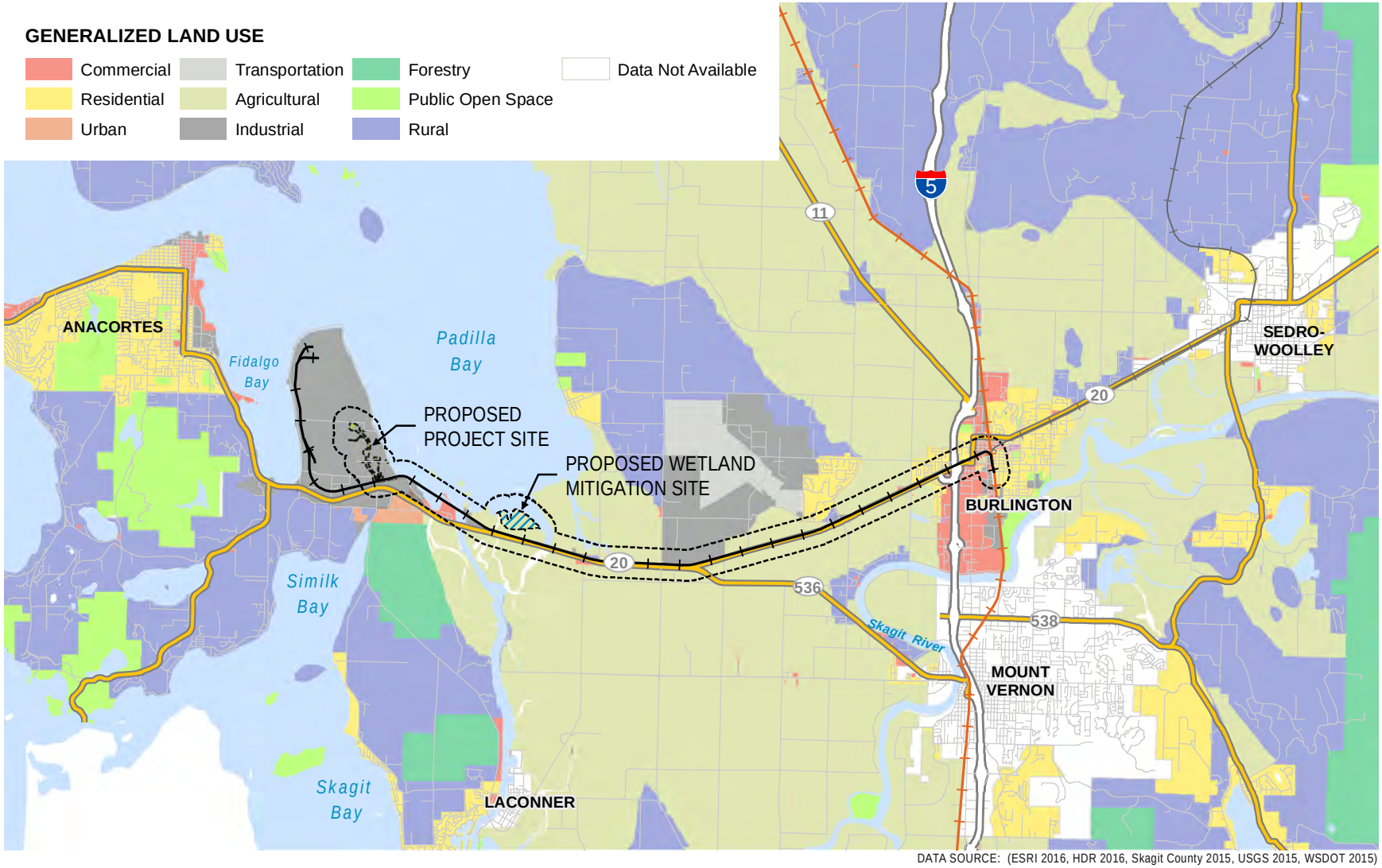

DATA SOURCE: (ESRI 2016, HDR 2016, Skagit County 2015, USGS 2015, WSDOT 2015)

Proposed Project Site
Proposed Wetland Mitigation Site
1/4-mile Study Area
Anacortes Subdivision
Bellingham Subdivision
BNSF Railway
Waterbody
Local Road
State Highway
Interstate Highway

N

0 1 2 Miles

Figure 3.12-6

GENERALIZED LAND USE IN SKAGIT COUNTY

ENVIRONMENTAL IMPACTS

No Action Alternative

Because no construction or operation would take place under the no action alternative, there would be no impacts to land use and social elements. Existing conditions and trends with regard to land use and social elements in the project vicinity would continue unless affected by other projects in the future.

Proposed Project Site

Direct Impacts to Land Use

Construction

Construction of the proposed project would occur within the Anacortes UGA Urban Development District, where construction activities are compatible with the land and shoreline use designations of the Skagit County and City of Anacortes comprehensive land use plans and codes. To ensure that the proposed project complies with all applicable federal, state, and local planning requirements, Shell must obtain all appropriate permits and approvals prior to construction (see Chapter 1, Table 1-1 for a list of required permits). Construction of the proposed project would be compatible with surrounding Heavy Industrial, Light Industrial, and Commercial land uses.

Grazing within the proposed project site has ceased. This pasture land is relatively small and is not contiguous with other grazing lands. As Skagit County has a robust agricultural community and ample land zoned for agriculture, it is anticipated that grazing could be accommodated elsewhere within the county.

There would be up to 200 full-time laborers during the entire construction period (less at any one time). It is anticipated that most of the workers would be from the local area (primarily Skagit County); however, workers from the greater northwest or outside of Washington may be needed if adequate laborers are not available locally. Current rental housing, hotels, and other temporary lodging is sufficient to support workers from outside the area. As such, impacts to population and housing are not anticipated during construction.

Operation

The proposed industrial uses at the project site are compatible with applicable Skagit County and City of Anacortes land use designations and surrounding uses. The proposed project would be developed on land currently zoned for industrial activities and operations and maintenance activities would be similar to those already occurring at the Shell PSR. Alterations to existing land uses or development patterns within the study area are not anticipated as a result of the proposed project.

Up to 45 full-time employees would be hired for operations and maintenance of the proposed facility. Most of the employees are expected to be from the local area (primarily Skagit County); however, employees from the greater northwest or outside of Washington may be hired if

needed. Current housing levels would be sufficient to support workers coming from outside the area. Impacts to population and housing during operation are anticipated to be minimal.

Direct Impacts to Recreation

Recreationists enjoy the Padilla Bay Shore Trail

Construction

Direct construction impacts on recreation would be limited to the area surrounding the proposed project site at the Shell PSR. As shown in Figure 3.12-5, the recreational opportunities in the immediate project vicinity are limited to dispersed activities including trails near Fidalgo and Padilla bay, and golf at the Swinomish Golf Links. Construction would not impact access to any of these activities. There would be an increase in trucks traveling to and from the construction site, but these trucks would not be expected to limit or block vehicle access to any recreation sites. No in-water construction activities are proposed, so there would be no impacts on dispersed recreation in Fidalgo or Padilla bays. Noise and vibration impacts are not anticipated because of other sound sources in the area including roadway traffic on SR 20, train traffic to the Tesoro Anacortes Refinery and neighboring industries, and industrial noise emanating from the Shell PSR itself. Also, on-site construction activities would be obscured by topography or vegetation and would not be visible to recreational users.

Operation

On-site operation of the proposed unloading facility would not directly impact recreational resources. As discussed in Chapter 3.13 – Visual Resources, the proposed unloading facility would be obscured by topography or vegetation and would not be visible to recreational users. No recreational areas are within the footprint of the proposed project.

Direct Impacts to Minority, Low-Income, and LEP Populations

Construction

Direct impacts resulting from construction at the proposed project site would be temporary and limited to the immediate vicinity of proposed activities. There were no significant adverse effects identified resulting from construction. Therefore, while the project area block group contains low-income populations, direct construction impacts at the proposed project site would not disproportionately impact minority or low income populations. A small LEP population is present within this block group.

Operation

The assessment of disproportionately high and adverse impacts on minority and low-income populations focused on potential impacts related to air quality, vehicle traffic and transportation, and noise and vibration. Operational impacts are anticipated to vehicle traffic and

transportation, mostly from vehicle delays due to rail traffic; however, these traffic delays are anticipated throughout the study area, are not significant, and would not disproportionately affect minority or low-income populations.

Direct Impacts to Public Health

Construction

Air quality emissions associated with construction activities, including the use of construction equipment, earthmoving operations, and on-road truck exhaust, are provided in Table 3.12-7. As discussed in Chapter 3.10 – Air Quality and Greenhouse Gases, these emissions are characterized as being temporary and minimal in the context of the other pollutants.

Operation

As discussed in Chapter 3.10 – Air Quality and Greenhouse Gases, the operational air emissions from the proposed project would not contribute enough air pollutants to result in an exceedance of the National Ambient Air Quality Standards (NAAQS) or the Washington Ambient Air Quality Standards (WAAQS) and, therefore, are not anticipated to result in public health effects.

Direct Impacts to Community Services

No increases in demand for hospitals, schools, libraries, community centers, or religious facilities are expected during construction or operations; therefore, no impacts are anticipated.

Direct Impacts to Utilities

Construction

Activities at the proposed project site would result in a temporary increase in water use and the generation of solid waste. No additional electricity or natural gas would be needed during construction. Construction activities would require water supplied by the City of Anacortes for dust control, soil compaction, and pressure testing of pipelines. Given that the volumes required for these activities would be small and would only occur during the construction period, it is not anticipated that Shell would exceed the water capacity provided under their 2008 agreement with the City of Anacortes; therefore, no impacts are anticipated on the water supply system.

Construction activities would result in the generation of solid waste and construction debris that would require off-site disposal. Neither waste stream would be substantial and would be sent to the Skagit County Recycling and Transfer Station and then shipped to the Roosevelt Regional Landfill. Both facilities have the available capacity to handle the temporary increase in waste generated by the proposed project. Construction of the proposed project would not result in an increase in demand or interfere with existing telecommunications services; therefore, no impacts are anticipated.

The BP Olympic pipeline, the Kinder Morgan Puget Sound pipeline, and PSE power lines cross the footprint of the proposed rail unloading facility. Approximately 1,350 feet of the BP Olympic pipeline, 4,250 feet of the Kinder Morgan Puget Sound pipeline, and 6,833 feet of PSE power lines would be removed and relocated to the eastern side of the proposed project site (Chapter 2,

Figures 2-5 and 2-6). Construction would interrupt operation of the pipelines for up to two days while the new pipelines come online. However, Shell would minimize potential service interruptions at the Shell PSR and Tesoro Anacortes Refinery by scheduling the relocated pipelines to come online when deliveries of crude oil were not taking place.

Operation

Operation of the proposed project would result in increased electricity and water use, and solid waste generation. No natural gas would be required during operation. Electricity use is anticipated to increase by less than 1 percent of the Shell PSR's existing use. The additional electricity would be supplied by PSE and would have no impact on its existing supply capabilities.

Facility operation would require water supplied by the City of Anacortes. The water necessary would be less than 1 percent of the Shell PSR's existing use. Given the small increase in volume, it is not anticipated that Shell would exceed the water capacity provided under its 2008 agreement; therefore, no impacts are anticipated on the water supply system.

Operations would result in the generation of solid waste that would require off-site disposal. The additional waste stream would not be substantial and would be sent to the Skagit County Recycling and Transfer Station and then shipped to the Roosevelt Regional Landfill. Both facilities have the available capacity to handle the increase in waste generated by the proposed project.

Stormwater generated at the proposed facility would be handled by two stormwater detention ponds and a third oil/water separation pond system designed to provide proper drainage for the rail unloading facility. Wastewater amounts could increase slightly as a result of additional employees, but would be handled by the existing septic system. Operations would not result in an increase in demand or interfere with existing telecommunications services; therefore, no impacts are anticipated.

Wetland Mitigation Site

Direct Impacts to Land Use

Construction activities at the proposed wetland mitigation site, including vegetation removal and grading, would occur within the Rural shoreline designation where such activities are compatible with the land and shoreline use designations. Construction of the wetland mitigation site would be compatible with surrounding agricultural land uses and single-family residences.

The proposed habitat enhancement use at the wetland mitigation site would be compatible with applicable Skagit County land use designations and surrounding agricultural and single-family residential properties.

Direct Impacts to Recreation

Construction of the wetland mitigation site would temporarily limit access to duck hunters in the Swinomish Duck Club. Access to Padilla Bay would be restored following construction; however,

after the wetland mitigation site is completed, members of the duck club would no longer be permitted to set up duck blinds on site. This would prevent hunting on the mitigation site itself, but access would be preserved to adjacent lands. Following construction, the wetland mitigation site would have a pump station and be surrounded by a dike. As access for hunters would be preserved, no long-term impacts on recreation are anticipated. Construction of the wetland mitigation site would be visible and audible to dispersed recreationists on Padilla Bay; however, construction activities would be temporary.

Direct Impacts to Minority, Low-Income, and LEP Populations

Construction

Direct impacts resulting from construction at the wetland mitigation site would be temporary and limited to the immediate vicinity of proposed activities (for example, noise and traffic). As discussed above, the nearest residences in areas with minority or low-income populations are located approximately 3 miles southwest of the wetland mitigation site. Because of the distance from identified minority and low-income populations, direct construction impacts at the wetland mitigation site would not disproportionately impact minority and low-income populations. LEP populations are not present in this block group.

Operation

While no traffic would be generated by the wetland mitigation site, impacts are anticipated to vehicle traffic and transportation from vehicle delays due to nearby rail traffic. These traffic delays are anticipated throughout the study area but are not significant and, therefore, would not disproportionately impact minority or low-income populations. LEP populations are not present in this block group.

Direct Impacts to Public Health

Construction

Air emissions from the use of construction equipment, earthmoving operations, and on-road truck exhaust are provided in Table 3.12-8 for the wetland mitigation site. As discussed in Chapter 3.10 – Air Quality and Greenhouse Gases, these emissions are characterized as being temporary and minimal in the context of the other pollutants.

Operation

As discussed in Chapter 3.10 – Air Quality and Greenhouse Gases, the operational air emissions from the proposed project would not contribute enough air pollutants to result in an exceedance of the NAAQS/WAAQS and, therefore, are not anticipated to result in public health effects.

Direct Impacts to Community Services

No increases in demand for hospitals, schools, libraries, community centers, or religious facilities are expected during construction or operation; therefore, no impacts are anticipated.

Direct Impacts to Utilities

Construction

Construction activities at the wetland mitigation site would result in a temporary increase in water use and the generation of solid waste. No electricity or natural gas would be needed. Construction activities would require water for dust control and soil compaction. The water could be supplied under the 2008 agreement with the City of Anacortes or trucked in during construction. Given that the volumes required for these activities would be small and occur only during the construction period, it is not anticipated that Shell would exceed the water capacity provided under their 2008 agreement with the City of Anacortes; therefore, no impacts are anticipated on the water supply system.

Construction activities would result in the generation of solid waste and construction debris that would require off-site disposal. Neither waste stream would be substantial; each would be sent to the Skagit County Recycling and Transfer Station and then shipped to the Roosevelt Regional Landfill. These facilities have the available capacity to handle the temporary increase in waste generated by the proposed project. Construction of the wetland mitigation site would not result in an increase in demand or interfere with existing telecommunications services; therefore, no impacts are anticipated.

Operation

The wetland mitigation site is located within Skagit County Dike, Drainage, and Irrigation District #12. Following construction, the district would be responsible for maintaining the setback dike. This is not anticipated to adversely affect the district as it has responsibility for maintaining the existing on-site dike and similar facilities throughout its territory.

Operation of the relocated pumping station at the wetland mitigation site would require electricity. The electricity would be minimal, as it would only operate occasionally; therefore, no impacts are anticipated.

Anacortes and Bellingham Subdivisions

Direct Impacts to Land Use

Transport of crude by rail to the proposed facility would increase rail traffic along the Anacortes Subdivision by up to six round-trip unit trains per week. Direct impacts could occur at recreational facilities within 0.25 mile of the Anacortes Subdivision because of increased noise and vibration and additional access delays. The traffic from added trains would generally result in greater overall average noise levels, but would not increase the maximum noise levels associated with a single train passing through the area. Therefore, significant impacts are not anticipated. See Chapter 3.9 – Noise and Vibration.

Direct Impacts to Recreation

Generally, the increase in rail traffic would not affect access to recreational areas along the Anacortes Subdivision. A train could temporarily block access to East March's Point Road, which would have the potential to block access to bird watchers at the northern end of March Point or clam and oyster harvesters along the east side of the peninsula. However, access to these areas would still be available via March's Point Road on the west side.

Recreation Impacts Beyond Skagit County

During the scoping process, commenters requested recreation impact assessments for a variety of locations outside of Skagit County. No construction activities would occur outside of Skagit County as part of the proposed project; therefore, only train traffic associated with operations has the potential to impact recreation outside of Skagit County.

The proposed project would add one daily round-trip train to an already busy rail corridor; therefore, impacts to recreation from temporary access blockages or noise are not anticipated to change appreciably.

Direct Impacts to Minority, Low-Income, and LEP Populations

The Bellingham Subdivision intersects 17 block groups, and contains six block groups with minority and/or low-income populations. Six block groups have LEP populations that exceed Skagit County's LEP population percentage.

Increased rail traffic would result in vehicle delays at intersections along both the Anacortes and Bellingham subdivisions. Based on noise modeling, operational noise from the proposed project is predicted to result in moderate or severe impacts at residential land uses at a few locations along these rail corridors (see Chapter 3.9 – Noise and Vibration, Figures 3.9-7 and 3.9-8, for more information). However, noise impacts are not predominately borne by minority and/or low-income populations in the study area and would not have a disproportionately high and adverse effect on these populations. Mitigation measures for noise are described in Chapter 3.9 – Noise and Vibration.

Direct Impacts to Public Health

As discussed in Chapter 3.10 – Air Quality and Greenhouse Gases, the operational air emissions from the transport of oil by rail in the extended study area would not contribute enough air pollutant emissions to result in an exceedance of the NAAQS/WAAQS and, therefore, is not anticipated to result in public health effects.

Direct Impacts to Community Services

No increases in demand for hospitals, schools, libraries, community centers, or religious facilities are expected during operation; therefore, no impacts are anticipated.

Direct Impacts to Utilities

Operation of trains along the Anacortes Subdivision would not require any new or expanded utility services; therefore, no impacts are anticipated.

Cumulative Impacts

Land Use

The proposed project is not anticipated to contribute to a cumulative impact on land use or social elements. Since 1958 (the beginning of the timeframe for the cumulative impacts analysis), there has been significant agricultural, industrial, commercial, and residential development in the study area. Land uses have changed with this growth; however, development has been compatible with applicable Skagit County and City of Anacortes land use designations and surrounding uses. Construction and operation of the proposed Tesoro Clean Products Upgrade Project (Tesoro 2015) (see Table 3.0-2 in Chapter 3.0 – Introduction, for additional project details) would be compatible with existing land uses. No cumulative impacts are anticipated.

Recreation

The proposed project would temporarily impact recreational resources during construction. This would not contribute to a cumulative impact as the effect would be temporary; therefore, no long-term impacts are anticipated. Past development in the study area has not adversely affected recreational resources and the Tesoro Clean Products Upgrade Project; therefore, no adverse impacts to recreational resources are anticipated. No cumulative impacts are anticipated.

Minority, Low-Income, and LEP Populations; Public Health; and Community Services

The proposed project would not affect public health or demand for community services or disproportionately impact minority or low income populations. Neither past development in the study area nor the Tesoro Clean Products Upgrade Project are expected to adversely affect these resources. No cumulative impacts are anticipated.

Utilities

The proposed project would temporarily increase demand for utilities during construction and result in a negligible increase in demand for utilities during operations. Past development in the study area has not adversely impacted the supply of any utilities and the Tesoro Clean Products Upgrade Project would not adversely affect future supplies. No cumulative impacts are anticipated.

MITIGATION MEASURES

Avoidance and Minimization

To minimize potential for barriers to access for LEP populations, online open house content was made available during the scoping and draft EIS comment periods in multiple languages. The SEPA EIS Fact Sheet and materials prepared for the draft EIS public hearings are available in English and Spanish formats, and interpretation services will be made available at the draft EIS public hearings upon request. Additional information about accommodations for LEP populations is available at the project website: www.shellraileis.com.

Mitigation

No mitigation measures are proposed beyond the minimization measure described above.

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3.13 VISUAL RESOURCES

Visual resources are physical features that define the visual and aesthetic character of an area, including natural features, scenic vistas, or man-made urban or community visual characteristics such as architecture and skylines. Visual resources are important because of their uniqueness, and often provide a sense of community for local residents and may attract visitors to the area.

STUDY AREA AND METHODOLOGY

The study area used to analyze the visual impacts of the proposed project included the sensitive viewpoints that could be affected by changes at the proposed project site at the Shell Puget Sound Refinery (PSR), the proposed wetland mitigation site, and the Anacortes Subdivision. Because the potential impacts associated with visual resources are localized, the cumulative impacts study area would be the same as that described for direct and indirect impacts.

Select laws, regulations, and guidance applicable to visual resources are summarized in Table 3.13-1.

Table 3.13-1 Laws, Regulations, and Guidance for Project-Related Visual Resources

Laws, Regulations, and Guidance	Description
State	
State Environmental Policy Act (SEPA) (RCW 43.21c; WAC 197-11)	Helps state and local agencies in Washington identify possible environmental impacts that could result from a proposed action, alternatives to the proposed action, and potential impact minimization and mitigation measures. Information learned through the review process can be used to change a proposal to reduce likely impacts and inform permitting decisions at the state and local levels.
Local	
Skagit County Code Performance Standards (SCC14.16.840)	It is intended that all activities and land uses within Skagit County adhere to a common standard of environmental performance criteria. Criteria are listed for heat, glare, and steam.

Impact analyses of visual resources are typically conducted using methods developed by the agency that is reviewing the project or managing the land where the project would be constructed. In this case, Skagit County (County) and the Washington State Department of Ecology (Ecology) do not have their own methods for analyzing visual impacts. Therefore, the Visual Resources Management (VRM) methodology adapted by the U.S. Bureau of Land Management (BLM), a commonly used system, was chosen as the framework for this analysis to describe the existing scenic quality of the proposed project and its impacts on visual resources (BLM 1984).

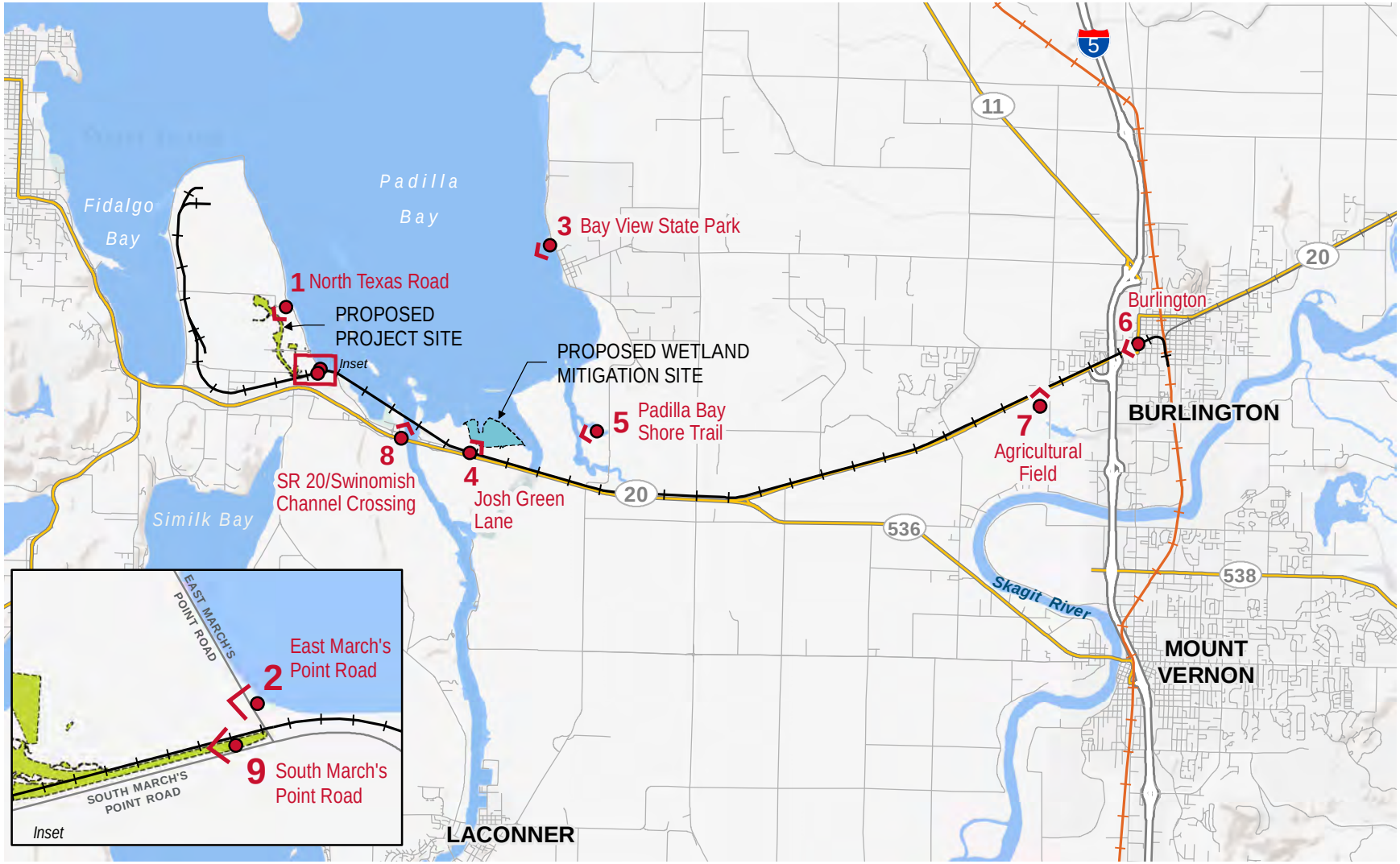
Impacts on visual resources were analyzed using the following steps:

1. Identify viewpoints or *Key Observation Points (KOPs)* of the landscape in and near the proposed project and wetland mitigation sites and the Anacortes Subdivision (Figure 3.13-1).
2. Assess the character and quality of these KOPs relative to overall regional visual character.
3. Determine the importance or sensitivity people have of views in the landscape.
4. Determine impacts on visual resources from project activities at each KOP, including light and glare from the facility and train traffic (light and glare impacts on wildlife are discussed in Chapter 3.6 – Vegetation and Terrestrial Wildlife).

Key Observation Point (KOP) is a term used by the BLM in their VRM methodology to describe potentially sensitive viewpoints where a project may be seen. Typically these include viewpoints from public spaces such as parks, or locations along publicly-accessible areas.

A detailed inventory of visual resources along the Anacortes Subdivision was not conducted because rail traffic currently occurs in these areas and is part of the baseline for the visual settings. Instead, the general character of these areas was described using information available from maps, photographs, and other sources. Sensitive viewers were identified using information on recreation and tourism. Visual impacts from the increase in rail traffic associated with the proposed project were described qualitatively.

A level of impact was assigned to each KOP based on the degree of contrast between project elements and the surrounding landscape. A negligible impact level was assigned if no contrast occurred. A minor level of impact was assigned where weak or moderate contrast occurred in a low or medium scenic quality area. A major level of impact was assigned where a strong contrast occurred in a minimally altered or highly scenic area.



DATA SOURCE: (ESRI 2016, HDR 2016, Skagit County 2015, USGS 2015, WSDOT 2015)

Key Observation Point and Direction of View
Proposed Project Site
Proposed Wetland Mitigation Site
Anacortes Subdivision
Bellingham Subdivision
BNSF Railway
Local Road
State Highway
Interstate Highway
N
0 1 2 Miles

Figure 3.13-1
KEY OBSERVATION POINTS

AFFECTED ENVIRONMENT

Proposed Project Site

The Shell PSR includes the following existing facilities: storage tanks, docks for marine vessels, refining equipment and facilities, pipelines, a parking and laydown area, a rail line and spur to receive manifest trains, paved and graveled roads, and fences. An aerial photo of the project site, with proposed project features overlaid, is shown in the photo below.

Graphic representation of the proposed project

The visual setting for the proposed project site is comprised of heavy industrial areas, including both the Shell PSR and Tesoro Anacortes Refinery, and nearby commercial and industrial development. The dominant natural features include Padilla Bay to the east, and Fidalgo Bay, which lies west of the project area on the opposite side of March Point. The proposed project site is primarily undeveloped and has been used as grazed pasture land. Buildings and structures are typically of concrete or metal construction.

Nearby recreation and tourism areas include Padilla Bay and its National Estuarine Research Reserve, Fidalgo Bay Aquatic Reserve, Fidalgo Bay Resort, the Tommy Thompson Trail, the Swinomish Casino, Swinomish Golf Links, Bayview State Park, the City of Anacortes, and the Anacortes Ferry Terminal that serves the San Juan Islands. There are no neighborhoods or concentrations of residences nearby; however, there are a few single-family residences on March Point. Roads near the proposed project site are largely used by workers at the Shell PSR and Tesoro Anacortes Refinery, birders, and residents on March Point.

Viewer Sensitivity

Viewers' activity often influences their sensitivity to the visual environment. Residents or visitors to recreation areas typically are more stationary and view an area over an extended period of time, which often makes the surrounding scenery an important aspect of their experience. Alternatively, motorists typically experience a particular view for shorter periods and are engaged in other activities that occupy their attention. Workers may observe a particular area frequently but are also engaged in other activities and would not be considered sensitive viewers.

Based on surrounding land uses, the proposed project site is most frequently viewed by workers at the Shell and Tesoro refineries, people engaged in recreational activities in Padilla Bay, local residents, and motorists. Sensitive viewers could also include members of local Indian tribes who use lands and waters nearby. Members of these Indian tribes would likely be very perceptive of changes in the visual environment and, as such, would have higher sensitivity levels.

Scenic quality is a measure of the visual appeal of an area based on landform, vegetation, water, color, adjacent scenery, scarcity, and cultural modifications.

Sensitivity levels are a measure of public concern for scenic quality and are assigned a value of low, medium, or high by evaluating the type of users, amount of use, public interest, adjacent land uses, and any land use designations that require protection of visual resources.

The proposed project site is visible from a close distance along adjacent roads and Padilla Bay, and would also be visible from recreational and residential areas to the east, across Padilla Bay. A *scenic quality* rating was developed for each KOP using methods adapted from VRM methodology. Figure 3.13-1 (above) shows the location of each KOP and the direction of the view. Table 3.13-2 provides the name, location, viewer type, viewer *sensitivity level*, and scenic quality rating of each KOP at the proposed project site.

Table 3.13-2 Key Observation Point Summary – Proposed Project Site

KOP	Location	Viewer Type	Viewer Sensitivity Level	Scenic Quality Rating
1	North Texas Road	Motorists	Low	Low
		Workers	Low	
2	East March's Point Road	Recreationists	Medium	Low
		Residents	Medium	
		Indian tribes	High	
		Motorists	Low	
		Workers	Low	
3	Bay View State Park	Recreationists	Medium	Medium
		Residents	Medium	

Key Observation Point 1, North Texas Road

North Texas Road is primarily used by workers at the adjacent Shell and Tesoro refineries, and provides an east/west connection across March Point. The sensitivity for motorists and workers in this area is low at this viewpoint as it is a frequently used road. The viewing time at this location would be limited to a few seconds.

The photo of KOP 1 (below) shows the current view approximately 650 feet northeast of the proposed project site along North Texas Road. Topography is flat, and vegetation provides different textures with pasture, shrubs, and mixed evergreen and deciduous trees. Colors are primarily greens, browns, and grays from vegetation, buildings, and roadways. Adjacent scenery is mainly industrial in nature. Man-made features are visible, including North Texas Road, several outbuildings, and the Shell PSR features in the background. The scenic quality rating for this viewpoint is low (Table 3.13-2).

Key Observation Point 1, North Texas Road (looking southwest)

Key Observation Point 2, East March's Point Road

East March's Point Road roughly parallels the proposed project site for approximately 4,200 feet. Much of this road acts as a visual break from Padilla Bay because of the change in topography; however, toward the intersection of East March's Point Road/South March's Point Road, the topography is more in line with Padilla Bay. Therefore, this KOP was selected to provide a representation of views from recreationists in Padilla Bay.

Topography is generally flat with distant hills visible in the background. Vegetation provides varying colors and textures. Wetlands are visible but blend in with surrounding vegetated areas, and are not unique to March Point. The Shell PSR is a dominant feature of the background. The sensitivity of the majority of views is low as viewing times are typically short and topography farther north along East March's Point Road effectively obscures interior areas of March Point from recreationists or Indian tribal members on Padilla Bay. The scenic quality rating is low (Table 3.13-2).

Key Observation Point 2, East March's Point Road (looking west)

Key Observation Point 3, Bay View State Park

Distant views (approximately 3 miles) of the proposed project site are experienced by recreationists at Bay View State Park and nearby residents. The existing view from KOP 3 is shown in the photo below. Padilla Bay dominates the view in the foreground and middleground, while the distant background contains heavy industrial (refinery) developments with forested hills farther in the distance. Color varies between tones of blues/grays from water, gravel, and distant features. The scenic quality rating for this KOP is medium (Table 3.13-2).

Key Observation Point 3, Bay View State Park (looking southwest across Padilla Bay)

Light and Glare

Current ambient lighting levels at the proposed project site occur from lights used at the Shell PSR and nearby Tesoro Anacortes Refinery, street lighting on East March's Point Road, the rail corridor, and from car headlights on East March's Point Road and North Texas Road. Minimal light also results from residential and commercial/industrial areas on March Point.

Wetland Mitigation Site

The proposed wetland mitigation site is located approximately 2 miles east of the project site at the south end of Padilla Bay (Figure 3.13-1) and was planted with hybrid poplars in 1997; however, due to damage from tidewaters, these trees have not been harvested. The mitigation site is approximately 100 acres and contains poplars that range in height from approximately 30 to 60 feet. Nearby above-grade features include single-family residences and associated outdoor storage areas, agricultural fields, buildings, power lines, and a marina farther west along Josh Green Lane.

Viewer Sensitivity

Based on surrounding land uses, the wetland mitigation site is most frequently viewed by motorists traveling along State Route (SR) 20, people engaged in recreational activities in Padilla Bay, and local residents. SR 20 is classified as a *scenic and recreational highway* by the Washington State Department of Transportation (WSDOT), as part of the scenic Cascade Loop. Sensitive viewers could also include members of Indian tribes who use lands and waters nearby.

Scenic and recreational highways are identified in State law (RCW 47.39 and 47.42) and designated because of a need to develop management plans that will protect and preserve the scenic and recreational resources from loss through inappropriate development.

A management plan for the Cascade Loop is currently in development.

Sensitive Views

The wetland mitigation site is visible from a close distance along adjacent roads, Padilla Bay, and agricultural areas. The site would also be visible in the distance from recreational and agricultural areas to the east. Figure 3.13-1 shows the location of each KOP and the direction of the view. Table 3.13-3 provides the name, location, viewer type, viewer sensitivity level, and scenic quality rating of each KOP of the wetland mitigation site.

Table 3.13-3 Key Observation Point Summary – Wetland Mitigation Site

KOP	Location	Viewer Type	Viewer Sensitivity Level	Scenic Quality Rating
4	Josh Green Lane/SR 20	Motorists	Low	Low/Medium
		Residents	Medium	
		Indian tribes	High	
5	Padilla Bay Shore Trail	Recreationists	Medium	Medium
		Indian tribes	High	

Key Observation Point 4, Josh Green Lane

Josh Green Lane is located immediately north of SR 20 and is typically used by nearby residents, Indian tribal members, and motorists (including farmers and users of the marina and associated commercial areas to the west). The photo below offers a current view of the wetland mitigation site as seen from SR 20. Man-made structures, including power lines and the Anacortes Subdivision rail line, are visible in the foreground, while outbuildings associated with a single-family residence comprise the background. Poplars are visible in the middleground and background. Similar textures and colors are characteristic of this KOP from vegetation and man-made structures. Viewing time would be short (seconds) for motorists and longer for residents. The scenic quality rating is low/medium (Table 3.13-3), based on the rural character of the area and durations of viewing time.

Key Observation Point 4, Josh Green Lane (looking northeast)

Key Observation Point 5, Padilla Bay Shore Trail

Padilla Bay Shore Trail is a 2.25-mile-dike-top bicycle and pedestrian pathway managed by Skagit County. Users of this trail include recreationists, birders, and Indian tribal members. The trail is open year-round. Area views are shown in the photo below, dominated by Indian Slough, nearby agricultural fields, and distant trees and hills. Colors are muted blues, greens, and grays. Texture is relatively smooth from the water and fields, and topography is flat until the distant hills. Viewing time depends on the type of recreation and could be several minutes or longer. Similar views are found farther north along the trail. The scenic quality rating for this KOP is medium (Table 3.13-3).

Key Observation Point 5, Padilla Bay Shore Trail (looking west/southwest)

Anacortes Subdivision

The 14-mile-long Anacortes Subdivision connects to the Bellingham Subdivision in Burlington and currently serves the Shell PSR, Tesoro Anacortes Refinery, and other neighboring industries (Figure 3.13-1). As described in Chapter 3.12 – Land Use and Social Elements, land uses along the Anacortes Subdivision are varied and include agricultural, single-family residential, industrial, and commercial. SR 20 parallels the Anacortes Subdivision for much of the line, and there are several at-grade railroad crossings as described in Chapter 3.16 – Vehicle Traffic and Transportation.

Viewer Sensitivity

Based on surrounding land uses, the Anacortes Subdivision is most frequently viewed by motorists traveling along SR 20, local residents, farmers, workers, recreationists, and Indian tribal members who live or use lands and waters nearby who may have views of trains.

Sensitive Views

The Anacortes Subdivision is visible from a close distance along adjacent roads, residential and commercial/industrial areas, and Padilla Bay. Figure 3.13-1 shows the location of each KOP and the direction of the view. Table 3.13-4 provides the name, location, viewer type, viewer sensitivity level, and scenic quality rating of each KOP along the Anacortes Subdivision.

Table 3.13-4 Key Observation Point Summary – Anacortes Subdivision

KOP	Location	Viewer Type	Viewer Sensitivity Level	Scenic Quality Rating
6	Burlington	Motorists	Low	Low
		Residents	Low	
		Workers	Low	
7	Agricultural Field	Workers	Low	Low
		Residents	Low	
8	SR 20/Swinomish Channel Crossing	Motorists	Low	Medium
		Tourists	Medium	
		Recreationists	Medium	
		Indian tribes	High	
9	South March's Point Road	Motorists	Low	Low
		Workers	Low	
		Residents	Low	

Key Observation Point 6, Burlington

The photo below was taken from the intersection of the Anacortes Subdivision and South Burlington Boulevard (also known as SR 20). This view is representative of other at-grade railroad crossings near the beginning of the Anacortes Subdivision in the City of Burlington. The area is frequented by motorists, nearby workers, and local residents. Land is flat and contains some trees and grassy areas. Visuals are mostly gray with pops of color from nearby buildings and trees. Man-made features dominate the area. If no train is crossing, viewing time at this intersection is short (seconds) for motorists and longer for local workers and residents walking along South Burlington Boulevard. If a train is crossing and the gates are down, viewing time is longer (around 4 minutes on average). The scenic quality rating is low (Table 3.13-4).

Key Observation Point 6, Burlington (intersection of South Burlington Boulevard/Anacortes Subdivision, looking southwest)

Key Observation Point 7, Agricultural Field

The photo of KOP 7 (below) was taken from an active agricultural field just south of the Anacortes Subdivision and SR 20, and west of Pulver Road. This photo is representative of the many farms within the study area. Viewers would be workers and single-family residences surrounding these agricultural areas. Topography along the Anacortes Subdivision is generally flat; mountains and hills may be visible in the distance depending on the viewpoint. Colors vary depending on the crops and other vegetation (mainly greens/browns), along with muted blues of distant mountains and hills. Man-made features include equipment, power lines, buildings, SR 20, and the Anacortes Subdivision rail line. Viewing times may be long and depend on activities being done by workers and nearby residents. The scenic quality rating is low (Table 3.13-4).

Key Observation Point 7, Agricultural field along the Anacortes Subdivision (west of Burlington, looking north)

Key Observation Point 8, SR 20/Swinomish Channel Crossing

The photo of KOP 8 (below) was taken looking north from the SR 20 crossing of the Swinomish Channel, southeast of the Swinomish Casino. This photo is also representative of views from both the casino and the Swinomish Channel. Viewers would be motorists, boaters (both recreationists and Indian tribal members), and tourists. Topography is flat with mountains in the distance. The Swinomish Channel and the swing bridge dominate the view. Colors are mainly blues, greens, and browns. Man-made features include the swing bridge and associated bank armoring. Viewing times are likely short (seconds) for motorists and longer for recreationists and tourists, depending on the activity. The scenic quality rating is medium (Table 3.13-4), as functional swing bridges are relatively rare.

Key Observation Point 8, SR 20/Swinomish Channel Crossing (view of Anacortes Subdivision, looking north)

Key Observation Point 9, South March's Point Road

The photo of KOP 9 (below) was taken looking northwest along South March's Point Road, south of the proposed project site. Viewers would be motorists, workers at nearby businesses and the refineries, and local residents. The topography is relatively flat. The existing Anacortes Subdivision tracks, rock armoring, and Puget Sound Energy power lines are the prominent man-made features visible. The Shell PSR is also visible in the background. Vegetation includes shrubs, deciduous, and evergreen trees. Colors include gray, browns, and greens. Viewing times are likely short (seconds) for motorists. The scenic quality rating is low (Table 3.13-4).

Key Observation Point 9, South March's Point Road (view of Anacortes Subdivision, looking northwest)

ENVIRONMENTAL IMPACTS

No Action Alternative

Because no construction or operation would take place under the no action alternative, there would be no impacts to visual resources. Existing conditions of visual resources in the project vicinity would remain the same unless affected by other projects in the future.

Proposed Project

Direct Impacts

Construction

During construction, temporary changes to the visual setting at KOPs 1 and 2 near the project site would occur from the presence of construction workers, equipment, vehicles, and partially constructed structures. The roads along KOPs 1 and 2 serve motorists, all of which could have views of the proposed project. Dust and emissions generated by construction activities such as grading could cause visual impacts. Temporary outdoor lighting would be used during construction for on-site safety; however, construction activities would occur during daylight hours. Users of Padilla Bay (including recreationists and Indian tribal members) would pass by the project area, but because of site topography, it is unlikely that they would be able to see construction activities, which would take place farther inland. Because the proposed project would be constructed in an area with existing industrial development and activities, visual impacts from construction would be minor at KOPs 1 and 2. Given the distance from the proposed project site, visual impacts during construction are not anticipated from KOP 3.

Operation

The proposed rail spur would be located adjacent to the existing rail line and within the Shell PSR property. The largest structure would be a new overhead platform that would run the length of the unloading area and be approximately 20 feet high (Chapter 2, Figure 2-8). Small buildings associated with operations are also proposed. Most of the project area would be constructed within a depression and would, therefore, not be visible from surrounding areas, including East March's Point Road and Padilla Bay.

The proposed project site is located within an industrially-zoned area and would be largely obstructed from view by topography and existing vegetation. Therefore, the project is not expected to alter views in the immediate vicinity or from KOPs 1, 2, and 3.

Impacts from light and glare from the proposed project would be minor because neighboring properties share similar land uses, hours of operation, and security requirements. The facility would adhere to applicable performance standards for light and glare set forth in Skagit County Code 14.16.840 related to building materials and lighting.

The facility would also minimize impacts from light on neighboring properties in accordance with recommendations from the *International Dark Sky Association (IDA)*, which includes installing full cut-off light boxes, adjusting light direction, and providing additional screens with supplemental light shields. The proposed project would make minimal contribution to overall ambient light levels in the immediate vicinity. Light and glare impacts on residential areas would be minor as lighting levels would be similar to that of existing conditions. Light and glare impacts during operation of the proposed facility are expected to be minor from KOPs 1, 2, and 3.

A common source of technical information on the impacts and mitigation of light and glare is the **International Dark Sky Association (IDA)**. The IDA recognizes the necessity for night lighting to maintain security, safety, utility and an attractive environment. The IDA has identified a number of impacts from poor night lighting, including urban sky glow, glare, light trespass, and energy waste.

Wetland Mitigation Site

Direct Impacts

Construction

During construction, temporary changes to the visual setting near the proposed wetland mitigation site would occur from the presence of construction workers, equipment, and vehicles. An approximately 4- to 5-foot-tall new setback dike and pump station would be constructed (see Chapter 3.5 – Wetlands, Figure 3.5-7). Temporary outdoor lighting would be used during construction for on-site safety; however, construction activities would occur during daylight hours. Tree removal outside of the wetland mitigation site is not proposed. As poplars surrounding the site would remain and largely obscure construction activities, the view would not change substantially from KOP 4 during construction. Removal of poplars during construction would be noticeable from KOP 5; however, given its distance (approximately 1 mile) from the wetland mitigation site, on-site construction activities would be difficult to see.

Because construction activities at the wetland mitigation site would be largely shielded from surrounding areas or occur at a distance, visual impacts from construction at KOPs 4 and 5 would be minor.

Operation

While all of the poplars waterward of the new setback dike would be removed, poplars surrounding the site would remain and would largely obscure the new setback dike and pump station. Therefore, the view would not substantially change from KOP 4.

The new setback dike and pump station would be behind an existing band of poplars and would not be visible from Josh Green Lane, SR 20, or nearby residences. Permanent removal of poplars would change the existing view from KOP 5; however, due to the distance (approximately 1 mile), it would be difficult to see on-site features. Also, views from the shore trail are dominated by adjacent agricultural areas and Padilla Bay, rather than the wetland mitigation site. Since the habitat restoration activities at the wetland mitigation site would be similar in character to the surrounding areas and would not attract attention of viewers, visual impacts are not anticipated after construction from KOP 4 or KOP 5.

While SR 20 is considered part of the Cascade Loop Scenic Highway, a management plan for this corridor has not been created; therefore, there are no specific design standards in place. However; as the view of the wetland mitigation site would largely remain unchanged from SR 20 because a band of poplars would remain along its southern perimeter, visual impacts on motorists driving along SR 20 are not anticipated.

Anacortes Subdivision

Direct Impacts

Construction

A retaining wall would be constructed by BNSF Railway along an approximately 1,000-foot-long stretch of the Anacortes Subdivision to provide stability for the additional track proposed within BNSF Railway right of way. This retaining wall would be located between the BNSF Railway tracks and South March's Point Road, generally along the existing ditch (see photograph of KOP 9). Construction would likely require the use of heavy equipment and possibly materials and equipment staging along South March's Point Road. Motorists along South March's Point Road would see equipment, construction workers, and lighting during construction of the retaining wall. This would be temporary and would likely occur during daylight hours. Visual impacts during construction would be minor from KOP 9.

Operation

The retaining wall proposed by BNSF Railway along the Anacortes Subdivision near the project site would be approximately 1,000 feet long and an average of 10 feet tall (maximum height of 12.5 feet tall). As the retaining wall is in the conceptual design phase, construction details are not yet known about the material or design. However, retaining walls along railroads may be designed as gravity walls (such as cast-in-place concrete or modular block walls) or nongravity walls (such as soldier pile walls). A simulation of the retaining wall is presented below from KOP 9 showing approximate location, height, and bulk. The wall would be at a similar height level as the existing tracks, but located close to the roadway in the existing ditch area. The retaining wall would result in a moderate visual impact from KOP 9.

Visual simulation of proposed retaining wall, KOP 9 (looking southwest along South March's Point Road)

The proposed project would add up to two trains per day (one in each direction) along the Anacortes Subdivision. This rail line is currently used to transport crude oil on unit trains to the Tesoro Anacortes Refinery, manifest trains to the Shell PSR and Tesoro Anacortes Refinery, and other trains to neighboring industries. Trains are currently part of the visual setting along the Anacortes Subdivision as shown in the photos of KOPs 7 and 8. Additional trains traveling along the Anacortes Subdivision would result in an increase in the frequency and the length of time that trains are operating and in view, but would not add a new type of visual impact to the existing rail corridor. Therefore, visual impacts from trains associated with the proposed project would be minor.

Cumulative Impacts

As described above, construction and operation of the proposed project could result in impacts to visual resources. Within the study area, there has been significant agricultural, industrial, commercial, and residential development. It is assumed that with this growth and new construction, visual resources have been affected. It is assumed that with this growth and new construction, visual resources have been affected. Construction and operation of the Tesoro Clean Products Upgrade Project (Tesoro 2015) (see Table 3.0-2 in Chapter 3.0 – Introduction, for additional project details) has the potential to impact these resources. Together, these projects would contribute to a cumulative impact on visual resources. However, given their proximity, the impacts would be localized to the Tesoro Anacortes Refinery site and the proposed project and mitigation sites.

MITIGATION MEASURES

Avoidance and Minimization

Impacts to visual resources would be minimized by the implementation of the best management practices (BMPs) required as part of the Shoreline Substantial Development Permit and in accordance with Skagit County Code, which states that:

- Building materials with high light-reflective qualities would not be used in construction of buildings where sunlight would throw intense glare on adjacent areas.
- Artificial lighting would use full cut-off fixtures so that direct light from high-intensity lamps would not result in glare.
- Lighting would be directed away from adjoining properties so that not more than 1 *foot-candle of light* leaves the property boundaries.

A **foot-candle of light** refers to the intensity of light that is cast on a surface one foot away from the source.

In addition, Shell would minimize the impacts of light on neighboring properties in accordance with recommendations from the IDA, which includes installing full cut-off light boxes, adjusting light direction, and providing additional screens with supplemental light shields.

Mitigation

No additional mitigation measures are proposed beyond the avoidance and minimization measures that would be developed and enforced as part of the permit conditions.

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3.14 ECONOMICS

While Washington State Environmental Policy Act (SEPA) policies and procedures do not normally require an analysis of economic impacts of a project be included in an environmental impact statement (EIS), both SEPA and the Skagit County Code 16.12.140 allow for inclusion of such an analysis when it would describe a part of the existing environment that would be impacted.

STUDY AREA AND METHODOLOGY

The study area for economics includes the Washington State economy and the Skagit County economy. Construction impacts are measured at the state level. Operational impacts are measured at the county level where most of the facility operations and expenditures would occur. The cumulative impacts study area for economics is the same as described for direct and indirect impacts.

Select laws, regulations, and guidance applicable to economics are summarized in Table 3.14-1.

Table 3.14-1 Laws, Regulations, and Guidance for Project-Related Economics

Laws, Regulations, and Guidance	Description
State	
State Environmental Policy Act (SEPA) (RCW 43.21c; WAC 197-11)	Helps state and local agencies in Washington identify possible environmental impacts that could result from a proposed action, alternatives to the proposed action, and potential impact minimization and mitigation measures. Information learned through the review process can be used to change a proposal to reduce likely impacts and inform permitting decisions at the state and local levels.
Local	
Skagit County Code (Section 16.12.140)	Allows for the inclusion of an economic analysis when it would describe a part of the existing environment that would be impacted, but does not add to the criteria for threshold determination.

The economic impact analysis framework evaluates effects resulting from the construction and operation of the proposed project. Construction impacts are short term and would only occur during the construction phase. Impacts from the operation and maintenance of the proposed project would occur over the operational life of the facility. The following were considered in the economic impacts analysis:

Short-term impacts:

- State-sourced construction expenditures for materials, equipment, and fuel.
- Employment of construction workers from within the state.
- Increases in the household consumption by the state workforce.

Long-term impacts:

- Annual expenditures for materials, equipment, and fuel during the operational phase.
- Employment of operation workers from within the county.
- Increases in the household consumption by the county workforce.

The economic impacts analysis for the Shell Puget Sound Refinery (PSR) considered potential increases in economic output, employment, and employee compensation. Economic output is best described as sales of all goods produced by industries. The economic analysis included three types of impacts: direct, indirect, and induced.

- **Direct impacts** would be the primary rounds of economic activity that would create the initial increases in economic output and employment directly attributable to expenditures by the Shell PSR.
- **Indirect impacts** would be the secondary rounds of economic activity that would begin when the suppliers who contributed to the construction or operation of the proposed project spent their dollars. This secondary phase generates additional rounds of spending that cycle through the economy (known as the multiplier effect).
- **Induced impacts** would be the third round of economic activity that the multiplier effect would generate from changes in household income. Additional employment by the Shell PSR and its suppliers may increase household expenditures in the region. These changes then affect related industries.

What are input-output models?

Input-output models create an accounting framework for a regional economy that describes flows of outputs to and from industries and institutions. In the model, economics sectors can:

- Purchase outputs of other sectors.
- Sell to other sectors.
- Sell outside the local economy.
- Buy outside the local economy.

This accounting framework allows the user to predict how a change in the level of economic activity will affect the local economy.

The IMPLAN Model is considered the industry standard for this type of economic analysis. IMPLAN was developed by MIG, Inc., formerly Minnesota IMPLAN Group, Inc. (MIG), Software and Data, www.implan.com.

Impacts to economic output, employment, employee compensation, and value added were evaluated using the IMPLAN Pro 3.0 software. IMPLAN is a widely used computer simulation tool that employs an *input-output model* to measure regional impacts.

IMPLAN uses proprietary datasets that are based on the Bureau of Economic Analysis National Income and Product Accounts (NIPA) datasets. Datasets are available down to the county and state levels. The IMPLAN model generates indirect and induced impacts by applying regional multipliers to direct impacts. The multipliers are influenced by the size of the study area, the timeframe of the datasets being used in the model, and the level of economic activity being evaluated. Both county and state level datasets were employed in this analysis.

AFFECTED ENVIRONMENT

This section presents the regional economic conditions that could be affected by construction and operation of the proposed project. The economic conditions include population, employment, and income dynamics in Skagit County and Washington State. Data presented is the most recent 10-year period where available.

Proposed Project

Regional Population

The Skagit County population was estimated to be 120,365 in 2014 (Table 3.14-2). The county's population expanded 17 percent from 2000 to 2014. This was lower than the statewide population growth rate of 20 percent over the same period. The three largest cities by population in Skagit County are Mount Vernon, Anacortes, and Burlington.

Table 3.14-2 Population, Labor Force, Median Household Income, Unemployment Rate, and Poverty Rate for Washington State and Skagit County (2000 and 2014)

		WASHINGTON STATE			SKAGIT COUNTY		
Statistic	Units	2000	2014	Percent Change	2000	2014	Percent Change
Population	Number of persons	5,894,121	7,061,530	20%	102,979	120,365	17%
Labor force	Number of persons	2,979,824	3,476,885	17%	49,129	56,001	14%
Median household income	Dollars	45,776	59,478	30%	42,381	55,925	32%
Unemployment rate	Percent	6.2%	9.4%	3.2%	6.9%	9.8%	2.9%
Poverty rate	Percent	10.6%	13.4%	2.8%	11.1%	15.7%	4.6%

Source: U.S. Census Bureau 2016

Regional income, Poverty, and Unemployment

As shown in the Table 3.14-2, Skagit County's civilian labor force averaged 56,001 in 2014. Of that, 50,520 people were employed and 5,481 were estimated to be unemployed and actively seeking work. This tracks similarly with population growth in the county over the same period.

