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).