As with other counties in Washington State, unemployment and poverty have increased in recent years because of the economic recession in 2009–2010 (reflected in the increases at statewide levels). The average unemployment rate in 2014 was 9.8 percent. This is up from 2000, at which time the pre-recession (pre-2008) unemployment average was 6.9 percent. Overall, unemployment is down from the peak of 12.9 percent in Skagit County observed in January 2010 (yearly average of 10.9 percent). However, unemployment has not yet returned to pre-2008 levels.

In 2014, Skagit County was ranked 11th highest in Washington State on both median household income and per-capita income. Median household income grew at a rate higher than the state average between 2000 and 2014, while the overall level ($55,925) remained just below the statewide average ($59,478). Per-capita income has grown by approximately 29 percent per year over the period 2005 to 2014 (3). However, income growth was halted during the recession. The trends in income growth closely match the state average.

Table 3.14-3 Per-Capita Income in Washington State and Skagit County (2005 to 2014)

Year	Washington State	Skagit County
2005	$37,754	$33,268
2006	$40,204	$35,800
2007	$42,954	$37,841
2008	$44,460	$38,672
2009	$42,248	$37,771
2010	$42,821	$37,321
2011	$44,800	$38,841
2012	$47,344	$40,701
2013	$47,468	$40,904
2014	$49,610	$42,829
Percent Change 2005 to 2014	31%	29%

Source: U.S. Bureau of Economic Analysis, 2016

Regional Employment and Wages

As shown in Table 3.14-3, between 2005 and 2014, the state industries that experienced the greatest increases in statewide employment levels were mining, professional scientific and technical services, management of companies and enterprises, educational services, health care and social assistance, and information. Only one industry—construction—declined during the same period.

As shown in Table 3,14-4, in Skagit County, the industries that experienced the greatest increases in employment between 2005 and 2014 were mining, wholesale trade, finance and insurance, management of companies and enterprises, administrative and waste management/remediation, and educational services. The industries in which employment declined were farm, forestry, construction, retail trade, information, civilian federal government, and military.

Skagit County's manufacturing employment declined significantly between 2005 and 2010 (15.5 percent) (BEA 2016). From 2010 to 2014, the manufacturing sector rebounded, resulting in a net increase in the total sector employment. Although the recovery from the recession has taken several years, Skagit County has developed a diverse manufacturing base that has played an instrumental role in its overall economic upturn.

Table 3.14-4 Employment by Place of Work in Washington State and Skagit County by Industry (2005 and 2014)

Sector	WASHINGTON STATE			SKAGIT COUNTY		
	2005	2014	Percent Change	2005	2014	Percent Change
Farm employment	73,700	85,664	16%	2,759	2,650	-4%
Forestry, fishing, and related activities	36,918	43,693	18%	1,277	1,192	-7%
Mining, quarrying, and oil and gas extraction	5,527	9,368	69%	132	173	31%
Utilities	4,774	5,237	10%	181	196	8%
Construction	222,345	214,531	-4%	4,559	4,340	-5%
Manufacturing	278,284	310,931	12%	5,532	6,370	15%
Wholesale trade	131,126	142,543	9%	1,085	1,521	40%
Retail trade	388,509	418,122	8%	8,715	8,405	-4%
Transportation and warehousing	105,577	122,605	16%	1,414	1,660	17%
Information	101,509	121,769	20%	638	470	-26%
Finance and insurance	144,319	161,000	12%	1,867	2,532	36%
Real estate, rental, and leasing	148,659	172,691	16%	2,395	2,794	17%
Professional, scientific, and technical services	234,766	295,460	26%	2,681	3,028	13%
Management of companies and enterprises	34,139	42,206	24%	173	246	42%
Administrative and support and waste management and remediation services	178,653	199,937	12%	1,830	2,300	26%
Educational services	60,899	77,795	28%	585	889	52%
Health care and social assistance	331,131	454,163	37%	5,385	6,258	16%
Arts, entertainment, and recreation	82,135	94,255	15%	1,291	1,395	8%
Accommodation and food services	228,241	269,882	18%	4,358	4,521	4%

Sector	WASHINGTON STATE			SKAGIT COUNTY		
	2005	2014	Percent Change	2005	2014	Percent Change
Other services (except public administration)	196,251	215,069	10%	3,593	3,723	4%
Federal, civilian	69,936	71,470	2%	420	368	-12%
Military	76,030	76,552	1%	381	328	-14%
State government	143,384	144,370	1%	1,498	1,413	-6%

Source: U.S. Bureau of Economic Analysis, 2016

Average wages in Skagit County are significantly less than the statewide average, and have increased more slowly between 2005 and 2014 compared with statewide figures (Table 3.14-5).

Table 3.14-5 Average Weekly Wages for Washington State and Skagit County (2005 and 2014)

Year	Washington State	Skagit County
2005	783	604
2014	1,058	795
Percent Change	35.1%	31.6%

Source: U.S. Bureau of Labor Statistics, 2016

ENVIRONMENTAL IMPACTS

No Action Alternative

Because no construction or operation would take place under the no action alternative, there would be no impacts to economics. Existing economic trends would continue unless affected by other projects in the future.

Proposed Project

Direct Impacts

Construction

Construction of the proposed project would create a short-term stimulus for the Washington State economy through purchases of materials, supplies, equipment, and services; labor wages for construction workers; and associated impacts. As described in Chapter 2 – Proposed Project and Alternatives, construction of the proposed project is anticipated to begin as early as 2017,

and take about two years to complete. The total construction cost is estimated at $95 million and would employ approximately 200 workers (Table 3.14-6). After accounting for the portion of the project that could be spent outside of Washington State, the direct economic impact would be $60 million. This amount accounts for adjustments from taxes, equipment purchases outside the state, specialized nonlocal labor, and other construction services that may not be sourced from within the state.

Total construction wage estimates were not available from the Shell PSR. However, a recently completed economic impact analysis for the Westway Expansion Project provided a breakdown of construction expenditures including wage estimates (Ecology 2014). Average annual construction wages for that project were $129,900 per worker when adjusted to 2015 dollars. Combining this estimate with the number of construction workers, total construction wages for the proposed project are estimated to be $25,681,000.

Table 3.14-6 Estimated Direct Impacts of the Proposed Project (2015 Dollars)

Impact	Total Value	Direct Impact to Regional Economy
Construction (Washington State)		
Total Outlays[1]	$95,000,000	$60,080,000
Estimated Total Employment[1]	200	200
Estimated Total Construction Wages[2]	25,681,000	25,681,000
Operations (Skagit County)		
Average Annual Employment[1]	35	35
Average Annual Employee Income[3]	$4,546,000	$4,546,000

Notes:
1. Source: Shell PSR Response to Data Request – January 20, 2016.
2. Assumed average annual construction wage of $125,000.
3. Assumed average annual employee income of $129,900.

Operation

The proposed project would not alter the annual economic output of the Shell PSR. Instead, the improvements would ensure consistent, incoming supplies of crude oil that are necessary to maintain current levels of production. The operational analysis does not include any change in gross output in oil products generated by the Shell PSR.

After the proposed project becomes operational, the facility would result in a change in net employment and payroll at the Shell PSR, as well as some general operational expenditures, such as energy and office supplies. The Shell PSR would employ additional workers and increase its payroll to operate the rail unloading facility and the pipelines to the storage tanks. Additionally, the improvements would require power to operate the rail unloading facility, pipelines, and

operations building. Further expenditures, such as tools and various equipment, may be necessary over the course of the operational life of the facility. At the time of this EIS, the Shell PSR had estimated the number of future workers necessary to operate the proposed project would be 30 to 40. Therefore, the scope of this economic analysis is limited to the impact of payroll (worker spending) on the Skagit County economy.

The Shell PSR indicated that annual wages could range from $110,000 to $140,000 per worker. Two recent studies, "Economic Impacts of the Refineries in Skagit County" and "The Economic Contribution of Washington State's Petroleum Refining Industry in 2013," state that average wages for refinery workers are likely to be $129,900 in 2015 dollars (CEBR 2015; Washington Research Council 2014). The average value from these studies is used in the analysis as a middle value in the range provided by the Shell PSR.

Indirect and Induced Impacts

Construction

The direct, indirect, induced, and total economic impacts from construction of the proposed project are listed in Table 3.14-7. The impacts show how construction spending creates additional economic output, and how that output can be translated into full-time jobs and labor income.

Table 3.14-7 Estimated Economic Impacts from Construction in Washington State – Proposed Project (2015 dollars)

Impact	Employment (jobs)	Labor Income	Economic Output
Direct	200	$25,681,000	$ 60,080,000
Indirect	128	$ 7,427,000	$ 23,399,000
Induced	153	$ 7,409,000	$ 23,251,000
Total	481	$40,517,000	$106,730,000

Source: IMPLAN 3.0 Model Estimates.

Approximately $60 million in direct construction impacts would produce positive, short-term economic benefits to the state. The proposed project would generate approximately $47 million in indirect economic output (indirect plus induced). The total impact of the project would be nearly $107 million over the course of the 25 months of construction. Indirect employment associated with the project (approximately 281 jobs) would have average annual incomes of $52,800 (indirect plus induced).

The $60 million in direct construction impacts would produce positive, short-term economic benefits to the state. The proposed project would generate approximately $47 million in indirect economic output (indirect plus induced).

In addition to these economic impacts, the construction of the proposed project is estimated to generate approximately $3.38 million in increased property and sales taxes (Table 3.14-8).

Table 3.14-8 Estimated Tax Revenues from Construction in Washington State – Proposed Project (2015 dollars)

Property Tax	Sales Tax	Total
$1,106,000	$2,277,000	$3,383,000

Source: IMPLAN 3.0 Model Estimates

Operation

Operational impacts represent the steady stream of economic benefits that may accrue in the county following construction of the proposed project. These impacts would begin in late 2019 and occur annually over the operational life of the project. The direct impacts are the result of increased employment and payroll at the Shell PSR. The additional 35 workers on site would spend dollars from their incomes in the Skagit County economy, thus creating additional indirect impacts. The Shell PSR workers' incomes would help contribute approximately $3 million in indirect economic output (Table 3.14-9). Household spending would help to support seven additional jobs with an average income of $32,700.

Table 3.14-9 Estimated Economic Impacts in Skagit County from Operations – Proposed Project (2015 dollars)

Impact	Employment (jobs)	Labor Income	Economic Output
Direct	35	$4,546,000	NA
Indirect	4	$ 128,000	$2,725,647
Induced	3	$ 101,000	$ 355,000
Total	42	$4,775,000	$3,080,647

Source: IMPLAN 3.0 Model Estimates.

In addition to these economic impacts, the operation of the proposed project is estimated to generate approximately $224,000 in increased property and sales taxes (Table 3.14-10).

Table 3.14-10 Estimated Tax Revenues in Skagit County from Operations – Proposed Project (2015 dollars)

Property Taxes	Sales Taxes	Total
$73,000	$151,000	$224,000

Source: IMPLAN 3.0 Model Estimates.

Cumulative Impacts

Construction of the proposed project and reasonably foreseeable future projects would create a short-term stimulus for the Washington State economy through purchases of materials, supplies, equipment, and services, and labor wages for construction workers. During operation, the proposed project and reasonably foreseeable future projects would create cumulative economic benefits for local economies in Washington State through the creation of jobs and operational expenditures, and generate additional property and sales taxes.

MITIGATION MEASURES

Avoidance and Minimization

No avoidance or minimization measures are proposed.

Mitigation

No mitigation measures are proposed.

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3.15 RAIL TRAFFIC AND TRANSPORTATION

Rail transportation is an integral part of our regional and national economy. BNSF Railway is one of the busiest rail lines in the region and transports freight on the Bellingham and Anacortes subdivisions every day. As described in Chapter 2 – Proposed Project and Alternatives, the proposed project would add six round-trip trains per week traveling to and from the Shell Puget Sound Refinery (PSR). This chapter provides context for the potential impacts the proposed project could have on the regional rail transportation network.

STUDY AREA AND METHODOLOGY

The extended study area was used to analyze direct and indirect impacts on rail traffic and transportation. The study area includes the rail corridor that would be used to transport crude oil by rail to the Shell PSR. Specifically, the analysis was focused on the impacts of the proposed unit trains along the rail route between the Skagit/Snohomish county line within the Bellingham Subdivision (BNSF Railway, Northwest Division, Milepost [MP] 59.56), and the Anacortes Subdivision (BNSF Railway, Northwest Division, MP 6.135) to the Shell PSR. Based on input received during the environmental impact statement (EIS) scoping process, the study area was determined to include the Bellingham Subdivision main line track to the Skagit/Snohomish county line to address concerns from local residents. The study area is shown in Figure 3.15-1.

Additionally, the Washington State Department of Transportation (WSDOT) has identified existing state highway locations that are operationally sensitive to increases in train traffic. These locations were included as part of the extended study area (Figure 3.15-3).

The study area for cumulative impacts includes the movement of unit trains on the BNSF Railway main line route(s) proposed for the transport of crude by rail to the Shell PSR within Washington from Sandpoint, Idaho (Figure 3.15-2).

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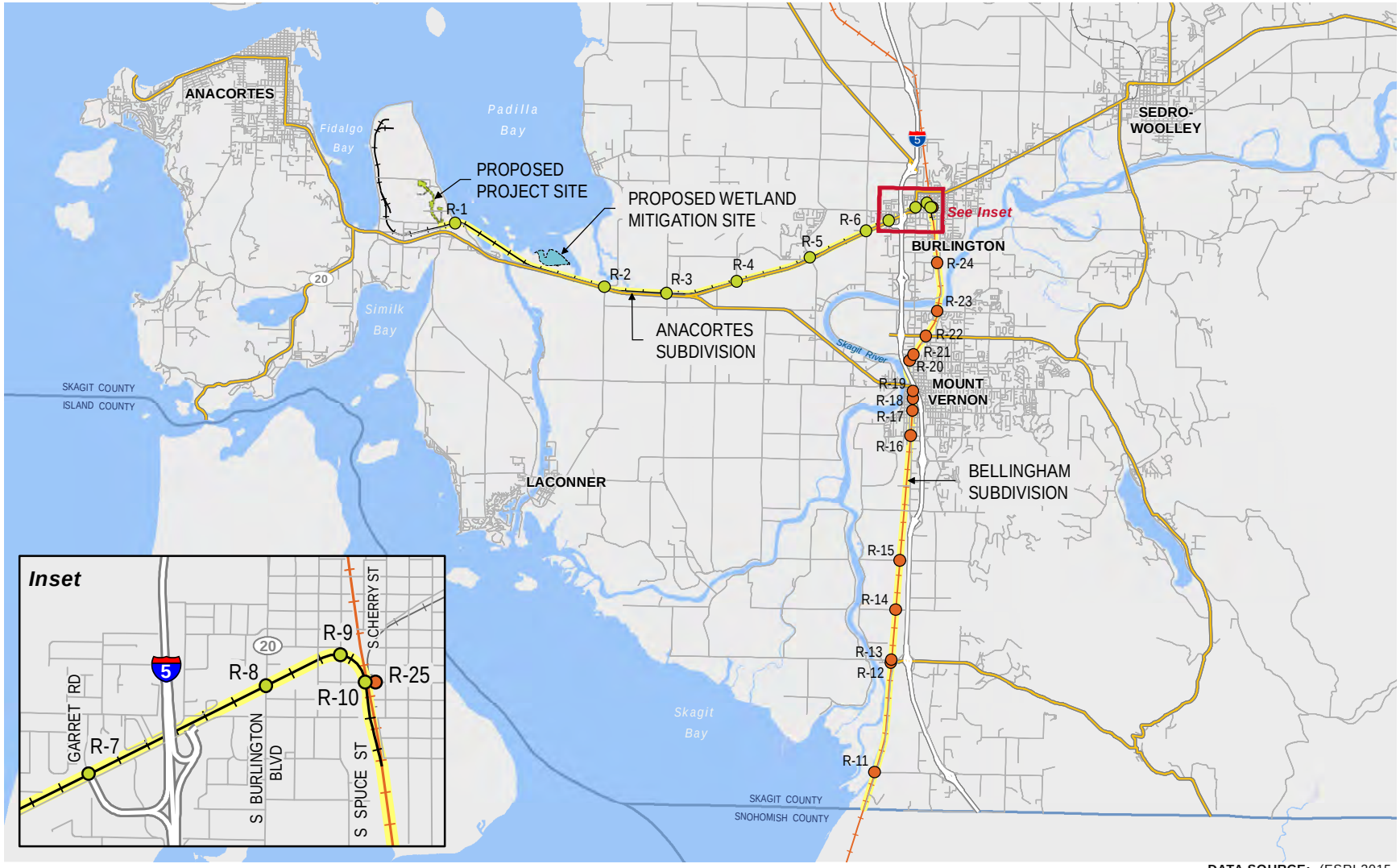

DATA SOURCE: (ESRI 2015, Skagit County 2015, WSDOT 2015)

Figure 3.15-1
AT-GRADE RAILROAD CROSSINGS STUDIED

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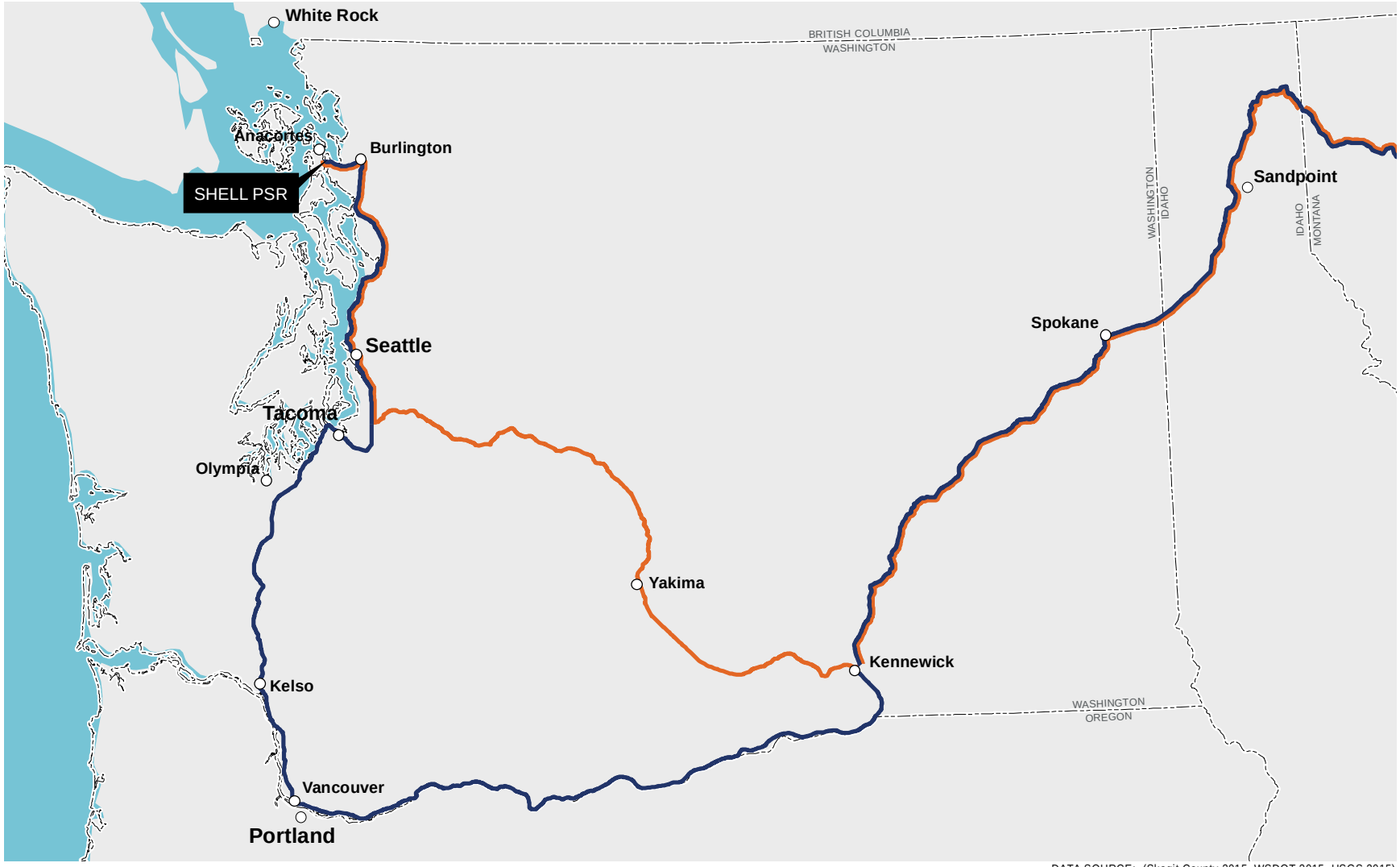


DATA SOURCE: (Skagit County 2015, WSDOT 2015, USGS 2015)

Representative Train Route to Shell PSR
Representative Train Route from Shell PSR
State/Provincial/International Boundary

N

0 25 50 Mile

Figure 3.15-2
RAIL TRANSPORTATION STUDY AREA FOR CUMULATIVE IMPACTS

Select laws, regulations, and guidance applicable to rail traffic and transportation are summarized in Table 3.15-1.

Table 3.15-1 Laws, Regulations, and Guidance for Project-Related Rail Traffic and Transportation

Laws, Regulations, and Guidance	Description
Federal	
Federal Railroad Safety Act of 1970	This comprehensive law authorizes the Secretary of Transportation to prescribe regulations for all areas of railroad safety (supplementing existing rail safety statutes and regulations) and conduct necessary research, development, testing, evaluation, and training.
Highway Safety Act and the Federal Railroad Safety Act	Gives the Federal Highway Administration (FHWA) and Federal Railroad Administration (FRA) regulatory jurisdiction over safety at federal highway/rail grade crossings.
Federal Railroad Administration, Department of Transportation (49 CFR Parts 200-299)	Establishes railroad regulations, including safety requirements related to tracks, operations, and cars.
Interstate Commerce Commission Termination Act of 1995 (49 USC 101)	Establishes the Surface Transportation Board, an independent adjudicatory and economic-regulatory agency charged by Congress with resolving railroad rate and service disputes and reviewing proposed railroad mergers.
Federal Regulations for the Safe and Secure Transportation of Hazardous Materials (49 CFR § 171-174 and 179)	Establishes hazardous materials regulations including communications, emergency response information, training requirements and security plans, shipper requirements and carriage by rail including specifications for tank cars.
State	
State Environmental Policy Act (SEPA) (RCW 43.21c; WAC 197-11)	Helps state and local agencies in Washington identify possible environmental impacts that could result from a proposed action, alternatives to the proposed action and potential impact minimization and mitigation measures. Information learned through the review process can be used to change a proposal to reduce likely impacts and inform permitting decisions at the state and local levels.
Transportation—Railroads, Employee Requirements and Regulations (RCW 81.40)	Establishes general requirements for railroad employee environments and working conditions, the minimum crew size for passenger trains, and conditions for flaggers.

Laws, Regulations, and Guidance	Description
Transportation—Railroads, Crossings (RCW 81.53)	Establishes requirements and processes for railroad construction and extensions that would cross any existing railroad or highway at grade and vice versa.
Rail Companies—Clearances (WAC 480-60)	Establishes clearances for railroad companies operating in Washington State. Includes rules of practice and procedure, walkway clearances, side clearances, track clearances, and rules for operation of excess dimension loads.
Rail Companies—Operation (WAC 480-62)	Establishes operating procedures for railroad companies operating in Washington State with defined exceptions.
Washington Utilities and Transportation Commission (WUTC)	Protects consumers to ensure that utility and transportation services are fairly priced, available, reliable, and safe. Regulates the rates and services of private or investor-owned utility and transportation companies. In cooperation with the Federal Railroad Administration, WUTC inspects railroad crossings and authorizes safety and operation improvements.
Washington State Department of Transportation (WSDOT) Local Agency Guidelines M 36- 63.28, June 2015, Chapter 32, Railroad/Highway Crossing Program	Reduces the number of fatalities and injuries at public highway-rail grade crossings through the elimination of hazards and/or the installation/upgrade of protective devices at crossings.
WSDOT Design Manual M 22.01.10, November 2015, Chapter 1350, Railroad Grade Crossings	Provides specific guidance for the design of at-grade railroad crossings.

The proposed project has the potential to affect rail traffic and transportation in the following ways:

- Create changes to grade crossing operations (increased blockages or delays at intersections).
- Create changes to regional capacity for rail traffic.

The methods used to analyze these potential impacts are described on the following pages.

At-Grade Crossing Operations Analysis

The potential impacts to at-grade railroad crossing operations were analyzed per the following sequential steps:

An **at-grade crossing** is defined as a junction or intersection where two or more transport axes cross at the same level or grade. For example, an at-grade crossing occurs where a rail crossing intersects a road.

1. Conducted a site reconnaissance to establish existing rail operations on the Bellingham Subdivision between the Skagit/Snohomish county line and the proposed rail route to the Shell PSR on the Anacortes Subdivision.
2. Interviewed staff at BNSF Railway and Shell to identify and assess current rail operations along the Anacortes Subdivision.
3. Collected the following public roadway-railway, at-grade crossing data on the route between the Skagit/Snohomish county line and the Shell PSR:
    a. Road name and railroad milepost.
    b. U.S. Department of Transportation (USDOT) identification number.
    c. City and county.
    d. Number of traffic lanes.
    e. Number of tracks.
    f. Maximum train speed for unit trains transporting crude oil.
4. Calculated occupancy for a 6,750-foot-long Shell unit train (four distributed locomotives, two buffer cars, 102 60-foot-long tank cars) at each public roadway/railway at-grade crossing on the route between the Skagit/Snohomish county line and the Shell PSR traveling at the maximum posted track speed.
5. Calculated rail capacity using industry-standard methodology and best available data on the Anacortes Subdivision.
6. Reviewed publicly available data regarding BNSF Railway Bellingham Subdivision rail capacity.

This capacity analysis represents just one perspective on how freight rail volumes will change over time. Publicly available existing daily train counts on the Bellingham and Anacortes subdivisions, plus the proposed Shell unit train operations (one in each direction) were compared to BNSF Railway capacities.

Ten at-grade railroad crossings on the Anacortes Subdivision and 15 at-grade railroad crossings on the Bellingham Subdivision between Burlington and the Skagit/Snohomish county line were studied. These at-grade railroad crossings are listed in Table 3.15-2 and shown on Figure 3.15-1. Each at-grade railroad crossing was assigned a label “R-X” to easily reference crossings on Figure 3.15-1.

Table 3.15-2 At-Grade Railroad Crossings Studied – Anacortes and Bellingham Subdivisions

Roadway	USDOT Crossing Number	Jurisdiction	Subdivision
R-1. March's Point Road	092234F	Skagit County	Anacortes
R-2. Bayview-Edison Road	092241R	Skagit County	Anacortes
R-3. Farm to Market Road	092242X	Skagit County	Anacortes
R-4. Higgins Airport Way	092246A	Skagit County	Anacortes
R-5. Avon Allen Road	092249V	Skagit County	Anacortes
R-6. Pulver Road	092252D	Skagit County	Anacortes
R-7. Garrett Road	929012P	Burlington	Anacortes
R-8. SR 20 / South Burlington Boulevard	092255Y	WSDOT/Burlington	Anacortes
R-9. South Spruce Street	092259B	Burlington	Anacortes
R-10. South Walnut Street	092260V	Burlington	Anacortes
R-11. Milltown Crossing Road	084727X	Skagit County	Bellingham
R-12. Spruce / Main Street	084733B	Skagit County	Bellingham
R-13. Fir Island Road	084734H	Skagit County	Bellingham
R-14. Peter Johnson Road	084735P	Skagit County	Bellingham
R-15. Stackpole Road	084736W	Skagit County	Bellingham
R-16. Old Hwy 99 South / Blackburn Road	084739S	Mount Vernon	Bellingham
R-17. Section Street	084741T	Mount Vernon	Bellingham
R-18. SR 536 – Kincaid	084744N	Mount Vernon	Bellingham
R-19. Montgomery Street	084746C	Mount Vernon	Bellingham
R-20. Fir Street	084753M	Mount Vernon	Bellingham
R-21. Riverside Drive	084758W	Mount Vernon	Bellingham
R-22. College Way – SR 538	084759D	WSDOT/Mount Vernon	Bellingham
R-23. Hoag Road	084760X	Mount Vernon	Bellingham
R-24. Pease Road	084763T	Burlington	Bellingham
R-25. Greenleaf Avenue	084764A	Burlington	Bellingham

Rail Traffic Capacity Analysis

Shell provided the following assumptions about the proposed project unit trains for use in the analysis of rail traffic and transportation:

- Distributed power – two locomotives would be placed at the front of the train and two locomotives at the rear for improved safety. Each locomotive would be 75 feet long.
- Two 50-foot-long buffer cars would be included at each end of the train. Buffer cars add separation between tank cars and the engines where the crew is located.
- One hundred and two tank cars would be included in each unit train, each 60 feet long.
- Total length of each unit train would be approximately 6,750 feet.

Federal Railroad Administration (FRA) crossing inventory data was collected and recently prepared agency studies both provided a foundation for the rail traffic analysis. The following data and studies were used for this analysis:

- FRA crossing inventory (FRA 2016).
- Washington State 2014 Marine & Rail Oil Transportation Study (Etkin et al. 2015).
- Washington State Rail Plan, Integrated Freight and Passenger Rail Plan, 2013–2015 (WSDOT 2014).
- Skagit Council of Governments Rail Crossing Study (SCOG 2016).

To evaluate potential impacts of the proposed Shell unit trains on other rail traffic along the Bellingham and Anacortes subdivisions, rail traffic data were compiled and analyzed per the following steps:

1. Conducted a site reconnaissance to establish an existing conditions baseline of rail operations on the Bellingham Subdivision between the Skagit/Snohomish county line and the proposed rail route to the Shell PSR.
2. Reviewed the Skagit Council of Governments Rail Crossing Study (SCOG 2016) to determine 2015 train volumes on the Bellingham and Anacortes subdivisions.
3. Reviewed the Washington State Rail Plan, Integrated Freight and Passenger Rail Plan, 2013–2015, developed by the Washington State Department of Transportation (WSDOT 2014), to determine 2015 average daily train use and average daily train capacity in the study area. The average daily train capacities in the Washington State Rail Plan were determined from 2010, 2012, and 2013 counts, federal agency datasets as well as train sizes, schedules, and train priorities.
4. Calculated the track capacity of the Anacortes Subdivision. This capacity is calculated using the Line Occupancy Index (LOI) method, which is a theoretical maximum capacity in average trains per day. A sustainable capacity is expressed as a percentage and described below.
5. Analyzed impacts of proposed Shell unit train operations on average daily track capacity for the study area.

An *LOI analysis* was conducted on the Anacortes Subdivision between Burlington and the Shell PSR to determine if the rail line would have adequate capacity for the proposed additional train per day.

An **LOI analysis** compares a rail line's standard train capacity to the actual number of trains that would occupy the rail line. The maximum available occupancy per day is adjusted based on various types of train movements that can occur on a particular rail line.

For example, a rail line with an LOI of 50 indicates the line is handling 50 percent of its maximum theoretical train capacity. Vehicle transportation analysts use a similar categorization for capacity defined as Level of Service (see Chapter 3.16 – Vehicle Traffic and Transportation). LOI values (and the comparable LOS designation or intersection delay) can be described as follows:

- Values between 0 and 39 (LOS = A and B) indicate that the rail line segment has adequate capacity for additional train traffic and to perform track, structure, and signal maintenance.
- Values between 40 and 69 (LOS = C and D) indicate that the rail line segment is reaching an upper threshold for adding more train traffic, and maintenance activities will need to be carefully scheduled to avoid excessive interruption to train traffic.
- Values between 70 and 100 (LOS = E and F) indicate that the rail line segment has exceeded its theoretical capacity and maintenance activities will likely result in interruption and delays to train traffic, rerouting of train traffic to other lines, temporary reductions in rail service levels offered to freight customers, or all three.

While rail lines with LOIs greater than 70 can be operated successfully, they are generally considered economically impractical and unsustainable by the rail industry. They have insufficient time for track maintenance and have insufficient capacity to make up for unforeseen rail service interruptions and fluctuations in rail traffic. In addition, trains that cannot be accepted on a rail line with a high LOI must wait somewhere, using up additional capacity and effectively increasing the LOI on adjoining rail lines for a considerable distance.

The length of the Anacortes Subdivision between Burlington and the Shell PSR was assumed to be approximately 14 miles with an operating speed of 10-25 miles per hour (mph). Assuming 6,750-foot train lengths, the calculated train running time to operate over the subdivision was about 40 minutes. Given the limited number of origin/destinations on the line and no track available for meeting trains, it is assumed that only one train can travel on the Anacortes Subdivision at a time between Burlington and the Shell PSR.

Freight trains, unlike passenger trains, do not run on a schedule. BNSF Railway develops a daily traffic plan for dispatching trains based on a number of criteria, including available train crews, number of cars to be moved, cost of fuel, and overall revenue.

This chapter analyzes potential impacts of typical rail operations associated with the proposed project. The potential impacts of an accident associated with transporting crude oil by rail are discussed in Chapter 4 – Environmental Health and Risk.

AFFECTED ENVIRONMENT

Anacortes and Bellingham Subdivisions

Rail Traffic Capacity

Currently, four freight trains of varying types and lengths operate on an average day, traveling in both directions, on the Anacortes Subdivision between Burlington and Anacortes (SCOG 2016). The current trains, combined with the proposed two daily Shell unit trains (one in each direction), represent less than the capacity of 14 trains per day on the Anacortes Subdivision. Trains must use the Swinomish Channel Swing Bridge on their travels along the Anacortes Subdivision. The bridge remains in the open position for boat traffic to freely pass, and is closed only for railroad operations.

Current rail traffic on the Bellingham Subdivision between the Skagit/Snohomish county line and Burlington is a mix of passenger and freight trains. Four daily passenger trains (two northbound and two southbound) operate between Seattle and Vancouver, B.C. On an average day, 21 trains of varying types and lengths operate in both directions on this rail line (SCOG 2016). The approximate 21 existing trains, plus the two daily unit trains proposed by Shell (one in each direction), represent less than the BNSF Railway capacity of 25 trains per day.

Two different methodologies were used to determine the average daily train capacities for the Anacortes and Bellingham subdivisions. The average daily train use in 2015 and the average daily train capacity on the Anacortes and Bellingham subdivisions are listed in (Table 3.15-3).

On the Anacortes Subdivision, the average daily train capacities were calculated using the LOI analysis methodology described above. The maximum theoretical available track minutes per day is 1,440 minutes on a single track. At 40 minutes per trip, the maximum theoretical train capacity on the rail line is 36. An adequate capacity based on this analysis is 40 percent of the maximum (of the LOI), which equates to 14 average daily trains.

For the Bellingham Subdivision, the average daily train capacities were determined through a standard industry methodology based on actual train sizes, schedules, numerous federal agency datasets, train priorities that were prepared by WSDOT, and a historical record of freight rail traffic, as shown in Table 3.15-3 (WSDOT 2014).

Table 3.15-3 Average Daily Trains in 2015 and Average Daily Train Capacity

Segment	BNSF Railway Subdivision	2015 Average Daily Trains	Average Daily Train Capacity
Everett to Vancouver, BC	Bellingham	21[1]	25[2]
Burlington to Anacortes	Anacortes	4	14

Notes:

1. Source: SCOG Rail Crossing Study 2016.
2. Source: WSDOT 2014.

Rail transportation beyond Skagit County

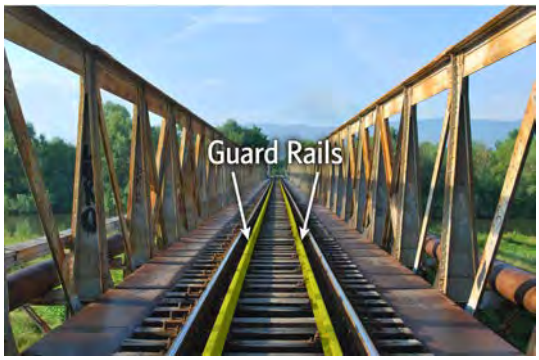
One additional train daily in each direction from the proposed project would be absorbed in the flow of trains on the BNSF Railway main line without the need for capital investment or major changes in operational patterns.

The BNSF Railway main line in the Pacific Northwest has large daily, seasonal, and annual variability in traffic flows. The main line has the capacity to absorb substantial variability in the volume of rail traffic. This variability is caused by consumer buying habits that peak during the fall and increase the transport of containerized goods; grain export volumes that vary with currency rates, global weather patterns in grain-growing areas and general economic patterns; and global economic trends.

If additional capacity is needed, BNSF Railway can readily implement operational plans to accommodate the traffic peaks such as including directional running schemes using BNSF Railway's three parallel routes between Spokane and the Pacific Coast, and "fleeting" trains on high-traffic volume days (e.g., running multiple trains in one direction at once, then after they arrive, running multiple trains in the other direction). For these reasons, the proposed project is not expected to affect rail traffic or transportation on the BNSF Railway main line beyond Skagit County.

Rail Bridge Safety Features

The use of guard rails on bridge structures is standard in the industry and required in Washington State under statute Washington Administrative Code [WAC] 296-54-597. Guard rails are additional rails placed parallel to and inside the regular track running rails to keep the wheels in alignment in case of derailment. They prevent excessive damages from overturned or capsized derailed rail cars on bridges in the event of an accident. They also help to minimize damage to the structure and allow easier cleanup. The Swinomish Channel Swing Bridge and Skagit River Bridge both have guard rails on their structures.



An example of guard rails on a rail track (shown in yellow)

Federal law requires that rail bridges be inspected annually, that the safe load capacity of bridges is known, and that special inspections are conducted if weather or other conditions warrant additional inspections (49 CFR Part 237). The FRA enforces these requirements with all railroads. BNSF Railway inspected the Swinomish Channel Swing Bridge in June 2016, and the Skagit River bridge crossing in August 2016. Both bridges were found to have the capacity to safely carry the rail traffic being operated over them (BNSF 2016a; BNSF 2016b).

ENVIRONMENTAL IMPACTS

This section describes impacts to rail traffic and transportation. Grade crossing occupancy times and associated vehicular traffic impacts are described in Chapter 3.16 – Vehicle Traffic and Transportation.

No Action Alternative

Because no construction or operation would take place under the no action alternative, there would be no impacts to rail traffic or transportation. Under the no action alternative, no additional unit trains would operate to or from the Shell PSR.

Although the proposed project and related rail traffic would not occur under the no action alternative, it is assumed that growth in the region would continue. This could lead to development of other industrial uses reviewed for this analysis (2018 to 2038) that could occur on the Anacortes Subdivision within the 20-year life of the project (see Chapter 2 – Proposed Project and Alternatives). Increased rail traffic, if any, would likely be in the form of additional cars in a typical train or as additional trains. However, rail capacity is not expected to be exceeded within the 20-year analysis period. According to the 2013-2015 Washington State Rail Plan (WSDOT 2014), rail capacity from Seattle to Portland, and from Everett to Burlington, is projected to be nearly 100-percent utilized, which would make it difficult to handle variations or additional traffic without adding excessive delays.

Providing capacity to serve customer demand is crucial to the railroad's sustainability and therefore, it is anticipated that the railroads would continue to adjust operations and capital improvements to respond to capacity needs over time. It also is important to understand that rail capacity is not static. The volume of traffic that can be accommodated depends not only on infrastructure, but also on the railroad's operating strategies, traffic mix, use of technology, and many other business decisions.

The volume of traffic that can be accommodated depends not only on infrastructure, but also on the railroad's operating strategies, traffic mix, use of technology, and many other business decisions.

Proposed Project and Anacortes Subdivision

Direct Impacts

Construction

Rail access would be provided by a new connection to the existing Anacortes Subdivision located to the southeast of the project site, which would require minor modifications to the existing rail line's configuration. Short segments of the existing Anacortes Subdivision and a siding track would be realigned slightly to the south. Temporary construction impacts to rail traffic could occur as the new alignment is brought into operation. The majority of the construction would be done adjacent to the existing rail line and the only disruption to rail traffic would occur when the formal rail line connection is made. BNSF Railway would manage the timing, testing, and opening of the new alignment and maintain current rail operations to the extent possible to minimize delay.

Construction of the proposed project would not modify the existing Anacortes Subdivision east of the proposed project site and would have no impact on rail traffic or transportation. The new rail spur that would connect the Anacortes Subdivision to the proposed rail unloading facility would be designed to meet BNSF Railway's published Design Guidelines for Industrial Track Projects (BNSF 2011). These guidelines ensure that trains enter and exit the rail line at a safe speed and minimize rail line track occupancy.

Operation

As described in Chapter 2 – Proposed Project and Alternatives, operation of the proposed project at maximum throughput would result in approximately six unit trains received at the rail unloading facility per week—or two trips per day on average, one in each direction—on the Anacortes Subdivision. Unit trains on the Anacortes Subdivision cross at-grade intersections at a maximum speed of 10 mph. Intersection occupancy time by a proposed Shell unit train would be approximately 8 minutes. Marine vessel traffic would experience approximately 12-minute delays at the Swinomish Channel Swing Bridge to allow for the closing of the bridge, the passing of a train, and the subsequent reopening of the bridge (the bridge is open by default). In addition, proposed project trains occasionally have the potential to stop within at-grade crossings due to rail capacity constraints, accidents, or other issues.

Current operations at the project site would continue under the proposed project. One additional unit train, loaded or empty, operating in each direction between Burlington and the Shell PSR on the Anacortes Subdivision, would be incorporated into the daily traffic plan, increasing line occupancy to 42 percent, which would not result in unacceptable delays. The new rail spur and the proposed track configuration and unloading facility would allow the unit train to quickly clear the Anacortes Subdivision during arrival and departure without blocking any public at-grade railroad crossings.

Indirect Impacts

The proposed project could result in a reduction in marine vessel deliveries of crude oil to the Shell PSR. A recent study of crude oil transport estimated that 403 marine vessel deliveries of crude oil to Puget Sound refineries and terminals occur annually (Etkin et al 2015). The proposed project could result in a reduction of up to 28 vessel deliveries per year when operating at maximum capacity, or approximately 7 percent of total crude oil deliveries to Puget Sound annually. Crude oil shipments represent only one segment of all marine transport; therefore, this indirect impact is not expected to result in a substantial change with regard to marine vessel traffic in Puget Sound.

Bellingham Subdivision and Extended Study Area

Direct Impacts

Construction

Construction of the proposed project would not modify the existing rail line in the extended study area and would have no impact on rail traffic or transportation. The construction activity to connect the new spur to the existing rail line would be coordinated with train scheduling to minimize delays and disruption to rail traffic and transportation.

Operation

Current Bellingham Subdivision operations would continue under the proposed project. Maximum occupancy times for the proposed project were studied at 16 selected at-grade crossings along the Bellingham Subdivision between Burlington and the Skagit/Snohomish county line. The crossing times on this line are shorter in duration than crossings on the Anacortes Subdivision because unit train speeds are permitted to travel to a maximum of 50 mph. The crossing occupancy time per train at the studied intersections was approximately 2 minutes. The addition of two unit trains (one train in each direction) would increase the number of trains on the Bellingham Subdivision but would still be well below the available capacity.

The Washington Utilities and Transportation Commission (WUTC) has compiled an inventory of 347 public at-grade railroad crossings along routes used by BNSF Railway and Union Pacific Railroad to transport crude oil across the state (WUTC 2015). Of these grade crossings, WSDOT identified 47 existing state highway locations that are operationally sensitive to increases in train traffic and include at-grade railroad crossings that are nearing operational thresholds. Of the 47 operationally sensitive crossing locations, 26 were previously analyzed for crossing occupancy time in the Tesoro Savage Vancouver Energy Terminal Traffic Impact Analysis (Kittelson 2013). Of the WSDOT-identified locations, eight at-grade railroad crossings are located along the delivery route of the proposed project, as illustrated in Table 3.15-4 and Figure 3.15-3. The 26 WSDOT-identified crossings would see train utilization of those crossings increase between 5 and 22 percent, resulting in moderate to major intersection delays to motorists.

The crossing occupancy time per train at the eight studied at-grade railroad crossings was approximately 2 minutes with the exception of the SR 528 and 4th Avenue intersection in the City of Marysville. That intersection would see an approximate 3-minute occupancy time due to a lower maximum unit train speed limit at this location.

Table 3.15-4 WSDOT-Identified Operationally Sensitive At-Grade Railroad Locations

Road Name	USDOT Crossing Number	Rail Alignment	County	Subdivision
R-26. SR 528 4th Avenue	084640G	Delivery/Return Route	Snohomish	Bellingham
R-27. I-5/ 88th Street NE	084650M	Delivery/Return Route	Snohomish	Bellingham
R-28. I-5/ 116th Street NE	084654P	Delivery/Return Route	Snohomish	Bellingham
R-29. SR 531/172nd Street	084669E	Delivery/Return Route	Snohomish	Bellingham
R-30. SR 536 East Kincaid Street	084766N	Delivery/Return Route	Skagit	Bellingham
R-31. SR 538 West College Way	084775M	Delivery/Return Route	Skagit	Bellingham
R-32. SR 104/Main Street	085445K	Delivery Route	Snohomish	Scenic
R-33. SR 516/Willis Street	085640K	Delivery Route	King	Seattle

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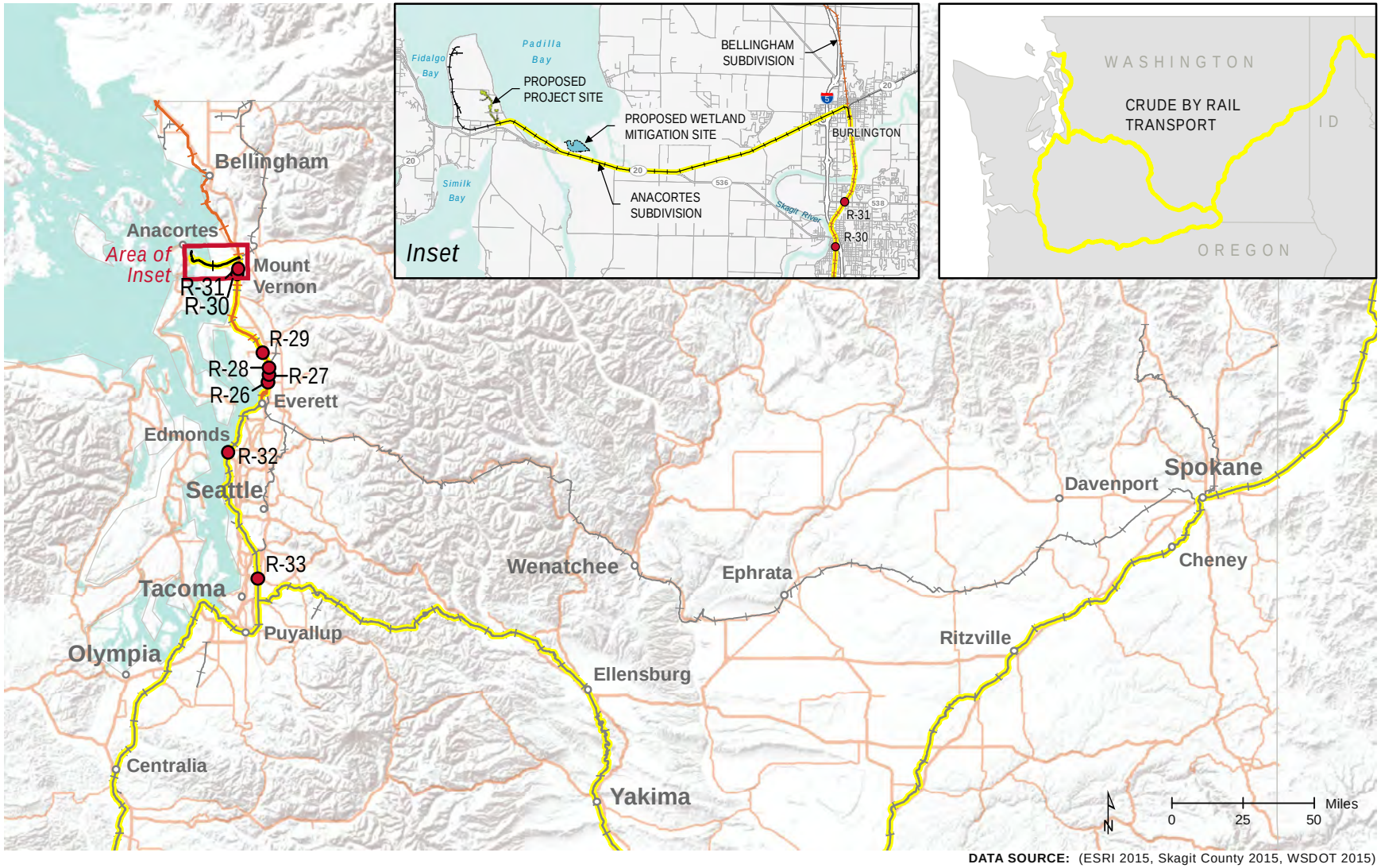


DATA SOURCE: (ESRI 2015, Skagit County 2015, WSDOT 2015)

Railroad Crossings Studied
Proposed Project Site
Proposed Wetland Mitigation Site
Anacortes Subdivision
Bellingham Subdivision
BNSF Railway
Crude-by-Rail Transport Route
Major Road

Figure 3.15-3
WSDOT-IDENTIFIED OPERATIONALLY SENSITIVE AT-GRADE RAILROAD LOCATIONS

Cumulative Impacts

Currently, four freight trains of varying types and lengths operate on an average day on the Anacortes Subdivision between Burlington and Anacortes. The direct impact of the proposed project would be additional train traffic on the Anacortes Subdivision. As no other reasonably foreseeable future actions were identified for the Anacortes Subdivision, the cumulative impact would be the same as the direct impact.

The proposed project, combined with the past, present, and reasonably foreseeable future actions, would contribute to a cumulative impact on the rail transportation network in Washington State. In the Washington State Rail Plan, WSDOT indicates that five of the nine subdivisions used by proposed project unit trains are projected to be over capacity by 2035 (WSDOT 2014). Although they would represent a small portion of existing and projected traffic, the two additional proposed Shell unit trains per day would contribute to a cumulative impact on the capacity of the rail transportation network. Rail capacity is an issue that the railroad companies continually monitor and address. BNSF Railway would likely address key capacity issues as they arise.

MITIGATION MEASURES

Avoidance and Minimization

No avoidance or minimization measures are proposed for the addition of six unit trains per week in each direction to existing traffic.

Mitigation

No mitigation measures are proposed for the addition of six unit trains per week in each direction to existing traffic.

3.16 VEHICLE TRAFFIC AND TRANSPORTATION

The vehicle transportation network provides access and economic vitality to local and regional communities. Changes in traffic patterns due to local projects can affect public safety and the quality of life in a community. Traffic can also create indirect impacts such as air pollution, economic costs incurred by delays, or traffic diversion resulting in trips being added to local roads.

STUDY AREA AND METHODOLOGY

The study area used to analyze direct and indirect impacts of the proposed project on vehicle traffic and transportation encompasses the roadways, intersections, and at-grade railroad crossings that would be affected by construction and operation. For construction impacts, the study area consists of the roads and intersections that construction vehicles would use to access the proposed project and wetland mitigation sites as well as the proposed haul routes to dispose of debris.

The study area for operational impacts consists of the roadway intersections and at-grade railroad crossings that could be affected by an increase in train traffic on the Anacortes and Bellingham subdivisions. Analysis was limited to this area because the increase in rail traffic would be most noticeable on these subdivisions. The study area also includes eight state highway *at-grade crossings* along the BNSF Railway main line that have been identified by the Washington State Department of Transportation (WSDOT) as operationally sensitive to increases in rail traffic (also described in Chapter 3.15 – Rail Traffic and Transportation). The cumulative impacts study area for vehicle traffic and transportation is the same as described above for direct and indirect impacts.

An **at-grade crossing** is defined as a junction or intersection where two or more transport axes cross at the same level or grade.

Select laws, regulations, and guidance applicable to vehicle traffic and transportation associated with the proposed project are summarized in Table3.16-1.

Table 3.16-1 Laws, Regulations, and Guidance for Project-Related Vehicle Traffic and Transportation

Laws, Regulations, and Guidance	Description
Federal	
Highway Safety Act and the Federal Railroad Safety Act	Gives the Federal Highway Administration (FHWA) and Federal Railroad Administration (FRA) regulatory jurisdiction over safety at federal highway/rail grade crossings.

Laws, Regulations, and Guidance	Description
Railroad-Highway Grade Crossing Handbook (Federal Highway Administration 2007) and Manual on Uniform Traffic Control Devices (23 USC 109(d))	The handbook is a single reference document on prevalent and best practices as well as adopted standards relative to highway-rail grade crossings. The manual, by setting minimum standards and providing guidance, ensures uniformity of traffic control devices across the nation.
State	
State Environmental Policy Act (SEPA) (RCW 43.21c; WAC 197-11)	Helps state and local agencies in Washington identify possible environmental impacts that could result from a proposed action, alternatives to the proposed action, and potential impact minimization and mitigation measures. Information learned through the review process can be used to change a proposal to reduce likely impacts and inform permitting decisions at the state and local levels.
Washington State Department of Transportation, Design Manual M 22.01.10, November 2015, Chapter 1350, Railroad Grade Crossings	Provides specific guidance for the design of at-grade railroad crossings.
Motor Vehicles, Rules of the Road Approaching train signal (RCW 46.61.340)	Provides driving rules for vehicles approaching a railroad grade crossing under specified circumstances.
Washington Utilities and Transportation Commission (WUTC)	Protects consumers to ensure that utility and transportation services are fairly priced, available, reliable, and safe. Regulates the rates and services of private or investor-owned utility and transportation companies. In cooperation with the Federal Railroad Administration, WUTC inspects railroad crossings and authorizes safety and operation improvements.

The proposed project could affect vehicle traffic and transportation in two ways:

1. Create changes in traffic during the construction period.
2. Create changes in access or vehicle delays on roadways and intersections near at-grade railroad crossings from increased rail traffic during project operation.

The methods used to analyze these impacts are described below.

Construction Traffic

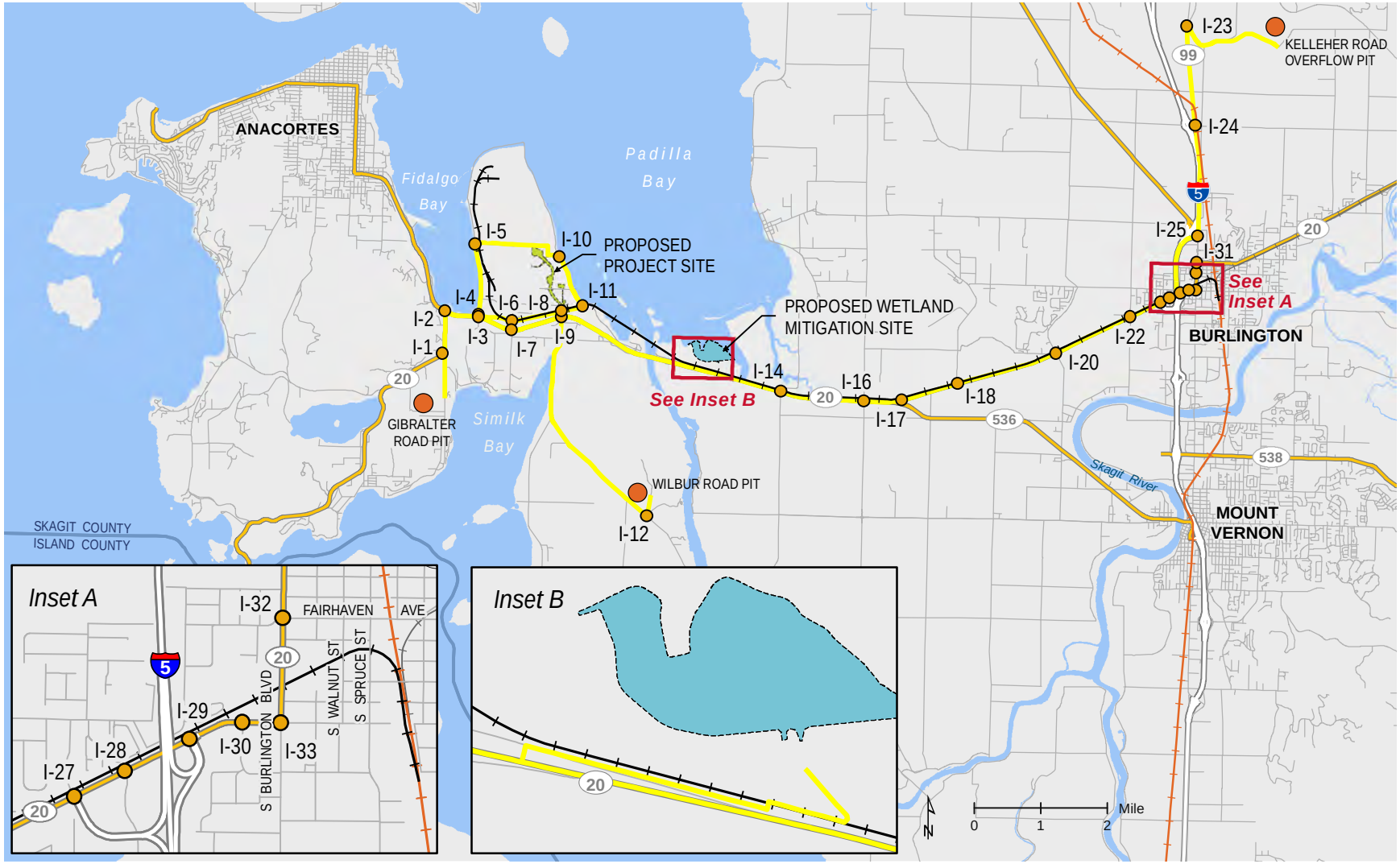
The analysis of construction impacts focused primarily on temporary increases in truck traffic on area roadways, including proposed haul routes for transport of construction debris. The analysis also evaluated impacts of construction on roadway intersections shown in Table 3.16-2 and Figure 3.16-1. Each intersection was assigned a label “I-X” to easily identify intersections on figures.

Table 3.16-2 Roadway Intersections Studied

North/South Roadway*	East-West Roadway*	Construction	Operation
I-1. Gibralter Road	SR 20	●	
I-2. SR 20/Oak Harbor	SR 20 Spur	●	
I-3. Christianson Road	SR 20	●	
I-4. March's Point Road	South March's Point Road	●	
I-5. March's Point Road	North Texas Road	●	
I-6. Thompson Road/Bartholomew Road	South March's Point Road	●	
I-7. Thompson Road	SR 20	●	
I-8. Reservation Road	SR 20	●	
I-9. Reservation Road	South March's Point Road	●	
I-10. East March's Point Road	North Texas Road	●	
I-11. East March's Point Road	South March's Point Road	●	●
I-12. Reservation Road	Wilbur Road	●	
I-13. LaConner Whitney Road	Bayview Edison Road		●
I-14. LaConner Whitney Road	SR 20	●	●
I-15. Farm to Market Road	McFarland Road		●
I-16. Farm to Market Road	SR 20	●	●
I-17. SR 536 (Memorial Highway)	SR 20	●	
I-18. Higgins Airport Way	SR 20	●	●
I-19. Avon Allen Road	Ovenell Road		●
I-20. Avon Allen Road	SR 20	●	●
I-21. Pulver Road	Peterson Road		●
I-22. Pulver Road	SR 20	●	●
I-23. Old Hwy 99 North	Kelleher Road	●	
I-24. Old Hwy 99 North	Cook Road	●	
I-25. North Burlington Boulevard	SR-11 [Roundabout]	●	
I-26. Garrett Road	Peterson Road		●

North/South Roadway*	East-West Roadway*	Construction	Operation
I-27. Garrett Road / I-5 Southbound Ramp	SR 20	●	
I-28. Nevitt Road	SR 20	●	
I-29. I-5 Northbound Ramp	SR 20	●	
I-30. Haggen Drive	SR 20 (Rio Vista Avenue)	●	
I-31. North Burlington Boulevard / SR 20	Avon Avenue	●	
I-32. North Burlington Boulevard / SR 20	Fairhaven Avenue	●	●
I-33. South Burlington Boulevard / SR 20	SR 20 (Rio Vista Avenue)	●	●
I-34. South Walnut Street	Washington Avenue		●
I-35. South Walnut Street	Greenleaf Avenue		●
I-36. South Spruce Street	Washington Avenue		●
I-37. South Spruce Street	Greenleaf Avenue		●
I-38. South Cherry Street	Greenleaf Avenue		●
I-39. I-5 Southbound Ramps	SR 538 (College Way)		●
I-40. I-5 Northbound Ramps	SR 538 (College Way)		●
I-41. Riverside Drive	SR 538 (College Way)		●
I-42. Continental Place	SR 538 (College Way)		●
I-43. Riverside Drive / North 4th Street	Fir Street		●
I-44. 3rd Street	Kincaid Street		●
I-45. I-5 Southbound Ramps	Kincaid Street		●
I-46. I-5 Northbound Ramps	East Kincaid Street		●
I-47. Old Hwy 99 South	Blackburn Road		●
I-48. Dike Road	Fir Island Road		●
I-49. Pioneer Highway	Fir Island Road		●

* Cardinal directions are approximate.



DATA SOURCE: (ESRI 2015, Skagit County 2015, WSDOT 2015)

Study Intersections
Potential Spoils Disposal Site
Proposed Haul Routes
Proposed Project Site
Proposed Wetland Mitigation Site
Anacortes Subdivision
Bellingham Subdivision
BNSF Railway
Local Road
State Highway
Interstate Highway

Figure 3.16-1
STUDY AREA INTERSECTIONS REVIEWED FOR CONSTRUCTION IMPACTS

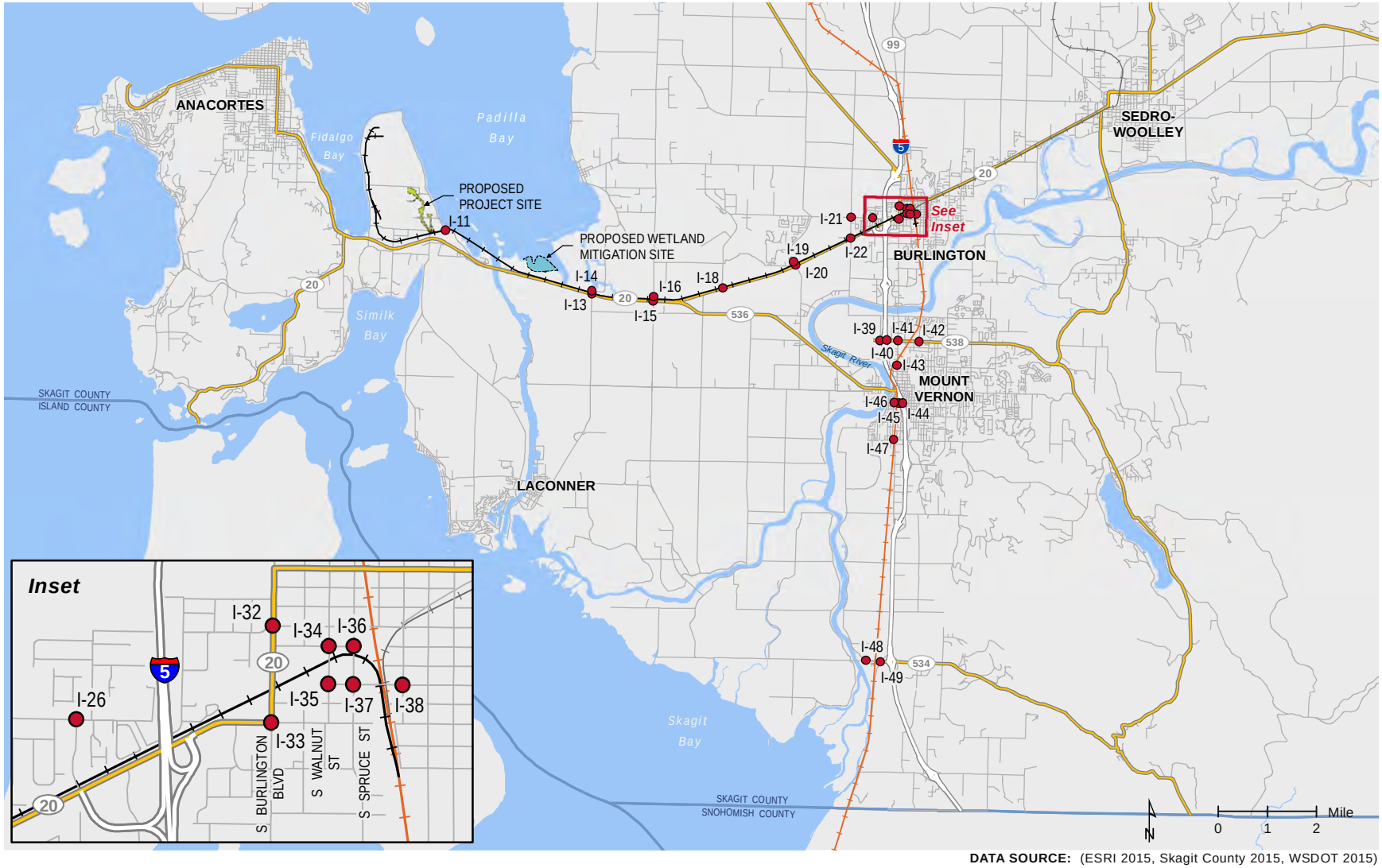
Traffic During Project Operation

Operational transportation impacts are described in terms of the changes in delays that could result from the additional rail activity the project would generate. The roadway intersections and at-grade railroad crossings evaluated for potential operational impacts are shown in Figures 3.16-2 and 3.16-3. All 49 intersections included in the operations impact analysis are listed in Table 3.16-2 above.

Traffic volumes and turning movements (i.e., the number of vehicles making left, through, and right movements) were assessed at at-grade railroad crossings in the study area and the adjacent intersections where the annual average traffic volume was greater than 2,000 vehicles per day. Twelve at-grade railroad crossings along the Anacortes and Bellingham subdivisions met this threshold and are listed in Table 3.16-3 (also Figure 3.16-3). The analysis also included eight at-grade railroad crossings of state highways identified by WSDOT as operationally sensitive to increases in train traffic (Figure 3.16-5). Each at-grade railroad crossing was assigned a label "R-X" for easy reference on figures.

Table 3.16-3 At-Grade Railroad Crossings Reviewed for Traffic Operations – Anacortes and Bellingham Subdivisions

At-Grade Crossing	Jurisdiction
R-1. March's Point Road	Anacortes
R-2. Bay-View Edison Road	Skagit County
R-3. Farm to Market Road	Skagit County
R-4. Higgins Airport Way	Skagit County
R-5. Avon Allen Road	Skagit County
R-6. Pulver Road	Skagit County
R-7. Garrett Road	Burlington
R-8. SR 20 / South Burlington Boulevard	WSDOT/Burlington
R-9. South Spruce Street	Burlington
R-10. South Walnut Street	Burlington
R-13. Fir Island Road	Skagit County
R-16. Old Hwy 99 South/ Blackburn Road	Mount Vernon



DATA SOURCE: (ESRI 2015, Skagit County 2015, WSDOT 2015)

Study Intersections
Proposed Project Site
Proposed Wetland Mitigation Site
Anacortes Subdivision
Bellingham Subdivision
BNSF Railway
Local Road
State Highway
Interstate Highway

Figure 3.16-2
STUDY AREA INTERSECTIONS REVIEWED FOR TRAFFIC OPERATIONS

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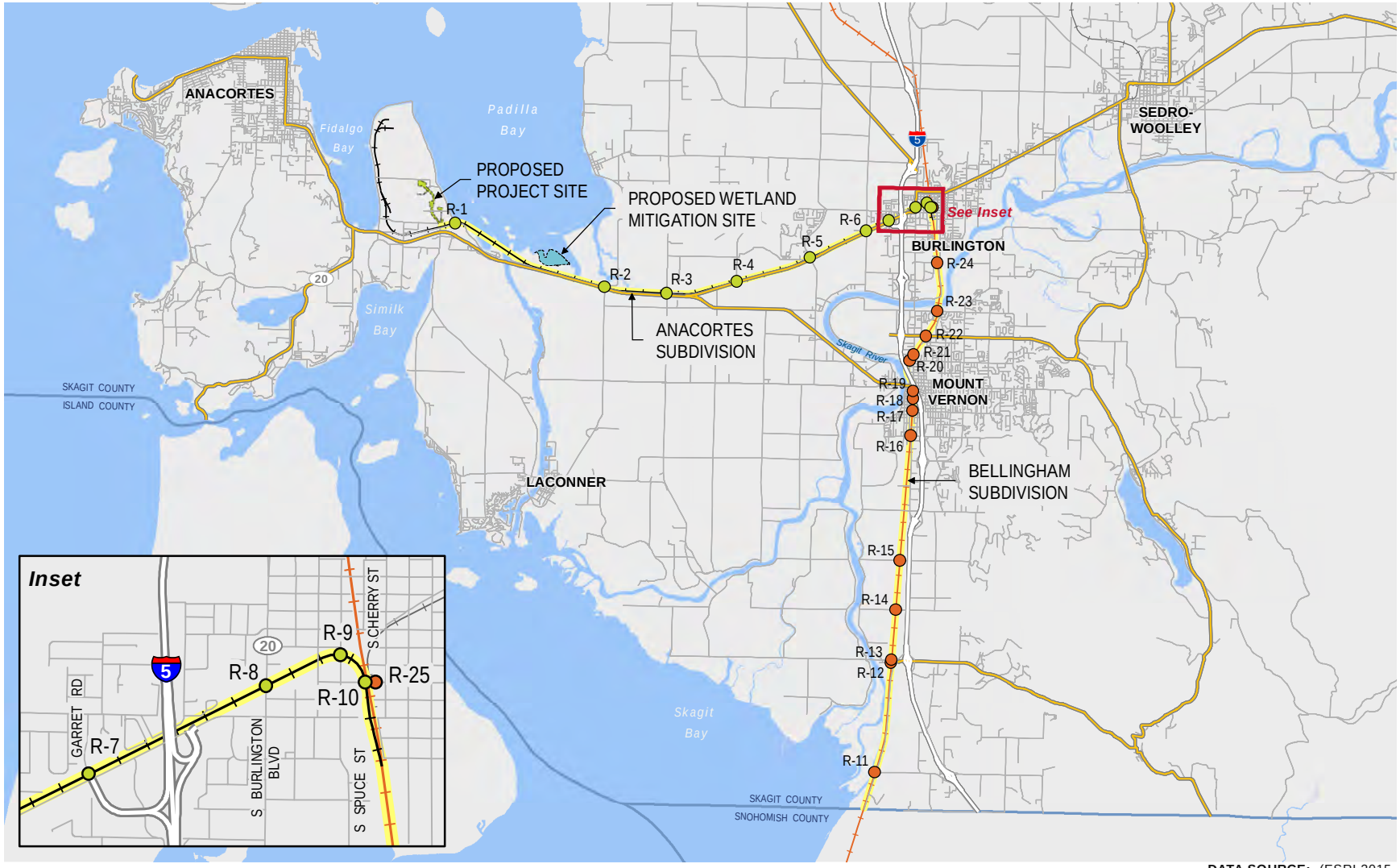

DATA SOURCE: (ESRI 2015, Skagit County 2015, WSDOT 2015)

Figure 3.16-3

AT-GRADE RAILROAD CROSSINGS STUDIED

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Traffic Operations and Vehicle Delays

Roadway traffic analysis involves assessing both the traffic volume at each at-grade railroad crossing and the turning movement data. The latter refers to the number of vehicles making left, through, and right movements at adjacent roadway intersections. Each of these conditions has the potential to affect the other. Roadway traffic was evaluated to determine how the road system would operate during the existing year (2016), opening year (2018), and future year (2038). To determine roadway conditions, the following steps were taken:

A vehicle waiting for a train to pass at Pease Road and E. Whitmarsh Road

1. Traffic volumes were modeled at at-grade railroad crossings and adjacent intersections where the annual average traffic volume was greater than 2,000 vehicles per day.
2. The modeled volumes were then used to calculate intersection delays (the average time in seconds that vehicles must wait before moving through an intersection) and vehicle *queue lengths* adjacent to the at-grade crossings.
3. Rail crossing times included in Chapter 3.15 – Rail Traffic and Transportation, were used to analyze wait times for vehicles at the crossings (Table 3.16-4).

A **queue length** is the distance that vehicles extend back from the intersection while waiting to move through. Queue lengths are typically longest during morning and afternoon "rush hours."

Intersection delay is typically expressed as a *level of service* (*LOS*) using methods established by the Transportation Research Board's Highway Capacity Manual, Special Report 209 (TRB 1994). The length of traffic queues at an intersection indicates how well an intersection functions. For this analysis, vehicle queue lengths were reviewed to determine the 95th percentile queues, defined as a queue length that has only a 5-percent chance of being exceeded. The 95th percentile queue is commonly used to set the length of a turn pocket at an intersection.

Level of Service (LOS) ranges from "A" to "F", with the letter "A" describing the least amount of congestion and best operations, and the letter "F" indicating the highest amount of congestion and worst operations.

For study area jurisdictions, LOS D or better is an acceptable standard for intersection function; LOS E or F represents unacceptable intersection function.

Table 3.16-4 Average Vehicle Delays at Rail Crossings

Level of Service (LOS)	Average Delay (seconds per vehicle)	Description
A	≤10	Free flow
B	>10 - 20	Stable flow (slight delays)
C	>20 - 35	Stable flow (acceptable delays)
D	>35 - 55	Approaching unstable flow
E	>55 - 80	Unstable flow
F	>80	Jammed

Traffic counts were gathered in the field in January 2016. A 2-percent growth rate was applied to the existing year peak hour traffic volumes to develop Year 2038 baseline traffic volumes for both the weekday AM and PM peak hours. The growth rate was calculated based on existing traffic data available along State Route (SR) 20/North Burlington Boulevard in the City of Burlington (City of Burlington 2005). This growth rate was also used to show a worst-case scenario, even though traffic volumes may grow at a lower rate.

Anticipated delays, or queues, were reviewed at the identified at-grade railroad crossings during the opening year (2018) and the design year of the project (2038). Many of these crossings are closely situated to a state route signalized intersection. An increase in train trips may increase traffic delays.

AFFECTED ENVIRONMENT

Anacortes and Bellingham Subdivisions

BNSF Railway manages the railway corridor through the study area. SR 20 runs east-west, parallel to the Anacortes Subdivision on its south side. The proposed project includes building a new rail spur from the Anacortes Subdivision to the Shell Puget Sound Refinery (PSR) property.

Existing year (2016) peak hour LOS and delay at the study intersections affected by construction and adjacent to the at-grade railroad crossings along the Anacortes and Bellingham subdivisions are listed in Table 3.16-5. Two intersections are currently operating at conditions worse than the standard of LOS D (shown in bold text): intersection I-33. South Burlington Boulevard / SR 20 (Rio Vista Avenue) and intersection I-44. 3rd Street / Kincaid Street.

Table 3.16-5 Existing (2016) Peak Hour Level of Service at Roadway Intersections – Anacortes and Bellingham Subdivisions

Intersection	Traffic Control	Level of Service Delay (seconds per vehicle)	
		AM	PM
I-1. Gibralter Road / SR 20	Two-way Stop	A (6.4)	C (5.2)
I-2. SR 20 / Oak Harbor / SR 20 Spur	Signal	C (23.0)	D (40.0)
I-3. Christianson Road / SR 20	Signal	B (19.7)	C (26.3)
I-4. March's Point Road / South March's Point Road	One-way Stop	A (1.2)	A (1.9)
I-5. March's Point Road / North Texas Road	One-way Stop	A (1.5)	A (0.6)
I-6. Thompson Road / South March's Point Road	One-way Stop	A (6.5)	A (9.4)
I-7. Thompson Road / SR 20	Signal	A (8.3)	A (2.1)
I-8. Reservation Road / SR 20	Signal	B (17.9)	B (17.7)
I-9. Reservation Road / South March's Point Road	One-way Stop	A (4.0)	A (4.5)
I-10. East March's Point Road / North Texas Road	One-way Stop	A (2.3)	A (0.6)
I-11. East March's Point Road / South March's Point Road	Two-Way Stop	A (1.3)	A (5.2)
I-12. Reservation Road / Wilbur Road	One-way Stop	A (0.4)	A (0.1)
I-13. LaConner Whitney Road / Bayview Edison Road	Two-way Stop	A (9.3)	A (1.3)
I-14. LaConner Whitney Road / SR 20	Signal	B (14.5)	C (22.0)
I-15. Farm to Market Road / McFarland Road	Two-way Stop	A (0.1)	A (1.2)
I-16. Farm to Market Road / SR 20	Signal	B (14.1)	B (19.9)
I-17. SR 536 (Memorial Highway) / SR 20	Signal	A (7.6)	A (9.8)
I-18. Higgins Airport Way / SR 20	Signal	A (15.9)	B (13.7)
I-19. Avon Allen Road / Ovenell Road	Two-way Stop	A (3.7)	A (2.6)
I-20. Avon Allen Road / SR 20	Signal	B (19.5)	C (22.0)
I-21. Pulver Road / Peterson Road	All-way Stop	A (9.9)	A (8.9)

Intersection	Traffic Control	Level of Service Delay (seconds per vehicle) AM	PM
I-22. Pulver Road / SR 20	Signal	B (18.2)	C (23.8)
I-23. Old Hwy 99 North / Kelleher Road	One-way Stop	A (1.3)	A (1.0)
I-24. Old Hwy 99 North / Cook Road	Signal	C (25.0)	D (47.5)
I-25. North Burlington Boulevard / SR 11	Roundabout	B (15.0)	C (16.1)
I-26. Garrett Road / Peterson Road	All-way Stop	A (9.8)	B (11.5)
I-27. Garrett Road / I-5 Southbound Ramp / SR 20	Signal	B (16.3)	C (25.5)
I-28. Nevitt Road / SR 20	Signal	B (13.8)	B (17.2)
I-29. I-5 Northbound Ramp / SR 20	Signal	C (28.3)	C (28.4)
I-30. Haggen Drive / SR 20 (Rio Vista Avenue)	Signal	B (15.1)	B (15.3)
I-31. North Burlington Boulevard / SR20 / Avon Avenue	Signal	A (7.8)	A (9.2)
I-32. North Burlington Boulevard / SR 20 / Fairhaven Avenue	Signal	B (15.6)	C (20.7)
I-33. South Burlington Boulevard / SR 20 / Rio Vista Avenue	Signal	C (25.0)	**F (>110)**
I-34. South Walnut Street / Washington Avenue	Two-way Stop	A (3.9)	A (5.7)
I-35. South Walnut Street / Greenleaf Avenue	Two-way Stop	A (1.8)	A (0.9)
I-36. South Spruce Street / Washington Avenue	Two-way Stop	A (0.5)	A (1.1)
I-37. South Spruce Street / Greenleaf Avenue	Two-way Stop	B (3.7)	B (5.0)
I-38. South Cherry Street / Greenleaf Avenue	Two-way Stop	A (0.8)	A (0.9)
I-39. I-5 Southbound Ramps / SR 538	Signal	B (10.1)	C (21.2)
I-40. I-5 Northbound Ramps / SR 538	Signal	C (22.6)	D (49.4)
I-41. Riverside Drive / SR 538	Signal	C (22.6)	D (32.3)
I-42. Continental Place / SR 538	Signal	B (12.5)	B (13.5)
I-43. Riverside Drive / North 4th Street / Fir Street	Signal	A (9.0)	B (12.9)
I-44. 3rd Street / Kincaid Street	Signal	C (25.6)	**E (58.7)**

Intersection	Traffic Control	Level of Service Delay (seconds per vehicle)	
		AM	PM
I-45. I-5 Southbound Ramps / Kincaid Street	Signal	A (9.5)	B (12.8)
I-46. I-5 Northbound Ramps / East Kincaid Street	Signal	D (54.1)	D (49.6)
I-47. Old Hwy 99 South / Blackburn Road	Signal	A (7.1)	A (6.3)
I-48. Dike Road / Fir Island Road	Two-way Stop	B (0.7)	A (0.9)
I-49. Pioneer Highway / Fir Island Road	Roundabout	A (7.7)	B (13.0)

Accident History

Table 3.16-6 provides accident history at railroad crossings along the Anacortes and Bellingham subdivisions. Ten years of crash history was obtained from the Federal Railroad Administration (FRA) website. In the table below, accidents have been categorized by severity: property damage only, injury, and fatality.

Table 3.16-6 At-Grade Railroad Crossings Crash Data – Anacortes and Bellingham Subdivisions

Roadway	USDOT Crossing Number	No. of Crashes in 10-Year Period (2005–2015)	Accident Type		
			PDO (Property Damage Only)	Injury	Fatality
I-16 / R-3. Farm to Market Road	092242X	0	0	0	0
I-20 / R-5. Avon Allen Road	092249V	0	0	0	0
I-26/R-7. Garrett Road	929012P	0	0	0	0
I-36/R-9. South Spruce Street	092259B	1	1	0	0
I-34/R-10. South Walnut Street	092260V	1	1	0	0
R-12. Spruce/Main Street	084733B	1	1	0	0
I-49/R-13. Fir Island Road	084734H	0	0	0	0
R-14. Peter Johnson Road	084735P	0	0	0	0
R-15. Stackpole Road	084736W	0	0	0	0

Roadway	USDOT Crossing Number	No. of Crashes in 10-Year Period (2005–2015)	Accident Type		
			PDO (Property Damage Only)	Injury	Fatality
I-44/R-18. SR 536 – Kincaid Street	084744N	0	0	0	0
R-19. Montgomery Street	084746C	1	1	0	0
R-20. Fir Street	084753M	0	0	0	0
I-41/R-21. Riverside Drive	084758W	3	0	2	1
R-22. College – SR 538	084759D	1	1	0	0
R-23. Hoag Road	084760X	0	0	0	0
R-24. Pease Road	084763T	0	0	0	0
R-25. Greenleaf Avenue	084764A	1	0	1	0
R27. I-5 / 88TH Street NE	084650M	1	0	1	0
R28. I-5 / 116th Street NE	084650M	1	0	1	0
R29. SR 531 / 172nd Street	084669E	0	0	0	0
R30. SR 536 / East Kincaid Street	084766N	0	0	0	0
R32. SR 104 / Main Street	085445K	1	1	0	0
R-33. SR 516 / Willis Street	085640K	0	0	0	0

ENVIRONMENTAL IMPACTS

No Action Alternative

Because no construction or operation would take place under the no action alternative, there would be no impacts to vehicle traffic and transportation.

Two intersections operate at unacceptable LOS under the existing conditions. As traffic volumes increase in 2038, several additional intersections would reach unacceptable LOS without the proposed project. There are potential indirect impacts associated with unacceptable LOS, including a decrease in air quality from vehicle emissions, lost time, increase in fuel expenditures, and negative impacts on economic growth.

Proposed Project and Wetland Mitigation Sites

Direct Impacts

Construction

Short-term, minor impacts on vehicular transportation would be expected during proposed project construction. Vehicle traffic would peak during the seven-month excavation period at 652 vehicles per day on local roads. During the remaining 15 months of construction, vehicle traffic would peak at 203 vehicles per day on local roads. These additional vehicles during construction would degrade the LOS at one intersection—Sharpes Corner (I-2. SR 20 / Oak Harbor / SR 20 Spur).

As described in Chapter 2 – Proposed Project and Alternatives, approximately 1.1 million cubic yards (cy) of material is expected to be excavated during construction activities. Of this material, some 400,000 cy would be hauled for use at the wetland mitigation site. The remaining material would be hauled to spoils disposal sites. In addition, approximately 175,000 cy of structural fill material appropriate for construction purposes would be imported to the proposed project site. This quantity is expected to require 55,000 truck trips in total, or 449 truck trips per day. If these trips were evenly distributed, that equates to a maximum of 26 in-and-out trips during any given hour, including the peak traffic hour of the day. Transport routes (capable of carrying trucks) would be established along existing routes. Approximately 144 truck trips per day would haul materials from the proposed project site to the wetland mitigation site. Approximately 244 truck trips per day would haul materials to potential spoils disposal sites. An estimated 61 truck trips per day would haul import fill to the construction site. No fill material is anticipated to arrive or depart via rail. There is the possibility that the new rail tracks would arrive via rail.

The number of construction employees is expected to be 200, which would add about 200 trips to both the morning and afternoon peak traffic periods. In addition, three trips would be made daily for materials deliveries. In total, 203 vehicles per day are expected on local roads for construction activities after excavation is complete (Table 3.16-7).

Table 3.16-7 Estimated Construction Trip Generation

Trip Type	Daily Trips[1]	Non-Peak Hour Trips	Weekday AM Peak Hour Trips		Weekday PM Peak Hour Trips	
			In	Out	In	Out
Construction Employees	200	0	200	0	0	200
Disposal Excavation Trips	244	196	24	24	24	24
Excavation Trips (Mitigation Site)	144	116	14	14	14	14

Trip Type	Daily Trips[1]	Non-Peak Hour Trips	Weekday AM Peak Hour Trips		Weekday PM Peak Hour Trips	
			In	Out	In	Out
Import Fill	61	49	6	6	6	6
Material Deliveries	3	3	0	0	0	0

1. Daily trips result in up to 652 vehicles per day for the excavation period and up to 203 vehicles per day for the nonexcavation period.

Construction workers are anticipated to travel primarily to and from the east using SR 20 to access the project site. A smaller percentage is expected to travel to and from the west. Construction activities on the Shell PSR property would mostly occur during daylight hours for 10 hours per day, four days per week (Monday through Thursday). However there may be a need to work outside these hours because of schedule or time constraints. No night work is currently anticipated.

The distribution of construction employee traffic was based on existing travel patterns in the area. Seventy percent is expected to travel to and from the east to the communities of Mount Vernon, Burlington, and Sedro-Woolley, among others. Thirty percent is expected to travel to and from the west to the communities of Anacortes and Oak Harbor.

Construction of the new rail unloading facility is anticipated to occur over a two-year period. An annual growth rate of 2.0 percent was applied to traffic movements at the study intersections. In addition to *background traffic* growth, construction traffic associated with delivery of materials and hauling fill were included. The total construction year AM and PM peak hour background traffic volumes and operations are presented in Table 3.16-8. Only one intersection during construction is shown to operate at conditions worse than the standard of LOS D—intersection I-2. SR 20 / Oak Harbor / SR 20 Spur at Sharpes Corner. In July 2016, WSDOT announced that a roundabout will be installed at this intersection to relieve traffic congestion and improve safety (WSDOT 2016). The remaining study intersections are forecast to operate at LOS D or better and satisfy local LOS criteria. At the intersections that exceed LOS criteria, traffic conditions would likely be worse with or without the proposed project.

Background traffic is comprised of vehicles that are present on the roadway today during the AM and PM peak hours.

Table 3.16-8 2017 Construction Peak Hour Level of Service at Roadway Intersections – Anacortes and Bellingham Subdivisions

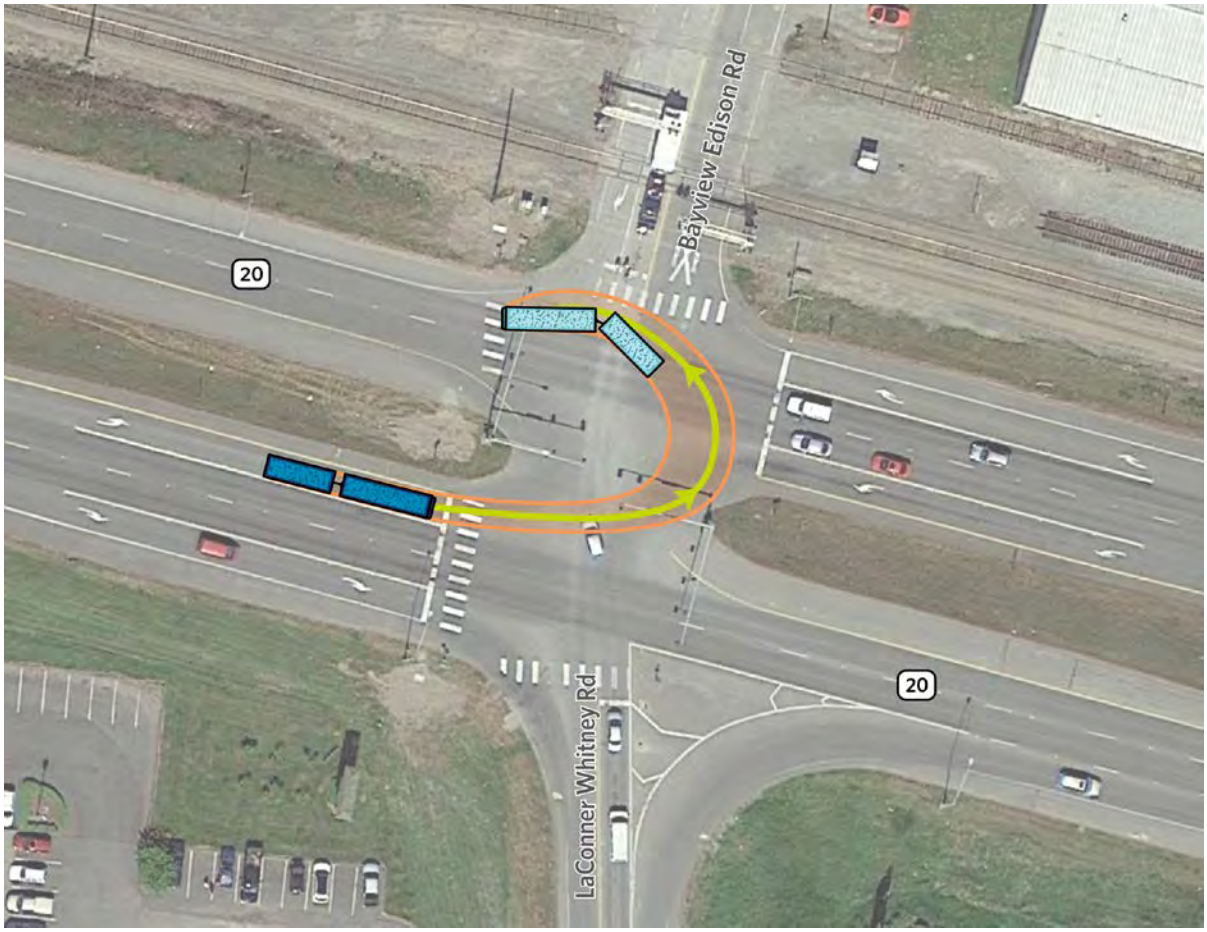
Intersection	Traffic Control	Level of Service (LOS) WITH Construction Trips (Delay, seconds per vehicle)	
		AM	PM
I-1. Gibralter Road / SR 20	Signal	A (7.4)	A (5.9)
I-2. SR 20 / Oak Harbor / SR 20 Spur	Signal	C (27.9)	E (75.8)
I-3. Christianson Road / SR 20	Signal	B (17.9)	C (29.0)
I-4. March's Point Road / South March's Point Road	One-way Stop	A (1.8)	A (8.2)
I-5. March's Point Road / North Texas Road	One-way Stop	A (0.4)	A (2.7)
I-6. Thompson Road / Bartholomew Road	Two-way Stop	A (6.5)	A (9.6)
I-7. Thompson Road / SR 20	Signal	B (16.7)	B (18.5)
I-8. Reservation Road / SR 20	Signal	B (14.9)	D (48.1)
I-9. Reservation Road / South March's Point Road	One-way Stop	A (8.1)	A (7.1)
I-10. East March's Point Road / North Texas Road	One-way Stop	A (7.0)	A (2.7)
I-11. East March's Point Road / South March's Point Road	Two-way Stop	A (6.9)	A (8.3)
I-12. Reservation Road / Wilbur Road	One-way Stop	A (2.9)	A (2.4)
I-14. LaConner Whitney Road / SR 20	Signal	B (18.7)	D (39.2)
I-16. Farm to Market Road / SR 20	Signal	B (18.3)	C (31.1)
I-17. SR 536 (Memorial Highway) / SR 20	Signal	A (6.1)	B (11.3)
I-18. Higgins Airport Way / SR 20	Signal	B (13.2)	B (14.4)
I-20. Avon Allen Road / SR 20	Signal	B (18.8)	C (24.0)

Intersection	Traffic Control	Level of Service (LOS) WITH Construction Trips (Delay, seconds per vehicle)	
		AM	PM
I-22. Pulver Road / SR 20	Signal	B (17.9)	B (19.1)
I-23. Old Hwy 99 North / Kelleher Road	One-way Stop	A (2.1)	A (1.6)
I-24. Old Hwy 99 North / Cook Road	Signal	C (23.4)	C (30.3)
I-25. North Burlington Boulevard / SR 11	Roundabout	B (14.9)	C (17.6)
I-27. Garrett Road / I-5 Southbound Ramp / SR 20	Signal	B (14.2)	C (27.9)
I-28. Nevitt Road / SR 20	Signal	B (13.5)	C (20.3)
I-29. I-5 Northbound Ramp / SR 20	Signal	B (11.0)	A (9.8)
I-30. Haggen Drive / SR 20 (Rio Vista Avenue)	Signal	B (15.6)	B (14.2)
I-31. North Burlington Boulevard / SR 20 / Avon Avenue	Signal	A (9.1)	A (8.7)
I-32. North Burlington Boulevard / SR 20 / Fairhaven Ave	Signal	B (12.1)	B (19.3)
I-33. North Burlington Boulevard /SR 20/SR 20 (Rio Vista Ave)	Signal	B (17.0)	D (42.8)

Proposed haul routes are illustrated on Figure 3.16-1. The haul route to the proposed wetland mitigation site is more complicated than those to the disposal sites. Inset B of Figure 3.16-1 illustrates one alternative for trucks to enter the wetland mitigation site. Trucks would turn left from eastbound SR 20 followed by an immediate right onto the frontage road (Josh Green Lane) between the railroad tracks and westbound SR 20. Trucks would then take a left from the frontage road across the railroad tracks before taking an immediate right paralleling the railroad tracks and then entering the wetland mitigation site.

Another alternative, illustrated in Figure 3.16-4 (below), would have trucks travel along eastbound SR 20 and make a U-turn at LaConner Whitney Road. The U-turn movement would require additional left-turn green time at the traffic signal. The westbound trucks would then make a right turn to cross the railroad tracks, and a right turn again to parallel the railroad tracks before entering the wetland mitigation site.

Figure 3.16-4 U-Turn Movement at I-14 LaConner Whitney Road/ SR 20



Operation

The proposed project would add two daily Shell unit trains (one in each direction) through the study area. Regardless of traffic volume, each additional train crossing would create intersection delays that do not occur under existing conditions. The extent of impacts would depend on the time of day the additional train crossings occur. For the traffic analysis, a worst-case assumption was used: the additional train would travel through the study area during the PM peak hour.

As described in Chapter 3.15 – Rail Traffic and Transportation, the roadway blockage duration associated with the proposed project unit trains on the Anacortes Subdivision would be up to approximately 8 minutes for a train traveling at 10 miles per hour (mph), thereby causing delay in local vehicle trips. This crossing blockage time of 8 minutes is less than the maximum allowed blockage time of 10 consecutive minutes (WAC 480-62-220) and is the worst case as trains may travel between 10 and 25 mph along the Anacortes Subdivision.

Two intersections during opening year (2018) are shown to operate at conditions worse than the standard of LOS D: intersection I-33. South Burlington Boulevard / SR 20 (Rio Vista Avenue) and intersection I-44. 3rd Street / Kincaid Street. The failing delays for these intersections are highlighted with bold text in Table 3.16-9.

Table 3.16-9 Rail Unloading Facility Opening Year (2018) Peak Hour Level of Service at Roadway Intersections – Anacortes and Bellingham Subdivisions

Intersection	Traffic Control	Level of Service (LOS) (Delay, seconds per vehicle)	
		AM	PM
I-11. March's Point Road / South March's Point Road	Two-way Stop	A (1.3)	A (5.2)
I-13. LaConner Whitney Road / Bayview Edison Road	Two-way Stop	A (9.3)	A (1.3)
I-14. LaConner Whitney Road / SR 20	Signal	B (14.5)	C (22.0)
I-15. Farm to Market Road / McFarland Road	Two-way Stop	A (0.1)	A (1.2)
I-16. Farm to Market Road / SR 20	Signal	B (14.1)	B (19.9)
I-18. Higgins Airport Way / SR 20	Signal	A (15.9)	B (13.7)
I-19. Avon Allen Road / Ovenell Road	Two-way Stop	A (3.7)	A (2.6)
I-20. Avon Allen Road / SR 20	Signal	B (19.5)	C (22.0)
I-21. Pulver Road / Peterson Road	All-way Stop	A (9.9)	A (8.9)
I-22. Pulver Road / SR 20	Signal	B (18.2)	C (23.8)
I-26. Garrett Road /Peterson Road	All-way Stop	A (9.8)	B (11.5)
I-29. I-5 Northbound Ramp / SR 20	Signal	C (28.3)	C (28.4)
I-32. North Burlington Boulevard/SR 20 (Fairhaven Ave)	Signal	B (15.6)	C (20.7)
I-33. South Burlington Boulevard / SR 20 (Rio Vista Ave)	Signal	C (25.0)	**F (>110)**
I-34. South Walnut Street / Washington Avenue	Two-way Stop	A (3.9)	A (5.7)

Intersection	Traffic Control	Level of Service (LOS) (Delay, seconds per vehicle)	
		AM	PM
I-35. South Walnut Street / Greenleaf Avenue	Two-way Stop	A (1.8)	A (0.9)
I-36. South Spruce Street / Washington Avenue	Two-way Stop	A (0.5)	A (1.1)
I-37. South Spruce Street / Greenleaf Avenue	Two-way Stop	B (3.7)	B (5.0)
I-38. South Cherry Street / Greenleaf Avenue	Two-way Stop	A (0.8)	A (0.9)
I-39. I-5 Southbound Ramps / SR 538 (College Way)	Signal	B (10.1)	C (21.2)
I-40. I-5 Northbound Ramps / SR 538 (College Way)	Signal	C (22.6)	D (49.4)
I-41. Riverside Drive / SR 538 (College Way)	Signal	C (22.6)	C (32.3)
I-42. Continental Place / SR 538 (College Way)	Signal	B (12.5)	B (13.5)
I-43. Riverside Drive / North 4th Street / Fir Street	Signal	A (9.0)	B (12.9)
I-44. 3rd Street / Kincaid Street	Signal	C (25.6)	**E (58.7)**
I-45. I-5 Southbound Ramps / Kincaid Street	Signal	A (9.5)	B (12.8)
I-46. I-5 Northbound Ramps /Kincaid Street	Signal	D (54.1)	D (49.6)
I-47. Old Hwy 99 South / Blackburn Road	Signal	A (7.1)	A (6.3)
I-48. Dike Road / Fir Island Road	Two-way Stop	B (0.7)	A (0.9)
I-49. Pioneer Highway / Fir Island Road	Roundabout	A (7.7)	B (13.0)

Table 3.16-10 reports the build-out year 2038 baseline traffic conditions for the respective weekday AM and PM peak hour periods. Due to the increase in traffic volumes, there would be nine intersections that operate below LOS D standards in 2038. The failing delays for these intersections are highlighted in bold text.

Table 3.16-10 Rail Unloading Facility Build-Out Year (2038) Level of Service at Roadway Intersections – Anacortes and Bellingham Subdivisions

Intersection	Traffic Control	Level of Service (LOS) (Delay, seconds per vehicle)	
		AM	PM
I-11. East March's Point Road / South March's Point Road	Two-way Stop	A (1.3)	A (5.6)
I-13. LaConner Whitney Road / Bayview Edison Road	Two-way Stop	A (2.1)	**F (>110**)**
I-14. LaConner Whitney Road / SR 20	Signal	**F (>110**)**	**F (>110**)**
I-15. Farm to Market Road /McFarland Road	Two-way Stop	A (0.2)	A (1.5)
I-16. Farm to Market Road / SR 20	Signal	**E (60.2)**	**F (>110**)**
I-18. Higgins Airport Way / SR 20	Signal	A (16.6)	C (22.5)
I-19. Avon Allen Road / Ovenell Road	Two-way Stop	A (3.9)	A (2.9)
I-20. Avon Allen Road / SR 20	Signal	B (22.8)	C (33.6)
I-21. Pulver Road /Peterson Road	Four-way Stop	A (9.7)	B (10.5)
I-22. Pulver Road / SR 20	Signal	B (17.1)	C (31.5)
I-26. Garrett Road / Peterson Road	Four-way stop	B (11.7)	C (18.0)
I-29. I-5 Northbound Ramp /SR 20	Signal	C (27.0)	**E (56.1)**
I-32. North Burlington Boulevard / SR 20 / Fairhaven Ave	Signal	B (18.6)	D (45.4)
I-33. South Burlington Boulevard/SR 20 /SR 20 (Rio Vista Ave)	Signal	C (24.1)	**F (113.5)**
I-34. South Walnut Street / Washington Avenue	Two-way Stop	A (4.2)	A (6.1)
I-35. South Walnut Street / Greenleaf Avenue	Two-way Stop	A (1.8)	A (1.0)
I-36. South Spruce Street / Washington Avenue	Two-way Stop	**F (>110**)**	**F (>110**)**
I-37. South Spruce Street / Greenleaf Avenue	Two-way Stop	A (5.4)	**E (45.7)**

Intersection	Traffic Control	Level of Service (LOS) (Delay, seconds per vehicle)	
		AM	PM
I-38. South Cherry Street / Greenleaf Avenue	Two-way Stop	A (0.9)	A (1.0)
I-39. I-5 Southbound Ramps / SR 538 (College Way)	Signal	B (10.1)	D (38.6)
I-40. I-5 Northbound Ramps / SR 538 (College Way)	Signal	C (22.6)	**F (88.0)**
I-41. Riverside Drive / SR 538 (College Way)	Signal	C (22.6)	**F (100.8)**
I-42. Continental Place / SR 538 (College Way)	Signal	B (10.6)	D (38.3)
I-43. Riverside Drive / North 4th Street/ Fir Street	Signal	A (9.0)	B (12.9)
I-44. 3rd Street/ Kincaid Street	Signal	C (23.2)	C (30.0)
I-45. I-5 Southbound Ramps / Kincaid Street	Signal	B (15.2)	C (25.7)
I-46. I-5 Northbound Ramps / Kincaid Street	Signal	B (18.7)	D (51.9)
I-47. Old Hwy 99 South / Blackburn Road	Signal	A (6.6)	A (7.4)
I-48. Dike Road / Fir Island Road	Two-way Stop	A (0.9)	A (1.2)
I-49. Pioneer Highway / Fir Island Road	Roundabout	B (13.0)	C (20.8)

** Delay beyond limits of Highway Capacity Manual model.

As described in Chapter 2 – Proposed Project and Alternatives, the number of employees commuting to the site would likely increase by 25 during long-term operation of the proposed project.

Queue lengths were calculated with opening year traffic volumes (Year 2018) and future traffic volumes (Year 2038) at each at-grade railroad crossing within Skagit County. Average vehicle queue lengths at these crossings vary depending on the number of lanes, the length of the gate-down time during a crossing event, and the approaching vehicle volume. The queue length per travel lane for a single unit train event during opening year (2018) and the build-out year (2038) is shown in Table 3.16-11. The 8-minute blockage time is less than the maximum

See Appendix F for the calculations that show how the average number of total vehicles stopped was estimated.

10-minute allowable blockage time. Queue lengths would spill back into intersections I-32 and I-33 from railroad crossing R-8 due to the volume of traffic along that portion of South Burlington Boulevard.

Table 3.16-11 Opening Year (2018) and Build-Out Year (2038) Queue Length per Travel Lane at At-Grade Railroad Crossings – PM Peak Hour

At-Grade Crossing	2018 Queue Length per Travel Lane (feet)	2038 Queue Length per Travel Lane (feet)
R-1. March's Point Road	190	290
R-2. Bayview Edison Road	105	165
R-3. Farm to Market Road	550	830
R-4. Higgins Airport Way	210	320
R-5. Avon Allen Road	340	490
R-6. Pulver Road	150	220
R-7. Garrett Road	375	575
R-8. SR 20/ South Burlington Boulevard	1260	1945
R-9. South Spruce Street	200	300
R-10. South Walnut Street	80	110
R-13. Fir Island Road	60	80
R-17. Old Hwy 99 South/Blackburn	120	180

Extended Study Area

Direct Impacts

The Washington Utilities and Transportation Commission (WUTC) has compiled an inventory of 347 public at-grade railroad crossings along routes used by BNSF Railway and Union Pacific Railroad to transport crude oil across the state (WUTC 2015). Of these at-grade crossings, WSDOT identified 47 operationally sensitive crossing locations. Of the WSDOT-identified locations, eight at-grade railroad crossings are located along the delivery route of the proposed project, as listed in Table 3.16-12 and shown on Figure 3.16-5. None of the at-grade railroad crossings identified was located solely along the return route from the Shell PSR.

To determine the impacts of unit trains traveling to the Shell PSR at these locations, the highest volume sensitive crossing was analyzed at SR 516 (R-33). As described in Chapter 3.15 – Rail Traffic and Transportation, the roadway blockage duration associated with the proposed project

unit trains at R-33 would be approximately 2 minutes, 11 seconds. The average number of vehicles stopped for a single unit train event at this location is 73 vehicles. The other sensitive locations analyzed would stop fewer vehicles.

Table 3.16-12 WSDOT-Identified Operationally Sensitive At-Grade Railroad Locations

Road Name[1]	County	Rail Alignment
R-26. SR 528 4th Avenue	Snohomish	Delivery Route/Return Route
R-27. I-5 / 88th Street NE	Snohomish	Delivery Route/Return Route
R-28. I-5 / 116th Street NE	Snohomish	Delivery Route/Return Route
R-29. SR 531 172nd Street	Snohomish	Delivery Route/Return Route
R-30. SR 536 East Kincaid Street	Skagit	Delivery Route/Return Route
R-31. SR 538 West College Way	Skagit	Delivery Route/Return Route
R-32. SR 104 Main Street	Snohomish	Delivery Route
R-33. SR 516 Willis Street	King	Delivery Route

1. The numbered railroad crossings (R27 through R33) correspond to the rail crossings in Chapter 3.15 – Rail Traffic and Transportation.

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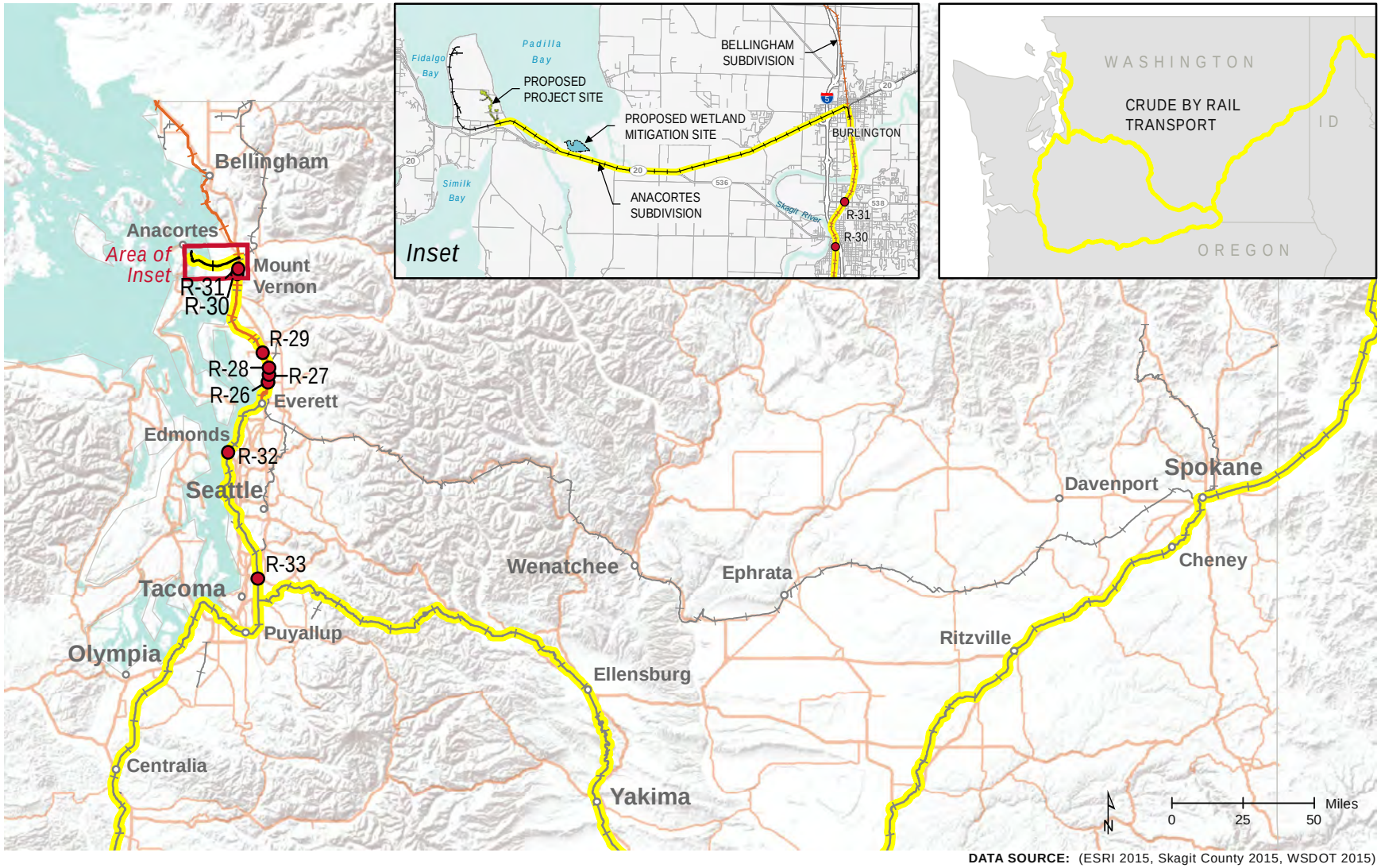

DATA SOURCE: (ESRI 2015, Skagit County 2015, WSDOT 2015)

Railroad Crossings Studied
Proposed Project Site
Proposed Wetland Mitigation Site
Anacortes Subdivision
Bellingham Subdivision
BNSF Railway
Crude-by-Rail Transport Route
Major Road

Figure 3.16-5
WSDOT-IDENTIFIED OPERATIONALLY SENSITIVE AT-GRADE RAILROAD LOCATIONS

WSDOT has indicated that increases in train traffic at these eight crossing locations and from other similar rail proposals, would eventually require some degree of mitigation to address impacts related to safety, traffic circulation, vehicle delay, or emergency response capability. Operational improvements could involve fleeting (sending all trains in one direction on certain segments) and adjusting scheduling/timing, speed, and size of trains on particular segments. Physical mitigation measures could include upgrading passive crossings to active safety crossings, rerouting high-traffic vehicular routes to use existing grade-separated crossings, adding U-turns to allow drivers to easily access alternate routes, and/or installing grade-separated crossings with a bridge or underpass.

Cumulative Impacts

The proposed project would add six weekly unit trains in each direction. The gate-down time duration associated with each proposed project unit train trip would be approximately 8 minutes at intersections within the Anacortes Subdivision. The 8-minute blockage time is less than the maximum 10-minute allowable blockage time (WAC 480-62-220). No other reasonably foreseeable future action is associated with this rail line specific to crossings or intersections. The direct impact of the proposed project is additional intersection traffic delays at crossings. However, as there are no other reasonably foreseeable future actions on the Anacortes Subdivision, the proposed project would not contribute to a cumulative impact.

Proposed traffic improvements in Skagit County

The Skagit Council of Governments (SCOG) has identified potential measures to improve at-grade crossings in Skagit County (SCOG 2016). Improvements were identified at the following locations:

- R-8. SR 20/ South Burlington Boulevard.
- R-16. Old Hwy 99 South/ Blackburn Road.
- R-18. SR 536/ Kincaid Street.
- R-22. College Way/ Continental Place.
- R-5. SR 20/ Avon Allen Road.

These at-grade crossing locations are anticipated to be impacted by an increase in rail traffic on the Anacortes Subdivision, creating subsequent vehicle delays. At-grade railroad crossings identified for mitigation measures including grade-separated crossings and advance message signs.

Most of these locations are on state routes, which are maintained by WSDOT. Funding for these projects is likely to come from a mix of sources, including the gas tax increases passed in 2003 and 2005, the Washington State Legislature, and federal funding mechanisms such as the Highway Trust Fund and the General Fund.

The proposed project, combined with the past, present, and reasonably foreseeable future actions, would have a cumulative impact on traffic delays at at-grade crossings along the Bellingham Subdivision. The Gateway Pacific Terminal project, would add an estimated total of 18 train trips per day along to rail traffic on the Bellingham Subdivision (Gateway Pacific Terminal 2013). Combined with the proposed project, this would increase the daily train volume from 21 to 41 trains per day, which would lead to additional delays at at-grade crossings. Although they would represent a small portion of existing and projected traffic, the additional proposed Shell unit trains would contribute to a cumulative impact on traffic delays.

For WSDOT-identified sensitive rail crossings on the Scenic and Seattle subdivisions, shown on Figure 2.9 in Chapter 2, the proposed project would add six unit trains per week with an estimated gate-down time of approximately 2 minutes per trip. At the busiest rail crossing studied (SR 104), an average of 73 vehicles would be stopped by a single unit train event (using 2018 traffic volumes). The projected 2035 train volumes on the Scenic and Seattle subdivisions are 64 and 77 trains, respectively (WSDOT 2014). The additional trains per day comprise 3.1 percent (Scenic) and 2.6 percent (Seattle) of these projected train volumes. Therefore, the proposed project, combined with past, present, and reasonably foreseeable future actions, would have a cumulative impact on vehicular transportation for these intersections.

MITIGATION MEASURES

Avoidance and Minimization

Shell has incorporated engineering and operational measures into the design of the proposed project to avoid and minimize impacts to vehicle traffic and transportation including:

- The configuration of the new rail spur and unloading facility has been designed to allow an incoming unit train to quickly clear the Anacortes Subdivision during arrival and departure without blocking any public at-grade crossings.
- To the extent feasible with BNSF Railway train schedules, Shell would request that BNSF Railway schedule trains to arrive and depart during non-peak vehicle traffic hours.

In addition, impacts to vehicle traffic and transportation would be minimized by the implementation of the best management practices (BMPs) recommended as part of the Shoreline Substantial Development Permit. For example, degradation of the level of service at the SR 20 / Oak Harbor / SR 20 Spur intersection at Sharpes Corner would be minimized by the following measures:

- Making arrangements for vanpools, or providing incentives for carpools among construction employees.
- Encouraging construction employees to arrive and depart at variable times.
- Switching start and end shift times to time periods outside of the AM and PM peak periods.

Mitigation

The proposed project, when considered with other reasonably foreseeable future projects, would increase delays at at-grade crossings along the Anacortes and Bellingham Subdivisions. This potential cumulative impact would be mitigated by:

- Shell would fund a study to evaluate the feasibility of implementing signal timing revisions at the at-grade crossings listed below along the Bellingham and Anacortes subdivisions in Skagit County. Revisions to the timing of traffic signals can reduce the time for trips through the intersection, thereby reducing overall delays. If the revisions are feasible, and the jurisdiction agrees, Shell would provide the funding for implementation. The following crossings would be analyzed if the jurisdictions agree:

- Christianson Road / SR 20.
- LaConner Whitney Road / SR 20.
- Avon Allen Road / SR 20.
- Pulver Road / SR 20.
- Old Hwy 99 North / Cook Road.
- Garrett Road / I-5 Southbound Ramp / SR 20.
- North Burlington Boulevard / SR 20 / Fairhaven Avenue.
- South Burlington Boulevard / SR 20 / Rio Vista Avenue.
- I-5 Southbound Ramps / SR 538.
- I-5 Northbound Ramps / SR 538.
- Riverside Drive / SR 538.
- 3rd Street / Kincaid Street.
- I-5 Northbound Ramps / East Kincaid Street.

Recommended signal timing revisions to the intersections would be prepared in a report format and would be submitted to WSDOT and the appropriate local jurisdictions for review and comment. Staff at these agencies would provide comments and decide upon implementation.

3.17 PUBLIC SERVICES AND INCIDENT RESPONSE

Public services contribute greatly to the general welfare of local communities. Police, fire, and emergency medical responders help to promote safety and protect life and property. Industries, railroads, and government agencies plan and respond to human-caused accidents such as fires or spills of hazardous substances that can impact people and the environment. This chapter describes existing public services and incident response in the study area and the proposed project's potential impacts on them.

STUDY AREA AND METHODOLOGY

The study area used to analyze impacts to public services and incident planning and response includes the proposed project site, the proposed wetland mitigation site, and the Anacortes and Bellingham subdivisions within Skagit County. An extended study area was determined for potential impacts of the proposed crude-by-rail transport route through Washington beginning at Sandpoint Junction, Idaho. Sandpoint Junction is approximately 22 miles east of the Washington-Idaho state line and is where the BNSF Railway main line meets the Montana Rail Link line. Existing services at the proposed project site and the crude-by-rail transport routes were evaluated, and the potential demands on services that would be caused by the proposed project were assessed. The cumulative impacts study area for public services and incident response is the same as described for the direct and indirect impacts.

Select laws, regulations, and guidance applicable to public services and incident response, including hazardous materials accidents, associated with the proposed project are summarized in Table3.17-1.

Table 3.17-1 Laws, Regulations, and Guidance for Project-Related Public Services and Incident Response

Laws, Regulations, and Guidance	Description
Federal	
Department of Transportation Hazardous Materials Regulations (49 CFR 100–185)	Governs the transportation of hazardous materials in all modes of transportation—air, highway, rail, and water.

Laws, Regulations, and Guidance	Description
Clean Water Act (CWA), Section 311 (33 USC 1251 et seq.)	Establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulates quality standards for surface water. Section 311(b)(3) of the Clean Water Act prohibits the discharge of threshold amounts of oil or hazardous substances into U.S. navigable waters.
U.S. Environmental Protection Agency (USEPA) Spill Prevention, Control, and Countermeasure Plan and Facility Response Plan (40 CFR 112)	Provides guidelines for the prevention and response plans for accidental discharges of oils and hazardous substances into the waters of the United States.
U.S. Coast Guard Facility Operations Manual (33 CFR 154, Subpart F)	Establishes oil spill response plan requirements for all marine transportation-related facilities that could reasonably be expected to cause substantial harm or significant and substantial harm to the environment by discharging oil into or on the navigable waters.
Federal Railroad Administration (FRA) General Regulations (49 CFR Parts 200 299)	Established the Surface Transportation Board—an independent adjudicatory and economic-regulatory agency charged by Congress with resolving railroad rate and service disputes and reviewing proposed railroad mergers.
Comprehensive Environmental Response, Compensation, and Liability Act CERCLA) (42 USC)	Establishes prohibitions and requirements concerning closed and abandoned hazardous waste sites, provides for liability of persons responsible for releases of hazardous waste at these sites, and establishes a trust fund to provide for cleanup when no responsible party can be identified.
Superfund Amendment and Reauthorization Act (SARA) (40 CFR 302)	Amended CERCLA to stress the importance of permanent remedies and innovative treatment technologies in cleaning up hazardous waste sites. Requires actions to consider the standards and requirements found in other state and federal environmental laws and regulations; provides new enforcement authorities and settlement tools, increases state involvement in every phase of the program and the focus on human health problems posed by hazardous waste sites; encourages greater citizen participation in making decisions on how sites should be cleaned up; and increases the size of the trust fund.
Resource Conservation and Recovery Act (RCRA) (42 USC 6901 et seq.)	Gives the USEPA the authority to control hazardous waste from the "cradle-to-grave." This includes the generation, transportation, treatment, storage, and disposal of hazardous waste. Also sets forth a framework for the management of non-hazardous solid wastes. This is a delegated Washington State program under the Washington Hazardous Waste Management Act.

Laws, Regulations, and Guidance	Description
Toxic Substances Control Act (15 USC 2601–2629)	Provides USEPA with authority to require reporting, record-keeping and testing requirements, and restrictions relating to chemical substances and/or mixtures.
Occupational Safety and Health Act (OSHA) (29 USC 651 et seq.)	Enacted to "assure safe and healthful working conditions for working men and women." Sets standards and enforces inspections to ensure that employers are providing safe and healthful workplaces.
State	
State Environmental Policy Act (SEPA) (RCW 43.21c; WAC 197-11)	Helps state and local agencies in Washington identify possible environmental impacts that could result from a proposed action, alternatives to the proposed action, and potential impact minimization and mitigation measures. Information learned through the review process can be used to change a proposal to reduce likely impacts and inform permitting decisions at the state and local levels.
Water Pollution Control Act and Water Quality Standards for Groundwaters of the State of Washington (RCW 90.48; WAC-173-200)	Maintains the highest possible standards to ensure the purity of all waters of Washington State are consistent with public health and public enjoyment, the propagation and protection of wildlife, birds, game, fish, and other aquatic life and industrial development of the state. To that end, requires the use of all known available and reasonable methods by industries and others to prevent and control the pollution of state waters. Establishes and implements policies to maintain the highest quality of the state's groundwaters and protects existing and future beneficial uses of the groundwater through the reduction or elimination of the discharge of contaminants.
Washington State Oil and Hazardous Substance Spill Prevention and Response (RCW 90.56)	Establishes a comprehensive prevention and response program to protect Washington's waters and natural resources from oil spills. Anyone responsible for spilling oil into state waters is liable for damages resulting from injuries to public resources.
Oil Movement by Rail and Pipeline Notification Rule (WAC 173-185) (Effective October 1, 2016)	Oil Movement by Rail and Pipeline Notification to enhance oil spill preparedness and response in Washington State. Establishes reporting standards for facilities that receive crude oil by rail, and pipelines that transport crude oil in or through the state. Additionally, the rule identifies reporting standards for the Washington State Department of Ecology (Ecology) to share information with emergency responders, local governments, tribes, and the public.

Laws, Regulations, and Guidance	Description
Oil Spill Contingency Plan - Railroad Rule (WAC 173-186; RCW 90.56) (Effective October 1, 2016)	These regulations establish oil spill contingency plan, drill and equipment verification requirements, and provisions for inspection of records for owners and operators of railroad required to submit oil spill contingency plans under chapter 90.56 RCW, and for the response contractors that support the implementation of the railroad plans. The adoption of this rule will require railroads to develop and maintain contingency plans approved by Ecology.
Washington State Hazardous Waste Management Act (RCW 70.105, and WAC 173–303)	Establishes and implements a comprehensive statewide framework for the planning, regulation, control, and management of hazardous waste that will prevent land, air, and water pollution and conserve the natural, economic, and energy resources of the state.
Model Toxics Control Act (MTCA) and Cleanup Regulation (RCW 70.105D; WAC 173-340)	Sets cleanup standards to ensure that the quality of cleanup and protection of human health and the environment are not compromised and requires potentially liable persons to assume responsibility for cleaning up contaminated sites.
Washington State Solid Waste Handling Standards (WAC 173–350)	Set standards for the proper handling and disposal of solid waste.
Washington State Hazardous Waste Operations (WAC 296–843)	Applies to facilities that have workers handling hazardous waste at a treatment, storage, or disposal facility and are required to have a permit under RCRA. The Shell Puget Sound Refinery has RCRA Permit: WAD 009 276 197.
Oil Spill Natural Resource Damage Assessment (WAC 173-183)	Establishes procedures for convening a resource damage assessment committee, pre-assessment screening of resource damages resulting from oil spills to determine which damage assessment methods to use, and determining damages in cases where the compensation schedule is selected as the damage assessment methodology to apply.
Industry Agreements	
Mutual Aid Agreement for Rail Emergency Response	In 2015, Shell and the other Washington refineries entered into a Mutual Aid Agreement with BNSF Railway to share personnel and resources in the event of a rail accident involving crude oil in Washington State.

AFFECTED ENVIRONMENT

Proposed Project and Wetland Mitigation Sites

Public Services

Fire Protection and Emergency Medical Response

Fire protection and emergency medical response support services are available to address accidents at the Shell Puget Sound Refinery (PSR) and the surrounding areas, including the wetland mitigation site. Those services include localized support at the Shell PSR, as well as a broader network made possible by established mutual aid agreements with fire districts throughout the region (Figure 3.17-1).

The **Incident Command System (ICS)** is a standardized approach to integrating facilities, equipment, personnel, procedures, and communications into an organized structure so emergency responders from multiple agencies can be effective. The National Incident Management System establishes a unified command structure for responses and includes federal, state, local on-scene coordinators, and tribal and agency representatives with jurisdiction.

The Shell PSR maintains teams of trained personnel to respond to fire and medical emergencies, as well as oil spills, hazardous material releases, and other events. These teams are the first responders to all accidents within the Shell PSR boundaries. The Shell Refinery Emergency Response Plan provides the framework for preparing for and responding to accidents, with specific plans for firefighting, spill response, notifications, and evacuation (Shell PSR 2014). This plan uses universal *Incident Command System* (ICS) protocols to facilitate an integrated organizational structure.

In addition, the Shell PSR and other surrounding industrial facilities coordinate regularly with fire departments, emergency service providers, Skagit County Emergency Management Department, and hospitals through Skagit County's Community Awareness and Emergency Response organization (Shell PSR 2014).

Fire District 13

Skagit County Rural Fire Protection District 13 provides volunteer fire and rescue response services in the unincorporated areas to the east and south of Anacortes, including the Shell PSR. District 13 boundaries encompass the areas south of State Route (SR) 20 and immediately adjacent to the proposed project site. The nearest District 13 fire station is located at 8652 Stevenson Road, approximately 0.4 mile south of the project site.

Fire District 11

Skagit County Fire District 11 (also known as the Mt. Erie Volunteer Fire Department) is available to respond to incidents at the Shell PSR. District 11's boundaries are southwest of the Shell PSR. The nearest District 11 fire station is located at 14825 Deception Road, approximately 4.7 miles from the project site.

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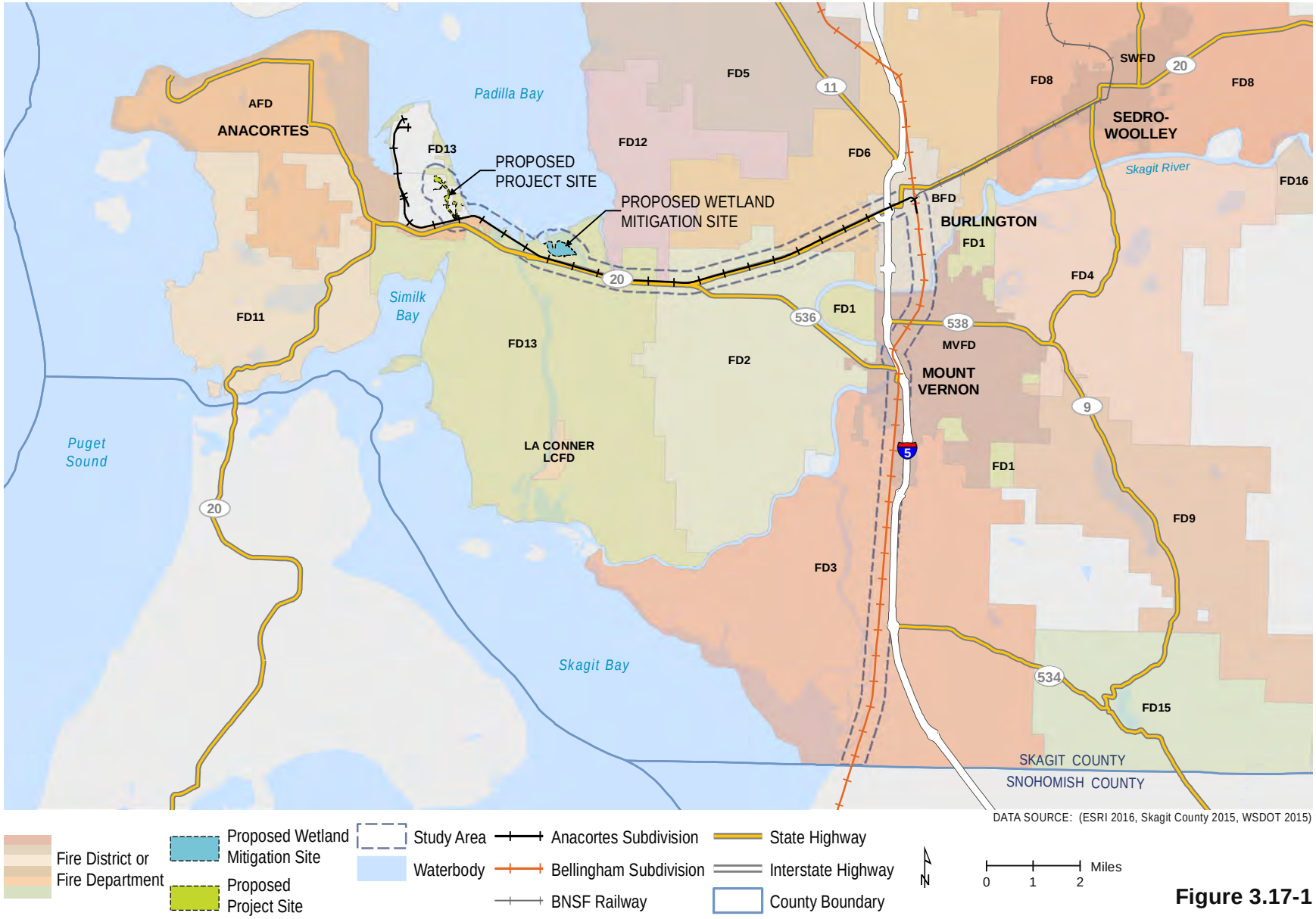


DATA SOURCE: (ESRI 2016, Skagit County 2015, WSDOT 2015)

Fire District or Fire Department
Proposed Wetland Mitigation Site
Proposed Project Site
Study Area
Waterbody
Anacortes Subdivision
Bellingham Subdivision
BNSF Railway
State Highway
Interstate Highway
County Boundary
N
0 1 2 Miles

Figure 3.17-1
FIRE DISTRICTS

City of Anacortes Fire Department

Under a Mutual Aid Agreement, the City of Anacortes Fire Department (AFD) provides fire protection and emergency medical response services to the project site. The AFD has 18 firefighters/paramedics, two firefighters/emergency medical technicians (EMTs) (City of Anacortes 2016a), and four volunteer firefighters (City of Anacortes 2014). In 2014, the AFD responded to 430 fire calls and 2,563 medical calls; average response time was 8 minutes. Of the fire response calls in 2014, 7 percent (30 calls) were related to hazardous materials; 10 percent (43 calls) were for structure fires.

The largest category of fire response calls in 2014 (24 percent) was in response to automatic fire alarms. AFD Station 3 is the closest fire station to the proposed project site, located at 9029 Molly Lane in Anacortes, about 0.3 mile south of the project site. Access to the project site from Station 3 would be via Reservation Road (across SR 20 and the Anacortes Subdivision tracks) and South March's Point Road.

Skagit County Sheriff's Office

Law Enforcement

Patrols of the Skagit County Sheriff's Office and the Anacortes Police Department provide protective and response services to the areas around the project site. The Anacortes Police Department has 25 commissioned officers and seven noncommissioned employees (City of Anacortes 2016b).

Incident Planning and Response

As noted above, Shell has teams of trained personnel to respond to fire and medical emergencies, as well as oil spills, hazardous material releases, and other events. These teams are the first responders to all accidents within the Shell PSR boundaries. The Shell Refinery Emergency Response Plan provides the framework for preparing for and responding to accidents, with specific plans for firefighting, spill response, notifications, and evacuation, as well as coordination with public emergency response agencies.

The Skagit County Department of Emergency Management, under the direction and guidance of the Skagit Emergency Management Council, is responsible for coordinating local agencies' responses to accidents that occur within the county. The Skagit County Comprehensive Emergency Management Plan provides the framework for responses to natural and human-caused emergencies or disasters.

Anacortes and Bellingham Subdivisions

Public Services

Fire Protection and Emergency Medical Response

Fire and emergency medical services along the Anacortes and Bellingham subdivisions within Skagit County include multiple departments: the Anacortes, Burlington, and Mount Vernon fire departments, and Skagit County Fire Protection Districts 2, 3, 6, 12, and 13. The locations of these fire districts are shown in Figure 3.17-1.

Law Enforcement

Law enforcement services are provided by the Skagit County Sheriff's Office and the police departments of Anacortes, Burlington, Mount Vernon, and the Swinomish Tribe.

Skagit County Sheriff's Office Patrol Division is responsible for law enforcement in unincorporated Skagit County and is comprised of approximately 50 commissioned officers, including 35 patrol deputies, and a marine patrol unit. In addition, the Washington State Patrol's Autonomous Patrol Area 7 serves Skagit County and provides two detachments of 17 troopers and two sergeants based out of the Burlington Detachment office (Skagit County 2016).

Incident Prevention and Response Planning

The local fire department typically acts as the first responder to accidents along the railway. However, BNSF Railway also acts as a responder for accidents such as derailments, fires, or spills involving the railroad on the Anacortes and Bellingham subdivisions. BNSF Railway has an extensive network of first responders, equipment, and contractors with the capacity to respond to potential crude oil and hazardous materials accidents. In addition, BNSF Railway has developed and shared its emergency response plans with local emergency response teams and provided accident training to fire departments within 2 miles of its rail lines (Shell 2014). The BNSF Railway's Geographic Response Plan for the Anacortes Subdivision (MP 16-0) (BNSF 2013) presents details and site-specific responses by milepost. BNSF Railway has identified the following response steps for accidents in Skagit County:

- Coordinate BNSF Railway staff (train crews and hazardous materials response teams) with Skagit County emergency dispatch and on-site responders.
- Mobilize response contractors from Anacortes, Everett, and/or Seattle.
- If needed, mobilize specialty response staff, such as the BNSF Railway Hazardous Materials Response "Strike Team" from Vancouver, Washington (Shell 2014).

Emergency responders have control of railroad accidents in which hazardous materials are spilled; however, railroads provide the resources for mitigating accidents. Railroad companies also reimburse local emergency agencies for the costs of materials the agencies expend during such response efforts.

In addition to these steps, the response plans and procedures described for the extended study area below would also apply to the Anacortes and Bellingham subdivisions in Skagit County.

Through the Oil Spill Contingency Plan - Railroad Rulemaking (WAC 175-186), adopted by Washington State in August 2016, BNSF Railway will be required to develop and maintain oil spill contingency plans approved by Ecology. The regulations establish oil spill contingency plan, drill and equipment verification requirements, and provisions for inspection of records for owners and operators of railroad required to submit oil spill contingency plans under RCW 90.56, and for the response contractors that support the implementation of the railroad plans.

If the Shell PSR is notified of a tank car accident on the Anacortes or Bellingham subdivision, Shell would send members of the Shell PSR Response Action Team or approved contractors to respond or provide technical support to address the situation. The Response Action Team consists of trained hazardous materials responders located throughout the U.S. and Canada. In 2015, Shell and the other refineries located in Washington State entered into a mutual aid agreement with BNSF Railway to share personnel and resources in the event of a rail accident involving crude oil in the state (WSPA 2015).

Shell is a member of Community Awareness and Emergency Response (CAER), an organization established to enhance awareness of local chemical and petroleum industries. The local CAER is made up of industrial members: Shell, Tesoro, Air Liquide, Linde, and Chemtrade Solutions. Other members include Skagit County Department of Emergency Management, several local police and fire departments, Swinomish Tribe, Island Hospital, and Anacortes Red Cross. Annually, CAER conducts an emergency response drill at one of the member facilities.

Shell regularly conducts response drills and provides personnel with training, which is a required component of their contingency plan. The Shell PSR typically conducts monthly training that includes review of oil spill response plans, gear inventories, and deployment of response equipment with agency representatives on site for observation. Typical trainings are six hours long; some trainings are two hours long. They are a mix of classroom training, local on-site, in-water trainings, and off-site training. Approximately every three years, each team member is sent for training at schools such as Ohmsett and Texas A&M University in Corpus Christi, Texas. The participants include oil spill team members; the Marine Spill Response Corporation (MSRC), the Shell PSR's oil spill response organization, and others. The Washington State Department of Ecology (Ecology) typically evaluates one to two trainings per year. The Swinomish and Samish tribes have participated in Shell's oil spill response training and annual oil spill tabletop exercises.

Firefighting equipment and facility response equipment is maintained at the Shell PSR, with a large inventory located throughout the main facility and marine terminal. Facility response equipment is intended to provide an efficient initial response to contain a spill before it spreads. This inventory includes six vessels and five individual boom packs with a total of 8,000 feet of boom available; 24 marine radios and four cell phones. The vessels and boom are located either on site or at the Cap Sante Marina in Anacortes. Oil spill response consumables such as absorbent pads and oil snares (i.e., pompoms) are also available for deployment.

Extended Study Area

Public Services

Multiple jurisdictions provide police, fire, and emergency medical response services along the BNSF Railway corridor in Washington State that would be used for transporting crude oil to the Shell PSR. The BNSF Railway main line traverses Spokane, Lincoln, Adams, Franklin, Benton, Klickitat, Skamania, Clark, Cowlitz, Lewis, Thurston, Pierce, King, and Snohomish counties, and includes areas served by urban fire and police departments, rural fire districts, and county sheriff's department offices.

Incident Prevention and Response Planning

Incident Prevention

Federal and state agencies share responsibility for establishing prevention guidelines. The U.S. Coast Guard (USCG) and U.S. Environmental Protection Agency (USEPA) are responsible for implementing federal prevention plans for facilities (33 CFR 154, Operations Manual; 33 CFR 156, Oil and Hazardous Material Transfer Operations, 40 CFR 112, Spill Prevention, Control and Countermeasure plans). Ecology's Spill Prevention, Preparedness and Response Program regulates facilities that handle oil. Ecology inspectors may conduct facility inspections to ensure compliance with state pollution prevention requirements. Federal and state laws mandate specific facility and tank car design elements to reduce the risk of spills and to contain them immediately.

Emergency Response Plans and Systems

As with the Anacortes and Bellingham subdivisions, BNSF Railway is the first responder for fires, spills, or other accidents involving the railroad. BNSF Railway maintains equipment and a network of contracted first responder teams throughout the extended study area. They also coordinate with, and make incident response training available to, fire districts and departments.

As described above, through the Oil Spill Contingency Plan - Railroad Rulemaking (WAC 173-186), BNSF Railway will be required to develop and maintain oil spill contingency plans approved by Ecology. The regulations establish oil spill contingency plan, drill and equipment verification requirements, and provisions for inspection of records for owners and operators of railroad required to submit oil spill contingency plans under RCW 90.56, and for the response contractors that support the implementation of the railroad plans.

In the event of a crude oil spill, fire, or explosion along the rail transportation route, BNSF Railway would implement its own System Emergency Response Plan. This plan defines roles and responsibilities of BNSF Railway personnel, outlines notification procedures, provides guidelines for hazard identification and accident classification, and describes incident management procedures, resource utilization, and health and safety procedures. It also incorporates the relevant response plans addressed above. In the event of an accident, BNSF Railway would inform appropriate federal, state, and local response agencies. BNSF Railway has numerous first responders positioned across its rail network. Along the BNSF Railway route to the Shell PSR

within Washington, there are five hazardous materials first responder locations that would be available to assist local emergency teams in the event of a rail accident (BNSF 2014).

BNSF Railway emergency responders complete an initial 80-hour hazardous materials course and security and emergency response training at the Transportation Technology Center, Inc. (TTCI), a railroad testing and training facility specifically devoted to crude oil emergency response. In addition, they receive an annual refresher course related to tank cars, incident command, air quality monitoring, and advanced technologies (BNSF 2015). BNSF Railway response equipment includes industrial firefighting foam trailers, emergency breathing air trailers, chlorine kits, midland kits, and air monitoring equipment (BNSF 2014). The BNSF Railway system has 20 fire trailers to provide equipment and supplies to contract firefighters in response to an accident (BNSF 2014).

In addition to incident response procedures for the railroad transportation corridor, there are multiple guidelines and requirements that are applicable to all accidents with which BNSF Railway, Shell, and other entities must comply in conducting activities related to transporting and handling oil. Preventing oil spills is the best strategy for avoiding potential damage to human health and the environment. However, if an accident occurs, a quick response in a well-organized manner is the optimal approach for containing and controlling the spill.

Regulations adopted by Ecology in August 2016, in the Oil Movement by Rail and Pipeline Notification rule (WAC 173-185), created reporting standards for facilities that receive crude oil by rail, and pipelines that transport crude oil through the state. Additionally, the rule identifies reporting standards for Ecology to share information with emergency responders, local governments, tribes, and the public. Notification of oil movement will provide emergency responders with essential information they can use to better prepare for and respond to accidents. The information provided will identify the volume and type of crude oil scheduled for transport through the state. Emergency responders can use the information to plan response strategies, equipment selection, and staffing levels.

Rail Safety Requirements

On May 1, 2015, the Federal Railroad Administration (FRA) released the "Enhanced Tank Car Standards and Operational Controls for High-Hazard Flammable Trains" Final Rulemaking. This rule implemented requirements to improve safety for all key trains (trains with 20 or more cars carrying hazardous materials) traveling on main line tracks. Although some of these requirements are not in place yet, in many cases, BNSF Railway and other railroads have implemented some of the additional safety measures for crude oil trains beyond those required by the FRA (BNSF 2015). The rule included a requirement for all tank cars for use in a high-hazard flammable train constructed after October 15, 2015, to meet DOT Specification 117 design criteria. These safety requirements and standards are described below.

Enhanced Braking

Beginning in 2021, trains operating on main line tracks carrying at least 20 tank cars of crude oil must be equipped either with distributed power (locomotives placed in locations other than the front of the train) or with end-of-train (EOT) devices that have a two-way radio link that connects the rear of the train with the head locomotive. Distributed power and EOTs allow brakes to be applied from the head of the train and locations farther back to stop the train faster.

Increased Track Inspections

The FRA establishes railroad safety regulations (49 CFR 200–299) that relate to tracks, bridges, signaling systems, operations, and locomotives. FRA regulations also dictate the types and frequencies of inspections that railroads must perform. Railroad company inspections often exceed these requirements. For example, railroads have agreed to perform at least one additional internal rail inspection, and at least two automated comprehensive track geometry inspections each calendar year. BNSF Railway further exceeds FRA requirements by increasing rail detection testing frequencies along critical waterways to 2.5 times per calendar year.

Increased Wayside Detector Technology

As of July 2014, specialized wayside "hot box" detectors have been installed at least every 40 miles along routes with trains carrying 20 or more tank cars containing crude oil. These detectors help prevent incidents by measuring if wheel bearings are generating excessive heat and, therefore, are in the process of failing. BNSF Railway exceeds this requirement by spacing the "hot box" detectors at every 10 miles on crude oil routes that parallel critical waterways. A key train stopped by a "hot box" detector must remove the indicated car.

Lower Operating Speeds

Nationwide, the maximum speed is 50 miles per hour (mph) for all key trains. BNSF Railway exceeds this requirement by reducing the maximum train speed to 30 mph for all shale crude oil trains traveling through municipalities with populations of 100,000 or more.

Key Train Operating Practice Restrictions

When two trains meet on a track, a key train is given priority and will hold the main track whenever practicable. This practice reduces the risk of a derailment because the train is not required to switch on and off the main track. Also, a key train experiencing an emergency brake application requires inspection of the entire train before proceeding.

Unattended Train Requirements

Unit trains transporting crude oil that are left unattended require specific job safety briefings between the train crew and the train dispatcher. Trains left unattended have their reverser removed and cab doors locked to maximize security.

Several contingency plans and transportation regulations provide coordinated preparation for an oil spill or hazardous substance release. These measures establish roles and responsibilities and identify resources and response procedures to protect life. They also help to reduce and mitigate the impacts of a pollutant discharge on the environment and property. The following sections summarize the contingency plans that have been developed to prepare for an accident.

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 accidents.

National Contingency Plan

Through the National Response System, the National Contingency Plan establishes national response capability and overall coordination among the responders and contingency plans for oil spills. The National Response System consists of three organizational levels: national, regional, and local at the Shell PSR. 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.

Under the National Contingency Plan, the federal on-scene coordinator is designated as either USCG or USEPA, 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.

PHMSA and U.S. Fire Administration-National Fire Academy Guidance

The Pipeline and Hazardous Materials Safety Administration (PHMSA) and the U.S. Fire Administration-National Fire Academy continue to work to develop and provide access to emergency response guidelines. As part of this initiative, a Lessons Learned Roundtable forum was convened in 2014 to leverage the expertise of fire chiefs and emergency management officials from areas that had experienced a crude oil or ethanol rail transportation incident (PHMSA 2014). The key findings from this roundtable have been referenced in the proposed revisions to regulations that would expand the applicability of comprehensive oil spill response plans (PHMSA 2016).

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 owners or operators within federal, state, and local agencies in connection with spill response, and in mitigating or preventing potential discharges.
- A list of equipment (including firefighting equipment) and personnel available to respond to oil spills.
- Site-specific geographic response plans (GRPs).

GRPs are written by Ecology and/or USEPA for a specific area and include tactical response strategies tailored to a particular shore or waterway at risk of injury from oil. GRPs have two main objectives: 1) to identify sensitive resources at risk of injury from oil spills, and 2) to direct response actions related to sensitive resource protection during the initial hours of a response.

GRPs help to coordinate response efforts conducted 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. Three GRPs are relevant to the proposed project site, the Anacortes Subdivision, Skagit County, and the Puget Sound region:

- **North Central Puget Sound Geographic Response Plan** – The North Central Puget Sound GRP covers roughly 373 square miles of Puget Sound. It extends from Mukilteo in the south and north to Skagit Bay and the Swinomish Channel.
- **San Juan Islands/North Puget Sound Geographic Response Plan** – The San Juan Islands/ North Puget Sound GRP is bounded by Point Roberts to the north; the southern tip of Lopez Island and Fidalgo Island to the south; Haro Strait to the west; and the mainland of northern Washington to the east (including Boundary Bay, Semiahmoo Bay, Drayton Harbor, Birch Bay, Lummi Bay, Bellingham Bay, Padilla Bay, and Burrows Bay).
- **Central Puget Sound Geographic Response Plan** – The Central Puget Sound GRP is bounded by Edmonds to the north and Commencement Bay to the south. It includes Liberty Bay, Port Orchard, Sinclair Inlet, and Dyes Inlet.

Other GRPs for the representative crude-by-rail transport route (see Chapter 2, Figure 2-9) on the BNSF Railway main line include: Spokane River, Snake River/Ice Harbor Pool, Middle Columbia River (GRPs for McNary Pool, John Day Pool, and Bonneville Pool), Clark/ Cowlitz/ Lower Columbia Rivers, Chehalis River, Nisqually River, South Puget Sound, Green/Duwamish River, Lake Washington, and Snohomish/Skykomish rivers.

Washington State Emergency Response System

Ecology is designated as the state's lead agency "to oversee prevention, abatement, response, containment, and cleanup efforts with regard to an oil or hazardous substance spill to waters of the state" (Etkin et al. 2015). Washington State law has established Ecology as the predesignated state on-scene coordinator for all oil and hazardous substance spills in state waters. Ecology is also responsible for supporting federal response actions. The Washington State Emergency Response System is designed to provide coordinated state agency response, in cooperation with federal agencies, for effective cleanup of oil or hazardous substance spills. The following agencies have a role in responding:

In 2015, the Washington State Legislature directed Ecology to develop rules on reporting requirements for the movement of crude oil by rail. Ecology adopted rules in August 2016 that are intended to enhance oil spill preparedness and response in the state. A new rule (WAC 173-185) created notification requirements for facilities receiving crude oil by rail and establish procedures for Ecology to disclose crude oil movement to the public. Ecology also issued a new rule establishing contingency plan requirements for railroads transporting oil by rail (WAC 173-186). The new rules are expected to take effect in October 2016.

- The Washington State Patrol assumes responsibility as Incident Commander and acts as the lead state agency responsible for cleanup activities when oil and hazardous substance spills occur on state highways. The Washington State Patrol also assists local jurisdictions with law enforcement and evacuations and represents local jurisdictions as designated.
- The Incident Commander coordinates and maintains liaison with other state agencies involved with an accident, assists in receiving and disseminating warning information, provides communications and technical support to responders, provides radiological monitoring, provides aerial reconnaissance of the impacted area, coordinates fire resources when an emergency mobilization is authorized for a hazardous substance incident, and provides 24-hour, statewide communications support.
- The Washington Military Department's Emergency Management Division (EMD) maintains capabilities to make 24-hour notifications to Ecology, Washington State Patrol, and other appropriate local, tribal, state, and federal agencies. The EMD also activates the state Emergency Operations Center when required, where it also coordinates state agency response activities; provides public information officer support to the Joint Information Center or Incident Command posts; and provides communication links on an ongoing basis.

Ecology response teams are based in Bellingham, Bellevue, Olympia, Vancouver, Yakima, and Spokane. These teams are available year-round, 24 hours a day.

- During oil spills, the Washington Department of Fish and Wildlife (WDFW) coordinates activities for rescuing and rehabilitating wildlife injured, assists in identifying fish and wildlife protection needs, and assists in reconnaissance and Natural Resource Damage Assessment efforts.

- The state Department of Health is responsible for handling environmental spills and releases involving radioactive substances and biological agents. The department assists in determining public health impacts to fish and shellfish harvesting and consumption.
- The state Department of Natural Resources assists in the identification of aquatic habitat/state lands protection needs.
- The state Department of Archaeology and Historic Preservation assists in the identification of historic/archaeological resource protection needs.
- The state Parks and Recreation Commission assists in response activities involving state park lands and property.
- The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly known as Superfund, was amended by the Superfund Amendments and Reauthorization Act (SARA) on October 17, 1986. Title III of SARA, the Emergency Planning and Community Right-to-Know Act, establishes requirements for federal, state, tribal, and local governments and industry regarding emergency response planning and the right to know about hazardous chemicals in a community. The Washington State Emergency Response Commission was created in accordance with SARA to implement the provisions of Title III, designate and oversee local emergency planning committees, and facilitate preparation and implementation of emergency planning and preparedness.

Local First Responders

Local and state fire, police, or emergency personnel are likely to be first responders to an accident.

Railroad Response to Oil Spills

Railroads have extensive emergency response capabilities. Railroad personnel work in cooperation with federal, state, and local governments, to assist communities in the event of an accident involving crude oil or other hazardous materials. The major railroads, including BNSF Railway, have teams of full-time personnel whose primary focus is hazardous materials safety and emergency response. Teams of environmental, industrial, and medical professionals are available to provide assistance during hazardous materials accidents.

Railroads also maintain networks of hazardous materials response contractors and environmental consultants, strategically located throughout their service areas, who can handle virtually any air, water, waste, or public health issue. These contractors are on call at all times, have multiple offices and equipment storage locations, as well as monitoring equipment, containment booms, industrial pumps, and other spill response tools and equipment.

“Standard of care” protocols are also used by railroad companies to ensure that community impacts, such as evacuations, are addressed promptly and professionally.

Emergency Response Training

Each year, railroads actively train over 20,000 emergency responders throughout the country, ranging from general awareness to in-depth courses. The parameters of these emergency response training programs vary from railroad to another, but, in general, they consist of a combination of some or all of the following aspects:

- Using "hazmat safety trains" and other equipment to simulate a hazardous materials incident that can be shipped from community to community to provide hands-on training for local first responders.
- Operating hazardous materials training centers where they train employees, first responders, customers, and other railroad industry personnel in how to manage hazardous materials incidents.
- Visiting hundreds of local firehouses each year to provide classroom and face-to-face hazardous materials training.
- Partnering with local emergency responders to conduct simulations of emergency scenarios. The focus is on training and familiarization with roles, procedures, and responsibilities.
- Offering self-study programs for emergency responders that allow students to learn proper procedures at their own pace. Some railroads also provide web-based training on hazardous materials and general rail safety issues.

AskRail, a web-based application covering all the major freight railroads, is a system that enables emergency responders to input the identification number of a particular rail car and immediately determine whether the car is loaded or empty, identify the commodity contained in the rail car, the hazard class, the handling railroad, the handling railroad's emergency contact phone number, and any emergency response information associated with the commodity.

Railroads also support our nation's emergency response capability through the Security and Emergency Response Training Center (SERTC). Since its inception in 1985, SERTC has provided hands-on hazardous materials training to more than 50,000 local, state, and tribal emergency responders, as well as railroad, chemical, and petroleum industry employees from all over the country. Most of the training at SERTC is advanced and builds on basic skills responders receive elsewhere. Also, many railroads regularly provide funding to emergency responders in their service areas to attend SERTC. In addition, railroads have funded the development of a curriculum at TTCI.

ENVIRONMENTAL IMPACTS

No Action Alternative

Because no construction or operation would take place under the no action alternative, there would be no impacts to public services or incident response. Existing conditions with regard to public services and incident response would remain the same unless affected by other projects in the future.

Proposed Project Site

Direct Impacts

Construction

Construction activities would cause a temporary increase in the potential for worker injuries or other accidents that may require dispatch of fire or emergency medical services. Health and safety measures would be implemented during construction to help reduce the chance of accidents requiring emergency response (see Chapter 5 – Summary of Impacts and Mitigation). Increased worker and truck traffic to and from the project site would cause delays on access roads, including SR 20, which could affect the response times of fire, police, or emergency medical response teams. However, such impacts would be minor and would end following construction. The scope of construction for the proposed project is similar to other large-scale construction efforts in Skagit County, and would include traffic management planning to minimize impacts.

Operation

Operation of the proposed rail unloading facility would not create a substantial new demand for public services at the project site. Shell would integrate the new rail unloading facility into its Emergency Response plans to address the specific operations and potential incidents of the proposed project, and would coordinate with local first responders regarding those changes. While elements of operations would change, the overall scope of the refining operations at the Shell PSR would remain essentially the same as the no action alternative. Water, equipment, and materials for fire suppression and spill response activities would be provided on site. While operations at the proposed project site would not involve increasing capacity or production, the new rail unloading facility would require Shell and local providers to adapt to emergency response procedures and would have no long-term impact on the provision of those public services.

Wetland Mitigation Site

Direct Impacts

Construction activities at the wetland mitigation site have the potential to result in injuries or accidents that may require public services. Construction would be temporary and limited to the wetland mitigation site and haul routes in and out of the site. Construction would have a minimal increase in the need for public services and minor travel delays on roads serving the wetland mitigation site.

Anacortes and Bellingham Subdivisions

Direct Impacts

Transporting crude oil by rail to the proposed project site would have impacts on police, fire, and emergency medical response services. Service response times could increase because of delays at at-grade railroad crossings on the Anacortes and Bellingham subdivisions caused by passing unit trains arriving and departing the project site. There would also be the potential for increased demand for emergency services due to a rail accident (e.g., a fire or spill).

Roads with at-grade railroad crossings on the Anacortes and Bellingham subdivisions in Skagit County have poor network redundancy, which means there is a lack of alternate routes around blocked crossings within 0.5 mile of the crossings (SCOG 2016). While the impacts to emergency responders cannot be quantified because of the uncertainties associated with both train traffic and accidents requiring emergency services, responders would experience inevitable delays, thereby adversely affecting their response times. However, incident response planning, as outlined above, would minimize the potential for adverse impacts on emergency services. Shell, BNSF Railway, emergency responders, and federal, state, and local governments would work together to coordinate personnel and resources in the case of an accident.

Detailed discussions on vehicle delays at at-grade railroad crossings are presented in Chapter 3.15 – Rail Traffic Transportation, and Chapter 3.16 – Vehicle Traffic and Transportation.

Extended Study Area

Direct Impacts

Crude-by-rail transport to and from the Shell PSR through Washington State would increase blockages and delay times for at-grade crossings along the proposed delivery and return routes. Based on a survey of fire departments and districts conducted for the Tesoro Savage Vancouver Energy Draft EIS (Kittelson 2013), which identified impacts similar to those anticipated for the proposed rail unloading facility at the Shell PSR, the impacts on emergency services would vary based on the location, characteristics of the road network, train speed, and other factors. Given the current train volumes on the BNSF Railway main line routes through Washington (e.g., the BNSF Railway main line from Vancouver to Anacortes has train volumes of 15 to 41 trains per day; the route through Stampede Pass currently handles four to six trains per day [WSDOT 2014]), additional delays as a result of the proposed project would have a minor impact on public services.

Additional train traffic would result in an increased safety risk at at-grade railroad crossings that could require police, fire, and/or emergency medical response services. While the Bellingham Subdivision currently carries heavy levels of train traffic, existing protection at crossings reduces risk of conflicts with passing trains. The increased risk and potential need for response services would be minor.

Incident response planning, as outlined above, would minimize the potential for adverse impacts on emergency services. Shell, BNSF Railway, emergency responders, and federal, state, and local governments would work together to ensure that personnel and resources are available and response is coordinated in the case of an accident.

Indirect Impacts

The added train traffic and intersection vehicular delay could result in indirect impacts due the potential increase in fire damage and personal harm or death if first responders are waiting at crossings occupied by a train.

Cumulative Impacts

On the Anacortes Subdivision, there are no other reasonably foreseeable projects that would increase rail traffic. Direct impacts for the proposed project include the potential for increased service response times because of delays at at-grade railroad crossings caused by passing unit trains arriving and departing the project site. Therefore, the potential for cumulative impacts is the same as direct impacts identified for the proposed project.

On the Bellingham Subdivision, the proposed project, when considered with other reasonably foreseeable future projects, would increase delays at at-grade crossings, which could lead to increased police, fire, and emergency medical response times. The potential for a delay in response times is dependent on the timing and direction of train traffic and the time and location of an emergency response call. The additional gate-down time created by the proposed project, combined with past, present, and reasonably foreseeable future actions, would also increase the potential for delayed response times for emergency services. Therefore, the proposed project would contribute to a cumulative impact on public services. Improvements to local transportation networks proposed by the Skagit Council of Governments (SCOG) and other local jurisdictions, if implemented, would reduce the cumulative impact of the proposed project as well as past, present, and reasonably foreseeable future actions.

MITIGATION MEASURES

Avoidance and Minimization

Minimizing potential impacts that could result from an accident associated with crude-by-rail trains begins with prevention measures. Shell, BNSF Railway, emergency responders, and federal, state, and local governments would continue to work together to coordinate personnel and resources in the case of an accident. The rail unloading facility would be added to the emergency response procedures of BNSF Railway, Shell and local providers, which would enhance the response to an accident.

In addition, Shell has incorporated engineering and operational measures into the design of the proposed project to avoid and minimize impacts to emergency response time including:

- To the extent feasible with BNSF Railway train schedules, Shell would request that BNSF Railway schedule trains to arrive and depart during nonpeak vehicle traffic hours.

Mitigation

Potential impacts to emergency response from increased train traffic and associated delays at at-grade crossings would be minimized by:

- Shell would fund a study to evaluate the feasibility of implementing signal timing revisions at the at-grade crossings along the Bellingham and Anacortes subdivisions in Skagit County, as described in Chapter 3.16 –Vehicle Traffic and Transportation.

In addition, Shell would support measures to enhance incident planning and response and mitigate the potential risks associated with a release of oil in Skagit County and along the proposed project rail transport route throughout Washington State. These measures include:

- Shell would provide funding to create or augment existing oil and hazardous spill response equipment caches along the proposed project rail transport route throughout the state. The caches would contain oil spill response equipment specifically to help respond to spills on land. The co-lead agencies would determine the number and location of caches to be provided.
- Shell would coordinate and fund a deployment drill for a crude-by-rail spill scenario with BNSF Railway and invite the local emergency responders and the tribes to participate.
- Shell would update its existing Puget Sound Refinery oil spill contingency plan to reflect operations of the new crude by rail unloading facility. The updated plan would demonstrate financial responsibility for the potential costs of response and cleanup of oil spills, natural resource damages, and costs to state and affected jurisdictions for response actions to reduce the risks and impacts from an oil spill at the facility. Shell would update the PSR contingency plan in two steps:
  - Shell would submit a draft update to their existing oil spill contingency plan that fully integrates the rail operations into the plan and addresses all factors listed in RCW 88.40.025. The update must be submitted at least 60 days prior to commencing rail operations and include an appropriate level of financial responsibility for a reasonable worst-case spill at the refinery.
  - Once the draft update is reviewed and approved by Ecology, the plan would be updated again to include documentation of financial responsibility. Ecology would then manage a 30-day public review process. Once all requirements have been met, Ecology would grant final approval of the plan update.

CHAPTER 4 ENVIRONMENTAL HEALTH AND RISK

During the public scoping process for the proposed project, many concerns were raised about the potential for spills, fires, and explosions that could occur during crude-by-rail transport from the mid-continent area to the Shell Puget Sound Refinery (PSR) (Skagit County and Ecology 2015). This chapter investigates the likelihood and potential consequences related to a release of oil into the environment. The intent of this chapter is to inform the public and decision makers about the probabilities and potential impacts of an oil release, and provide information for use in planning and response efforts to minimize impacts.

INTRODUCTION

This chapter presents an analysis of the probability of accidents in Washington State that could result in releases, fires, or explosions from trains transporting crude oil to or from the proposed Shell Puget Sound Refinery (PSR) rail unloading facility. Although the probability of a *rail accident* is low, such an event could occur. Therefore, this chapter also describes the potential consequences of spills, fires, or explosions at various locations along the proposed rail transportation routes.

Rail accidents include derailments, collisions, fire or explosion events, highway-rail incidents, and miscellaneous accidents (e.g., trains striking objects on the track and other impacts). These categories are based on accident reporting data from the Federal Railway Administration (FRA). As used in this EIS, the term "rail accident" follows the FRA definition of an accident, which is a safety-related event involving on-track rail equipment causing monetary damages above a prescribed amount (currently $10,500). The term "accident" is not meant to convey lack of liability or culpability for the event occurring.

The information presented in the following sections is summarized from the detailed analyses provided in Appendix G, Rail Spill Probability and Volume Analysis; Appendix H, Evaluation of Hydrocarbon Releases from Crude-by-Rail Incidents Using Trajectory, Fate, and Effects Modeling; and Appendix I, Dispersion, Fire, and Explosion Analysis. These analyses are intended to inform the public and decision makers about the probabilities and potential impacts of an oil release, and to provide meaningful information for use in planning and response efforts that can minimize impacts.

This chapter focuses on answering the four questions listed below regarding an accident in Washington State. The co-leads chose to limit the probability analysis to Washington State based on two primary considerations: the transfer of track responsibility between BNSF Railway and Montana Rail Link occurs just east of the state border at Sandpoint Junction, Idaho; and the regulatory authority of Washington State.

The analyses of the consequences of a spill, fire, or explosion focus on three locations in the Puget Sound region. These sites were selected to provide a range of scenarios that could occur elsewhere along the rail corridor.

1. What is the probability of an accident and release of oil from a proposed project train?

This question focuses on the *probability* of a crude-by-rail accident occurring in Washington State, the likelihood that an accident would result in a release of oil from tank cars or locomotives, and the *frequency* at which releases would be anticipated. A detailed explanation of the methodology and results of the probability analysis conducted for this environmental impact statement (EIS) are presented in Appendix G.

The **probability** of an accident is a measure of the likelihood that such an event will happen in a given year. The **frequency** of an accident is the anticipated number of times that such an event will happen over a given period.

2. What are the potential consequences following an oil spill?

This question focuses on the *potential consequences* of a release of oil into the environment. The detailed explanation of the methodology and analyses of potential spills prepared for this EIS are provided in Appendix G.

The potential consequences were modeled at three representative locations along the proposed rail transportation route to the Shell PSR: the Swinomish Channel Swing Bridge, the Skagit River Crossing, and the Edmonds Ferry Terminal.

The Swinomish Channel Swing Bridge site was chosen as a representative location for releases into relatively confined saltwater environments with extensive tidal flats and marshy areas. The location is adjacent to the Swinomish Reservation and is in an area with sensitive aquatic receptors such as crabs harvested for human consumption and migratory bird populations).

The Skagit River Crossing site was chosen as a representative location for releases into a freshwater environment with a high potential for extensive oiling of shorelines before entering Skagit Bay. The site also has the potential for oil to sink due to oil interactions with suspended particulate matter and is upstream of a municipal water intake that could be affected.

The **potential consequences** described in this chapter were estimated by using a computer model to analyze hypothetical, unmitigated releases of oil into the environment. An unmitigated release is one in which no response measures are taken. The consequence analyses for all release scenarios intentionally ignore the potential for emergency response, which would limit the overall impacts to the environment. The estimated potential impacts presented in this chapter are therefore conservatively high.

As described in Chapter 3.17 – Public Services and Incident Response, and outlined below, numerous plans are in place at local, state, and federal levels to respond to oil spills. In the event of an actual release, many of the impacts described in this chapter would be minimized through the use of the procedures outlined in those plans.

The Edmonds Ferry Terminal site was selected as a representative location for releases onto land and into less confined areas within Puget Sound with a high potential for transport of surface oil due to currents, winds, and larger “open water” areas compared with the other sites. The ferry terminal was also chosen for modeling because of its proximity to residential areas, high ferry traffic, and the large influx of tourists during the summer months. These sites were not selected

based on any increased potential for risk, but for their diversity of physical, natural, and social characteristics and due to concerns raised during the EIS scoping process.

The investigation included modeling the variability of environmental conditions that could affect oil trajectory, fate, and potential effects including tides, river flow, and wind conditions. At the Swinomish Channel Swing Bridge, scenarios were modeled in the summer with spring tide conditions, and in the winter with neap tide conditions. The scenarios modeled at the Skagit River Bridge Crossing targeted high river flow (summer) and low river flow (winter) for seasonal conditions. The Skagit River Bridge Crossing was also considered to evaluate a release over freshwater. Factors considered at the Edmonds Ferry Terminal included the summer (low-wind speeds) and the winter (high-wind speeds).

The scenarios modeled at the Skagit River Bridge Crossing used high river flow conditions during the freshet (the flood of a river from heavy rain or snow melt; modeled here during summer) and average low river flow conditions during the winter.

While the variability in certain environmental parameters was targeted for each scenario, it is important to note that seasonally appropriate corresponding values for all modeled environmental parameters (e.g., hydrodynamics, winds, temperature, and concentration of total suspended solids) were characterized at each location based on the identified season. Therefore, seasonally appropriate hydrodynamics would include variability in general circulation, river flows, and tidal fluctuations. For each scenario, this would be coupled with the appropriate temperature, wind speed and direction, and other values for all of the other environmental parameters. Data inputs for the modeling efforts were obtained from independent sources with rigorous quality standards.

The potential consequences of an unmitigated oil release at any one of these locations are intended to be representative of the impacts that could occur if a release were to happen at any point along the proposed train routes. The modeled spill scenarios for each location included two potential release volumes:

- 5,700 barrels (239,400 gallons). The 5,700-barrel release volume corresponds with seven to eight cars rupturing and is slightly above the average release volume from 16 observed crude-by-rail releases that have occurred in the U.S. and Canada between 2013 and 2015.
- 20,000 barrels (840,000 gallons). The 20,000-barrel release volume corresponds with 28 to 30 cars rupturing and is roughly twice the size of the largest observed U.S. crude-by-rail release in Casselton, North Dakota, and about 60 percent of the volume of the largest crude-by-rail release in North America in Lac-Mégantic, Quebec.

These volumes were chosen based on concerns raised during the public scoping process about the potential for a high volume, high consequence release. See Appendix G for a detailed explanation of how distributions of release volumes were modeled. The model results are intended to demonstrate the potential range of impacts that could occur if there were a spill. In addition, the analysis considers the potential consequences of a spill in urban and rural environments. It also looks at potential consequences of a higher probability, lower volume release accident.

3. What is the probability and what are the potential consequences of a release that results in a fire or explosion?

A third question focuses on the frequency and potential consequences of a release that results in a fire or explosion. The potential consequences are discussed in detail in Appendix I. Unmitigated accidents resulting in fire and explosions were modeled at the same three locations as the spill analysis to determine the potential consequences. In addition, the analysis considers the potential consequences of a fire and explosion in urban and rural environments, as well as the potential consequences of a higher probability, lower volume release accident.

4. What are the potential economic consequences of an oil release, fire, or explosion?

The final question focuses on the potential economic consequences of an oil release, fire, or explosion. The potential consequences are meant to encompass the types of impacts that could occur, rather than offer a complete accounting of all the potential impacts.

Select Laws, Regulations, and Guidance

Select laws, regulations, and guidance applicable to environmental health and risk are summarized in Table 4-1.

Table 4-1 Laws, Regulations, and Guidance for Environmental Health and Risk

Laws, Regulations, and Guidance	Description
Federal	
U.S. Environmental Protection Agency Spill Prevention, Control, and Countermeasure Plan and Facility Response Plan (40 CFR 112)	Provides guidelines for the prevention and response plans for accidental discharges of oils and hazardous substances into the waters of the United States.
U.S. Coast Guard Facility Operations Manual (33 CFR 154, Subpart F)	Establishes oil spill response plan requirements for all marine transportation-related facilities that could reasonably be expected to cause substantial harm or significant and substantial harm to the environment by discharging oil into or on the navigable waters.
Federal Railroad Administration (FRA) General Regulations (49 CFR Parts 200 299)	Established the Surface Transportation Board—an independent adjudicatory and economic-regulatory agency charged by Congress with resolving railroad rate and service disputes and reviewing proposed railroad mergers.
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 USC)	Establishes prohibitions and requirements concerning closed and abandoned hazardous waste sites, provides for liability of persons responsible for releases of hazardous waste at these sites, and establishes a trust fund to provide for cleanup when no responsible party can be identified.

Laws, Regulations, and Guidance	Description
Superfund Amendment and Reauthorization Act (SARA) (40 CFR 302)	Amended CERCLA to stress the importance of permanent remedies and innovative treatment technologies in cleaning up hazardous waste sites. Requires actions to consider the standards and requirements found in other state and federal environmental laws and regulations; provides new enforcement authorities and settlement tools, increases state involvement in every phase of the program and the focus on human health problems posed by hazardous waste sites; encourages greater citizen participation in making decisions on how sites should be cleaned up; and increases the size of the trust fund.
Resource Conservation and Recovery Act (RCRA) (42 USC 6901 et seq.)	Gives the U.S. Environmental Protection Agency (USEPA) the authority to control hazardous waste from the "cradle-to-grave." This includes the generation, transportation, treatment, storage, and disposal of hazardous waste. Also sets forth a framework for the management of non-hazardous solid wastes. This is a delegated Washington State program under the Washington Hazardous Waste Management Act.
Toxic Substances Control Act (15 USC 2601–2629)	Provides USEPA with authority to require reporting, record-keeping and testing requirements, and restrictions relating to chemical substances and/or mixtures.
Occupational Safety and Health Act (OSHA) (29 USC 651 et seq.)	Enacted to "assure safe and healthful working conditions for working men and women." Sets standards and enforces inspections to ensure that employers are providing safe and healthful workplaces.
State	
State Environmental Policy Act (SEPA) (RCW 43.21c; WAC 197-11)	Helps state and local agencies in Washington identify possible environmental impacts that could result from a proposed action, alternatives to the proposed action, and potential impact minimization and mitigation measures. Information learned through the review process can be used to change a proposal to reduce likely impacts and inform permitting decisions at the state and local levels.
Water Pollution Control Act and Water Quality Standards for Groundwaters of the State of Washington (RCW 90.48; WAC-173-200	Maintains the highest possible standards to ensure the purity of all waters of Washington State are consistent with public health and public enjoyment, the propagation and protection of wildlife, birds, game, fish, and other aquatic life and industrial development of the state. To that end, requires the use of all known available and reasonable methods by industries and others to prevent and control the pollution of state waters. Establishes and implements policies to maintain the highest quality of the state's groundwaters and protects existing and future beneficial uses of the groundwater through the reduction or elimination of the discharge of contaminants.

Laws, Regulations, and Guidance	Description
Washington State Oil and Hazardous Substance Spill Prevention and Response (RCW 90.56)	Establishes a comprehensive prevention and response program to protect Washington's waters and natural resources from oil spills. Anyone responsible for spilling oil into state waters is liable for damages resulting from injuries to public resources.
Oil Movement by Rail and Pipeline Notification Rule (WAC 173-185) (Effective October 1, 2016)	Oil Movement by Rail and Pipeline Notification to enhance oil spill preparedness and response in Washington State. It establishes reporting standards for facilities that receive crude oil by rail, and pipelines that transport crude oil in or through the state. Additionally, the rule identifies reporting standards for Ecology to share information with emergency responders, local governments, tribes, and the public.
Oil Spill Contingency Plan – Railroad Rule (WAC 173-186) (Effective October 1, 2016)	These regulations establish oil spill contingency plan, drill and equipment verification requirements, and provisions for inspection of records for owners and operators of railroad required to submit oil spill contingency plans under chapter 90.56 RCW, and for the response contractors that support the implementation of the railroad plans. The rule requires railroads to develop and maintain contingency plans approved by Ecology.
Washington State Hazardous Waste Management Act (RCW 70.105, and WAC 173–303)	Establishes and implements a comprehensive statewide framework for the planning, regulation, control, and management of hazardous waste that will prevent land, air, and water pollution and conserve the natural, economic, and energy resources of the state.
Model Toxics Control Act (MTCA) and Cleanup Regulation (RCW 70.105D; WAC 173-340)	Sets cleanup standards to ensure that the quality of cleanup and protection of human health and the environment are not compromised and requires potentially liable persons to assume responsibility for cleaning up contaminated sites.
Washington State Solid Waste Handling Standards (WAC 173–350)	Sets standards for the proper handling and disposal of solid waste.
Washington State Hazardous Waste Operations (WAC 296–843)	Applies to facilities that have workers handling hazardous waste at a treatment, storage, or disposal facility and are required to have a permit under RCRA. The Shell Puget Sound Refinery has RCRA Permit: WAD 009 276 197.
Oil Spill Natural Resource Damage Assessment (WAC 173-183)	Establishes procedures for convening a resource damage assessment committee, pre-assessment screening of resource damages resulting from oil spills to determine which damage assessment methods to use, and determines damages in cases where the compensation schedule is selected as the damage assessment methodology to apply.

Laws, Regulations, and Guidance	Description
Industry Agreements	
Mutual Aid Agreement for Rail Emergency Response	In 2015, Shell and the other Washington refineries entered into a Mutual Aid Agreement with BNSF Railway to share personnel and resources in the event of a rail accident involving crude oil in Washington State.

PROBABILITY OF AN ACCIDENT AND RELEASE

The probability analysis quantified the likelihood and frequency of a release in Washington State associated with the transport of crude oil by rail for the proposed project, as well as the likelihood of different volumes of oil being released. The probability of a release was calculated for unit trains traveling to and from the Shell PSR considering three possibilities: a release of crude oil from tank cars, a release of diesel fuel from locomotives on a loaded train, and a release of diesel fuel from locomotives transporting unloaded (empty) tank cars.

Typically, crude-by-rail accidents are thought of as releases of crude oil from tank cars. However, smaller spills from locomotives may also occur. The co-lead agencies chose to include analyses of potential spills of diesel from locomotives to address these additional lower volume releases.

The release probability analysis followed the steps presented in Figure 4-1. For each train traveling to or from the Shell PSR, there either would or would not be an accident, and that accident either would or would not result in a release of oil. The geographic area covered in the probability analysis included all BNSF Railway main line routes that would most likely carry crude oil from Sandpoint Junction, Idaho, into Washington State, through the Columbia River corridor, and north to the Shell PSR. Return routes would most likely travel through Stampede Pass, as shown in Figure 4-2.

The probability and spill volume analyses were conducted by performing a Monte Carlo simulation. A Monte Carlo simulation is one that produces distributions of possible outcomes based on variable inputs. It is named after the casino in Monte Carlo because, figuratively speaking, there is a lot of virtual “dice-rolling” involved in its application. A Monte Carlo simulation models the effects of a variety of different probabilities and uncertainties to provide predictions of outcomes. In the case of this analysis, the approach is used to incorporate uncertainties and randomness in input values and probabilities that affect both accident and spill rates to derive predictions of outcomes.

For this analysis, Monte Carlo simulations were conducted using computer models for 100,000 simulations. Each simulation randomly selected values for the variables input into the model. This determines the probability that there will be a rail accident, the probability that the accident will result in a spill, and estimates the number of tank cars (or locomotives) involved, which determines the likelihood of spills of various sizes.

Generally, for a release of crude oil to occur during rail transport, three events need to take place:

- Tank cars on a unit train in transit must be loaded with crude oil.
- An accident (Table 4-2) must occur.
- A breach must occur in at least one tank car.

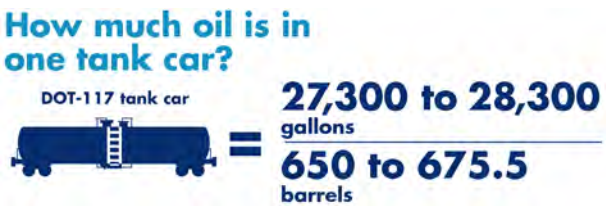
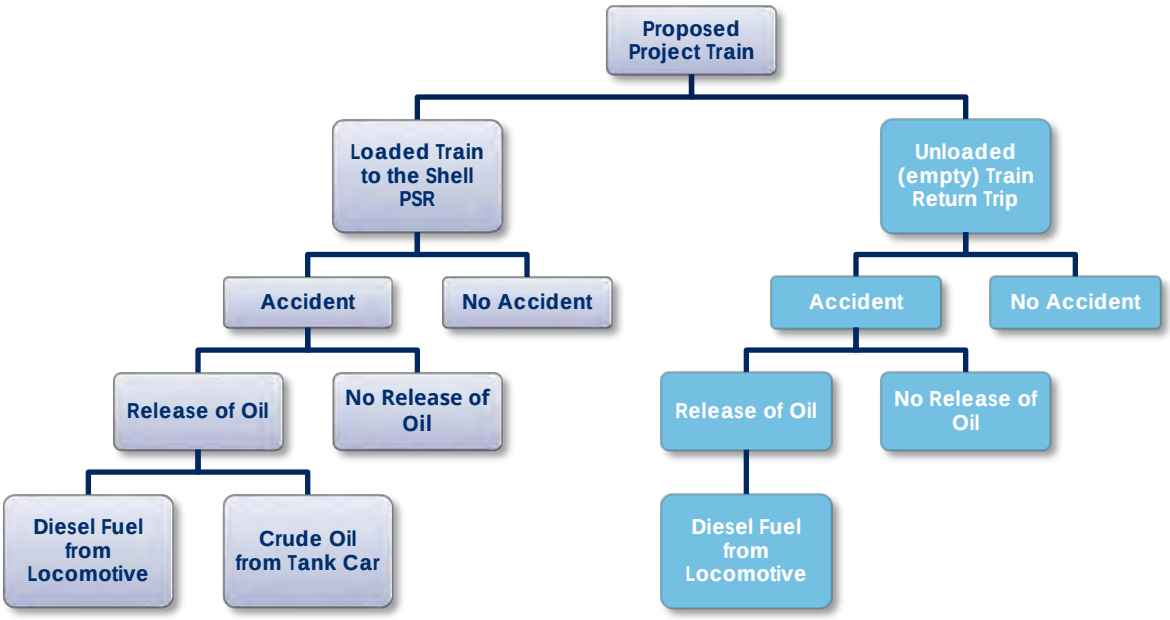


Figure 4-1 Shell PSR Crude-by-Rail Train Event Tree



Diesel fuel could also be released from one or more locomotives that derail or are otherwise damaged in an accident while transporting loaded or unloaded (empty) tank cars.

This analysis considered five different types of rail accidents: derailments, collisions, fire or explosions, highway-rail crossing incidents, and other miscellaneous accidents. There are many causes of different accident types. For example, one of the primary causes of derailments is track conditions, including broken track or welds; one of the primary causes of collisions is human error; and, one of the primary causes of fire and explosion accidents is mechanical or electrical failures. Table 4-2 outlines the accident types and their primary causes.

To determine the probability of an oil release from a proposed project unit train, the analysis considered the following questions:

- What is the probability that an accident could occur?
- If there were an accident, what is the probability of a release of oil?

- If there was a release of oil, how much oil would likely be released?

As described in more detail in Appendix G, to evaluate the potential range of probabilities that may occur from a rail accident and release, the analysis considers:

- High Estimate Evaluation of Accident and Release Rates (High Estimate).
- Low Estimate Evaluation of Accident and Release Rates (Low Estimate).

Table 4-2 Accident Types and their Primary Causes

Accident Type	Description	Primary Causes
Derailment	A derailment occurs when a train runs off of its rails.	Track conditions and mechanical/ electrical failures.
Collision	A collision occurs when a train hits another train or a structure.	Human error.
Fire or Explosion Events	Fire or explosion events include fires, violent ruptures, or detonations resulting in an accident, but do not include accidents in which a spill ignites or explodes after such an occurrence (i.e., a fire that results after a derailment, collision, highway-rail crossing or miscellaneous accident).	Mechanical/ electrical failures.
Highway-Rail Crossing Incidents	A highway-rail incident occurs when a train collides with a highway vehicle at an at-grade crossing.	A vehicle on the tracks at an at-grade crossing.
Miscellaneous Accidents	Miscellaneous accidents include obstruction accidents that occur when a train hits an object on a train right of way, and other accidents that cannot be captured under the other categories.	Human error and mechanical/ electrical failures.

Source: FRA 2016.

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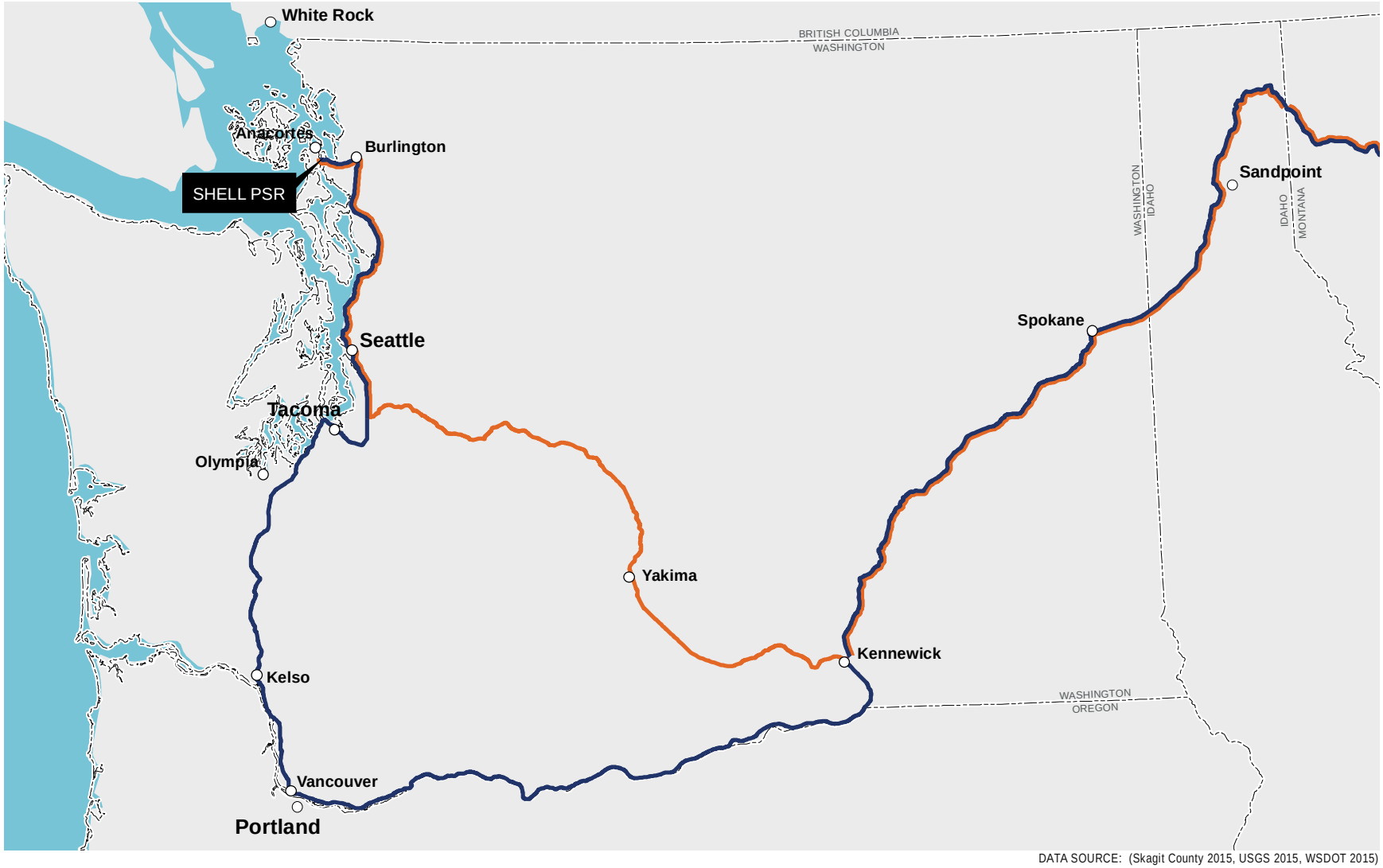


DATA SOURCE: (Skagit County 2015, USGS 2015, WSDOT 2015)

Representative Train Route to Shell PSR
Representative Train Route from Shell PSR
State/Provincial/International Boundary

N

0 25 50 Mile

Figure 4-2
PROPOSED PROJECT RAIL ROUTE THROUGH WASHINGTON STATE

The High Estimate is a purposefully conservative evaluation of the probability of an accident and release occurring based on historic rates of accidents and releases. This conservative estimate includes adjustments to the accident rate based on factors specific to crude-by-rail trains that would increase the likelihood of an accident over historic rates. These adjustments consider increased accident rates associated with sloshing and longer train length. The High Estimate assumes that safety measures (i.e., accident and release reduction measures) would not be in place or would be ineffective. These include some safety measures that are already in place, such as wayside detectors, and some measures that are expected to be implemented within the next year or two, such as positive train control.

The Low Estimate incorporates the various measures specific to crude-by-rail unit trains and for freight traffic in general that have been, or are anticipated to be, implemented to make train transport safer. These include positive train control, enhanced braking, wayside detectors, and track upgrades. Several of these measures would need to be sustained over time for the release rate probabilities to remain constant (e.g., improved track maintenance).

An Introduction to Probability

The probability of an accident occurring is a measure of the likelihood that an event will happen in a given year. The result is reported as either a frequency or a return period. The frequency is the anticipated number of times that that accident will occur over a given period of time.

The return period for a release is directly related to the probability of an accident occurring. The return period is the amount of time, on average, that passes between consecutive accidents of a similar magnitude. Return periods are frequently used with low probability events.

As an example, if an individual were to toss a coin once a minute hoping for "heads," the average frequency of a heads would be one in two tosses or 50 percent. The average return period for "heads" would be the inverse of 1/2, which is 2/1, or 2 minutes.

It is important to note that probabilities are estimates of likelihood and not a true prediction of an event occurring at a specific point in time. While there is a 50/50 chance that "heads" will be thrown with each toss of the coin, it is impossible to predict if the next toss will, in fact, be "heads." It is quite possible to toss 2, 3, or even more "tails" in a row. Furthermore, the likelihood of throwing "heads" on the 4th toss or subsequent tosses would still be 50 percent.

Therefore, when speaking of the frequency or return period, the word "average" is used to describe probability rather than certainty. To clarify, a return period of two years does not mean that an accident will happen every two years. The accident could happen tomorrow, in five years, or, possibly, not at all. However, on average and given a long enough period of time, the frequency of occurrence would average every two years.

When considering extremely low probability events, return periods help frame the likelihood of events with time. For example, it is estimated that more than 100 lightning bolts strike the Earth every second. Even with so many lightning strikes, the odds of being struck by lightning in the U.S. in any one year are roughly 1 in 700,000 years. However, we know that individual people do not live for 700,000 years and that some individuals are unfortunate enough to be struck by lightning. This statistic helps explain that while an event could occur, it is not likely.

In the following sections of this chapter, an overview of the probability analysis and results is presented. Overall, the probability of an accident involving a Shell PSR unit train in Washington State resulting in a release of oil is low. However, should such an accident occur, the consequences could be substantial. Tables 4-3 and 4-4 and Figures 4-3 and 4-4 present a summary of the anticipated release frequencies and return periods (average years between releases) for loaded proposed project trains. These tables also presents the cumulative release frequencies and return periods when project trains are grouped with current and reasonably foreseeable future crude-by-rail train traffic. Because the proposed project would add one train each direction per day in Washington, the probability of an accident and release involving a Shell unit train is low. However, when considered with all other existing and planned crude-by-rail traffic, the overall probability of an accident and release in Washington would be higher.

Table 4-3 Projected Release Frequencies for Loaded Proposed Project Trains in Washington

	Release Size (Barrels [gallons]	Frequency (Releases/Year)	Average Return Period (Years)	Probability ("Odds") of a Release in any Given Year
High Estimate Evaluation of Accident and Release Rates	250 (10,500)	0.046	22	1 in 22
	5,700 (239,400)	0.032	31	1 in 31
	20,000 (840,000)	0.0069	140	1 in 140
Low Estimate Evaluation of Accident and Release Rates	250 (10,500)	0.0055	180	1 in 180
	5,700 (239,400)	0.0036	280	1 in 280
	20,000 (840,000)	0.00055	1,800	1 in 1,800

Figure 4-3 Projected Release Frequencies for Loaded Proposed Project Trains in Washington

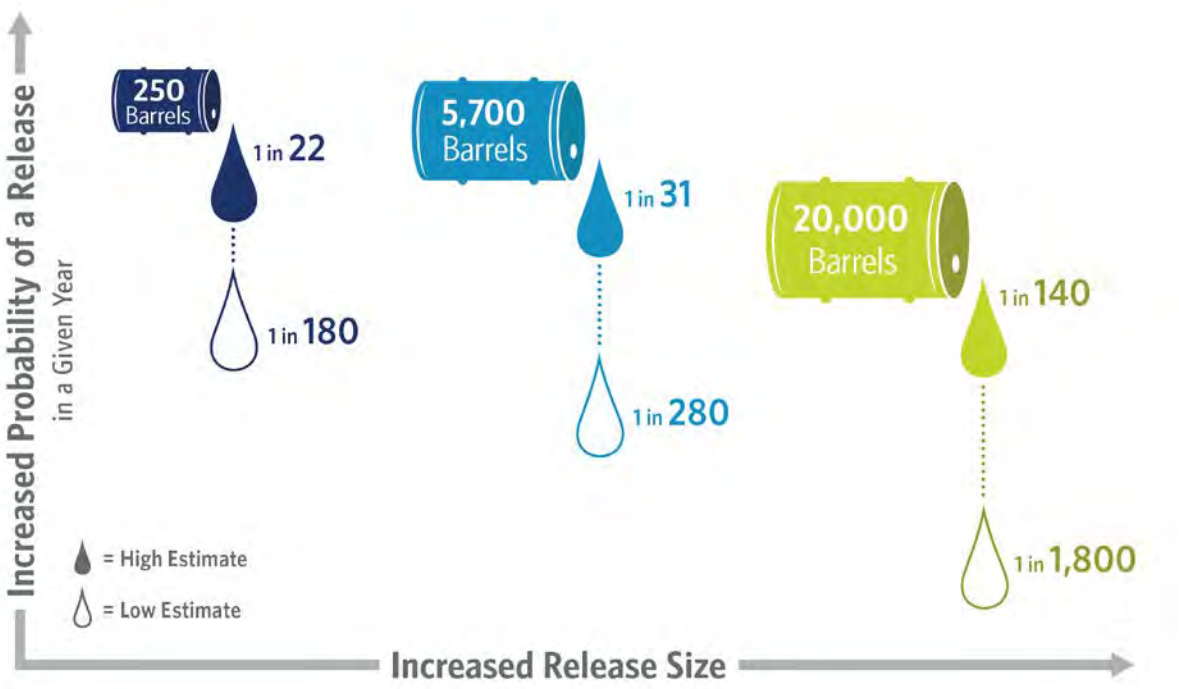
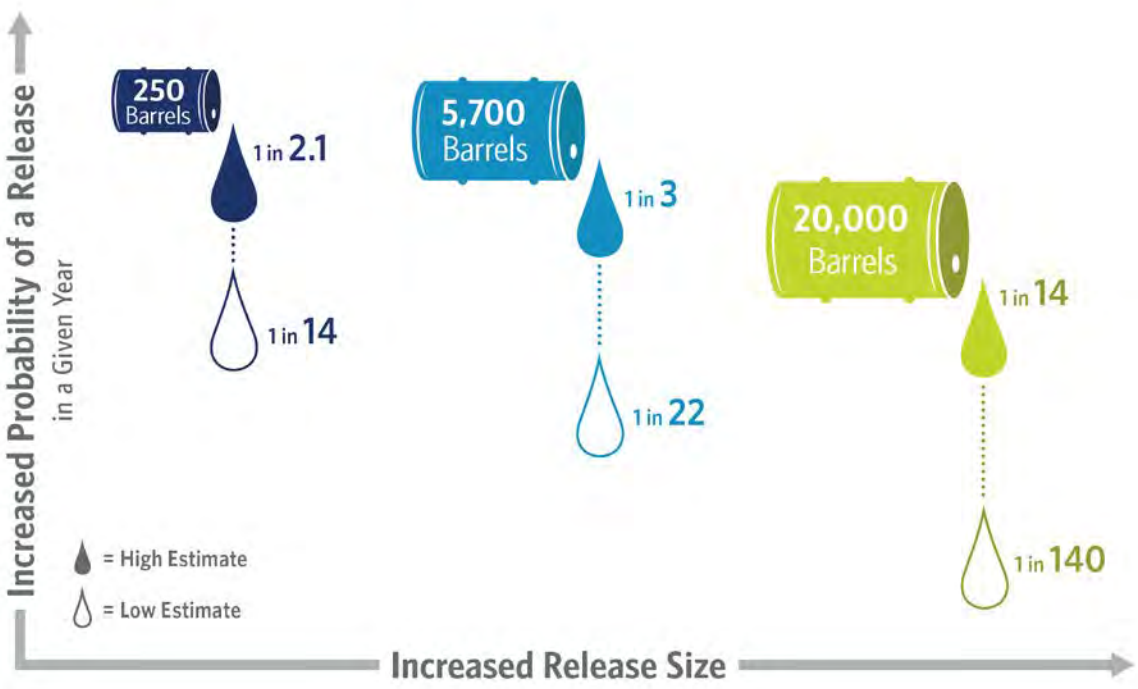


Table 4-4 Projected Cumulative Release Frequencies for Past, Present, and Future Loaded Crude Oil Trains in Washington

	Release Size (Barrels [gallons])	Frequency (Releases/Year)	Average Return Period (Years)	Probability ("Odds") of a Release in any Given Year
Cumulative High Estimate Evaluation of Accident and Release Rates	250 (10,500)	0.48	2.1	1 in 2.1
	5,700 (239,400)	0.34	3	1 in 3
	20,000 (840,000)	0.072	14	1 in 14
Cumulative Low Estimate Evaluation of Accident and Release Rates	250 (10,500)	0.069	14	1 in 14
	5,700 (239,400)	0.045	22	1 in 22
	20,000 (840,000)	0.0069	140	1 in 140

Note:
The cumulative low and high estimates assume that all planned crude-by-rail projects in Washington State would be constructed and that currently operating facilities continue to operate at the same level. This would increase the number of weekly crude-by-rail trains in the state from about 21 currently to about 70.

Figure 4-4 Projected Cumulative Release Frequencies for Past, Present, and Future Crude-by-Rail Projects in Washington



High Estimate Evaluation of Accident and Release Rates

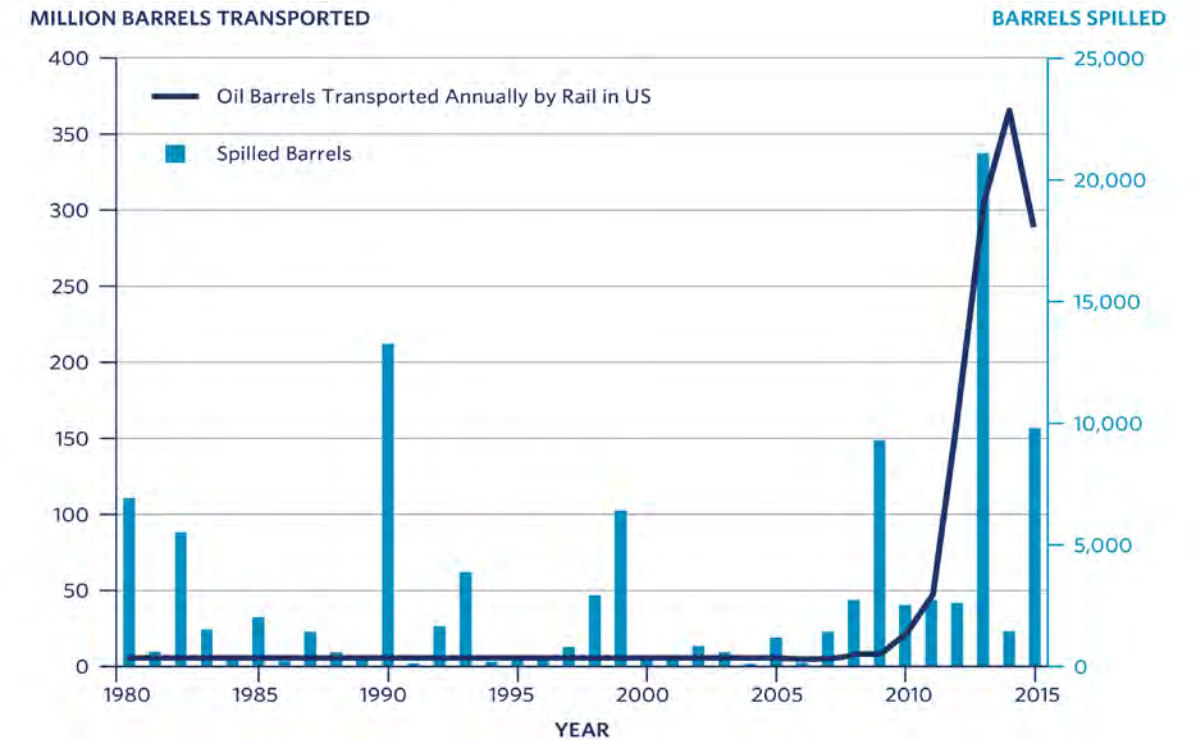
The High Estimate evaluation is based on historic accident data from 1985 to 2004, for freight trains and historic release data from 1985 to 2015, for hazardous materials rail cars. The reason that the 1985 to 2004 accident data time frame was selected is that it provided the higher, most conservative accident rates, while eliminating the much higher accident rates that occurred during 1975 to 1984, when railroad operations were considerably different. The accident rate in the time period for 2005 to 2015 was lower than the previous decades due to the incorporation of some safety measures. However, the time period for release rates (i.e., the probability of a tank car spilling some or all of its contents) was based on a larger time frame because having a larger data set provides a more statistically accurate analysis. The release rate from hazardous materials tank cars was not dependent on any changes in rail operations.

High Estimate Evaluation of a Rail Accident

The widespread transport of crude oil by rail is a relatively recent development, with shipments at the national level increasing from about 25 million barrels in 2010, to more than 350 million barrels in 2014 (Figure 4-5) (AAR 2016). This rapid expansion has led to an increase in the number of accidents that have occurred involving crude-by-rail trains. From 2010 to the present, there have been 36 accidents in North America (25 in the United States) (Figure 4-6), including the June 2016 derailment of a crude-by-rail train in Mosier, Oregon. However, as shown in

Figure 4-7, the number of accidents along the main lines nationwide for all freight traffic (of which crude by rail is only a small subset) has decreased over the past 30 years.

Figure 4-5 Oil Barrel Shipments by Rail 1980–2015



Source: AAR 2016.

Figure 4-6 North American Crude-by-Rail Accidents from 2010 to Present

Note:
The accidents depicted in Figure 4-6 are based on a review of the Pipeline and Hazardous Materials Safety Administration (PHMSA) database of accidents involving crude-by-rail shipments (USDOT 2016). Only those accidents that occurred along the rail line were included (i.e., if a crude-by-rail accident occurred at a receiving facility, it was not included). Further, the PHMSA database includes accidents that were not classified as accidents in the Federal Railway Administration (FRA) database because they did not exceed the monetary damages threshold or did not result in a release of oil. These data are included here to illustrate that crude-by-rail trains can be involved in accidents that do not result in a release of oil; many of these events did not result in a release as further illustrated in Figures 4-8 and 4-9.

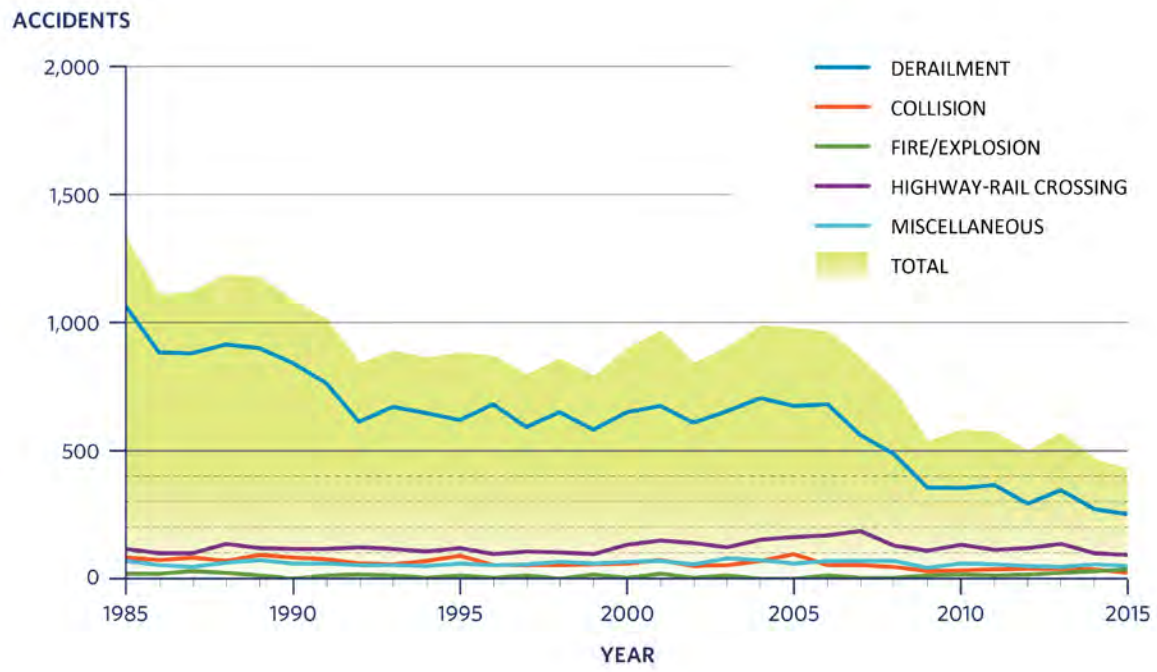
Conducting a statistically meaningful probability analysis requires a large enough sample size to minimize the margin of error in the results. In other words, if the sample size is too small, the results will not be reliable. In this case, because crude-by-rail transport did not become widespread until around 2010, there is not enough data across a long enough period of time to determine a statistically valid likelihood of an accident involving crude-by-rail unit trains. The crude-by-rail data from 2010 to the present provide a snapshot of the potential risk; however, it was necessary to use broader Federal Railway Administration (FRA) freight train accident data to create a statistically accurate analysis. Therefore, 20 years (1985 to 2004)

A **train mile** is one mile traversed by one train. For example, 100 trains traveling 50 miles each would be 5,000 train miles.

of freight train accident data from the FRA were analyzed to determine the frequency of rail accidents per *train mile* at the national level (FRA 2016).

The approach of using freight train data to assess risk has been applied in several other studies, including the risk analyses conducted at the University of Illinois at Urbana-Champaign Rail Transportation and Engineering Center, which is the leading center for rail transportation research in the United States. For most rail accidents (e.g., derailments, collisions) the cause of the accident is independent of the cargo being transported; therefore, it was appropriate and necessary to use the freight train accident data for this comparative analysis.

Figure 4-7 U.S. (Nationwide) Main Line Freight Accidents 1985–2015



Source: FRA 2016.

Evaluating the FRA train accident data relative to the number of freight train miles in any given year across the United States revealed the per-train mile rates at which different accident types would be anticipated. As described further in Appendix G, the accident rates were then adjusted to account for differences between general freight traffic and crude-by-rail traffic, including the greater likelihood of an accident due to increased train length and the potential effects of sloshing (longitudinal [front to back] liquid movement during transit within tank cars that are only partially loaded). With these adjustments, the following values were used as the rates of an accident involving a crude-by-rail unit train:

- Derailment: 0.9096 to 1.5251 accidents per million train miles.
- Collision: 0.0841 to 0.1763 accidents per million train miles.

- Fire/Explosion: 0.0000 to 0.0464 accidents per million train miles.
- Highway-Rail Crossing: 0.0743 to 0.2065 accidents per million train miles.
- Miscellaneous: 0.0878 to 0.1764 accidents per million train miles.

For context, proposed project trains would be expected to travel approximately 650 miles in Washington State to the Shell PSR facility, and 530 miles in Washington State on return trips. Annually, this would equate to about 372,000 miles traveled for proposed project trains both coming into and leaving the state.

High Estimate Evaluation of an Oil Release

When an accident occurs, it does not necessarily lead to a release of oil. Between 2010 and 2015, more than 1 billion barrels of oil were transported via crude-by-rail trains in the United States (Figure 4-5). In North America between 2010 and the present, 36 accidents occurred involving crude-by-rail trains, and 22 of those accidents resulted in a release of oil (Figure 4-8 for the U.S. and Figure 4-9 for Canada). The outcomes from these accidents varied widely. Some did not result in a release of any oil (e.g., Seattle and Philadelphia). At the low end of accidents resulting in oil releases, the February 2014 accident in Portage, Wisconsin resulted in a release of 179 barrels (7,500 gallons) of oil, and the June 2016 accident in Mosier, Oregon resulted in a release of 1,119 barrels (47,000 gallons) of oil. In contrast, at the high end, the July 2013 Lac-Mégantic, Quebec accident resulted in a release of 37,739 barrels (1.59 million gallons) of oil.

As depicted in Figure 4-9, the volume of oil released during the Lac-Mégantic accident is much higher when compared with the amount of oil released in other accidents. The approximately 38,000 barrels of oil that were released at Lac-Mégantic would fall near the 97th percentile in the spill volume distribution modeling. In other words, only three percent of releases would be expected to be more than 38,000 barrels. The Lac-Mégantic accident in Canada was the largest crude-by-rail accident to occur to date. In its Railway Investigation Report, the Transportation Safety Board of Canada concluded that "[operating railroad] did not have a functioning Safety Management System," which contributed directly to the accident (TSB of Canada 2016).

As described in the preceding discussion, although there have been numerous accidents resulting in releases from crude-by-rail trains, there are not enough data regarding crude-by-rail accidents across a long enough time period to inform a statistically meaningful release probability analysis. In addition, there are no reliable national train-mileage data for crude-by-rail transport, or even an accurate record of crude-by-rail accidents available from FRA or other sources, upon which a per-train-mile analysis could then be applied to the projections for the Shell PSR and Washington State as a whole. Therefore, for this analysis, release data from accidents associated with hazardous materials and petroleum (primarily refined products, but also some crude oil) tank car shipments served as a substitute for crude-by-rail trains. Historically, hazardous materials, refined petroleum products, and crude oil have been shipped in smaller, overall volumes in tank cars such as the DOT-111 or earlier models. Releases from these tank cars occurred independent of the materials that were being carried (e.g., ethanol is no more or less likely to spill than crude oil); therefore, it was appropriate to use the historic hazardous materials release data for this analysis.

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Figure 4-8 U.S. Historic Accidents Involving Crude-by-Rail Unit Trains and Amount of Crude Oil Released 2013–2015

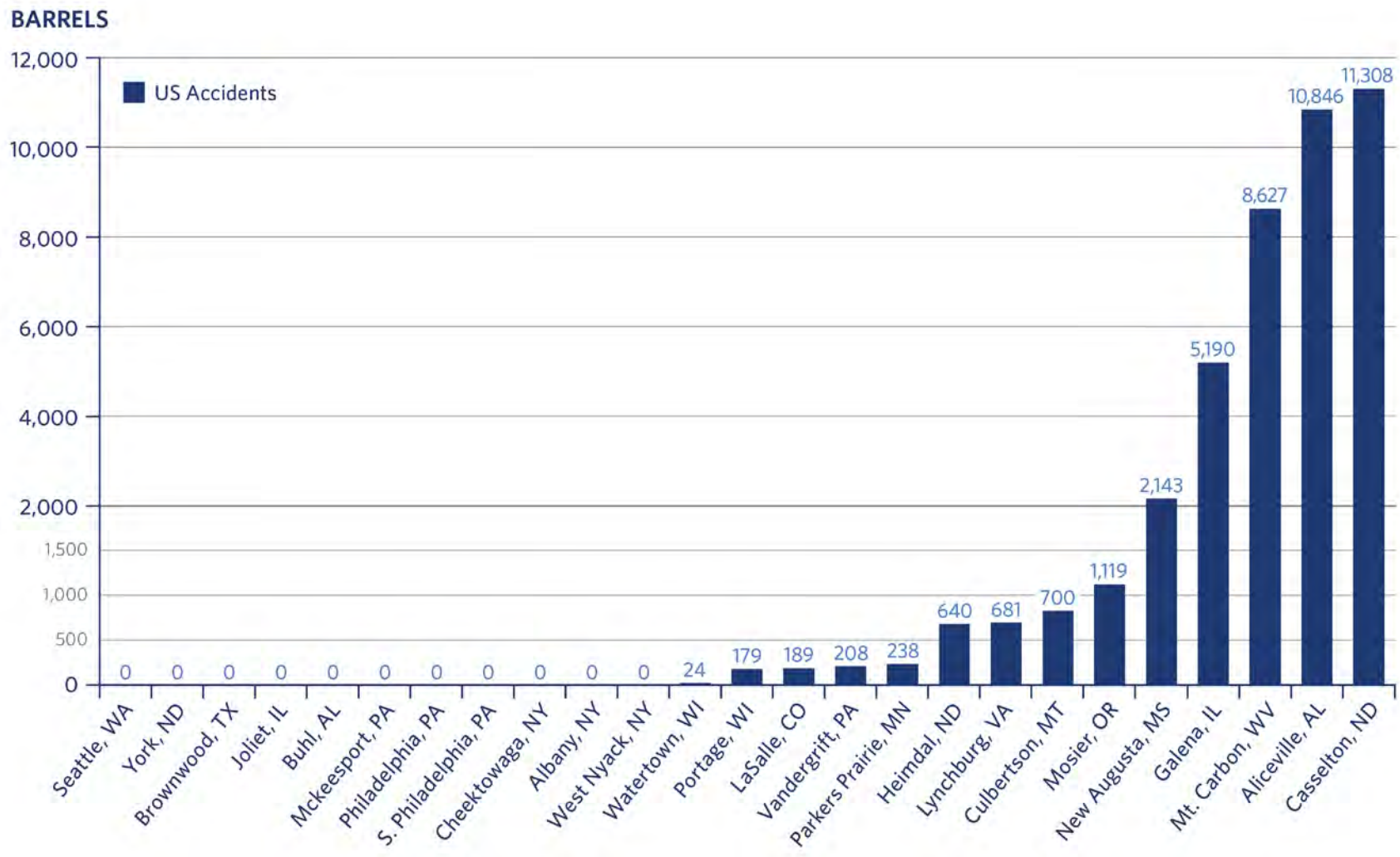

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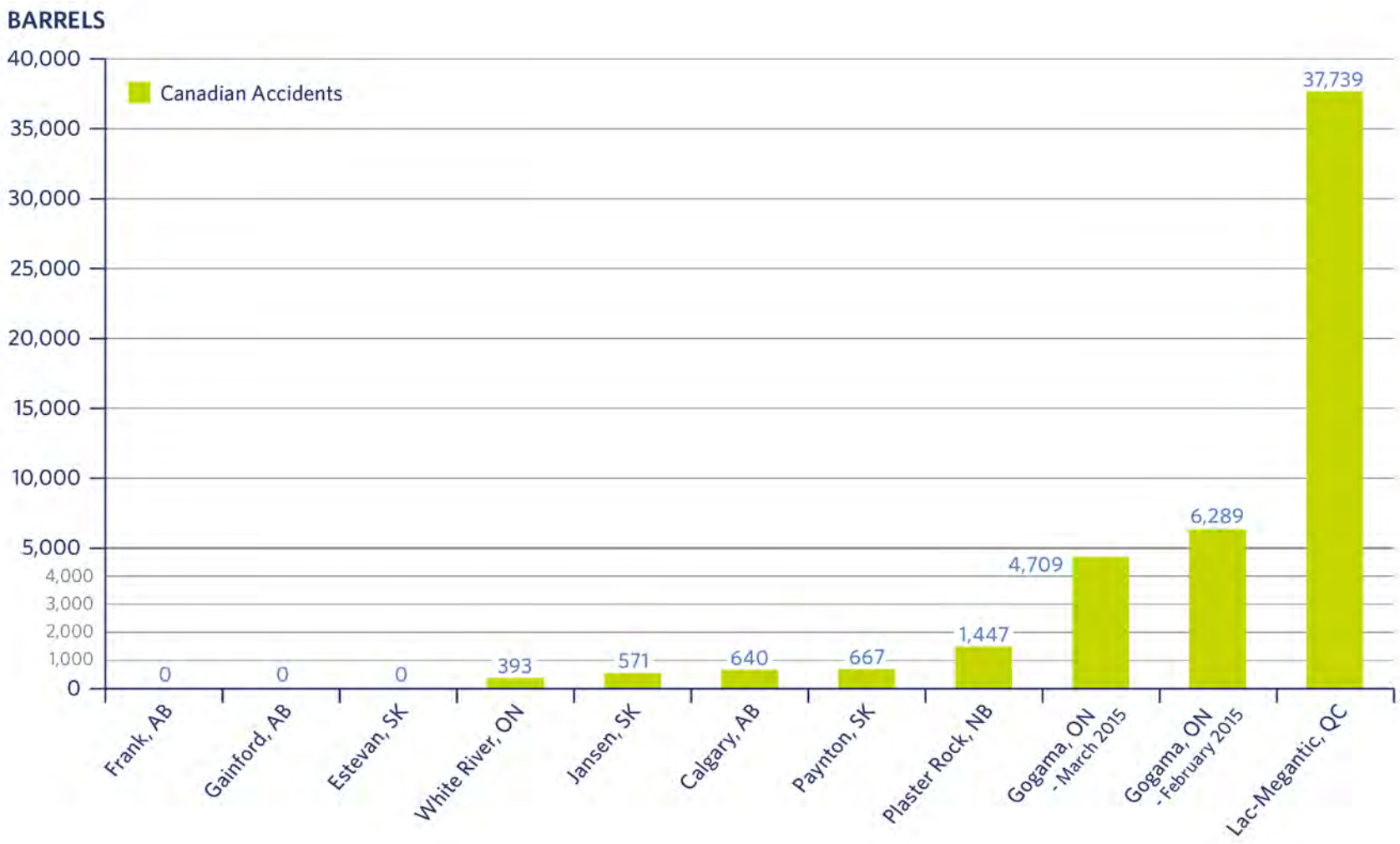
Figure 4-9 Canadian Historic Release Accidents Involving Crude-by-Rail Unit Trains and Amount of Crude Oil Released 2013–2015



Rail accidents involving hazardous materials tank cars, such as those used to transport crude oil, do not necessarily result in a release. An analysis of the FRA accident data from 1975 to 2015 in the United States showed that there were 3,589 accidents involving a total of 11,352 tank cars carrying hazardous materials that were either damaged or derailed. Of the 11,352 cars, 2,418 (21.3 percent) released hazardous materials. Over time, the release rate has been changing, with 22.6 percent of accidents resulting in a release between 1985 and 1994, 14.6 percent between 1995 and 2004, and 19.0 percent between 2005 and 2015.

As described in Appendix G, the probability that an accident would result in a release is dependent on the accident type. Historically, accidents involving hazardous materials freight traffic have resulted in the following likelihoods of a release occurring:

- Derailment: 21.5 percent.
- Collision: 19.5 percent.
- Fire/Explosion: 60.0 percent.
- Highway-Rail Crossing: 17.0 percent.
- Miscellaneous: 19.1 percent.

In other words, if a derailment occurred, there is a 21.5 percent chance that it would result in a release. Similarly, if there were a fire or explosion, it could result in a release 60 percent of the time.

The results presented in this chapter are given as averages; however, the statistical modeling that was conducted resulted in a wide range of outputs. For a full discussion of the analysis conducted, please refer to Appendix G.

Based on these percentages, the High Estimate evaluation average annual number of releases of any size was calculated to be 0.222 releases per million train miles. The likelihood of a release from one or more tank cars (or locomotives) as a result of an accident was considered along with the number of train miles that proposed project trains would be expected to travel and the probability of any of the accident types occurring. This determined the frequency (releases per year) and return period (average years between releases) of a release of any size.

For proposed project trains, the average frequency of a release of any size would be 0.046 releases per year, or one release every 22 years. This does not mean it would take 22 years for another release of any size to occur, rather that there is a 1 in 22 chance that a release of any size could occur from an accident in any given year.

If a release of oil were to take place, there would be a range of potential release volumes that could occur. As described in Appendix G, the amount of oil released would depend on:

- The total number of tank cars in the unit train (up to 102 tank cars for proposed project trains).
- The number of tank cars involved in the accident (up to all of the tank cars on a train).
- The volume of oil contained and released within each tank car (650 to 675.5 barrels per DOT-117 tank cars, and 690 barrels per DOT-111 tank cars).

The results indicated that for an accident involving a proposed project train, the average release volume would be 11,144 barrels (468,000 gallons), or the equivalent of 16.2 tank cars. As shown in Figure 4-10, the potential distribution of release volumes trended toward smaller releases. In other words, 10 percent of the accidents would be expected to involve more than 20,000 barrels (840,000 gallons).

Overall, releases from the proposed project trains are not anticipated to occur with great frequency. However, the potential volumes released would be at different average frequencies. As indicated by the modeling results in Table 4-5, smaller releases from proposed unit trains are expected to occur more frequently than larger ones. The return period for all modeled releases from proposed project trains varied from one 250-barrel release every 22 years, to one 50,000-barrel release every 22,000 years. This does not mean it would take 22 years for another 250-barrel release to occur, rather, that there is a 1 in 22 chance a 250-barrel release could occur in any given year.

Figure 4-10 Distribution of Release Volumes

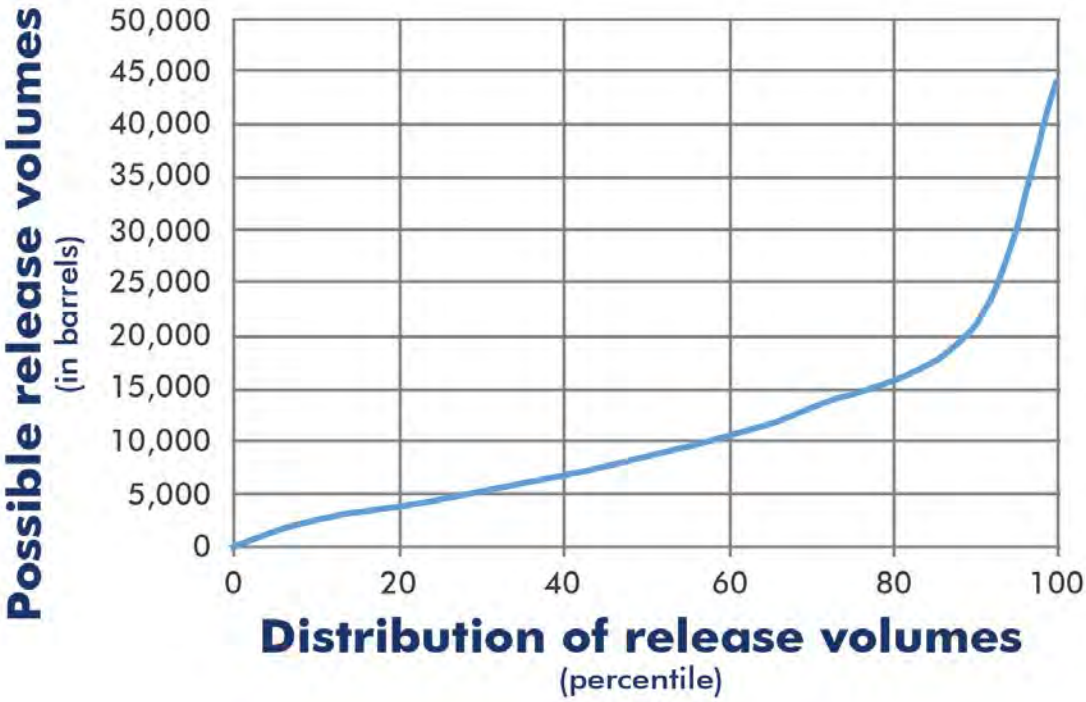


Table 4-5 High Estimate Evaluation – Expected Average Frequency of Releases by Volume for Shell PSR Trains

Release Volume (Barrels [gallons])	Average Frequency (Releases/Year)	Average Return Period (Years)	Probability ("Odds") of a Release in any Given Year
250 (10,500)	0.046	22	1 in 22
2,500 (105,000)	0.041	24	1 in 24
4,000 (168,000)	0.037	27	1 in 27
5,700 (239,400)	0.032	31	1 in 31
8,000 (333,600)	0.025	40	1 in 40
10,000 (420,000)	0.016	62	1 in 62
15,000 (630,000)	0.012	87	1 in 87
20,000 (840,000)	0.0069	140	1 in 140
40,000 (1,680,000)	0.00092	1,100	1 in 1,100
50,000 (2,100,000)	0.00005	22,000	1 in 22,000

From 2010 to 2014, there was an 84-fold increase in the number of crude-by-rail trains traveling nationally (though the number of shipments has been decreasing since late 2014) (Figure 4-5). The increase in the overall number of crude-by-rail trains has led to an overall higher rate of accidents. When there were no, or only few, crude-by-rail trains, there were limited opportunities for such accidents and releases. Prior to 2010, when oil spilled from rail tank cars, it was usually fuel oil from a locomotive or refined petroleum from a small number of tank cars. Occasionally, crude oil was transported in rail tank cars in small volumes. Despite the rise in the absolute number, accident rates on a per-mile basis are lower today because of improved operations (e.g., more routine track maintenance) (see Figure 4-7).

Currently, there are approximately 21 crude-by-rail trains traveling in Washington per week. Because the proposed project would add one unit train per day, on average, the probability of an accident and release involving a Shell unit train is low. However, when considered with all other existing and planned crude-by-rail traffic (which would increase traffic to approximately 70 crude-by-rail trains per week), the overall probability of an accident and release involving any crude-by-rail train in Washington would be higher. This probability is discussed below under Cumulative Impacts.

Low Estimate Evaluation of Accident and Release Rates

The Low Estimate accounts for the reductions in the probability of an accident or release that could occur from the various measures specific to crude-by-rail unit trains that have been, or are anticipated to be, implemented to make trains safer. These include positive train control,

enhanced braking, wayside detectors, track upgrades, and safer tank cars (Table 4-6). Several of these measures would need to be sustained over time for the release rate probabilities to remain constant (e.g., improved track maintenance).

Low Estimate Evaluation of a Rail Accident

As described in Appendix G and Chapter 3-15 – Rail Traffic and Transportation, there are a number of industry practices and policies that are designed to minimize the likelihood of accidents involving crude-by-rail trains (Table 4-6). These factors include safety improvements to the rail line, such as wayside detection systems, positive train control, and track upgrades; and unit train operating parameters, including enhanced braking. The Low Estimate also accounts for the increased train length, which increases accident probability, associated with Shell PSR unit trains.

Many of these factors, especially positive train control, track upgrades, and wayside detectors, would work together to prevent rail accidents. The net result of the analysis showed that accidents associated with crude-by-rail trains were assumed to be 25.1 to 71.3 percent less likely to occur than indicated by the historic accident data for all freight rail traffic based on safety enhancements that are or will shortly be in place. A review of technical engineering studies determined that lateral sloshing (side-to-side liquid movement within tank cars during transit) and changes in lateral stability associated with crude-by-rail trains, were not likely to have an effect on the likelihood of an accident.

The adjustment rate is based on a review of technical engineering, industry studies, and other evaluations of the potential changes to the accident rate. These adjustments were only applied to the probability of an accident of the type that lead to spillage. The adjustments were assumed to be independent of, and therefore did not apply to, the probability of a release of oil to the environment that could occur during an accident. When the 25.1 to 71.3 percent reduction in the likelihood of an accident occurring was applied to the historic rates, the following accident rates for different accident types would be expected:

- Derailment: 0.1264 to 0.5255 accidents per million train miles.
- Collision: 0.0035 to 0.0709 accidents per million train miles.
- Fire/Explosion: 0.0000 to 0.0087 accidents per million train miles.
- Highway-Rail Crossing: 0.0155 to 0.1002 accidents per million train miles.
- Miscellaneous: 0.0156 to 0.0962 accidents per million train miles.

For context, proposed project trains would be expected to travel approximately 650 miles in Washington State to the Shell PSR facility, and 530 miles in Washington State on return trips. Annually, this would equate to about 372,000 miles traveled for proposed project trains both coming into and leaving the state.

Table 4-6 Adjustments to Accident Rates for Crude-by-Rail Trains for the Low Estimate Evaluation

Adjustment	Description
Wayside Detectors	Wayside detection systems monitor the wheels of passing trains and alert rail car operators about potential defects. In Washington State, acoustic-bearing detectors, wheel impact load detectors, hot box detectors, and dragging detectors are currently in use.
Track Upgrades	Track improvements and upgrades are likely to prevent or reduce the occurrence of certain types of track-related derailment accidents.
Positive Train Control	The FRA has mandated the use of positive train control for all railroads. Positive train control is designed to automatically stop a train before certain accidents, including train-to-train collisions, derailments caused by excessive speed, and movement of trains on tracks where they are not supposed to be. This directive was originally mandated to be in effect by the end of 2015, but was extended to the end of 2018.
Enhanced Braking	The U.S. Department of Transportation (USDOT) Final Rule requires that crude-by-rail trains have in place a functioning end-of-train device or a distributive power braking system. It further requires that by January 1, 2021, all unit trains comprised of 70 or more loaded tank cars traveling at more than 30 mph be operated with an electronically controlled pneumatic braking system.
Lateral Stability	Unit trains carrying crude by rail are assumed to have greater lateral stability because all of the tank cars are relatively identical in size and shape. However, studies conducted have not shown a net change to the accident rate.
Sloshing	Sloshing (the movement of oil in partially filled tank cars) has been raised as a stability concern for the transport of crude by rail. However, studies have shown that lateral liquid sloshing actually has a dampening effect and reduces lateral movement of oil in the tank car. Any changed probability due to longitudinal sloshing (in the direction of the track) was considered to be negligible as there are no specific data that support the hypothesis that longitudinal sloshing increases accident rates.
Train Length	Train length changes the probability of accidents. As train length increases, the probability of an accident also increases.

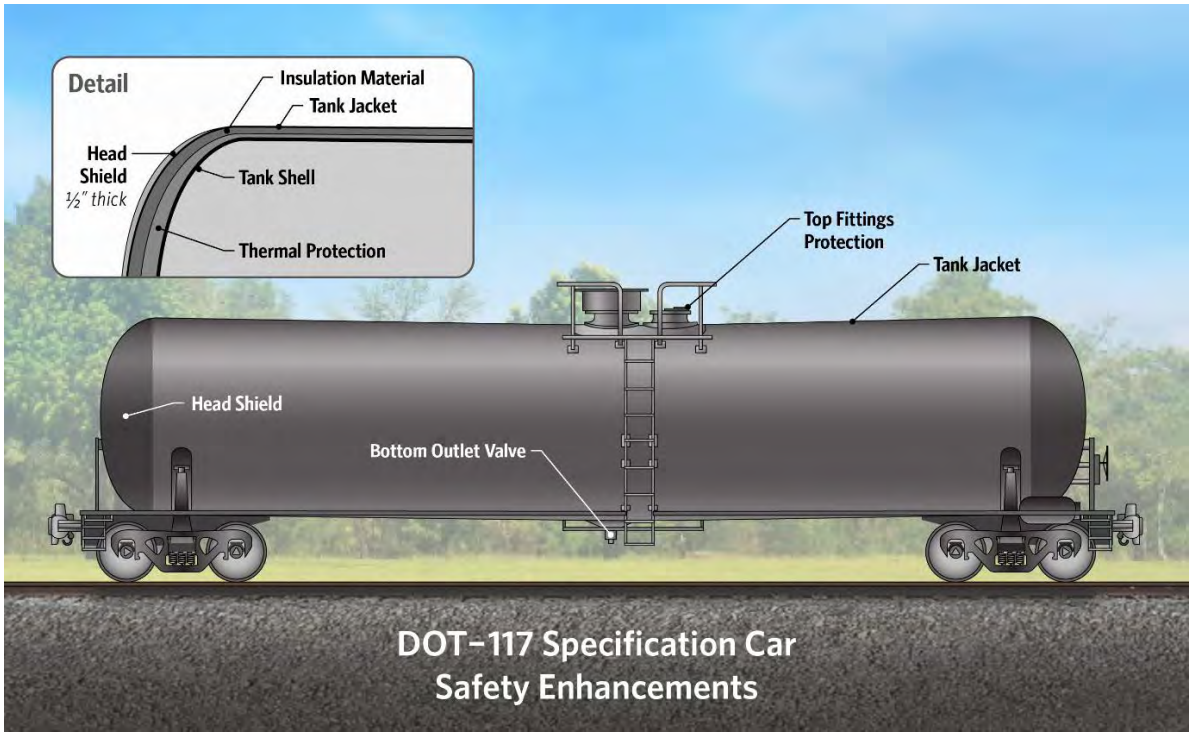
Note: For additional information and citations for all information please refer to Appendix G.

Low Estimate Evaluation of an Oil Release

As described in Appendix G, there are a number of factors specific to the transport of crude oil by rail such as the use of DOT-117 Specification tank cars and reduced crude-by-rail train traveling speeds (see below), both of which would reduce the probability of a release. Shell would use only tank cars that meet or exceed the specifications of DOT-117 tank cars to transport crude oil as part of the proposed project (Figure 4-11). This would be included as a condition of approval and would be enforced through state and local permitting requirements. These tank cars are considered safer and less likely to rupture and release oil in the event of an accident. Their safety

features are attributed to the increase in wall thickness, thermal protective measures, and other mechanical improvements such as fittings, valves, and brakes, when compared with the previously used DOT-111 tank cars (USDOT 2014).

Figure 4-11 DOT-117 Specification Tank Car Safety Enhancements



Source: adapted from USDOT 2016.

In accordance with the USDOT Final Rule issued on May 1, 2015, crude-by-rail trains are restricted to operating at less than 50 miles per hour (mph), which reduces the likelihood of an accident and may reduce the likelihood of a release in the event of an accident. The effects of this rule are not reflected in the historic release probabilities as the rule does not apply to general hazardous materials shipments and has only been in place for a little over a year.

As described in Appendix G, when combined, speed reductions and the use of DOT-117 tank cars, which include thermal protection, reduce the probability of releases in the case of all accident types except fire/explosions by 43 to 72.2 percent. Reductions associated with speed and the use of DOT-117 tank cars do not effect releases due to fire/explosions; therefore, releases from tank cars because of fire/explosions would be reduced by 12 percent because of the thermal protection measures incorporated into the DOT-117 tank cars. With these adjustments, the following average release probabilities for different accident types would be anticipated:

- Derailment: 6.0 to 12.3 percent.
- Collision: 5.5 to 11.1 percent.
- Fire/Explosion: 52.8 percent.

- Highway-Rail Crossing: 4.8 to 9.7 percent.
- Miscellaneous: 5.4 to 10.9 percent.

In other words, the probability that a derailment would result in a release would be reduced by 43 to 72.2 percent from the historic probability of 21.5 percent to 6.0 to 12.3 percent.

Based on these percentages, the average number of releases of any size was calculated to be 0.027 releases per million train miles. The likelihood of a release in the event of an accident was considered along with the number of train miles that proposed project trains would be expected to travel and the probability of any of the accident types occurring. This calculation determined the average frequency (average releases per year) and average return period (average years between releases) of a release of any size. For proposed project trains, the average frequency of a release of any size would be 0.0055 releases per year, or one release every 180 years. That means there is a 1 in 180 chance that a release of any size could occur in any given year.

A range of potential release volumes could occur if a release were to take place. As described in Appendix G, the results indicated for an accident involving a proposed project train, the average release volume would be 10,498 barrels (441,000 gallons), or the equivalent of 16.2 tank cars.

The potential volume released would be at different average frequencies. As indicated by the modeling results in Table 4-7, smaller releases from proposed unit trains are anticipated to occur more frequently than larger ones. The return period, on average, for all modeled releases varied from one 250-barrel release every 180 years, to one 50,000-barrel release every 180,000 years. This does not mean it would take 180 years for another 250-barrel release to occur; rather, that there is a 1 in 180 chance a 250-barrel release could occur in any given year.

Table 4-7 Low Estimate Evaluation – Expected Average Frequency of Releases by Volume for Shell PSR Trains

Release Volume (Barrels [gallons])	Average Frequency (Releases/Year)	Average Return Period (Years)	Probability ("Odds") of a Release in any Given Year
250 (10,500)	0.0055	180	1 in 180
2,500 (105,000)	0.005	200	1 in 200
4,000 (168,000)	0.0044	230	1 in 230
5,700 (239,400)	0.0036	280	1 in 280
8,000 (333,600)	0.003	330	1 in 330
10,000 (420,000)	0.0022	450	1 in 450
15,000 (630,000)	0.0014	730	1 in 730
20,000 (840,000)	0.0055	1,800	1 in 1,800

Release Volume (Barrels [gallons])	Average Frequency (Releases/Year)	Average Return Period (Years)	Probability ("Odds") of a Release in any Given Year
40,000 (1,680,000)	0.000055	18,000	1 in 18,000
50,000 (2,100,000)	0.0000055	180,000	1 in 180,000

Probability of Release from an Unloaded Train

Both loaded and unloaded (empty) proposed project trains could be involved in an accident that releases crude oil or diesel fuel. For a loaded train, there could be a release of crude oil from the tank cars and/or diesel fuel from the locomotives. For an unloaded train, the primary concern would be the release of diesel fuel from the locomotives because the residual crude oil content in the tank cars after unloading is considered too small to have an effect. The analysis of the probability of a release for unloaded project unit trains followed the same methodology for loaded trains under the High and Low Estimate evaluations, as described in Appendix G.

For the proposed project, each unit train is anticipated to have between four and six locomotives. Each locomotive would be carrying between 65 and 131 barrels of diesel fuel. During an accident, it is anticipated that 20 to 60 percent of the locomotives would be involved. Locomotives are typically placed in groups, with two or three positioned at both the front and back of the train. It is unlikely that both ends of the train would be involved in an accident. For analysis, it was assumed that the range of diesel fuel released from each locomotive would be between 1 to 100 percent.

The expected average frequency of a release would vary depending on the volume of diesel fuel released. As indicated by the modeling results in Table 4-8, smaller releases are anticipated to occur more frequently than larger ones. The return period, on average, for all modeled releases from a proposed project locomotive varied from a single, five-barrel release every 260 years under the High Estimate evaluation, to one 300-barrel release every 26,000 years. Under the Low Estimate evaluation, the return period ranged from a single, five-barrel release every 1,000 years, to one 300-barrel release every 100,000 years.

Table 4-8 Expected Average Frequency of Releases by Volume for Unloaded Shell PSR Trains

Release Volume of Diesel Fuel (Barrels [gallons])	High Estimate Evaluation			Low Estimate Evaluation		
	Frequency (Releases/ Year)	Average Return Period (Years)	Probability ("Odds") of a Release in any Given Year	Frequency (Releases/ Year)	Average Return Period (Years)	Probability ("Odds") of a Release in any Given Year
5 (210)	0.0038	260	1 in 260	0.00098	1,000	1 in 1,000
25 (1,050)	0.0034	290	1 in 290	0.00088	1,100	1 in 1,100
40 (1,680)	0.0027	380	1 in 380	0.00069	1,500	1 in 1,500
50 (2,100)	0.0021	480	1 in 480	0.00054	1,900	1 in 1,900
60 (2,520)	0.0015	660	1 in 660	0.00039	2,600	1 in 2,600
70 (2,940)	0.0011	880	1 in 880	0.00029	3,400	1 in 3,400
100 (4,200)	0.00038	2,600	1 in 2,600	0.000098	10,000	1 in 10,000
250 (10,500)	0.00019	5,300	1 in 5,300	0.000049	20,000	1 in 20,000
300 (12,600)	0.00006	26,000	1 in 26,000	0.000001	100,000	1 in 100,000

Cumulative Probability of an Accident and Release

As described in Chapter 1 – Introduction, four refineries in Washington currently receive crude by rail from the mid-continent area. Cumulative impacts for studied resources are described in Chapters 3.1 through 3.17 and include the reasonably foreseeable crude-by-rail projects that are currently proposed in Washington State. If all facilities, including the proposed project, were approved and implemented, weekly trainloads of crude oil would increase to approximately 70 trains from the current level of about 21 trains (Table 4-9). Shell PSR unit trains would constitute 8.7 percent of this statewide traffic. For train traffic in Northwest Washington—from King County to Whatcom County—the Shell PSR would constitute 19.6 percent of crude-by-rail traffic.

Table 4-9 State of Washington Crude-by-Rail Facilities and Expected Weekly Traffic

Washington Refinery	Facility Status	Weekly Trains
BP Refinery/ Cherry Point	Operating	7
Tesoro Refinery/Anacortes	Operating	14
Phillips 66 Refinery/Ferndale	Changes under construction	3.5
U.S. Oil Refinery/Tacoma	Changes under construction	3.5
NuStar Terminal/ Vancouver	Changes under construction	2
Imperium Terminal/Grays Harbor	Proposed changes to existing facility	2
Shell PSR/Anacortes	Proposed changes to existing facility	6
Grays Harbor Rail Terminal	Proposed new facility	3.5
Vancouver Energy/Vancouver	Proposed new facility	28

Cumulative High Estimate Evaluation of an Accident and Release

The cumulative High Estimate evaluation for the 70 possible weekly trains followed the same methodology that was used to calculate the High Estimate probability for loaded and unloaded proposed project trains, as described starting on page 4-14 and in Appendix G.

The High Estimate cumulative probability that an accident would result in a release would also be the same as described above and in Appendix G. The likelihood of a release in the event of an accident was considered along with the number of train miles that the 70 possible weekly trains would be expected to travel, and the probability of any of the accident types occurring. This determined the frequency (releases per year) and return period (average years between releases) of a release of any size.

The results indicated that the High Estimate cumulative average frequency of a release of any size from loaded existing crude-by-rail trains, loaded proposed project trains, and reasonably foreseeable future projects would be 0.48, or one release every 2.1 years (Table 4-10). In other words, there is a 1 in 2.1 chance that a release of any size would occur in any given year. This compares with an average frequency of a release of any size from a proposed project train of 0.046 releases per year or, on average, one release every 22 years.

If an accident from the 70 possible weekly trains were to occur, there is a range of potential volumes that could be released. These releases would be expected to occur at different average frequencies. As indicated by the modeling results in Table 4-11, smaller releases from the 70 possible weekly trains are anticipated to occur more frequently than larger ones. The return period for all modeled releases from the 70 possible weekly trains varied from one 250-barrel release every 2.1 years, to one 50,000-barrel release every 2,100 years. This does not mean it would take 2.1 years for another 250-barrel release to occur, rather that there is a 1 in 2.1 chance a 250-barrel release could occur in any given year. The frequency distribution of releases from locomotives by volume is presented in Table 4-12.

Table 4-10 Cumulative High Estimate Evaluation – Crude-by-Rail Release Frequencies and Return Periods for a Release of any Size from Loaded and Unloaded Trains

	Current Facilities (21 Trains/Week)		Proposed Project Trains (6 Trains/Week)		Reasonably Foreseeable Future Crude-by-Rail Projects (43 Trains/Week)		Total (70 Trains/Week)	
	Loaded Train	Unloaded Train	Loaded Train	Unloaded Train	Loaded Train	Unloaded Train	Loaded Train	Unloaded Train
Frequency (Releases/ Year)	0.17	0.013	0.046	0.0038	0.26	0.029	0.48	0.046
Average Return Period (Years)	6	76	22	260	4	34	2.1	22
Probability ("Odds") of a Release in any Given Year	1 in 6	1 in 76	1 in 22	1 in 260	1 in 4	1 in 34	1 in 2	1 in 22

Table 4-11 Cumulative High Estimate Evaluation – Expected Average Frequency of Crude Oil Releases by Volume – Loaded Trains

Release Volume (Barrels [gallons])	Current Facilities (21 Trains/Week)		Proposed Project Trains (6 Trains/Week)		Reasonably Foreseeable Future Crude-by-Rail Projects (43 Trains/Week)		Total (70 Trains/Week)		
	Number Per Year	Return Years	Number Per Year	Return Years	Number Per Year	Return Years	Number Per Year	Return Years	Probability ("Odds") of a Release in any Given Year
250 (10,500)	0.17	6	0.046	22	0.26	3.9	0.48	2.1	1 in 2.1
2,500 (105,000)	0.15	6.5	0.041	24	0.23	4.3	0.43	2.3	1 in 2.3
4,000 (168,000)	0.14	7.4	0.037	27	0.21	4.8	0.38	2.6	1 in 2.6
5,700 (239,400)	0.12	8.4	0.032	31	0.18	5.5	0.34	3	1 in 3
8,000 (333,600)	0.094	11	0.025	40	0.14	7	0.26	3.8	1 in 3.8
10,000 (420,000)	0.060	17	0.016	62	0.091	11	0.17	6	1 in 6
15,000 (630,000)	0.043	24	0.012	87	0.065	15	0.12	8.3	1 in 8.3
20,000 (840,000)	0.026	39	0.0069	140	0.039	26	0.072	14	1 in 14
40,000 (1,680,000)	0.0034	290	0.00092	1,100	0.0052	190	0.0096	100	1 in 100
50,000 (2,100,000)	0.00017	5,900	0.00005	22,000	0.00026	3,800	0.00048	2,100	1 in 2,100

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Table 4-12 Cumulative High Estimate Evaluation – Expected Average Frequency of Diesel Fuel Releases by Volume – Unloaded Trains

Diesel Fuel Release Volume (Barrels [gallons])	Current Facilities (21 Trains/Week)		Proposed Project Trains (6 Trains/Week)		Reasonably Foreseeable Future Crude-by-Rail Projects (43 Trains/Week)		Total (70 Trains/Week)		
	Number Per Year	Return Years	Number Per Year	Return Years	Number Per Year	Return Years	Number Per Year	Return Years	Probability ("Odds") of a Release in any Given Year
5 (210)	0.013	76	0.0038	260	0.029	34	0.046	22	1 in 22
25 (1,050)	0.012	85	0.0034	290	0.026	38	0.041	24	1 in 24
40 (1,680)	0.0091	110	0.0027	380	0.02	49	0.032	31	1 in 31
50 (2,100)	0.0072	140	0.0021	480	0.016	63	0.025	40	1 in 40
60 (2,520)	0.0052	190	0.0015	660	0.012	86	0.018	54	1 in 54
70 (2,940)	0.0039	260	0.0011	880	0.0087	120	0.014	72	1 in 72
100 (4,200)	0.0013	770	0.00038	2,600	0.0029	340	0.0046	220	1 in 220
250 (10,500)	0.00065	1,500	0.00019	5,300	0.0015	690	0.0023	440	1 in 440
300 (12,600)	0.00013	7,700	0.00006	26,000	0.00029	3,400	0.00046	2,200	1 in 2,200

Cumulative Low Estimate Evaluation of an Accident and Release

The cumulative Low Estimate evaluation for the 70 possible weekly trains followed the same methodology that was used to calculate the Low Estimate probability for loaded and unloaded proposed project trains, as described above and in Appendix G. The cumulative Low Estimate accounts for the reductions in the probability of an accident or release associated with the policies and regulations designed to minimize the risk of such an event involving a crude-by-rail train.

The assumptions regarding safety adjustments for crude-by-rail trains associated with projects other than that proposed by Shell, would be slightly different. For the purposes of this analysis, it was assumed that crude-by-rail trains associated with other projects would be up to 120 tank cars long, which would increase the probability of an accident relative to the 102 tank cars for the proposed project. Overall, the net result was that accidents associated with non-Shell PSR crude-by-rail trains would be 12.8 to 59.0 percent less likely to occur than with general freight traffic.

The same likelihoods of a release occurring during an accident as described for the Low Estimate evaluation were used for the Low Estimate cumulative analysis. The likelihood of a release during an accident was considered along with the number of train miles that the 70 possible weekly trains would be expected to travel, and the probability of any of the accident types occurring. This calculation determined the frequency (releases per year) and return period (average years between releases) of a release of any size.

The results indicated that the Low Estimate cumulative average frequency of a release of any size from loaded existing crude-by-rail trains, loaded proposed project trains, and reasonably foreseeable future projects would be 0.069, or one release every 14 years (Table 4-13). In other words, there is a 1 in 14 chance that a release of any size could occur in any given year. This compares with an average frequency of a release of any size from a proposed project train of 0.0055 release per year, or one release every 200 years.

Table 4-13 Low Estimate Evaluation – Crude-by-Rail Release Frequencies and Return Periods for a Release of any Size

	Current Facilities (21 Trains/Week)		Proposed Project Trains (6 Trains/Week)		Reasonably Foreseeable Future Crude-by-Rail Projects (43 Trains/Week)		Total (70 Trains/Week)	
	Loaded	Unloaded	Loaded	Unloaded	Loaded	Unloaded	Loaded	Unloaded
Frequency (Releases/ Year)	0.025	0.0050	0.0055	0.001	0.037	0.011	0.069	0.018
Average Return Period (Years)	40	200	180	1,000	27	89	14	56
Probability ("Odds") of a Release in any Given Year	In 40	1 in 200	1 in 180	1 in 1,000	1 in 27	1 in 89	1 in 14	1 in 56

If an accident from the 70 possible weekly trains were to occur, there is a range of potential volumes that could be released. The releases would be expected to occur at different average frequencies. As indicated by the modeling results in Table 4-14, smaller releases from the 70 possible weekly trains are anticipated to occur more frequently than larger ones. The return period for all modeled releases from the 70 possible weekly trains varied from one 250-barrel release every 14 years, to one 50,000-barrel release every 14,000 years. This does not mean it would take 14 years for another 250-barrel release to occur, rather that there is a 1 in 14 chance a 250-barrel release could occur in any given year. The frequency distribution of releases from locomotives by volume is presented in Table 4-15.

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Table 4-14 Cumulative Low Estimate Evaluation – Expected Average Frequency of Crude Oil Releases by Volume – Loaded Trains

Release Volume (Barrels [gallons])	Current Facilities (21 Trains/Week)		Proposed Project Trains (6 Trains/Week)		Reasonably Foreseeable Future Crude-by-Rail Projects (43 Trains/Week)		Total (70 Trains/Week)		
	Number Per Year	Return Years	Number Per Year	Return Years	Number Per Year	Return Years	Number Per Year	Return Years	Probability ("Odds") of a Release in any Given Year
250 (10,500)	0.025	40	0.0055	180	0.037	27	0.069	14	1 in 14
2,500 (105,000)	0.023	44	0.005	200	0.033	30	0.062	16	1 in 16
4,000 (168,000)	0.02	50	0.0044	230	0.03	34	0.055	18	1 in 18
5,700 (239,400)	0.016	62	0.0036	280	0.024	42	0.045	22	1 in 22
8,000 (333,600)	0.014	73	0.003	330	0.02	49	0.038	26	1 in 26
10,000 (420,000)	0.01	100	0.0022	450	0.015	68	0.028	36	1 in 36
15,000 (630,000)	0.063	160	0.0014	730	0.0093	110	0.017	58	1 in 58
20,000 (840,000)	0.0025	400	0.00055	1,800	0.0037	270	0.0069	140	1 in 140
40,000 (1,680,000)	0.00025	4,000	0.000055	18,000	0.00037	2,700	0.00069	1,400	1 in 1,400
50,000 (2,100,000)	0.000025	40,000	0.0000055	180,000	0.000037	27,000	0.000069	14,000	1 in 14,000

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Table 4-15 Cumulative Low Estimate Evaluation – Expected Average Frequency of Diesel Fuel Releases by Volume – Unloaded Trains

Diesel Fuel Release Volume (Barrels [gallons])	Current Facilities (21 Trains/Week)		Proposed Project Trains (6 Trains/Week)		Reasonably Foreseeable Future Crude-by-Rail Projects (43 Trains/Week)		Total (70 Trains/Week)		
	Number Per Year	Return Years	Number Per Year	Return Years	Number Per Year	Return Years	Number Per Year	Return Years	Probability ("Odds") of a Release in any Given Year
5 (210)	0.005	198	0.00098	1,000	0.011	89	0.018	56	1 in 56
25 (1,050)	0.0045	220	0.00088	1,100	0.0099	100	0.016	62	1 in 62
40 (1,680)	0.0035	290	0.00069	1,500	0.0077	130	0.013	79	1 in 79
50 (2,100)	0.0028	360	0.00054	1,900	0.0061	170	0.0099	100	1 in 100
60 (2,520)	0.002	500	0.00039	2,600	0.0044	230	0.0072	140	1 in 140
70 (2,940)	0.0015	670	0.00029	3,400	0.0033	300	0.0054	190	1 in 190
100 (4,200)	0.0005	2,000	0.000098	10,000	0.0011	910	0.0018	560	1 in 560
250 (10,500)	0.00025	4,000	0.000049	20,000	0.00055	1,800	0.0009	1,100	1 in 1,100
300 (12,600)	0.00005	20,000	0.000001	100,000	0.00011	9,100	0.00018	5,600	1 in 5,600

POTENTIAL OIL RELEASE CONSEQUENCES

Oil spill trajectory, fate, and effects modeling and analyses were performed to evaluate risks and impacts from potential releases of crude oil into aquatic environments from proposed project trains. The analysis predicted where oil released into those environments could move and how it could impact resources within the modeled area.

Analyses of **oil spill trajectory, fate, and effects** are modeled using the SIMAP and OILMAP Land modeling packages developed by RPS ASA (previously Applied Science Associates). Both models are used extensively by industry and government (French-McCay 2004, Horn and French-McCay, 2015).

The analysis focused primarily on aquatic environments as the area affected and the potential consequences of a release into water are typically greater than releases onto land. While a crude oil release into the environment is very unlikely, the analysis assumed a release had occurred and offered a reference point for contingency planning and response efforts. It also provided a range of expected impacts based on varying geographic and environmental conditions. The ecological and human health impacts identified from the modeled release scenarios were considered in the discussion of economic risks and potential cumulative impacts. Detailed methods, results, and discussion of the oil release consequence analysis are presented in Appendix H.

The *trajectory* and *fate* modeling, in combination with the fire and explosion analysis below, provided a detailed accounting of the potential consequences or impacts following an unmitigated release of oil. The lower probability, larger volume release accidents have been investigated to provide the upper range of anticipated effects should a release occur into the environment. In the event of a smaller volume release, the predicted areas, volumes of water, and potential effects are predicted to be lower. .

The **trajectory** of a release describes the movement of oil within the environment and includes the spatial extent of the release over time. The **fate** of a release describes the way in which the oil will interact with the environment and includes processes such as evaporation, dissolution, and degradation.

The representative locations chosen for this assessment included a wide range of environments that are typical along the rail corridor. A range of aquatic ecosystems within both urban and rural settings were selected for assessment. This included open waters and urban settings (Edmonds), more confined embayment with mud flats and a channel (Swinomish Channel and Padilla Bay), and a freshwater river (Skagit River). The intent was to target locations around water, which can increase both the extent and magnitude of potential effects. Trajectory and fate modeling and fire and explosion modeling were not provided for a purely terrestrial release location such as a downtown setting.

During the public scoping process, many commenters expressed concerns about the potential impacts of a rail accident occurring in the Columbia River Gorge, as well as a wide range of other locations along the rail corridor (Skagit County and Ecology 2015). The co-lead agencies considered these comments when selecting the study locations. The locations evaluated in this EIS are intended to capture the various types of environments that could be affected by an accident (e.g., fresh water or marine environments; rural or urban areas).

In the event of a release in a highly populated center, there are some qualitative predictions that may assist in understanding the potential effects. First and foremost, the population density in an urban center can increase the potential for significantly negative effects to people. This includes the inhalation hazards of volatilized compounds from released crude oil, as well as the increased risk of fire and explosion in more confined areas. Both factors may increase the potential consequences following a release in an urban environment.

There are also factors that may reduce potential effects in highly populated areas. Rail speeds through urban centers are typically much lower, which would reduce the likelihood of a derailment or rupture. For example, the USDOT Final Rule issued on May 1, 2015, requires that crude-by-rail trains operate at less than 50 mph in all areas, and less than 40 mph in all high-threat urban areas (i.e., Seattle and Bellevue, WA). Ecology also recently developed *two new rules* related to the shipment of crude oil by rail in Washington State that would improve preparation for and response to accidents and spills. Both rules would help to minimize the potential effects of shipments through highly populated areas.

The first rule, WAC 173-185, created notification requirements for facilities receiving crude oil by rail and established procedures for Ecology to disclose crude oil movement to the public.

The second rule, WAC 173-186, established contingency plan requirements for railroads transporting oil by rail.

Urban areas are complex in nature with certain aspects that can both increase and decrease the potential risks (probability and consequence) associated with a release of crude oil. Urban areas have a large number of first responders, which should reduce response times for emergency personnel when compared with some of the more remote and less accessible locations along the rail corridor. However, a release in an urban center may also cut power, sever transportation routes for citizens and emergency personnel (e.g. roads and bridges), and otherwise compromise safety. In addition, urban areas have stormwater management systems, which may assist in the containment and cleanup of released oil, or potentially convey drainage and spills directly to surface waters. It is important to note that every spill is unique, dependent on the site-specific characteristics and the accident itself.

If a release were to occur in a tunnel, there are a number of different outcomes that could result. The spill would be confined to a smaller area, which could aid in containment and cleanup. However, there is the possibility that volatile concentrations in the atmosphere within the confined space would be much higher, as compared with a release in the open. This could lead to an increased risk of fire or explosion due to the increased concentration of gases in the confined space.

Approach to Analysis of Oil Release

Oil spill release scenarios were developed to characterize the range of potential impacts from a number of environmental and oil spill release conditions. Understanding the potential trajectory of crude oil within the environment and its ultimate fate was necessary to identify the potential impacts. Results can also be used to inform planning and response efforts. Oil spill release scenarios were defined by release location, release volume, and environmental conditions.

Release Scenario Locations

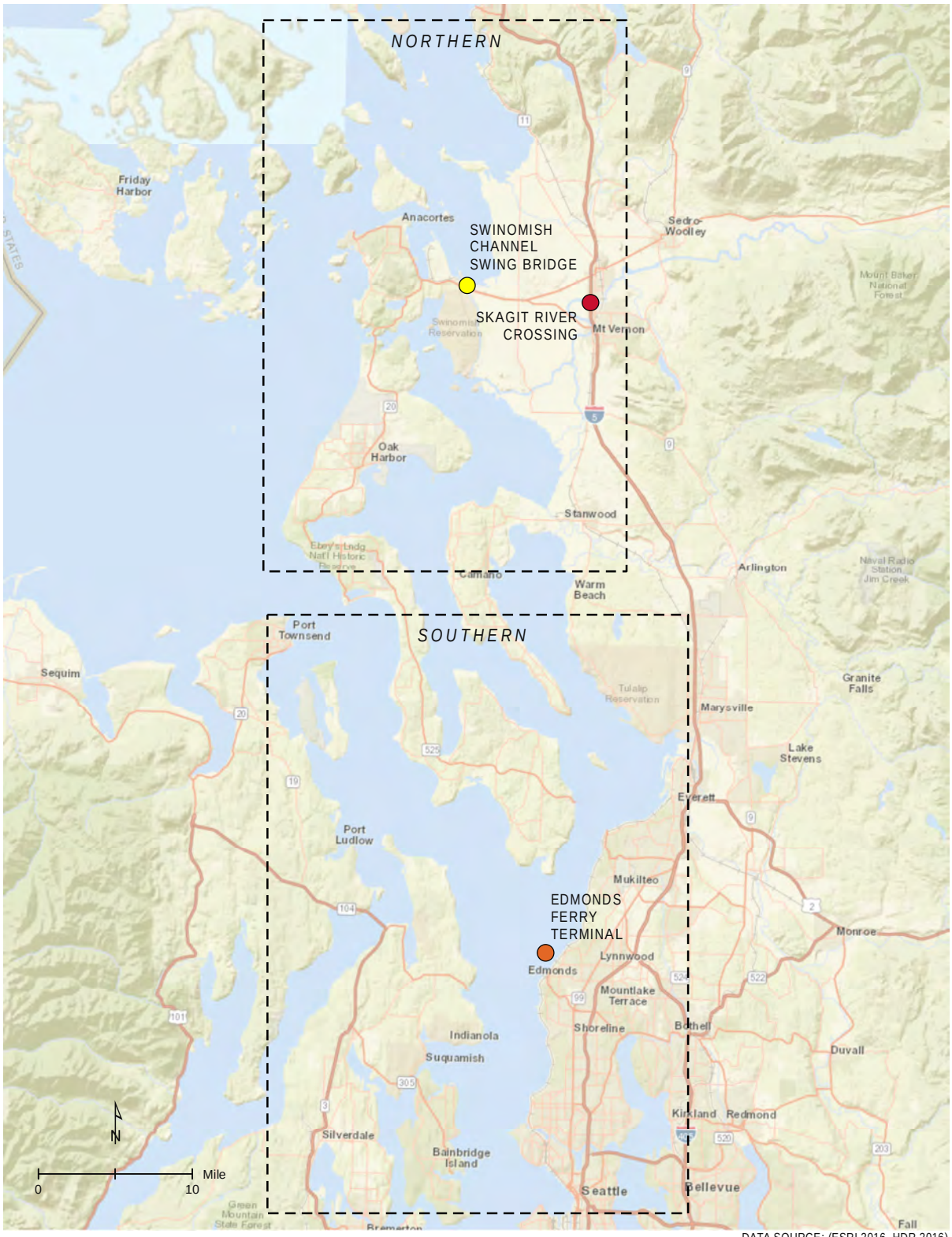
Potential releases of oil from unit trains were modeled at three locations along the rail transport route in western Washington (Figure 4-12). Several criteria were used to select locations along the rail corridor, including proximity to the corridor, proximity to populated areas and sensitive aquatic ecosystems, general geographic and environmental conditions, and the presence of variable environmental conditions. The locations were also chosen because they were identified as areas of interest by the public during scoping (Skagit County and Ecology 2015). Areas specifically identified included potential spills over waterbodies (such as the Skagit River and Padilla Bay), rivers, streams, nonmarine waterways, and wetlands. However, an oil spill is no more likely to occur in these locations than anywhere else along the rail transport route.

The release locations that were selected for analysis (Figure 4-12) are:

- Swing Bridge over the Swinomish Channel.
- Skagit River Bridge Crossing.
- Edmonds Ferry Terminal.

The co-leads modeled relatively low probability, high-impact accidents (i.e., large volume releases) to better understand the maximum potential consequences of a more extreme accident. These results provide the upper range of estimates of consequence in the unlikely event that there is a large volume release of oil. It is important to understand that lower volume oil spill release scenarios are more probable.

The co-leads did not specifically model the consequences of higher probability, low-impact accidents. Similarly, the co-leads did not model the consequences of low-probability, high-consequence scenarios in densely urbanized areas, such as the Seattle Tunnel, because such scenarios have a very low probability of occurring. Further, the Seattle Tunnel is fairly well-contained and, in terms of fate modeling, would not represent a potential movement of oil into water bodies.



DATA SOURCE: (ESRI 2016, HDR 2016)

Swinomish Channel Swing Bridge

Skagit River Crossing

Edmonds Ferry Terminal

Modeling Extents

Figure 4-12

MAP OF THE THREE HYPOTHETICAL RELEASE LOCATIONS

Release Scenario Volumes

The scenarios for each of the three selected sites included two potential release volumes of *conditioned* Bakken crude oil, identified as the 30th- and 90th-percentile release volumes:

- A 5,700-barrel release, which corresponds with a 30th-percentile discharge (30PD).
- A 20,000-barrel release, which corresponds with a 90th-percentile discharge (90PD).

Effective April, 1 2015, Bakken crude oil must be **conditioned** before being transported by rail to reduce volatility and to meet state crude oil safety standards (State of North Dakota Industrial Commission 2014). The intent was to reduce the vapor pressure of Bakken to levels below that of crude oil to decrease the likelihood and potential consequence (i.e., fire and explosion) following a release.

Both release volumes were modeled for 48 hours. Releases were modeled as "unmitigated," meaning that no response actions occurred during the entire 48 hours. An unmitigated release is extremely unlikely given local and regional response capabilities, including the Washington State Emergency Response System, the National Response System, and Shell and BNSF Railway's corporate policies regarding how to respond to accidents and regulatory requirements.

As detailed in Chapter 3.17 – Public Services and Incident Response, the local fire department typically acts as a first responder to such accidents. Normally, response times are on the order of minutes. In addition, Washington State's Spill Response Program is considered a national leader and the State Legislature recently passed new rules to strengthen preparedness and response capabilities. These include measures to require contingency plans for railroads transporting crude oil by rail and notification requirements for the movement of crude by rail through Washington State. The railroads are currently working with the State to implement these programs; however, there is the possibility that the applicability of the programs to the railroads could be challenged in court due to the commerce clause and/or federal preemption.

Unmitigated release scenarios were used to estimate the maximum theoretical extent of impacts. Spill response measures would alter the trajectory and fate of the released oil, depending on the timing of the response, the types of strategies used, and their effectiveness.

Release Scenario Environmental Conditions

The oil release analysis included modeling the seasonal variability of environmental conditions that could affect oil trajectory, fate, and potential impacts.

This analysis included high and low *tides*, river flow, and wind speed conditions. To provide a range of impacts, the single environmental parameter believed to be the most dominant seasonal forcing characteristic (i.e., natural processes driving the movement of oil) for each of the three scenario locations was selected.

For example, at the Swinomish Channel, scenarios were modeled in the summer with a *spring tide* condition and in the winter with a *neap tide* condition. The scenarios modeled at the Skagit River Bridge Crossing used high river flow conditions during the freshet (the flood of a river from heavy rain or snow melt; modeled here during summer) and average low river flow conditions during the winter.

The **tides** are controlled by the gravitational pull from the sun and the moon. When the sun, Earth, and moon are in alignment, the gravitational pull from the sun and the moon are also aligned. This results in the greatest difference between high and low tide (i.e., high tides are very high and low tides are very low) known as **spring tide**. When the sun and moon are at a right angle relative to Earth, the gravitational pull from each competes. This results in a smaller difference between high and low tide, known as **neap tide**.

Factors considered at the Edmonds Ferry Terminal included low-wind speeds (summer) and high-wind speeds (winter). The combination of three potential release locations, two release volumes, and two variations in the dominant seasonal environmental parameter resulted in a total of 12 modeling scenarios (Table 4-16).

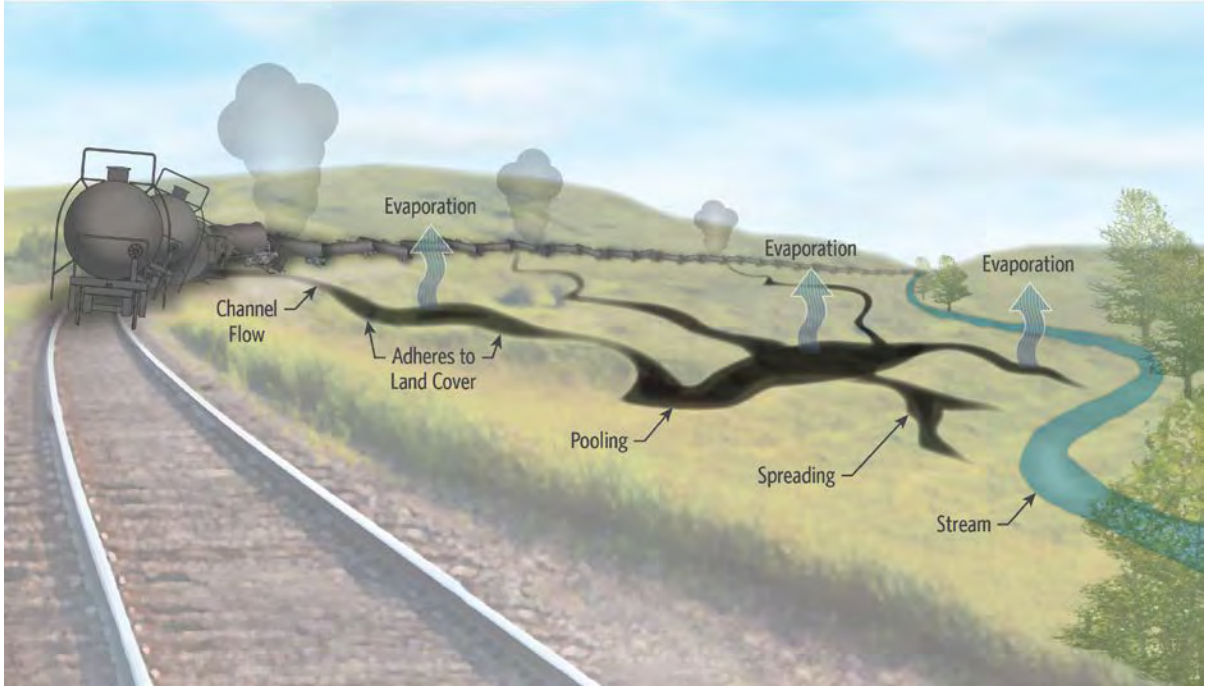
Table 4-16 Release Scenarios and Environmental Conditions

Scenario	Release Location	Seasonal/Environmental Condition	Release Volume (Barrels)
1	Swinomish Channel Swing Bridge	Summer – Spring Tide	20,000 (840,000 gallons)
2			5,700 (239,400 gallons)
3		Winter – Neap Tide	20,000 (840,000 gallons)
4			5,700 (239,400 gallons)
5	Skagit River Crossing	Summer – High River Flow	20,000 (840,000 gallons)
6			5,700 (239,400 gallons)
7		Winter – Low River Flow	20,000 (840,000 gallons)
8			5,700 (239,400 gallons)
9	Edmonds Ferry Terminal	Summer – Low Wind	20,000 (840,000 gallons)
10			5,700 (239,400 gallons)
11		Winter – High Wind	20,000 (840,000 gallons)
12			5,700 (239,400 gallons)

Release Scenario Trajectory and Fate Modeling Methods

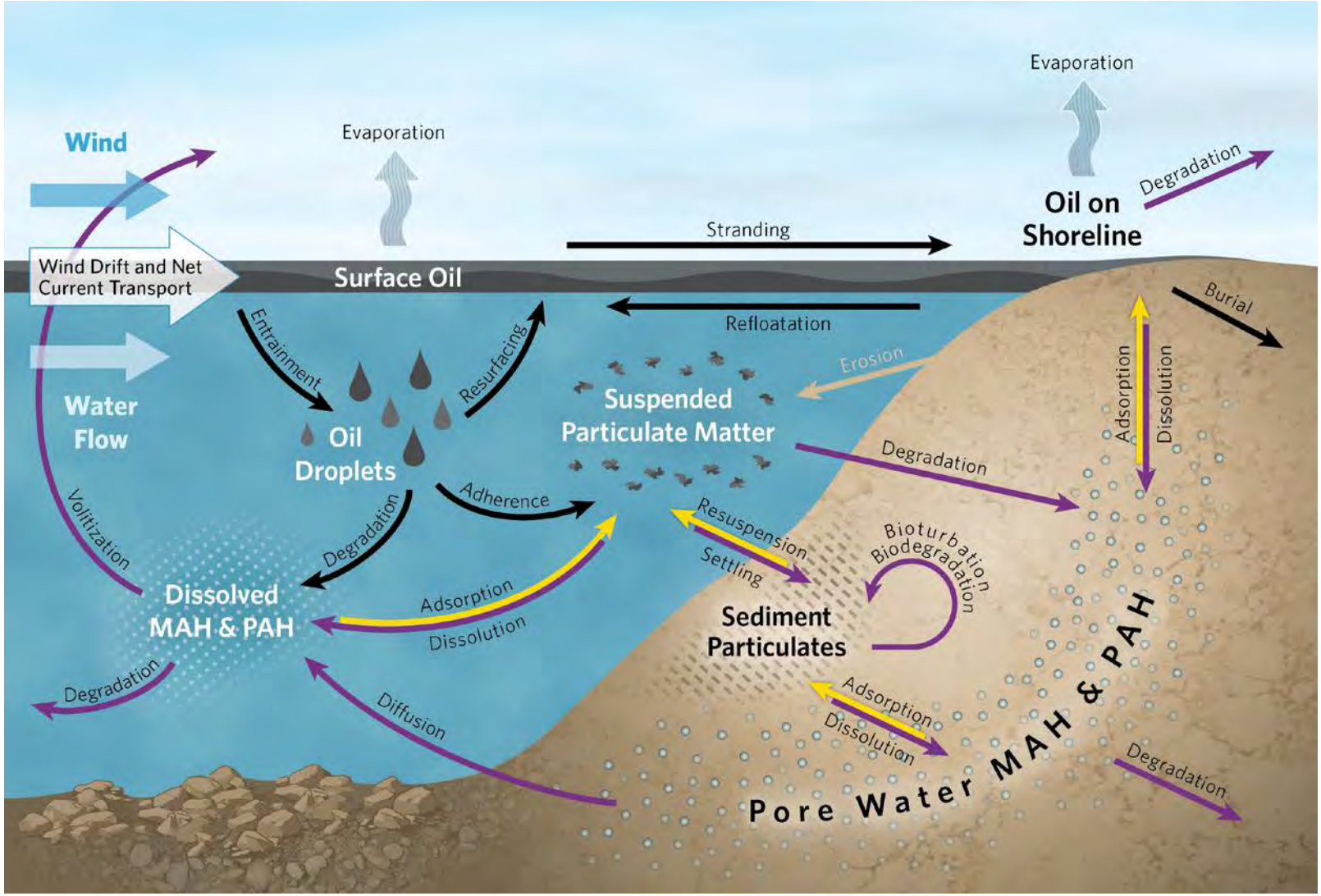
The OILMAP Land and SIMAP models that were used for the proposed project included separate applications for understanding trajectories for oil releases occurring on the land and in the water. OILMAP Land was used at the Edmonds Ferry Terminal scenario to determine how much oil adhered to land, pooled, and evaporated before reaching water (Figure 4-13).

Figure 4-13 Conceptual Diagram of the OILMAP Land Transport Model Depicting the Possible Fate of Oil as it Moves over the Land Surface



The SIMAP model was used at the Swinomish Channel Swing Bridge, Skagit River Crossing, and the Edmonds Ferry Terminal scenarios for the marine and river environments. It provided trajectory and fate information such as shoreline stranding, surface oiling, evaporation, entrainment, emulsification, dissolution, volatilization from the water column, adsorption and sedimentation, and degradation (See Appendix H for definitions). Additionally, this information was used to determine the potential biological impacts (Figure 4-14).

Figure 4-14 Conceptual Model of Oil Fate Processes in Water that are Simulated in the SIMAP Model



Refer to callout box on the next page and Appendix H for a detailed explanation of the technical terms provided in this figure.

The modeling results provided predictions of trajectory and fate for each of the 12 scenarios over the 48-hour release simulation. The results were presented in terms of:

- **Mass balance of released oil**. Estimates the oil's fate over time, including the amount of oil on the water surface, in the water column, on shorelines, evaporated to the atmosphere, on sediments, and oil that had decayed by natural weathering processes.
- **Trajectory**. Tracks the movement of each individual particle of released oil in both space and time as droplets of oil in the water column, *dissolved aromatics*, floating surface oil, stranded shoreline oil, and the amount on sediments.
- **Surface oil thickness**. Predicts floating surface oil and associated thicknesses over space and time.
- **Water column concentration**. Predicts maximum water column concentrations of dissolved aromatics over space and time. Dissolved aromatics are the portion of the oil having the greatest potential to affect water column animal and plant life.
- **Shoreline and sediment impact**. Predicts the total mass of oil deposited onto the shoreline and on sediments.

Hydrocarbons are organic compounds that comprise the main components of crude oil. **Total hydrocarbons** is a measure of the mixture of all different hydrocarbons found in a particular crude oil (i.e., total amount). There are several thousand different hydrocarbons. Whole oil is a combination of tens to hundreds of thousands of hydrocarbon compounds. A portion of these are soluble, meaning they dissolve into the water column. Total **dissolved aromatic** concentrations include both **mono-cyclic aromatic hydrocarbons (MAHs)**, **poly-cyclic aromatic hydrocarbons (PAHs)**, and others. Approximately 9 percent of Bakken crude oil can dissolve in the water column. Those compounds are typically responsible for biological impacts. The mass **balance** presents the fate of the oil released in an event (e.g., on shorelines, in/on the water, or evaporated).

Potential Impacts Overlay Analysis and Biological Impacts Assessment Methods

Resource Overlay Analysis

The trajectory and fate results were used to determine the potentially affected resources located within the oil spill footprint for each scenario. Potentially affected resources were compiled on a Geographical Information System (GIS) platform from the National Oceanic Atmospheric Association (NOAA 2016), Washington State Department of Ecology (Ecology 2016), Washington Department of Health (DOH 2016), and the Washington Department of Fish and Wildlife (WDFW 2016). A detailed list of spatial resource data and attributes is provided in Appendix H. Resources were mapped and the trajectory of the modeled release of oil was overlaid onto the resource maps.

Affected resources included the following categories of environmentally sensitive areas:

- **Socioeconomic resources**: Parks, management areas, public access points, fishing areas, and tribal resources.

- **Marine and freshwater resources**: Shellfish locations, fish spawning areas, and seal haulout points.
- **Avian and terrestrial resources**: Bird colonies, nesting areas, wetlands, biodiversity corridors, and wildlife observations.

This overlay analysis was strictly a count of resources that were intersected by the oil trajectory. The counts of affected resources may overstate a portion of the resources potentially affected. That means the counts should be used only to compare the relative impacts from one modeled release to another, rather than as a quantified number of affected resources.

Biological Impacts Assessment

The trajectory and fate modeling results were also used in a biological impacts assessment. The assessment estimated the potential short-term (acute) exposure of organisms to floating oil and subsurface oil contamination (in-water and on sediments), and predicted the resulting percent mortality. The acute exposure level to floating oil was defined as oil on the water surface with a thickness greater than 10 microns (µm). As a point of reference, a piece of regular copy paper is about 100 µm thick and a rainbow sheen of oil on a puddle of water is approximately 0.1 to 1 µm. The acute exposure level for organisms in the water column (i.e., exposure to dissolved aromatics) and sediment varied depending on the specific environment, season, and life stage of each species. For example, an egg or juvenile life stage may be more sensitive to habitat disruption or toxicity than older life stages. To bound this range of potential variations, two sensitivity thresholds for dissolved aromatics were used:

- **High sensitivity species**: Biological impacts were evaluated assuming these organisms were highly sensitive to dissolved aromatics (5 micrograms per liter [µg/L]), which is protective of 97.5 percent of species.
- **Average sensitivity species:** Biological impacts were evaluated assuming these organisms had an average sensitivity to dissolved aromatics (50 µg/L), which is protective of 50 percent of species.

Further definition of high and average sensitivity species is provided in Appendix H. For each of the 12 modeled scenarios provided in Table 4-16, acute toxicity for in-water impacts was calculated for the two sensitivity thresholds, resulting in a total of 24 biological modeling scenarios. These results provided a predicted range of potential acute impacts that could occur following a release of oil to the environment. The acute toxicity to aquatic biota within the water column (pelagic species) and bottom-dwelling species that live within the sediment bottom and up to 1 meter above (demersal species) were evaluated by tracking the exposure of both the high sensitivity and average sensitivity species.

Potential acute impacts following a release can vary greatly by space, time, and percent mortality. In some cases, 100-percent mortality may be experienced in localized regions, while much broader areas may experience only partial impacts (<100 percent mortality [death]). Mortality is calculated as percent loss in specified areas. This is translated into the *equivalent area* of 100-percent loss. This analysis simulates potential direct impacts (i.e., acute mortality) and does not necessarily account for food web or delayed impacts to species and populations. These sublethal impacts (i.e., chronic impacts) may occur over broader areas.

The results of the biological exposure model provide estimates of the **equivalent area** (in square kilometers [km^2]) of 100-percent mortality by behavior group. Exposure to oil often results in less than 100-percent mortality and the percent mortality often varies by area.

To compare the overall impact among release scenarios, the equivalent areas of 100-percent predicted mortality were estimated. For example, the equivalent area of 100-percent mortality would be the same for a release that resulted in 100-percent mortality over 1 km^2 versus 1-percent mortality over 100 km^2.

Resources potentially impacted by surface and shoreline oiling included waterfowl, aerial and diving birds, wetland and terrestrial wildlife, fur-bearing marine mammals, seals, sea lions, whales, and dolphins. Biota potentially impacted by water column toxicity included mobile and stationary bottom-dwelling fish and invertebrates, small fish and invertebrates, bottom-dwelling organisms, and plankton that drift with the currents. Mortality would only occur if the organism were present in the area predicted to be affected by released oil above the aforementioned thresholds. A full description of the acute biological impacts modeling, including selection of thresholds of concern and validation, are provided in Appendix H.

Release Scenario Trajectory and Fate Modeling Results

Among all release scenarios, common outcomes of trajectory and fate were predicted (Figure 4-15):

- Approximately 50 percent of the released oil was expected to evaporate within the first 48 hours.
- Very little oil decay would occur during the first 48 hours.
- The largest percentage of remaining oil would be deposited on shorelines or form surface slicks during the first 48 hours.

These theoretical release scenarios assumed no response actions (i.e., unmitigated) by the State, federal responders, Shell, BNSF Railway, or local emergency responders. In the Skagit River scenarios, the majority of the total volume of oil released was expected to adhere to the shorelines of the Skagit River. In the more open areas modeled near the Swinomish Channel (Padilla Bay), and Edmonds (Puget Sound), less oil was expected to oil shorelines compared with the Skagit River scenarios, where generally more oil remained on the water surface at the end of the 48-hour modeled simulation.

For each of the modeled scenarios, very little oil was expected to remain in the water column and on the sediments (Figure 4-15). The exception was the Edmonds Ferry Terminal high-wind scenarios. In those cases, high winds produced surface breaking waves that were predicted to force more oil into the water column. This would result in oil settling to the sediments. The extent of surface oiling and dissolved aromatic contamination within the water column is presented for each modeled release scenario (Figure 4-16).

In general, these results are driven by the degree of transport that is expected in each scenario, which is dependent on the season and the modeled environmental parameters. The spatial extent for each modeled component ranged greatly, with dissolved aromatics having more variability than surface oil thickness (Figure 4-16). For example, greater tidal action (i.e., the Swinomish Swing Bridge summer scenarios) and high-wind conditions (i.e., the Edmonds Ferry winter scenarios) acted to increase the area impacted by surface oil. Neap tides (lower tidal currents) and low-wind conditions resulted in less area affected by the oil. Similarly, lower river flow conditions resulted in less area oiled relative to high flow conditions.

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Figure 4-15 Fate of Oil at the End of the 48-hour Simulation

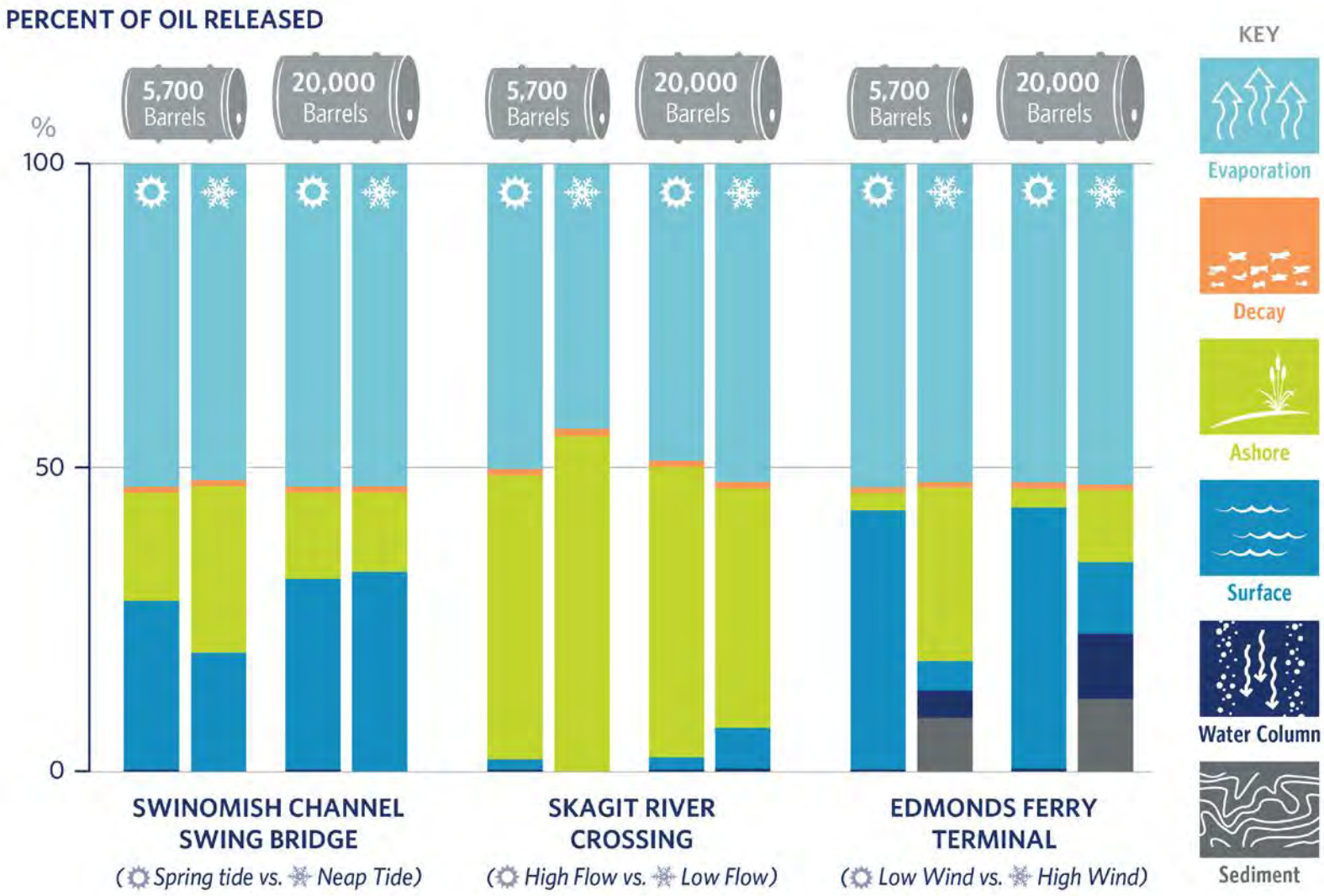

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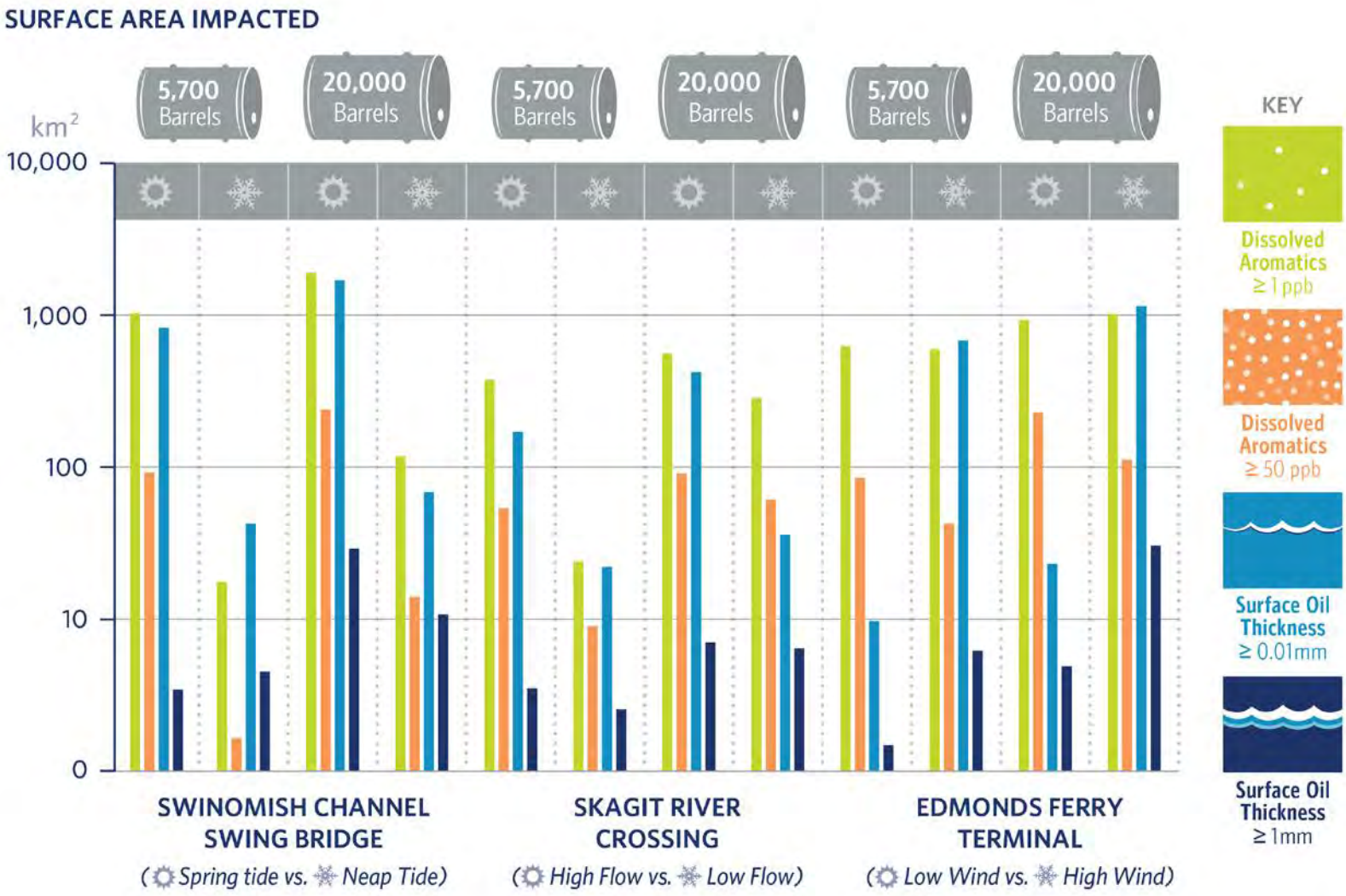
Figure 4-16 Area Experiencing Threshold Exceedance of Dissolved Aromatic Concentration and Surface Oil Thickness for Each of the Modeled Oil Releases



Potential Impacts Overlay Analysis and Biological Impacts Assessment Results

Resource Overlay Analysis

The overlay analysis results included counts of identified resources that could be affected by an oil release. It conservatively assumed that all resources would be present throughout the year for all release scenarios. The results of the overlay analysis provided a general understanding of potentially affected resources including public access, socioeconomic, marine, avian, and terrestrial regions of interest. It also identified sensitive areas that could be affected by released oil. Detailed overlay analysis results are provided in Appendix H.

Oil spill trajectory and fate results in the following sections are summarized in narrative form and in summary tables and figures. Detailed graphics of trajectory and fate results for each release scenario are presented in Appendix H.

For each release scenario, Appendix H presents time series graphics of mass balance depicting where oil would be in the environment from the time of release to the end of the 48-hour simulation.

In addition, Appendix H presents a series of maps depicting aspects of oil release trajectory and fate over the entire 48-hour simulation.

Generally, in the Swinomish Channel Swing Bridge and Skagit River Crossing locations, the summer release scenarios had a broader potential impact to resources than other modeled scenarios. Surf smelt spawning areas, waterfowl areas, and estuarine and marine wetlands were identified as resources that could be affected.

More extensive transport of hydrocarbons was predicted in the following scenarios:

- Edmonds Ferry Terminal high-wind winter scenarios.
- Skagit River high river flow summer scenarios.
- Swinomish Channel summer spring tide scenarios.

This relatively greater transport of hydrocarbons resulted in more potentially affected resources, when compared with their complementary scenarios (e.g., Edmonds Ferry Terminal low-wind scenarios, Skagit River lower river flow winter scenarios, and the Swinomish Channel winter neap tide scenarios).

Biological Impacts Assessment

The biological impacts assessment was used to determine the concentration and duration of exposure that biological receptors (organisms) could experience over the course of the 48-hour modeled release. Impacts were analyzed based on shoreline and surface oiling and in-water concentrations. The magnitude of biological impacts was closely tied to the spatial extent of surface oiling and dissolved aromatics (Figure 4-16).

Among all release scenarios, the greatest impacts from floating oil were on fur-bearing marine mammals, dabbling waterfowl, and surface diving birds. The least impacted groups were the terrestrial wildlife and marine mammals.

Among all release scenarios, the greatest impacts from floating oil were on fur-bearing marine mammals, dabbling waterfowl, and surface diving birds. The least impacted groups were the terrestrial wildlife and marine mammals. Maximum in-water impacts were primarily predicted for the sensitive plankton, pelagic fish and invertebrates, and demersal organisms. Potential impacts were much lower for sediment dwelling organisms. By definition, lower impacts were predicted for moderately sensitive species, when compared with high sensitivity species. Detailed biological impacts assessment results are provided in Appendix H.

Swinomish Channel Swing Bridge

Among the Swinomish Channel Swing Bridge scenarios, the surface and shoreline oil thickness analysis resulted in the largest mortality for all species types investigated within the 20,000-barrel release summer spring tide scenario. This scenario had the largest release volume and maximum spatial extent of surface oiling. Impacts among behavior groups ranged from areas less than 0.05 km^2 to 100.0 km^2.

The resources with the greatest predicted impact were dabbling waterfowl, surface diving birds, and fur-bearing marine mammals. In all release scenarios, there were very small potential areas of 100-percent mortality predicted for whales or dolphins and terrestrial wildlife if they were present in the affected habitat. Exposure of sensitive organisms to oil in the water column or sediment was generally small. Species of moderate sensitivity experienced less potential equivalent areas with 100-percent mortality predicted. Impacts to fish and shellfish may have implications for commercial and recreational harvest.

Skagit River Crossing

Among the Skagit River Crossing scenarios, the surface and shoreline oil thickness analysis indicated that the greatest equivalent areas of 100-percent mortality occurred during the high river flow summer scenarios with the 20,000-barrel release volume. Impacts among behavior groups ranged from areas less than 0.05 km^2 to 94.8 km^2. The resources with the greatest predicted impacts were dabbling waterfowl, surface diving birds, and fur-bearing marine mammals (e.g., otters).

In all release scenarios, there were very limited equivalent areas of 100-percent mortality for whales or dolphins and terrestrial wildlife. Areas of impact for sensitive organisms were generally greatest during the low river flow winter season with the 20,000-barrel release volume.

Impacts to fish and shellfish could affect the operation of both commercial and recreational fisheries.

Edmonds Ferry Terminal

Among the Edmonds Ferry Terminal scenarios, the surface and shoreline oil thickness analysis resulted in the greatest equivalent area of 100-percent mortality during the low-wind summer scenario with the 20,000-barrel release volume. An exception to this general trend included the relatively greater impacts to dabbling waterfowl and nearshore aerial birds during the winter (high-wind) scenarios. Impacts among behavior groups ranged from an area less than 0.05 km^2 to 74.3 km^2. The resources with the greatest predicted impact were aerial seabirds, surface diving birds, and fur-bearing marine mammals. In all release scenarios, the relatively low sensitivity of whales, dolphins, seals and sea lions, and terrestrial wildlife resulted in very limited predicted acute impacts. The greatest exposure was predicted to occur during the high-wind winter scenarios with the 20,000-barrel release volumes.

Potential Cumulative Consequences of a Release

The cumulative frequency of releases from all unit trains would be higher than from proposed project trains alone. As described in Tables 4-3 and 4-4, lower volume releases would be expected to occur with greater frequency than higher volume releases. Crude-by-rail trains associated with the other projects included in the cumulative impacts analysis could be up to 120 tank cars in length (compared with 102 tank cars for proposed project trains). This difference leads to a slightly larger potential release volume than described for the proposed project alone. However, because the volume would only be slightly larger, the analysis of oil spill trajectory, fate, and effects from proposed project trains would apply to the cumulative rail traffic.

FIRE AND EXPLOSION PROBABILITY AND POTENTIAL CONSEQUENCES

This analysis considers the probability and potential consequences of a *fire* and/or *explosion* resulting from an accident during the rail transport of crude oil to the Shell PSR. The probability of a fire or explosion occurring depends on the probability of an accident taking place first. The following types of events could occur and are considered in the analysis:

- **Pool Fire.** This is a fire that burns from a pool of vaporizing fuel. The primary concern with pool fires is hazards associated with increased temperatures from heat. For crude-by-rail trains, a pool fire could occur if there was an accident leading to a release of crude oil that formed a pool and then caught fire.
- **Vapor Cloud Explosion.** A vapor cloud explosion is the result of a flammable material that is released into the atmosphere, encounters both congestion and confinement, and ignites. The primary concern with a vapor cloud explosion is overpressure (pressure caused by a *shockwave*). If oil were released during a crude-by-rail accident, light

A **fire** occurs when fuel combines with oxygen to generate heat, smoke, and light.

An **explosion** is a sudden, intense release of energy that often produces a loud noise, high temperatures, and a shockwave.

A **shockwave** is a movement of extremely high pressure air.

hydrocarbons in the oil could evaporate into the air and form a vapor cloud. An explosion would not be immediate, but occur only if the vapor cloud had formed and then ignited.

- **Boiling Liquid Expanding Vapor Explosion (BLEVE).** A *BLEVE* is an explosion that results when a tank of combustible liquid (in this case, crude oil) is heated by fire and the pressure inside the tank car increases to the point where it weakens the tank and ruptures. The concerns with a BLEVE are the generation of overpressure and projectiles from the explosion. A BLEVE could occur if tank cars containing crude oil were exposed to the flames of a pool fire. This could lead to a sudden explosive rupture and ignition.

DOT-117 Tank Cars (Figure 4-11) are designed to minimize the risk of a **BLEVE** through improved thermal protection measures incorporated into the design of the tank cars (USDOT 2014).

Although the probability of fire and explosion in association with an accident is low; if a fire or explosion were to occur, the consequences could be substantial.

Approach to Fire and Explosion Analysis

To evaluate the potential consequences associated with fire and explosions, potential events were modeled at the same three scenario locations used for the oil release analysis. At each location, the objective of the analysis was to present areas that could be affected by a pool fire, a vapor cloud explosion, or a BLEVE.

Thermal Radiation (Heat) from a Pool Fire

Thermal radiation is the process by which energy (heat) is emitted from a source, such as the combustion of a flammable material. If a pool of released crude oil ignited, it would emit potentially harmful levels of heat that could cause property damage or human health and safety effects. At each location, the extent of heat generated by a pool fire was modeled by varying:

- The size of the pool (which is dependent on whether the pool forms on land or water and the local topography).
- The quantity of oil released.
- The amount of elapsed time between release and ignition (*early* vs. *late* pool fire).

An **early** pool fire occurs when the ignition of the pool takes place immediately following the release. During a **late** pool fire, ignition occurs at a later time.

An early pool fire is generally smaller in area than a late pool fire because it has less time to spread.

The analysis assumed that there were no obstructions, such as existing buildings or structures, to reduce the area affected by thermal radiation; therefore, the results presented are conservative.

The impacts of thermal radiation on the human body depend primarily on the level of heat generated, the duration of exposure, and the ease of escape or finding shelter. Exposure to thermal radiation requires line of sight to the source. Therefore, exposure can be avoided by hiding behind an object or escaping. Table 4-17 presents the impacts on the human body that could be expected at different thermal radiation exposure levels.

Table 4-17 Impacts of Exposure to Thermal Radiation on the Human Body

Thermal Radiation (kW/m^2)	Impact on the Human Body	Ability to Escape or Find Shelter
4 kW/m^2	Pain within 15 to 20 seconds and injury after 30 seconds	Escape or finding shelter is likely if available
6 kW/m^2	Pain within approximately 10 seconds	Escape or finding shelter is possible, but only during a very short period of time
12.5 kW/m^2	Extreme pain within 20 seconds of exposure; fatality if escape is not possible	Movement to shelter is instinctive
20 kW/m^2	Incapacitation, leading to fatality unless rescued	Escape or finding shelter is not possible
35 kW/m^2	Immediate fatality	Escape or finding shelter is not possible

Source: OGP 2010.

Overpressure from a Vapor Cloud Explosion or BLEVE

Overpressure is the pressure caused by a shockwave over and above normal atmospheric pressure. It is measured in pounds per square inch (psi). If a crude-by-rail accident resulted in a vapor cloud explosion or BLEVE, it could generate a potentially harmful shockwave. At each modeling location, the extent of overpressure resulting from specific vapor cloud explosions was modeled by varying the quantity of oil released, the size of the pool, and the ambient weather conditions (including wind speed, humidity, temperature, and air turbulence). Figure 4-17 presents the impacts on structures and the human body that could be expected at different overpressure levels.

The extent of overpressure from a BLEVE was modeled by varying the number of tank cars that would be involved. The results for the BLEVE modeling would be the same at all three locations.

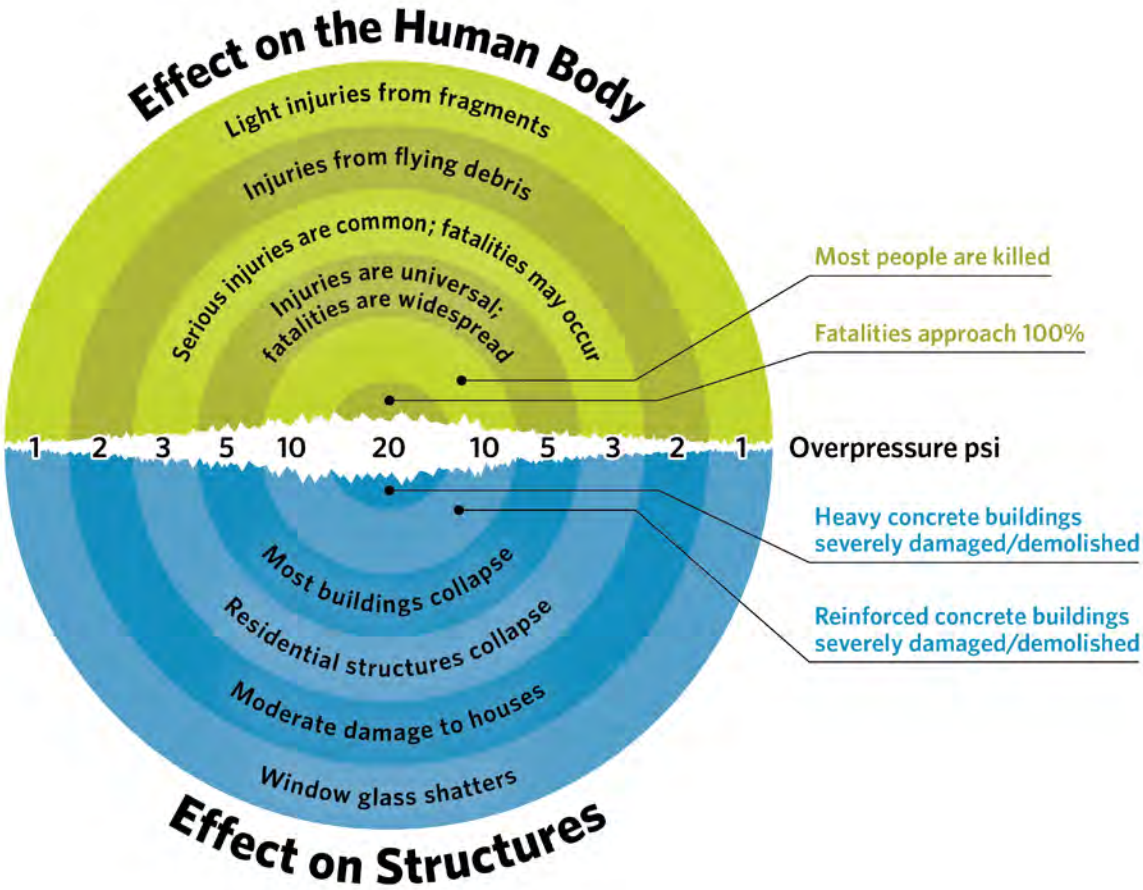
Probability of a Fire or Explosion

The probability of a fire or explosion in the event of an oil release is dependent on an accident and release first occurring. The expected frequency of a fire or explosion was calculated using the spill frequency rates and the probability of a fire or explosion occurring during a spill.

> The **return period** of a fire or explosion is the amount of time, on average, that passes between consecutive events of a similar magnitude.

Based on a review of historic fires in the petrochemical industry (Cox et al. 1990), there would be an 8-percent probability of an ignition leading to a fire in the event of a spill. Of these ignited events, there is a 30-percent probability of that fire resulting in a vapor cloud explosion. Table 4-18 outlines the expected frequencies and return periods of a fire or explosion based on combining these probabilities with the spill frequencies calculated above.

Figure 4-17 Impacts of Overpressure on Structures and the Human Body



Source: CDC 2016.

Although physically possible, there have been no BLEVEs involving crude-by-rail trains in the United States. There were roughly a dozen BLEVE events documented in the 40 years of reviewed freight train data from the FRA (FRA 2016). All of these BLEVEs involved cargoes of lighter hydrocarbon products with greater volatility (e.g., liquid petroleum gas, ethanol, mineral spirits), and, as such, are not comparable to crude oil. Because no crude-by-rail train accidents involving BLEVEs have taken place, it is not possible to perform a statistical estimate; therefore, the probability of a BLEVE occurring was not calculated.

Table 4-18 Frequency and Return Period of a Fire or Explosion in the Event of a Release

	High Estimate Evaluation			Low Estimate Evaluation		
	Frequency (Event/Year)	Average Return Period (Years)	Probability ("Odds") in a Given Year	Frequency (Event/Year)	Average Return Period (Years)	Probability ("Odds") in a Given Year
Oil Release	0.046	22	1 in 22	0.0055	180	1 in 180
Pool Fire	0.0037	270	1 in 270	0.00044	2,300	1 in 2,300
Vapor Cloud Explosion	0.0011	910	1 in 910	0.00013	7,600	1 in 7,600

Potential Pool Fire Hazard Range

In the event of a crude oil pool fire, the resulting *thermal radiation* from the ignited pool was analyzed. Table 4-19 presents the distances from the center of the source pool fire at which different modeled levels of thermal radiation would be experienced during early and late pool fires. The extent of heat generated by a pool fire would vary depending on the size of the pool, the quantity of oil released, and the amount of time that elapses between release and ignition (early vs. late pool fire).

When a person is 203 meters (666 feet) away from the center of the pool fire, the individual would experience pain within 15 to 20 seconds of exposure (equivalent to 4 kW/m^2). Within this area, there was a smaller area 74 meters (243 feet) from the source where the thermal radiation level reached 12.5 kW/m^2. At this radiation level, extreme pain would result within 20 seconds of exposure and mortality would reach 50 percent after 80 seconds of uninterrupted exposure.

None of the modeled scenarios resulted in thermal level rise to a point where immediate fatalities would occur (35 kW/m^2). This is why no values are presented in Table 4-19 for the extent of thermal radiation that would cause immediate fatalities.

Exposure to **thermal radiation** requires line of sight to the source. Therefore, exposure could be minimized by hiding behind an obstacle. To be conservative, the thermal radiation values presented throughout this analysis are worst case, where no cover is available.

As an example, Figure 4-18 presents the hypothetical thermal radiation levels at each modeled location for a 28- to 30-car release with medium winds. Appendix I presents the graphical representations for all of the modeled scenarios presented in Table 4-19.

Table 4-19 Thermal Radiation Hazards From a Pool Fire

			Level of Thermal Radiation					
			Pain within 15 to 20 seconds and injury after 30 seconds (4 kW/m²)		Extreme pain within 20 seconds; fatality if escape is not possible (12.5 kW/m²)		Immediate fatality (35 kW/m²)	
			Maximum Distance from Pool Fire (meters [feet])					
Location	Release Size	Wind Speed	Early Pool Fire	Late Pool Fire	Early Pool Fire	Late Pool Fire	Early Pool Fire	Late Pool Fire
Swinomish Channel Swing Bridge	5,700-Barrel Release (7-8 Cars)	Medium Wind	114 m (374 ft)	168 m (551 ft)	46 m (151 ft)	70 m (230 ft)	--	--
		High Wind	136 m (446 ft)	203 m (666 ft)	49 m (161 ft)	74 m (243 ft)	--	--
	20,000-Barrel Release (28-30 Cars)	Medium Wind	114 m (374 ft)	168 m (551 ft)	46 m (151 ft)	70 m (230 ft)	--	--
		High Wind	136 m (446 ft)	203 m (666 ft)	49 m (161 ft)	74 m (243 ft)	--	--
Skagit River Crossing	5,700-Barrel Release (7-8 Cars)	Medium Wind	114 m (374 ft)	165 m (541 ft)	46 m (151 ft)	69 m (226 ft)	--	--
		High Wind	136 m (446 ft)	199 m (653 ft)	48 m (157 ft)	72 m (236 ft)	--	--
	20,000-Barrel Release (28-30 Cars)	Medium Wind	114 m (374 ft)	165 m (541 ft)	46 m (151 ft)	69 m (226 ft)	--	--
		High Wind	136 m (446 ft)	199 m (653 ft)	48 m (157 ft)	72 m (236 ft)	--	--
Edmonds Ferry Terminal	5,700-Barrel Release (7-8 Cars)	Medium Wind	56 m (184 ft)	56 m (184 ft)	19 m (62 ft)	19 m (62 ft)	--	--
		High Wind	67 m (220 ft)	67 m (220 ft)	21 m (69 ft)	21 m (69 ft)	--	--
	20,000-Barrel Release (28-30 Cars)	Medium Wind	66 m (217 ft)	66 m (217 ft)	22 m (72 ft)	22 m (72 ft)	--	--
		High Wind	75 m (246 ft)	75 m (246 ft)	23 m (75 ft)	23 m (75 ft)	--	--

Note: The 35 kW/m² level of thermal radiation was not reached under any scenario. The modeling at the Edmonds Ferry Terminal includes analysis of land and water; however, the maximum modeled distance was the same over both land and water so only one value is reported.

Figure 4-18 Example of Pool Fire Thermal Radiation Levels from a 28- to 30-Car Release with Medium Winds

Potential Vapor Cloud Explosion Hazard Range

In the event of a vapor cloud ignition, the resulting overpressure from an explosion was analyzed. Table 4-20 presents the distance from the explosion at which different levels of overpressure would be experienced. The extent of overpressure resulting from vapor cloud explosions would vary depending on the quantity of oil released, the size of the pool, and the ambient weather conditions (including wind speed, humidity, temperature, and air turbulence).

The overpressure level at which window glass would shatter and light injuries from fragments would result (1 psi) extended on land up to 777 meters (2,549 feet). Over water, the 1 psi level extended up to 1,204 meters (3,950 feet). Within the 1 psi level, there was a smaller area where the psi level reached 3.5. At this level, which extended up to 509 meters (1,670 feet), residential structures would collapse and serious injuries would be common.

Over water, the 3.5 psi level extended to 938 meters (3,077 feet). Within the 3.5 psi level, there was a smaller area where the psi level reached 8. At this level, which extended up to 444 meters (1,457 feet), destruction of buildings would occur and most people would be killed. Over water, the 8 psi level extended to 729 meters (2,392 feet). As an example, Figure 4-19 presents the overpressure levels at each modeled location for a 28- to 30-car release with medium winds. Appendix I presents the graphical representations for all of the modeled scenarios presented in Table 4-20.

Potential BLEVE Hazard Range

In the event of a BLEVE, the resulting overpressure from the explosion was analyzed. Table 4-21 presents the distance from the explosion at which different levels of overpressure would be experienced. During a BLEVE involving one tank car at any of the three potential event sites, the 1 psi overpressure level (where glass shatters and light injuries result from fragments) extended approximately 157 meters (516 feet); the 3.5 psi overpressure level (where residential structures collapse and serious injuries are common) extended approximately 74 meters (243 feet).

Table 4-20 Overpressure from a Vapor Cloud Explosion

			Level of Overpressure		
			Window glass shatters and light injuries from fragments (1 psi)	Residential structures collapse and serious injuries are common (3.5 psi)	Destruction of buildings and most people are killed (8 psi)
Location	Release Size	Wind Speed	Maximum Distance from Vapor Cloud Explosion (meters [feet])		
Swinomish Channel Swing Bridge	5,700-Barrel Release (7-8 Cars)	Medium Wind	1,164 m (3,819 ft)	837 m (2,746 ft)	758 m (2,487 ft)
		High Wind	615 m (2,018 ft)	428 m (1,404 ft)	383 m (1,257 ft)
	20,000-Barrel Release (28-30 Cars)	Medium Wind	1,156 m (3,793 ft)	834 m (2,736 ft)	756 m (2,480 ft)
		High Wind	614 m (2,014 ft)	428 m (1,404 ft)	383 m (1,257 ft)
Skagit River Crossing	5,700-Barrel Release (7-8 Cars)	Medium Wind	777 m (2,549 ft)	509 m (1,670 ft)	444 m (1,457 ft)
		High Wind	443 m (1,453 ft)	288 m (945 ft)	251 m (823 ft)
	20,000-Barrel Release (28-30 Cars)	Medium Wind	773 m (2,536 ft)	508 m (1,667 ft)	444 m (1,457 ft)
		High Wind	442 m (1,450 ft)	288 m (945 ft)	250 m (820 ft)
Edmonds Ferry Terminal	5,700-Barrel Release (7-8 Cars)	Medium Wind	Water: 1,204 m (3,950 ft) Land: 317 m (1,040 ft)	Water: 938 m (3,077 ft) Land: 172 m (564 ft)	Water: 729 m (2,392 ft) Land: 119 m (390 ft)
		High Wind	Water: 599 m (1,965 ft) Land: 221 m (725 ft)	Water: 440 m (1,444 ft) Land: 129 m (423 ft)	Water: 402 m (1,319 ft) Land: 106 m (348 ft)
	20,000-Barrel Release (28-30 Cars)	Medium Wind	Water: 1,045 m (3,428 ft) Land: 273 m (896 ft)	Water: 790 m (2,592 ft) Land: 148 m (486 ft)	Water: 729 m (2,392 ft) Land: 119 m (390 ft)
		High Wind	Water: 599 m (1,965 ft) Land: 221 m (725 ft)	Water: 440 m (1,444 ft) Land: 129 m (423 ft)	Water: 402 m (1,319 ft) Land: 106 m (348 ft)

Note: The modeling at the Edmonds Ferry Terminal includes analysis of both land and water.

Figure 4-19 Example of Vapor Cloud Explosion Overpressure Levels from a 28- to 30-Car Release with Medium Winds

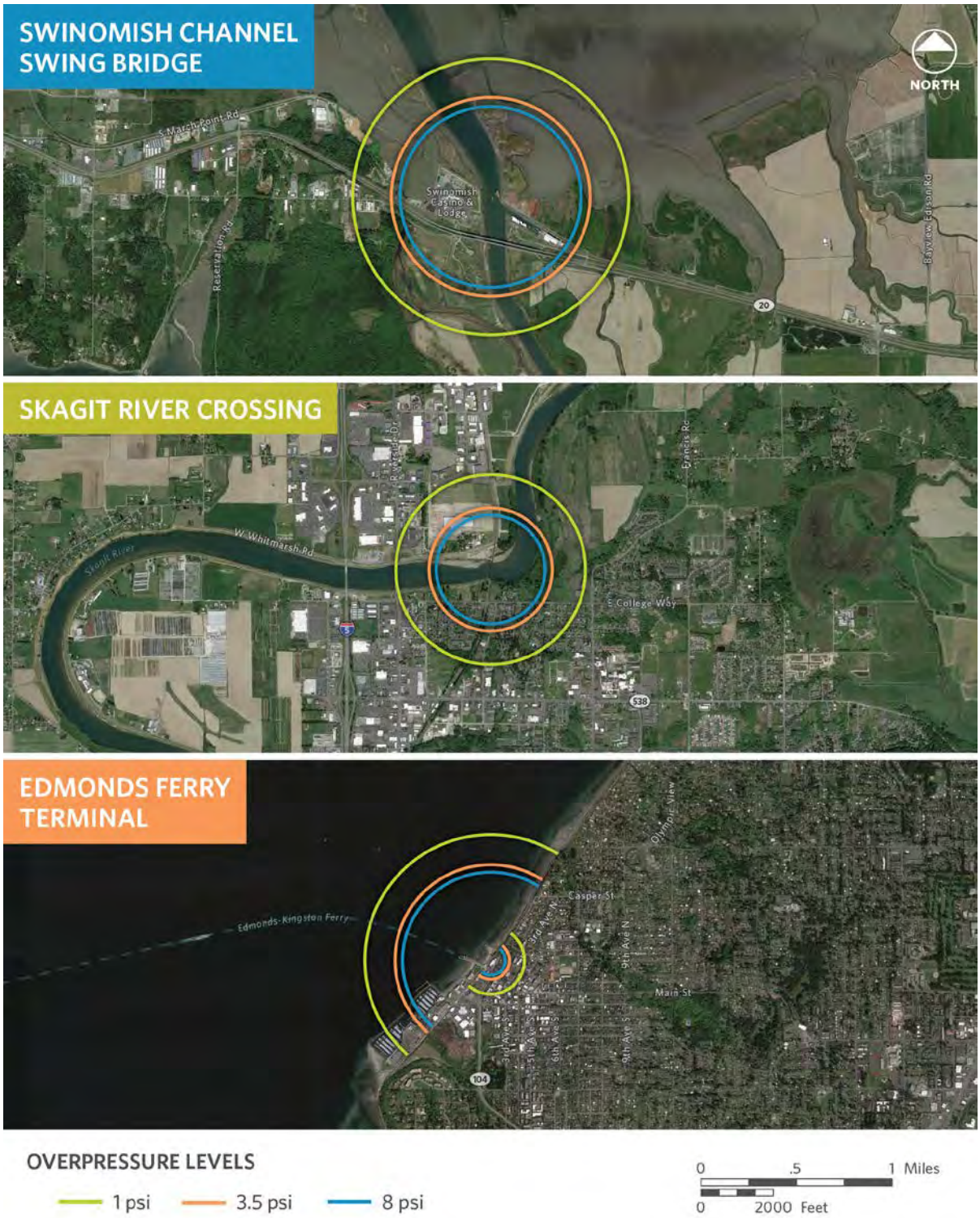


Table 4-21 Overpressure from a Potential BLEVE

	Level of Overpressure		
	Window glass shatters and light injuries from fragments (1 psi)	Residential structures collapse and serious injuries are common (3.5 psi)	Destruction of Buildings and most people are killed (8 psi)
	Maximum Distance from BLEVE (meters [feet])		
1 tank car (650 barrels)	157 m (515 ft)	74 m (243 ft)	46 m (151 ft)
7 tank cars (4,550 barrels)	300 m (984 ft)	142 m (466 ft)	88 m (289 ft)
28 tank cars (18,200 barrels)	476 m (1,562 ft)	225 m (738 ft)	139 m (456 ft)

Cumulative Probability and Consequences of a Fire or Explosion

As described in Chapter 1 – Introduction, four refineries in Washington currently receive crude by rail from the mid-continent area. If all facilities, including the proposed project, were approved and implemented, weekly trainloads of crude oil in the state would increase to approximately 70 trains from the current level of approximately 21 trains.

The cumulative probability of a fire or explosion in the event of a release depends on an accident and release first occurring. As such, the cumulative high and low estimate evaluations for the 70 possible weekly trains was calculated based on the probability of an accident occurring from the previously described probability analysis. The cumulative High Estimate is a purposefully conservative evaluation of the probability of an accident and release occurring based on the historic rates of accidents and releases. As outlined in Table 4-22, the cumulative High Estimate frequency of a pool fire would be 0.038 pool fires per year or, on average, one pool fire every 26 years (compared with a frequency of 0.00037 pool fires per year or, on average, one release every 270 years for proposed project trains). In other words, there is a 1 in 26 chance that a pool fire would occur in any given year. The cumulative High Estimate frequency of a vapor cloud explosion would be 0.012 events per year or, on average, one vapor cloud explosion every 87 years. In other words, there is a 1 in 87 chance that a vapor cloud explosion would occur in any given year. For comparison, the frequency of a vapor cloud explosion per year for the proposed project trains would be 0.0011 events per year, or one vapor cloud explosion every 911 years.

The cumulative Low Estimate incorporates the various safety measures specific to crude-by-rail unit trains that have been, or are anticipated to be, implemented to make trains safer. These include positive train control, enhanced braking, wayside detectors and track upgrades. Several of these measures would need to be sustained over time for the release rate probabilities to remain constant (e.g., improved track maintenance). The cumulative Low Estimate frequency of a pool fire would be 0.0055 pool fires per year or, on average, one pool fire every 180 years. In

other words, there is a 1 in 180 chance that a pool fire would occur in any given year. For comparison, the frequency of pool fires per year (average) for the proposed project trains would be 0.00044 pool fires per year or, on average, one release every 2,290 years. The cumulative Low Estimate frequency of a vapor cloud explosion would be 0.00166 events per year, or one vapor cloud explosion every 600 years. In other words, there is a 1 in 600 chance that a vapor cloud explosion would occur in any given year. For comparison, the frequency of vapor cloud explosions (average per year) for the proposed project trains would be 0.00013 events per year or, on average, one vapor cloud explosion every 7,617 years.

Table 4-22 shows the probability of an explosion or fire if all crude-by-rail projects proposed in Washington State were constructed and the number of unit trains operating in the state increased to about 70 per week. The probability of an explosion or fire involving a proposed project unit train is independent of the total number of unit trains operating in the state and would not change if more crude-by-rail projects were constructed. However, in general, if the number of unit trains increased, the overall probability of an explosion or fire would be higher. Regardless of the probability, the potential consequences from an individual accident resulting in a release, fire, or explosion would be similar to that described above.

Table 4-22 Cumulative Frequency and Return Period of a Fire or Explosion in the Event of a Release

	High Estimate Evaluation			Low Estimate Evaluation		
	Frequency (Event/Year)	Average Return Period (Years)	Probability in a Given Year	Frequency (Event/Year)	Average Return Period (Years)	Probability in a Given Year
Shell Unit Trains Estimate						
Oil Release	0.046	22	1 in 22	0.0055	180	1 in 180
Pool Fire	0.0037	270	1 in 270	0.00044	2,300	1 in 2,300
Vapor Cloud Explosion	0.0011	910	1 in 910	0.00013	7,600	1 in 7,600
Cumulative Estimate						
Oil Release	0.48	2.1	1 in 2.1	0.069	14	1 in 14
Pool Fire	0.038	26	1 in 26	0.0055	180	1 in 180
Vapor Cloud Explosion	0.012	87	1 in 87	0.0017	600	1 in 600

REGIONAL ECONOMIC RISK

Releases of oil from unit trains can have wide-ranging economic consequences. The public expressed concerns about potential economic impacts of a crude-by-rail accident during the scoping process (Skagit County and Ecology 2015). The potential consequences described below are hypothetical and are meant to encompass the types and range of impacts that could occur rather than offer a complete accounting of all the potential impacts. The impacts begin with the occurrence of a release at a specific location, time, and rate with a certain size, toxicity, and duration.

Approach to Economic Risk Analysis

This analysis focuses on the potential indirect consequences of a release of oil. The direct economic impacts of a release (i.e., the loss of crude oil revenue) were not evaluated. The indirect consequences are the damages that are imposed upon third parties, such as the public or natural resources. By definition, third parties would not be involved in the transport of crude oil that resulted in a release into the environment. Some indirect consequences may eventually be offset by direct compensation, either from government programs or through litigation. In Washington State, under state law (RCW 90.56.370), anyone responsible for spilling oil into state waters is liable for damages resulting from injuries to public resources. The process for determining damages is defined in the Oil Spill Natural Resource Damage Assessment rule (WAC 173-183).

The potential economic consequences may be both market- and nonmarket-based. Market-based damages are those that are felt directly in market transactions. Examples include losses in aquaculture, agriculture, commercial fishing, transportation services, damages to private property, reductions in the hospitality industry, or increased employee absenteeism from impaired health. Nonmarket damages include losses of ecosystem function, risks to public health, impairments to public recreation, or decreases in *nonuse values*.

Nonuse values represent the willingness of households to pay to avoid environmental damage to an environmental resource even if they never have and never will use the resource.

Potential consequences may be short term or long term. Short-term impacts are more immediate. They include decreases in tourism that would affect the hospitality industry during the initial release phase and last through the containment, cleanup, and restoration phases of the release. Longer-term impacts may take years to play out and include reductions in the salmonid stock, which could reduce commercial fishery harvests in future years due to losses of juvenile populations.

Some consequences may have both short-term and long-term impacts, e.g., health-related impacts. Cleanup workers may suffer immediate impacts from prolonged exposure to toxic chemicals released from the crude oil, such as developing rashes and other ailments. Long-term health impacts could result years later from cancers and other conditions as a result of exposure.

This evaluation of the potential economic consequences is organized using three major consequence categories: environmental, economic, and social (Table 4-23). The damages would range considerably, depending on environmental factors and where the release occurred (e.g., in aquatic or terrestrial habitat; in a rural or urban area; or during calm or windy conditions).

Table 4-23 Potential Economic Consequences Categories

Environmental	Economic	Social
Ecosystem Services	Commercial Fishing	Public Health Impacts
Nonuse Values	Transportation	Psychological Stress
Water Recreation	Private Property Loss or Damage	Public Recreation
	Tourism	
	Related Industries	
	Employee Health (Absenteeism)	
	Aquaculture	

Potential Economic Consequences of a Release of Oil

The potential economic consequences of an oil release resulting from the proposed project are discussed below for each category outlined in Table 4-23. While most of the damages of a release tend to be negative in value, some impacts can be offsetting. For example, a release may decrease tourist activities. The decrease in tourism could reduce sales of goods and services in hospitality and related industries (e.g., food, lodging, miscellaneous retail, and gas). During cleanup of the release, workers supported by government aid would likely spend dollars received, thereby offsetting some of the impacts to the local economy. Similarly, government relief programs or litigation could also help recoup some of the economic damages.

Environmental Consequences

Ecosystem Services

Ecosystem services are the beneficial outcomes that result from *ecosystem functions* such as support of the food chain, harvesting of animals or plants, and the provision of clean water or scenic views. A release of crude oil in an ecosystem could impair one or more of the functions and services. For example, a release occurring near estuarine wetlands could damage wetland vegetation. The die-off of plants could destabilize local soils, increasing the risk of erosion. It could also reduce the natural flood protection provided by estuarine wetlands.

Ecosystem functions are the physical, chemical, and biological processes that contribute to the self-maintenance of an ecosystem. Some examples of ecosystem functions are carbon cycling, removal of nutrients and pollutants from water bodies, and flood risk reduction.

Nonuse Values

Nonuse values represent the willingness of individuals to pay for avoiding damages to an ecosystem, apart from the direct use (such as fishing) or indirect use (such as ecosystem services) of that system. People tend to care about events that reduce fish populations, kill birds, or

damage habitat even if they never directly interact with those species or habitat. Nonuse values are not localized and tend to have wide-reaching effects.

A release of crude oil into local waters could kill salmon. The loss of salmon would have a damage value beyond the impacts on sport and commercial fishing industries. There are many studies on salmon that demonstrate their value to Washington State residents and tribes. This value comes from knowing that the fish exist. Even though people may not receive a direct benefit through interaction (e.g., commercial or sport fishing), they are willing to pay to preserve them. As such, any ecological impact on local salmon stocks would have an impact on nonuse values, which would be in addition to those measured by the direct impacts on the fisheries production. Further, as described in Chapter 3.8 – Treaty and Traditionally Used Resources, Swinomish Tribe members have been harvesting salmon within the study area since ancient times (Goren 2012). These resources are considered by the Swinomish to be culturally significant and represent their connection with the environment.

Water Recreation

Water-based recreation is a broad category including all paid water recreation, such as boating, scuba diving, and sport fishing. Water recreation is often valued based on the expenditures of individuals to take part in the activities. For example, an angler will spend money on bait and tackle to catch fish; purchase a permit; or charter a boat. Damages would be measured as the lost revenue that individuals would have spent on trips that were cancelled because the recreation resource had been impaired.

If a release of crude oil were to occur in the vicinity of either the Swinomish Channel marinas or the Swinomish Channel boat launches, for example, recreational boating could be affected in two ways. First, the amount of money that boaters would spend on recreational trips to the channel would decrease. Second, for boats that were docked in the water and damaged by the release, boat owners would be economically impaired by additional maintenance costs. These damages are realized as increases in operation, maintenance, and repair costs for boats and equipment, as well as in insurance claims for losses.

Economic Consequences

Commercial Fishing

Damages to commercial fisheries accrue from decreases in fish populations and revenues to fishermen. As described above, population reductions may occur to species such as coho salmon, Chinook salmon, chum salmon, sockeye salmon, steelhead, Dolly Varden, herring, halibut, and shellfish. Damages could result in the short term from mortality of adult fish in an area of a release. Damages could also occur over a longer period as a result of impacts to spawning grounds and juvenile fish populations. Damages to habitat may result in the movement of fishery populations away from traditional grounds.

Following a high-volume release, substantial reductions in populations can result in closures of fisheries until the population recovers. Decreases in market confidence about the safety of eating the fish may occur, leading to a drop in the price of fish or the outright rejection of seafood products by commercial buyers and consumers. In addition to production impacts for commercial fisheries, oil in the water can damage marine vessels, equipment, and engines if

fishing activities occur in the vicinity of an uncontained release. These damages could increase operational costs for commercial fisheries through added repair costs.

As described above, a crude oil release in Puget Sound could impact commercial fisheries in a number of ways. Direct contact between salmonid populations and oil could lead to immediate mortality of salmon stocks in local waters because crude oil could contaminate fish and make them unsafe for human consumption. These impacts would reduce the available harvest for both tribal and nontribal commercial fisheries and decrease revenues for locally caught salmon species.

If a ban on fishing in local waters were to occur, fishermen could go out of business. Others might seek temporary fishing grounds farther away, which would increase their operational costs and lower net revenues. There could also be future damages to the local salmonid commercial fishery if juvenile fish stocks are affected through direct mortality, loss of habitat, or loss of spawning grounds. This could lead to additional impacts on the commercial fisheries in the form of lost production and revenue.

Aquaculture

The potential consequences to aquaculture would be similar to those described for commercial fisheries. The most serious threat that releases of oil pose to aquaculture activity is the economic losses from business interruption. Population reductions can result in closures of fisheries until the populations recover. Decreases in market confidence could occur, leading to a drop in the price of fish or outright rejection of seafood products by commercial buyers and consumers.

A marine release could impact salmon net-pen operations and commercial shellfish beds. Direct contact between the fish and shellfish populations and crude oil could lead to immediate mortality. In addition, fish exposure to crude oil could leave them contaminated and unsafe for human consumption. Both impacts would reduce the available harvest, thereby leading to a decrease in revenues.

Transportation

Damages from closures to the transportation network can impact individuals and businesses. The value of a person's time because of delays is considered when assessing such damages. For example, a release could affect access across State Route (SR) 20 over the Swinomish Channel. If SR 20 were to suffer traffic restrictions or closures, regional commuters and shipping networks would experience delays as they travel between Fidalgo Island, Whidbey Island, the San Juan Islands, and surrounding areas.

To demonstrate how this example could play out, if a commuter travels to work between Anacortes and Burlington, the most direct route would be the SR 20 Bridge over the Swinomish Channel. If the bridge were closed, the commuter would seek an alternate route such as Pioneer Parkway in LaConner. This alternate route would add 40 minutes to the trip, assuming there were no additional congestion delays. Economic damages would result in lost income to the commuter—income that could have been earned from doing other activities such as working. Damages would also extend to the value of freight inventory that is shipped along the same corridor but is delayed between its origin and destination.

Private Property Loss or Damage

Private property loss or damage includes either partial of full loss of property value from an oil release. For example, a release could affect waterfront real estate in the region. First, the proximity to a release could decrease overall property values. Beaches provide an amenity value to properties and people are often willing to pay more for them than others. If a release of oil were to occur and damage beaches, waterfront properties could become less desirable and their values could decrease. At that point, a second impact could occur; the regional market for waterfront real estate could slow and result in fewer home sales. This impact could last until all cleanup activities had been completed, and possibly longer.

Tourism

Damages to the hospitality industry include changes in the economic activity of restaurants, hotels, and other businesses that cater specifically, although not exclusively, to visitors or tourists. A release in the Swinomish Channel, for example, could affect the town of La Conner and the Swinomish Casino, both of which rely on summer day trips to the area. A decrease in summer tourism would reduce the revenues for the local hospitality industry.

Related Industries

Related industries, like canneries and fish processors, could also be impacted. Following an oil release, these industries could slow or shut down operations because of lower inputs due to fishing losses. Related industries are also linked to agriculture and aquaculture.

If a release were to reduce salmonid stocks, the decrease in catch would affect multiple industries linked to commercial and recreational fishing. The reduction in commercial harvests of salmon would damage both tribal and nontribal commercial fish canneries and other food processors. Because the release could impact other commercial species, the canneries would not likely be able to substitute lost revenues from salmon processing with increased production of products from other species. In addition, a reduction in recreational fishing could impact fishing charters and gear shops, as fewer trips would be taken for sport fishing.

Employee Health (Absenteeism)

Exposure to toxic chemicals can increase the rates of labor force absenteeism due to chronic medical problems. This exposure would affect residents living near the release site who could experience a range of health problems, including headaches, eye irritation, or respiratory issues. Absenteeism increases direct costs for businesses through wages paid to absent employees; high-cost replacement workers (overtime pay for other employees or temporary workers); and administrative costs to manage absenteeism. Absenteeism can also lead to indirect damages such as overtime fatigue, which could reduce the quality of goods/services; decreases in productivity; increases in managerial time and costs; increases in safety issues; and diminished worker morale.

Social

Public Health Impacts

Damages to public health could occur when persons either inhale vapors or touch crude oil, or consume contaminated food. Health impacts from exposure could affect residents located in the

vicinity of a release or cleanup workers. Health impacts can be immediate, such as headaches, eye irritation, and respiratory issues; or they can be long term, such as cancers from breathing volatile organic compounds or coming into contact with oil.

Damages to public health resulting from a release of oil are measured either through the increase in the incidence of health cases, or the change in costs for the medical assistance required to treat them. In addition to physical health problems, individuals who are economically harmed through job or business losses, or individuals who have a strong connection to the environment, might also suffer emotionally. Technological disasters such as oil releases are shown to be more stressful than natural disasters. Threatened livelihoods could lead to stress and social breakdown. These events could result in an increased demand for clinical, mental health, and rehabilitation programs. The net impact could include increased direct costs through hospital bills and related expenses, or broader social costs through work stoppages and shorter life expectancy.

Public Recreation

Public recreation is a broad category that captures all unpaid recreation activities, such as public beach use, trail use, swimming, and surfing. Damage to public recreation is usually measured in one of two ways: 1) by any loss of utility associated with the forgone recreation activity; or 2) by having to travel to recreation areas that are less desirable to an individual.

A release into local waters, for example, could impact beaches and recreation opportunities such as walking, bird watching, swimming, and kayaking. The release of oil could prevent aquatic recreation, access to public beaches and other day use facilities, and could damage the aesthetic quality of the beaches and surrounding environments. Furthermore, toxic fumes could impose serious health risks for recreational visitors. Studies have shown that a reduction in either the aesthetic quality, and/or quantity of recreation available at a beach changes the overall economic value that the public receives from use of the beach.

Hypothetically, a person could be willing to pay $10 per daily trip to walk along Padilla Bay in its current condition. If a release were to occur, access to the beach could be limited. There would be an inability to approach water, access to walking paths would be restricted, and the aesthetic quality could be impaired. These factors could reduce the value of the recreational experience from $10 to $5 per daily trip. Furthermore, the reduced quality of the experience could lead to fewer trips taken.

Potential Economic Damages to Tribes

A release of oil could impact fishing, hunting, and culturally important tribal lands. Impacts could include oil contamination of fish and shellfish, and damages to fisheries. These impacts could affect the cultural, traditional, and economic uses of the tribes (See Chapter 3.8 – Treaty and Traditionally Used Resources). Oil releases could affect tribal communities that rely on the natural environment for subsistence and social-cultural uses. Many tribes, such as the Swinomish, have traditional cultures rooted in harvesting fish and other wildlife. For tribal fisherman, a reduction in commercial fishing as a result of an oil release would affect their livelihoods and incomes. For tribal families who rely on subsistence fishing, the loss of dietary protein would have to be replaced. Those families would see a substantial increase in costs as

they replaced the protein with other food sources to meet dietary needs. These economic impacts would place a strain on the overall wellbeing of the community.

Potential Total Value of Economic Damages

The economic damage categories discussed above focused on the third-party impacts of an oil release. The consequences presented were broad and hypothetical; therefore, the monetary values of the consequences were not quantified. However, a potential value of economic damages was identified based on historical evidence from other releases in Table 4-24 below. These values helped to provide some evidence for the value of the damages associated with releases of oil.

The damage estimates tended to be reported as a combination of direct economic losses (petroleum), cleanup costs, and environmental damages. The other environmental damage categories and cleanup costs combined both market- and nonmarket-based categories. In some instances, environmental damages were measured as fines, punitive damages, and/or litigation. As such, these measures did not report the true value of the economic damages that the releases imposed on society. Some reports of commercial fishery losses, tourism losses, and property damages were found. No direct losses were included in the estimates (i.e., the loss of crude oil revenue).

Several historic releases were identified in the economic literature for which a range of damages were available. Three of the identified releases occurred in a marine environment. These releases included:

- Pemex Ixtoc I (1979), located in the Gulf of Mexico, about 138 million gallons of oil spilled.
- Exxon Valdez (1981), located near Alaska, about 11 million gallons of oil spilled.
- Deepwater Horizon (2010), located off the Gulf Coast, about 210 million gallons of oil spilled.

With crude-by-rail transport being relatively new, damage estimates for releases are limited for the Lac-Mégantic spill (2013) in Quebec, Canada. Meanwhile, data on smaller spills are unavailable.

Identified damage estimates are reported in Table 4-24. For purposes of comparison, the total damages were converted to dollars per gallon by dividing them by the total gallons released. For each type of damage, the lowest and highest value was reported. All of the identified damage estimates varied substantially. Lac-Mégantic was determined to have the highest value in real estate damages and cleanup costs. The Deepwater Horizon spill provided the source for reporting losses in commercial fishery revenues. The Exxon Valdez spill was reported in total cleanup costs and environmental damages.

Table 4-24 Observed Economic Damages from Historical Spills

Description	Average Damage per Gallon (2015 Dollars)	Average Damage per Barrel (2015 Dollars)
Clean up costs[1]	$8 - $117	$336 - $4,914
Environmental damages[2]	$8 - $255	$336 - $10,710
Total cleanup and environmental damages[3]	$17 - $685	$714 - $28,770
Tourism losses (reported)[4]	$0.10 - $20	$4.20 - $840
Commercial fishery losses[5]	$22	$924
Loss of real estate values[6]	$22 - $1,588	$924 – $66,696

Notes:
1. Low value from Pemex Ixtoc I, [Restrepo 1982]; high value from Lac-Mégantic [Portland Press Herald 2013].
2. Low value from Pemex Ixtoc I, [Restrepo 1982]; high value from Exxon Valdez [Cohen 2010] public willingness-to-pay to avoid environmental losses.
3. Low value estimated; high value from Exxon Valdez [Cohen 2010].
4. Low value from Pemex Ixtoc I, [Restrepo 1982]; high value from Deepwater Horizon [Ashcroft and Smith 2010].
5. Only one value reported, Deepwater Horizon [Ashcroft and Smith 2010].
6. Low value from Deepwater Horizon [Ashcroft and Smith 2010]; high value from Lac-Mégantic [Portland Press Herald 2013]. High value included full reconstruction of the town over 10 years.

For the proposed Shell PSR project, the true scale and extent of spills is difficult to forecast. The historical values presented above were not attributable to crude-by-rail operations and demonstrate that the range of potential economic damages is large and influenced by many factors. One study estimated that the average damage from oil spills in the U.S. was $17.39 per gallon adjusted to 2016 dollars (cleanup and environmental damages) based on accounts from actual spill data (Cohen 1986). Table 4-25 shows the approximate damages that would result with the average, 30PD and 90PD spill sizes.

Table 4-25 Estimated Damages for the Release Volumes per Event

Statistical Parameter	Release Volume (Barrels)	Approximate Damages with Cohen 1986
Average Low Estimate Evaluation	10,498 (440,916 gallons)	$ 7,667,376
Average High Estimate Evaluation	11,144 (468,048 gallons)	$ 8,139,354
30th Percentile	5,700 (239,400 gallons)	$ 4,163,083
90th Percentile	20,000 (840,000 gallons)	$14,607,308

Source: Cohen 1986.

Potential Economic Consequences of a Fire or Explosion

The immediate economic consequences of a fire or explosion after the release of oil from a train derailment include impacts to human health and loss of life, property damages, impacts to transportation, and emergency response. Additional impacts such as damages to ecosystem services and nonuse values (see preceding section regarding the economic impacts of spills) could also occur when a fire or explosion results in damages to the natural environment. Variables affecting the extent of the damages are the physical environment, local economic conditions, land use, emergency response and preparedness, and government policy.

The following economic damages were assumed to likely occur as the result of a fire or explosion: losses or damages to private property; impacts to the transportation network; impacts to employee health; impacts to public health; and damages to ecosystem services.

Private Property Loss or Damage

A fire or explosion could result in private property losses or damages. This could be a partial or full loss of the economic value of the property. Impacts would be limited to the immediate area of the fire or explosion.

Transportation

Closures to the transportation network could cause damages to accrue to individuals and businesses. The value of a person's time because of delays is considered when assessing such damages. For example, a fire or explosion could result in the closure of the Edmonds Ferry Terminal. The potential economic consequences from a release would be similar to those described under the discussion of the potential economic consequences to transportation resources from a release of oil.

Employee Health (Absenteeism)

Personal injuries from a fire or explosion, such as burns, could increase the rates of labor force absenteeism. The potential for injuries near a fire or explosion is high, but the area potentially impacted is small. Absenteeism could increase direct costs for businesses through wages paid to absent employees, high-cost replacement workers (overtime pay for other employees and/or temporary workers), and administrative costs to manage absenteeism. Absenteeism could also lead to indirect damages such as overtime fatigue, which reduces the quality of goods/services, decreases in productivity, increases in managerial time and costs, increases in safety issues, and poor worker morale.

Public Health Impacts

While the likelihood is very low, a fire or explosion could have significant impacts on human health, ranging from light to fatal injuries in proximity to the event. Damages to public health from an oil release are valued either through the increase in the resulting events of health cases, or the change in costs for the medical assistance required to treat those health cases.

Ecosystem Services

A fire or explosion could impair one or more of the functions and services that are afforded by the environment. For example, a fire could damage a stand of trees along a riparian ecosystem, which could destabilize the bank and result in increased erosion. The erosion could cause a reduction in the quality of spawning habitat for fish species, thereby reducing future fish stocks. These damages are valued directly through either the cost to repair/replace the ecosystem, or indirectly through proxy benefits such as flood risk reduction.

ACCIDENT AND RELEASE RESPONSE AND MITIGATION MEASURES

The findings described in this chapter indicate that the probability of an accident involving a Shell PSR unit train in Washington State resulting in a release of oil is low; however, should such an accident occur, the consequences could be substantial. The co-lead agencies considered these findings in the development of the mitigation measures presented below. These measures are intended to achieve two goals: 1) to minimize the probability of a release from a Shell PSR unit train occurring, and 2) to augment response capabilities if an accident were to occur.

The consequences and impacts described above were derived from an unmitigated release (i.e., no emergency response) of oil into the environment. If an actual release of oil were to occur, response measures governed by regulatory agencies and provided by first responders, regulatory agencies, Shell, and BNSF Railway would provide a targeted intervention to minimize the potential impacts. The full list of existing and required response plans is outlined in Chapter 3.17 – Public Services and Incident Response.

BNSF Railway is the responsible party for fires, releases, or other events involving the railroad. The company maintains equipment and a network of contracted first responder teams. As described further in Chapter 3.17 – Public Services and Incident Response, the local fire departments act as the first responder to any accidents along the railroad. BNSF Railway coordinates with fire departments and districts when responding to accidents and provides accident response training along its entire rail network. In addition, there are multiple guidelines and requirements with which BNSF Railway, Shell, and other entities must comply in conducting activities related to the transport and handling of crude oil.

First responders and their broad response networks have benefited from the advancement of oil spill response technologies. Also, enhanced planning measures have followed the Oil Pollution Act of 1990. Existing regulations govern the movement of crude oil by train including federally mandated oil spill response plans (49 CFR 130.31[a] for transport of volumes of oil greater than 1,000 barrels [42,000 gallons]). These regulations require that preparation and response measures be in place to address potential releases of oil. In addition, Washington State has recently enacted rules for crude-by-rail projects that, when implemented, will require specific notification procedures for crude-by-rail train activity in the state and will require railroads shipping crude oil by rail to have contingency plans in place (see Chapter 3.17 – Public Services and Incident Response). These rules will help emergency responders and planners prepare for and respond to an accident.

The National Contingency Plan, the Northwest Area Contingency Plan, local response plans, facility plans, and transportation regulations provide additional coordinated preparation for an oil or hazardous substance release. These contingency plans establish roles and responsibilities, and identify resources and response procedures to protect life. They reduce and mitigate the impacts of a pollutant discharge on the environment and property. The applicable plans are described in Chapter 3.17 – Public Services and Incident Response.

Avoidance and Minimization

Minimizing potential impacts that could result from a release of crude oil associated with the proposed rail unloading facility begins with prevention measures. As described in Chapter 3.17 – Public Services and Incident Response, there are numerous regulations and policies that are currently or will soon be implemented to minimize the potential occurrence of crude-by-rail accidents.

Mitigation

The risk of a spill occurring during an incident would be minimized by using DOT-117 Specification tank cars that meet enhanced safety standards issued by the Pipeline and Hazardous Materials Safety Administration and the FRA. The Shell PSR would accept delivery of crude oil and petroleum products only in tank cars meeting or exceeding DOT-117 specifications.

Shell would fund the purchase of hand-held volatile organic compound (VOC) monitors for local responders. The co-lead agencies would determine the number and location of monitors to be provided. Shell would provide training to ensure that local responders know how to use and maintain air monitors.

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CHAPTER 8 DISTRIBUTION LIST

The draft EIS was issued on October 4, 2016. This chapter describes how interested parties were notified of its availability, and provides information about how the public may access the draft EIS.

The applicant (Shell) and the co-lead agencies received printed copies of the draft EIS. Table 8-1 provides a list of agencies, tribes, and organizations who have expressed interest in the proposed project and were notified of the availability of the draft EIS for viewing and download by email. In addition, an email or postcard about the availability of the EIS was sent to those individuals who provided their contact information prior to the release of the draft EIS.

Printed copies of the draft EIS were made available for viewing at several public reading rooms around the state. Table 8-2 provides a list of public reading room locations.

The draft EIS is available for download at the project website: www.shellraileis.com. To obtain a printed copy or a USB drive with an electronic copy of the draft EIS (for the cost of production and shipping), follow the instructions provided at www.shellraileis.com or www.ecy.wa.gov/services/disclosure/disclose.html.

To request ADA accommodation for disabilities, call Hannah Waterstrat at Ecology, 360-407-7668. Persons with impaired hearing may call Washington Relay Service at 711. Persons with speech disability may call TTY at 877-833-6341.

Accommodations for limited English proficiency (LEP) populations are available at www.shellraileis.com. To request materials in alternate formats, follow the instructions at www.shellraileis.com.

Table 8-1 Draft EIS Notification List

Applicant and Consultant
AECOM
Shell Oil Products
Co-Lead Agencies and Third Party Consultant Team
HDR
Skagit County
Washington State Department of Ecology

Tribes
Columbia River Inter-Tribal Fish Commission
Confederated Tribes of the Chehalis Reservation
Confederated Tribes of the Colville Reservation
Cowlitz Indian Tribe
Hoh Tribe
Jamestown S'Klallam Tribe
Kalispel Tribe
Lower Elwha Klallam Tribe
Lummi Nation
Makah Tribe
Muckleshoot Tribe
Nisqually Tribe
Nooksack Tribe
Port Gamble S'Klallam Tribe
Puyallup Tribe
Quileute Tribe
Quinault Indian Nation
Samish Indian Nation Tribal Council
Sauk-Suiattle Tribal Council
Shoalwater Bay Tribe
Skokomish Tribe
Snoqualmie Tribe
Spokane Tribe
Squaxin Island Tribe
Stillaguamish Tribe
Suquamish Tribe
Swinomish Indian Tribal Community
The Confederated Tribes of the Warm Springs Reservation of Oregon

Tribes
The Suquamish Tribe
The Tulalip Tribes
Upper Skagit Tribal Council
Yakama Nation
Agencies and Local Jurisdictions
City of Anacortes
City of Burlington
City of Edmonds
City of Mount Vernon
City of Seattle
City of Sedro-Woolley
City of Vancouver
Clark County
Economic Development Alliance of Skagit County
Energy Facility Site Evaluation Council
Everett Community College
King County
National Parks, Pacific West Region
NOAA Fisheries
Northwest Clean Air Agency
Northwest Straits Commission
Padilla Bay National Estuarine Research Reserve
Port of Anacortes
Port of Skagit County
Port of Vancouver
Puget Sound Clear Air Agency
Puget Sound Partnership
Region 10 Regional Response Team (RRT) and the Northwest Area Committee (NWAC)

State and Local Jurisdictions and Agencies
Skagit Conservation District
Skagit County Health Department
Skagit County Planning & Development
Skagit County Public Works
Skagit Public Utility District
Skagit River System Cooperative
Skagit Valley College - San Juan Campus
Skagit Valley Community College - Mount Vernon Campus
Snohomish County
Spokane City Council
Town of Concrete
Town of Hamilton
Town of La Conner
Town of Lyman
US Army Corps of Engineers
US Department of the Interior
US Environmental Protection Agency
US Fish and Wildlife Service
US Fish and Wildlife Service, Migratory Bird Permit Office
Washington Department of Ecology, Bellingham Field Office
Washington Department of Ecology, SEA Program
Washington Department of Fish and Wildlife
Washington Department of Health
Washington Department of Natural Resources
Washington Emergency Management Division
Washington State Department of Agriculture
Washington State Department of Archaeology and Historic Preservation
Washington State Department of Commerce

State and Local Jurisdictions and Agencies
Washington State Department of Ecology SEPA Register
Washington State Department of Transportation
Washington State Labor and Industries
Washington State Legislature, Representatives and Senators from Districts 3, 10, 14, 15, 17, 18, 19, 20, 21, 23, 24, 27, 32, 33, 34, 35, 36, 37, 38, 39, 40, 42, 43, 46, 49
Washington State Parks
Washington State Parks and Recreation Commission
Washington State U.S. Senators
Washington Utilities and Transportation Commission
Western Washington Agricultural Association
Western Washington University
Whatcom County Planning and Development Services
Whidbey Island Naval Air Station
White Salmon Valley Community College
Other Organizations
350 Seattle
Anacortes Chamber of Commerce
Anacortes Public Library
Anacortes School District
Anvil Corporation
Association of Northwest Steelheaders
Auburn Library
Audubon Washington
Bellingham Central Library
Blanchard Chapel Weddings & Hall Rentals
Bloomberg
BNSF Railway Company

Other Organizations
Burlington Chamber of Commerce
Burlington Public Library
Burlington School District
Center for Biological Diversity
Center for Justice
Citizens for a Clean Harbor
Climate Solutions
Coastal Observation and Seabird Survey Team
Columbia Riverkeeper
Concrete School District
Consolidated Dike District 22
Conway School District
Darrington School District
Dike, Drainage, and Irrigation District 12
Drainage and Irrigation District 14
Drainage and Irrigation District 15
Drainage and Irrigation District 17
Drainage and Irrigation Improvement District 19
Drainage District 22
Duwamish River Clean Up Coalition
Earth Ministry
Earthjustice
East County Resource Center
Ecology Center of Southern California
Edmonds Library
Evergreen Islands
Fidalgo Bay Aquatic Reserve Citizen Stewardship Committee
Fire District #3, Conway

Other Organizations
Fire District #5, Edison, Allen, Samish Island
Fire District #6, Burlington
Fire District #7, Lake Cavanaugh
Fire District #8, Hickson
Fire District #9, Big Lake
Flemish Centre for Indigenous Peoples
ForestEthics
Friends of Grays Harbor
Friends of Skagit Beaches
Friends of Skagit County
Friends of the Columbia Gorge
Friends of the Earth
Friends of the San Juans
Fuse Washington
Grays Harbor Audubon Society
Guemes Island Library
Hotel Services Group
IBT Local 600 Golden Age Retirees Club
Idaho Conservation League
Irthlingz Arts-Based Environmental Education
La Conner Regional Library
La Conner School District
Laborers Local 292
Lake Pend Oreille Waterkeeper
Landowners and Citizens for a Safe Community
League of Women Voters of Washington
League of Women Voters, Bellingham-Whatcom County
Lopez No COALition

Other Organizations
Marysville Library
McCullough Hill Leary, PS (Duck Club)
Mount Vernon Chamber of Commerce
Mount Vernon City Library
Mount Vernon School District
Mount Vernon Terminal Railway LLC
National Wildlife Federation
North Cascades Audubon Society
Northwest Jobs Alliance
Northwest Washington Building and Construction Trades Council
NW Jobs Alliance
OneAmerica
Pacific Northwest Waterways Association
Pederson Bros., Inc.
Physicians for Social Responsibility, Oregon Chapter
Physicians for Social Responsibility, Washington Chapter
Pilchuck Audubon Society
Protect Skagit
Protect Whatcom
Puget Soundkeeper Alliance
Rainforest Action Network
RE Sources for Sustainable Communities
Richland Public Library
Rising Tide Seattle
Safe Energy Leadership Alliance
San Juan Islanders for Safe Shipping
Scott Law Group
Seattle Public Library

Other Organizations
Seattle Raging Grannies
Sedro-Woolley School District
Sierra Club, Washington Chapter
Sightline Institute
Skagit Audubon Society
Skagit County Marine Resource Committee
Skagit Land Trust
Skagitonians to Preserve Farmland
Skamania County Fire District #4
Spokane Public Library
Surfrider Foundation
Tahoma Audubon Society
The Lands Council
The Nature Conservancy
The Nature Conservancy Washington Program
The Sierra Club
Washington Commission for Social Responsibility
Washington Environmental Council
Media
97.3 KIRO
Anacortes American
Capitol Hill Times
Concrete Herald
KING 5
KIRO TV
KOMO 1000 News
KUOW

Media
LaConner Weekly News
NWCN
Omak-Okanogan Chronicle
Q13 Fox
Seattle PI
Seattle Post Globe
Seattle Times
Seattle Weekly
Skagit Valley Herald
Spokesman
Stanwood/Camano News
The Argus
The Daily Herald
Tu Decides
Washington Free Press
White Salmon Enterprise
The News Tribune
The Olympian
Yakima Herald
The Daily News
The Columbian
Bonner County Daily Bee
El Mundo
El Sol de Yakima

Table 8-2 Public Reading Rooms

Location	Address
Skagit County	1800 Continental Pl, Mount Vernon, WA 98273
Mount Vernon City Library	315 Snoqualmie St, Mount Vernon, WA 98273
Burlington Public Library	820 E Washington Ave, Burlington, WA 98233
LaConner Regional Library	614 Morris St, La Conner, WA 98257
Anacortes Public Library	1220 10th St, Anacortes, WA 98221
Guemes Island Library	5293 Guemes Island Rd, Anacortes, WA 98221
Washington State Department of Ecology, Bellingham	1440 10th Street, Suite 102, Bellingham, WA 98225
Washington State Department of Ecology, Lacey	300 Desmond Drive, Lacey, WA 98503
Skagit Valley Community College	2405 East College Way, Mount Vernon, WA 98273
Western Washington University	Wilson Library, 516 High Street, Bellingham, WA 98225-9103
Everett Community College	2000 Tower Street, Everett, WA 98201
Skagit Valley College – San Juan Island	221 Weber Way, Friday Harbor, WA 98250
Padilla Bay National Estuarine Research Reserve, Breazeale Interpretive Center	10441 Bayview-Edison Road, Mount Vernon, WA 98273
Seattle Public Library	1000 4th Ave, Seattle, WA 98104
City of Burlington	833 S Spruce Street, Burlington, WA 98233
East County Resource Center	45770 Main Street, Concrete, WA 98237
Bellingham Central Library	210 Central Ave, Bellingham, WA 98225
White Salmon Valley Community Library	77 NE Wauna Ave, White Salmon, WA 98672
Spokane Public Library	906 W Main Street, Spokane, WA 99201
Edmonds Library	650 Main Street, Edmonds, WA 98020
Marysville Library – Sno-Isle Libraries	6120 Grove Street, Marysville, WA 98270
Auburn Library	1102 Auburn Way S, Auburn, WA 98002
Richland Public Library	955 Northgate Drive, Richland, WA 99352

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CHAPTER 9 ACRONYMS AND GLOSSARY

ACRONYMS AND ABBREVIATIONS

Acronym	Meaning
µg	microgram
µm	micron
AAR	Association of American Railroads
ACS	American Community Survey
AFD	Anacortes Fire Department
AOP	Air Operating Permit
APE	Area of Potential Effects
ARU	Aromatics Recovery Unit
ASM	alternative safety measures
A-UD	Anacortes UGA Urban Development District
bbl	barrels
BEA	Bureau of Economic Analysis
BLEVE	Boiling Liquid Expanding Vapor Explosion
BLM	United States Bureau of Land Management
BMP	best management practice
BNSF Railway	BNSF Railway Company
CAA	Clean Air Act
CAER	Community Awareness and Emergency Response
CEBR	Center for Economic and Business Research
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations

Acronym	Meaning
CO	carbon monoxide
CO_2	carbon dioxide
CO_{2e}	carbon dioxide equivalent units
CREP	Conservation Reserve Enhancement Program
CRS	Congressional Research Service
CWA	Clean Water Act
cy	cubic yards
DAHP	Washington Department of Archaeological and Historic Preservation
dB	decibel
dBA	A-weighted decibel
DNR	Washington State Department of Natural Resources
DNS	Determination of Nonsignificance
DOH	Washington State Department of Health
DPM	diesel particulate matter
DS	Determination of Significance
Ecology	Washington State Department of Ecology
EEM	estuarine emergent (wetland)
EIA	United States Energy Information Administration
EIS	environmental impact statement
EMD	Washington State Emergency Management Division
EMT	emergency medical technician
EOT	end-of-train
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FERC	Federal Energy Regulatory Commission

Acronym	Meaning
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
GHG	greenhouse gas
GIS	Geographic Information System
GLO	General Land Office
GRP	geographic response plans
GTM	gross-ton-miles
HDPE	high density polyethylene
HPA	Hydraulic Project Approval
ICS	Incident Command System
IDA	International Dark Sky Association
IPCC	Intergovernmental Panel on Climate Change
JARPA	Washington State Joint Aquatic Resource Permit Application
km^2	square kilometer
KOP	Key Observation Point
kW	kilowatt
L	liter
L_{dn}	day-night average sound level
L_{eq}	average energy sound level
$L_{eq(h)}$	energy-averaged equivalent hourly sound level
LEP	limited English proficiency
L_{max}	maximum sound level
LOI	Line Occupancy Index
LOS	level of service

Acronym	Meaning
MAH	monocyclic aromatic hydrocarbons
MBTA	Migratory Bird Treaty Act
MBTL	Millennium Bulk Terminals-Longview
MDNS	Mitigated Determination of Nonsignificance
MHHW	mean higher high water
MIG	Minnesota IMPLAN Group, Inc.
MP	milepost, monitoring position (noise and vibration)
mph	miles per hour
MRC	Snohomish County Marine Resources Commission
MT	metric tons
MTCA	Model Toxics Control Act
NAAQS	National Ambient Air Quality Standards
NEHRP	National Earthquake Hazard Reduction Program
NEI	National Emissions Inventory
NEPA	National Environmental Policy Act
NERR	National Estuarine Research Reserve
NIPA	National Income and Product Accounts
NMFS	National Marine Fisheries Service
NO_2	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Association
NOI	Notice of Intent
NO_x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NTU	nephelometric turbidity units

Acronym	Meaning
NWI	National Wetland Inventory
O_3	ozone
OAC	Order of Approval to Construct
OGP	International Association of Oil and Gas Producers
OHWM	ordinary high water mark
OSHA	Occupational Safety and Health Administration
PAH	polycyclic aromatic hydrocarbons
Pb	lead
PEM	palustrine emergent (wetland)
PFO	palustrine forested (wetland)
PHMSA	Pipeline and Hazardous Materials Safety Administration
PM_{10}	particulate matter smaller than 10 microns
$PM_{2.5}$	particulate matter smaller than 2.5 microns
ppm	parts per million
PPV	peak particle velocity
PSE	Puget Sound Energy
psi	pounds per square inch
PSNERP	Puget Sound Nearshore Ecosystem Restoration Project
PSR	Puget Sound Refinery
PSS	palustrine scrub-shrub (wetland)
RCRA	Resource Conservation and Recovery Act
RCW	Revised Code of Washington
rms	root mean square
SARA	Superfund Amendments Reauthorization Act
SCC	Skagit County Code

Acronym	Meaning
SCOG	Skagit Council of Governments
SEPA	State Environmental Policy Act
SERTC	Security and Emergency Response Training Center
Shell	Equilon Enterprises, LLC
SMA	Washington State Shoreline Management Act
SMMP	Shoreline Management Master Program
SO_2	sulfur dioxide
SPCC	spill prevention, control, and countermeasures
SR	State Route
SSA	Sole source aquifer
SSURGO	Skagit County and Soil Survey Geographic
STB	Surface Transportation Board
SWMMWW	Stormwater Management Manual for Western Washington
SWPPP	Stormwater Pollution Prevention Plan
TCDD	Tetrachlorodibenzo-p-dioxin
TCP	Traditional Cultural Properties
TESC	temporary erosion and sediment control
TMDL	total maximum daily load
TSB	Transportation Safety Board (of Canada)
TTCI	Transportation Technology Center, Inc.
UGA	urban growth area
ULSD	ultra-low sulfur diesel
USACE	United States Army Corps of Engineers
USC	United States Code
USCG	United States Coast Guard

Acronym	Meaning
USCGS	United States Coast and Geodetic Survey
USDA-NRCS	United States Department of Agriculture-Natural Resources Conservation Service
USDOT	United States Department of Transportation
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Service
USSG	United States Surveyor General
VdB	vibration decibel
VOC	volatile organic compound
VRM	Visual Resources Management
WAAQS	Washington Ambient Air Quality Standards
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WHR	Washington Heritage Register
WISAARD	Washington Information System for Architectural and Archaeological Records Data
WNHP	Washington Natural Heritage Program
WQI	water quality improvement
WRIA	Water Resource Inventory Area
WSDA	Washington State Department of Agriculture
WSDOT	Washington State Department of Transportation
WSPA	Western States Petroleum Association
WUTC	Washington Utilities and Trade Commission
WWHM	Western Washington Hydrologic Manual

GLOSSARY OF TERMS

Term	Definition
100-year flood	A flood level with a 1-percent chance of being equaled or exceeded in any given year.
100-year storm	A rainfall event total with a 1-percent probability of occurring at that location in that year.
absolute criteria (noise and vibration)	Noise impacts caused by the project alone.
adsorption	The adhesion of atoms, ions, or molecules from a gas, liquid, or dissolved solid to a surface.
air basin	An area that generally has similar meteorological and geographic conditions throughout.
alluvium	Clay, silt, sand, gravel, or similar material deposited by running water.
ambient noise	All noise sources that surround a location and could include third-party industrial noise, transportation sources, animals, and nature.
annual average daily traffic	The average volume of traffic for one day (24-hour period) during a data reporting year.
aquifer	Geologic layers that hold and transmit groundwater.
aquitard	A confining soil stratum that slows down but does not prevent the flow of water to or from an adjacent aquifer.
ash (volcanic)	Fine fragments (less than 2-4 millimeters in diameter) of volcanic rock formed by a volcanic explosion or ejection from a volcanic vent.
at-grade crossing	A junction or intersection where two or more transport paths cross at the same level or grade.
attainment area	An "attainment" classification means that air quality in a particular region meets (or "attains") a federal air quality standard.
average- sensitivity species	Organisms with an average sensitivity to dissolved aromatics (50 µg/L), which is protective of 50 percent of species.
A-weighted decibels	An expression of the relative loudness of sounds in air as perceived by the human ear.
background traffic	Vehicles that are present on the roadway during the AM and PM peak hours.
bad order track	A rail track designated for storage of rail cars with mechanical defects.
baseline probability	The initial set of critical observations or data used for comparison or a control to determine the probability of an incident.

Term	Definition
benzene	A component of products derived from coal and petroleum and found in gasoline and other fuels used in the manufacturing of plastics, detergents, pesticides, and other chemicals.
block group	The U.S. Census Bureau collects data in many geographic units, the smallest of which is a block, and contains general population data. Block groups are a combination of census blocks and generally contain between 600 and 3,000 people.
Boiling Liquid Expanding Vapor Explosion (BLEVE)	An explosion that results when a tank of combustible liquid (such as crude oil) is heated by fire, the pressure increases, and the tank ruptures.
cetaceans	Marine mammals in the taxonomic order *Cetacea*: whales, dolphins, and porpoises.
chrysene	A polycyclic aromatic hydrocarbon (PAH), a known carcinogen found in railroad ties treated with creosote.
concurrent mitigation	A compensatory mitigation that is implemented at approximately the same time as the authorized activities that result in wetland impacts (Ecology et al. 2006a).
coniferous	A shrub or tree (such as a pine) that produces cones and bears usually needle- or scale-shaped leaves that remain green all year. Found in mixed forested wetlands on the project site.
criteria air pollutants	Common air pollutants regulated by the National Ambient Air Quality Standards: ozone (O_3), particulate matter ($PM_{2.5}$ and PM_{10}), carbon monoxide (CO), nitrogen oxides (NO_x), sulfur dioxide (SO_2), and lead (Pb).
critical area	Areas regulated by county critical areas ordinances, including wetlands, aquifer recharge areas, frequently flooded areas, geologically hazardous areas, and fish and wildlife habitat conservation areas. Some of these, such as geologic hazards and frequently flooded areas, are critical because of the hazards they represent to public health. Others, such as fish and wildlife habitats and wetlands, are critical because of their public value.
critical area buffer	According to Skagit County, a critical area buffer (including wetland) is defined as "an area that is contiguous to and protects a critical area which is required for the continued maintenance, functioning, and/or structural stability of a critical area" (SCC 14.04.020).
cultural resources	Archaeological deposits, historic-era buildings, structures, and objects. Cultural resources illustrate how humans have used and modified the natural world.
cumulative impacts	The incremental impacts of an action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions (e.g., numerous small changes in land use could collectively lead to degradation of a watershed).

Term	Definition
deciduous	Trees or shrubs that shed their leaves every year. Found in mixed forested wetlands on the project site.
degradation	The biodegradation of organic substances by living organisms.
dewatering	Removing water from sediment, soil or waste materials by centrifugation, filtration, or similar solid-liquid separation processes
diluted bitumen	Low-grade oil sometimes referred to as *dil-bit.*
direct impacts	Impacts caused by an action and occur at the same time and place as the action. Direct impacts can occur through direct interaction of an activity (e.g., construction or operation of a project) with an environmental resource.
direct impacts (economics)	The primary rounds of economic activity that would create the initial increases in economic output and employment directly attributable to expenditures.
dissolution	A process by which gases, liquids, or solids dissolve to form a solution.
dissolved aromatic components	The small portion of released hydrocarbons that dissolves into water.
distributed power	A train configuration in which two locomotives are placed at the front of the train and two at the rear for improved safety.
ditches	Drainage features constructed to carry water away from built infrastructure.
ecosystem functions	The physical, chemical, and biological processes that contribute to the self-maintenance of an ecosystem.
ecosystem services	The beneficial outcomes that result from ecosystem functions such as support of the food chain, harvesting of animals or plants, and the provision of clean water or scenic views.
emulsification	The process by which a mixture of two or more liquids that are normally unmixable can be combined.
enhanced braking	A functioning two-way end-of-train (EOT) device or a distributive power braking system.
entrainment	A process by which solid particles or gas can be drawn in and transported by the flow of a fluid.
equivalent area	As an example, in a spill scenario, the equivalent area of 100-percent mortality would be the same for a release that resulted in 100-percent mortality over 1 square kilometer (km^2) versus 1-percent mortality over 100 km^2.
estuarine	Related to an estuary, which is a transition zone between fresh and salt water.

Term	Definition
Estuarine Emergent (EEM)	Wetland areas characterized by erect, rooted, herbaceous hydrophytes (plants adapted to living in submerged water), excluding mosses and lichens.
ethnographic	The time period when Native American cultures were in contact with Euro-Americans but still followed the majority of pre-contact lifeways.
explosion	A sudden, intense release of energy that often produces a loud noise, high temperatures, and a shockwave.
extirpation (wildlife)	Local extinction of a species from a given geographic region.
evaporation	The process by which water changes from a liquid to a gas or vapor.
fault	A fracture along which the blocks of crust on either side have moved relative to one another and parallel to the fracture.
fire	A complex chain reaction during which a fuel combines with oxygen to generate heat, smoke, and light.
foot-candle	The intensity of light that is cast on a surface 1 foot away from the source.
freeboard	The vertical distance between the crest of an embankment and the reservoir water surface, such as in a detention pond.
fugitive dust	Particulate matter from the mechanical disturbance of granular material exposed to the air. Common sources of fugitive dust include paved and unpaved roads, activities on vacant land or disturbed areas, unpaved parking lots and equipment yards, and military training exercises
full cut-off fixture	A light fixture that does not emit light above the horizontal plane (90°).
glaciolacustrine	Derived from glaciers and deposited in glacial lakes.
glacial marine drift	Sediment transported and deposited by glaciers in a marine environment.
glaciomarine	Describing an environment containing both glacial ice and marine water.
greenhouse gas	Any gas that absorbs infrared radiation in the atmosphere. Greenhouse gases include carbon dioxide, methane, nitrous oxide, ozone, chlorofluorocarbons, hydrochlorofluorocarbons, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride.
groundwater	Water that collects or flows beneath the Earth's surface, filling the porous spaces in soil, sediment, and rock.
halogenated	Chemical compounds that contain halogen atoms—fluorine, chlorine, bromine, or iodine. An example of a halogenated solvent is perchloroethylene (PCE), a chlorinated solvent that is widely used in dry cleaning. By contrast, nonhalogenated means no halogen atoms are present.

Term	Definition
haulout sites (seal)	Locations where seals temporarily leave the water to forage on land.
hazard range	The area around a source (such as a pool fire), measured in distances from the center of the source, from which a range of effects could be experienced by humans, animals, objects, and structures.
High Estimate of Incident Rates and Spills	A conservatively high estimate of the probability of an incident and oil release occurring based on the historic rates of incidents and releases.
high sensitivity species	Organisms that are highly sensitive to environmental changes, particularly dissolved aromatics (5 micrograms per liter [µg/L]), which is protective of 97.5 percent of species.
Historic era	The period when Euro-American development and lifeways spread and grew in the region.
Holocene Epoch	The geologic period that dates from about 11,700 years ago to the present day.
hotbox	A detector that measures if rail car wheel bearings are generating excessive heat and, therefore, are in the process of failing.
hydraulic conductivity	The property that describes the ease with which a fluid can move through pore spaces or fractures.
hydric soil	A soil that is formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part.
hydrogeology	The study of the geology and soils that influence groundwater flow.
hydroperiod	The seasonal pattern of the water level that results from the combination of the water budget and the storage capacity of the wetland.
igneous rock	Rock that is formed after molten rock (magma) has cooled and solidified (crystallized).
IMPLAN Model	IMPLAN is a widely utilized computer-based simulation tool that can measure the economic impacts of a project.
impervious surface	An area that releases all or a majority of the precipitation that falls on it as runoff. Common examples are rooftops, sidewalks, driveways, and streets, unless they have been specifically designed to allow water to infiltrate.
Incident Command System (ICS)	A management system designed to efficiently integrate a combination of facilities, equipment, personnel, procedures, and communications operating within a common organizational structure.
indirect economic output	The value of all goods and services produced by supporting industries for a specific project, projects, or industry. Used in economic impact analyses.

Term	Definition
indirect impacts	Impacts that result from the same action as direct impacts, but that occur later in time or are more distant. Indirect impacts on one resource may be caused by direct impacts to another, resource.
indirect impacts (economics)	Also known as secondary impacts. Changes in inter-industry purchases as they respond to new demands of directly affected industries.
induced impacts (economics)	The impacts typically reflect changes in spending from households as income increases or decreases due to changes in production.
institutional controls	Measures taken to limit or prohibit activities that may interfere with the integrity of a cleanup action or cause exposure to hazardous substances.
Key Observation Point (KOP)	A term used by the Bureau of Land Management in its Visual Resource Management (VRM) methodology to describe potentially sensitive viewpoints from which a project may be seen. Typically these KOPs include viewpoints from public spaces such as parks, or locations along publically-accessible areas.
lahar	A type of mudflow or debris flow composed of a slurry of pyroclastic material, rocky debris, and water. The material moves down from a volcano, typically along a river valley.
lateral stability	An object's ability to develop forces or to have forces imposed upon it that restore it to or maintain its original condition.
L_{dn}	The day-night equivalent sound level—the average equivalent sound level over a 24-hour period, with a 10 dB penalty added for nighttime hours (between 10 p.m. and 7 a.m.). Also known as the day-night noise indicator.
level of service (LOS) (vehicular traffic)	An expression of roadway intersection delay that uses methods established by the Transportation Research Board's Highway Capacity Manual. Level of service (LOS) ranges from "A" to "F", with the letter "A" describing the least amount of congestion and best operations, and the letter "F" indicating the highest amount of congestion and worst operations.
liquefaction	A process by which water-saturated sediment temporarily loses strength and acts as a fluid. This effect can be caused by earthquake shaking.
lithic scatter	Stone tools and chipped stone debris.
Low Estimate of Incident Rates and Spills	An estimate of the probability of an incident and oil release occurring that accounts for the reductions in the probability associated with policies and regulations specific to the operation of crude-by-rail trains that are already in place, or will be in place in the future.
main line	The track used for through trains or the principal artery of the rail system from which branch lines, yards, sidings, and spurs are connected.
manifest train	A train that carries a mixture of rail car types and cargoes.
marine nearshore	The transition zone between terrestrial, freshwater, and marine ecosystems.

Term	Definition
mass balance	The environmental fate of oil released in an incident over time, including the amount of oil on the water surface, in the water column, on shorelines, evaporated to the atmosphere, on sediments, and oil that has decayed.
metamorphic rock	A rock that has undergone chemical or structural changes produced by an increase in heat or pressure, or by replacement of elements by hot, chemically active fluids.
methyl tertiary butyl ether (MTBE)	A volatile oxygen-containing organic compound that is added to gasoline to promote more complete combustion, thereby reducing air pollution and enhancing octane rating.
mitigation	Avoiding, minimizing, rectifying (repairing), reducing, eliminating, compensating, or monitoring of environmental impacts.
natal stream	The stream in which a fish was hatched.
neap tide	A tide just after the first or third quarters of the moon when there is the least difference between high and low water.
noise	Unwanted sound measured in decibels (dB) on a logarithmic scale.
noise contour	A line on a map that represents equal levels of noise exposure.
nonattainment area	A "nonattainment" classification means that air quality in a particular region does not meet (or "attain") National Ambient Air Quality Standards (NAAQS). Nonattainment areas that fail to achieve attainment could receive cuts in federal transportation funding if air pollutants are expected to increase as a result of new projects.
nonnatal	Nonnatal fish species are produced from adults that spawn in other stream systems and could be present between January and May (e.g., juvenile Chinook salmon).
non-sensitive species	Unlike Special Status Species, nonsensitive species are generally widespread, abundant, and secure in the state.
nonuse values	The willingness of households to pay to avoid environmental damage to an environmental amenity even if they never have or never will use the amenity.
nonvascular plant	Simple plants without a vascular system (for transporting water, minerals, and nutrients throughout their bodies). Nonvascular plants move water and nutrients through the plants' structure cell by cell.
noxious weed	The traditional, legal term for any invasive, nonnative plant that threatens agricultural crops, local ecosystems or fish and wildlife habitat. Examples include nonnative grasses, flowering plants, shrubs, and trees. It also includes aquatic plants that invade wetlands, rivers, lakes, and shorelines.

Term	Definition
OILMAP™ Land	A software application developed by RPS ASA (previously Applied Science Associates or ASA) that uses computers to simulate the two-dimensional trajectory (movement) and fate (behavior) of oil and chemical releases over land and surface water.
Olcott component	The portion of an archaeological site dating to the Olcott period of the Puget Sound region (approximately 5,000 to 8,000 years ago). Artifacts commonly consist of flacked stone including cobble tools and lanceolate-shaped projectile points with few animal remains.
outwash	Sediments deposited by melt water streams beyond active glacier ice.
overpressure	The pressure caused by a shockwave over and above normal atmospheric pressure as measured in pounds per square inch (psi).
Palustrine Emergent (PEM)	Wetland areas dominated by sedges, rushes, grasses, cattails, and bulrushes.
Palustrine Forested (PFO)	Wetland areas dominated by woody vegetation that are 20 feet tall or higher.
Palustrine Scrub-shrub (PSS)	Wetland areas dominated by woody vegetation less than 20 feet tall.
peak particle velocity	The maximum velocity experienced by any point in a structure during a vibration event (defined as an event lasting less than 20 seconds), such as an earthquake.
permeability	The quality of a material or membrane to allow liquids or gases to pass through it without being chemically or physically affected.
petroleum	A naturally occurring complex liquid hydrocarbon.
physiographic province	A geographic region in which climate and geology have given rise to an array of landforms different from those of surrounding regions.
pinnipeds	Refers to marine mammals that have front and rear flippers: seals, sea lions, and walruses.
Pleistocene Epoch	The geological period dating from about 2,588,999 to 11,700 years ago.
polychlorinated biphenyls (PCBs)	A group of 209 man-made compounds that generally occur as complex mixtures. While historically the largest use of PCBs was in electrical equipment, there are many other sources. PCBs are very persistent, lasting for decades in the environment.
pool fire	A fire that burns from a pool of vaporizing fuel.

Term	Definition
positive train control	Uses communication-based/processor-based train control technology that provides a system capable of reliably and functionally preventing train-to-train collisions, overspeed derailments, incursions into established work zone limits, and the movement of a train through a main line switch in the improper position.
polycyclic aromatic hydrocarbons (PAHs)	A group of more than 100 different chemicals that generally occur as complex mixtures found in some natural substances like oil and coal. They are formed during the incomplete burning of organic matter such as coal, oil, gas, wood, garbage, or other organic substances, and are released during commonplace activities, such as burning wood and driving cars, and from commonplace objects like railroad ties.
Precontact	The time period of Native American history prior to initial contact with Euro-American goods and people.
probability	The likelihood that an incident will happen in a given year.
pyroclastic flows	A dense, destructive mass of very hot ash, lava fragments, and gases ejected explosively from a volcano and typically flowing downslope at great speed.
queue length	The distance that vehicles extend back from an intersection while waiting to move through.
rail accident	Rail accidents include derailments, collisions, fire or explosion events, highway-rail incidents, and miscellaneous accidents (e.g., trains striking objects on the track and other impacts). These categories are based on accident reporting data from the Federal Railway Administration (FRA). As used in this EIS, the term rail accident follows the FRA definition of an accident, which is a safety-related event involving on-track rail equipment causing monetary damages above a prescribed amount (currently $10,500). The term accident is not meant to convey lack of liability or culpability for the event occurring.
reasonably foreseeable future actions	Actions that are considered in a cumulative impact analysis if they meet at least one of the following criteria: 1) are currently within the planning stage and have funding secured for the action; 2) are currently undergoing SEPA review; and 3) the SEPA process has been completed and review is in process for another permitting phase.
relative criteria	Noise impacts caused by a change (increase) in the noise environment as a result of the project.
return period	The amount of time, on average, that passes between consecutive events of a similar magnitude.
riparian	Relating to or situated on the banks of a river.

Term	Definition
Scenic and Recreational Highway	Identified in Washington State law (RCW 47.39 and 47.42) and designated because of a need to develop management plans that will protect and preserve the scenic and recreational resources from loss through inappropriate development.
scenic quality	A measure of the visual appeal of an area based on landform, vegetation, water, color, adjacent scenery, scarcity, and cultural modifications.
second-growth forest	Forest that grows, either from natural reseeding or human replanting, after a human-caused or natural disturbance.
sedimentary rock	Formed from pre-existing rocks or pieces of once-living organisms. They form from deposits that accumulate on the Earth's surface. Sedimentary rocks often have distinctive layering or bedding.
sedimentation	The tendency for particles in suspension to settle out of the fluid in which they are entrained and come to rest against a barrier.
sensitivity level (visual resources)	A measure of public concern for scenic quality. Each level is assigned a value of low, medium, or high by evaluating the type of users, amount of use, public interest, adjacent land uses, and any land use designations that require protection of visual resources.
seiche	A temporary series of waves in an enclosed or partially enclosed body of water (e.g., harbors, lakes, bays, and rivers) as a result of earthquake shaking. Typically, seiches do not occur close to the epicenter of an earthquake, but hundreds of miles away.
sensitive receptors (noise and vibration)	Places that represent land use activity categories where the Federal Transit Administration has established noise impact criteria pertaining to noise sensitivity. Land use activity categories include residences, recreation areas, hotels, schools, churches, libraries, and hospitals.
sheet flow	An overland flow or downslope movement of water taking the form of a thin, continuous film over relatively smooth soil or rock surfaces that is not concentrated into channels larger than rills.
shell midden	A mound of discarded domestic wastes that can include bones, botanical material, human waste, shells, vermin, and other materials.
shoreline stranding	The visible accumulation of oil on shorelines following a spill.
shockwave	A movement of extremely high pressure air.
siding track	A low-speed auxiliary rail track that is separate from a main line or spur. It may connect to a through track or to other sidings.
SIMAP™	A computer modeling software application developed by Applied Science Associates (ASA), Inc., that estimates physical fates and biological effects of releases of oil.
sloshing	Irregular movement of a liquid in a container,

Term	Definition
sole-source aquifer (SSA)	The U.S. Environmental Protection Agency (USEPA) defines these aquifers as those that supply at least 50 percent of the drinking water for a service area and where there are no reasonably available alterative drinking water sources should the aquifer become contaminated.
Special Status Plants	Vascular and nonvascular plant species that are classified at the federal or state level as endangered, threatened, a species of concern, sensitive species, or candidate species.
stormwater	Water that runs off surfaces such as rooftops, paved streets, highways, and parking lots. It can also come from hard grassy surfaces like lawns, play fields, and from graveled roads and parking lots.
Special-Status Species	Species that are classified at the federal or state level as endangered, threatened, a species of concern, sensitive species, or candidate species. Designated species also include animal aggregations (e.g., heron colonies, bat colonies) considered vulnerable; and species of recreational, commercial, or tribal importance that are vulnerable.
spring tide	A tide just after a new or full moon, when there is the greatest difference between high and low water.
stratum	A layer of soil with internally consistent characteristics that distinguish it from other parallel layers laid down by natural geologic processes.
stream	Natural watercourses that convey water from headwaters to a receiving waterbody.
surface oiling	Oil found floating on the water surface following a release of hydrocarbons.
surface water	Water that moves over land as sheet flow and as channelized flow within streams and ditches.
subdivision	A timetable designation of a portion of railway track within a division.
tectonic plates	Large, thin, rigid plates that move relative to one another on the outer surface of the Earth.
temporary impacts (wetlands)	Direct impacts that do not result in the permanent filling of wetlands or in the permanent loss of wetland function. These impacts can be further divided into short term and long term.
terrestrial (wildlife)	Animals that live predominantly or entirely on land (e.g., cats, ants, snails).
thermal radiation	The process by which energy (heat) is emitted from a source, such as the combustion of a flammable material.
threshold	The magnitude or intensity that must be exceeded for a certain reaction, phenomenon, result, or condition to occur or be manifested.

Term	Definition
tidal estuary	A dynamic ecosystem with a connection to the open sea through which sea water enters with the rhythm of the tides. The sea water entering the estuary is diluted with freshwater flowing from rivers and streams.
till	An unsorted, nonstratified (not occurring in distinct layers), accumulation of glacial sediment deposited directly by glacier ice.
tsunami	A sea wave of local or distant origin that results from large-scale seafloor displacements associated with large earthquakes, major submarine slides, or exploding volcanic islands.
train mile	One mile traversed by one train.
trajectory (of a release)	Describes the movement of oil within the environment and includes the spatial extent of the release over time.
turbidity	The relative clarity of a liquid. Turbidity is measured by the amount of light that is scattered by material in the water when a light is shined through the water sample. The higher the intensity of scattered light, the higher the turbidity. Turbidity is reported in nephelometric turbidity units (NTU).
unit train	A train that carries the same type of commodity from origin to destination.
unmitigated release scenario	A response scenario that is modeled assuming that emergency response measures will not take place for some period of time.
urban growth areas	Areas where growth and higher densities are expected and can be supported by urban services.
vascular plant	A plant that is characterized by the presence of conducting tissue that transports fluid and nutrients internally.
visual resources	Physical features that define the visual and aesthetic character of an area, including natural features, scenic vistas, or man-made urban or community visual characteristics such as architecture and skylines.
volitilization	The process whereby a dissolved sample is vaporized.
water column	A conceptual column of water from the surface of a sea, river, or lake to the bottom sediments.
wayside detection system	Wayside detection systems, such as “hot boxes,” promote rail safety and performance by using automated technologies to detect defects in railway rolling stock.
Wellhead Protection Area	The area regulated by the Washington State Department of Health surrounding a pumping well, well field, or spring that encompasses all areas or features that supply groundwater recharge to the well, well field, or spring.

Term	Definition
wetlands	Areas that are saturated or inundated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation adapted for life in saturated soil conditions.
vapor cloud explosion	The result of a flammable material that is released into the atmosphere and ignites.
young-of-the-year	Fish or animals born within the past year.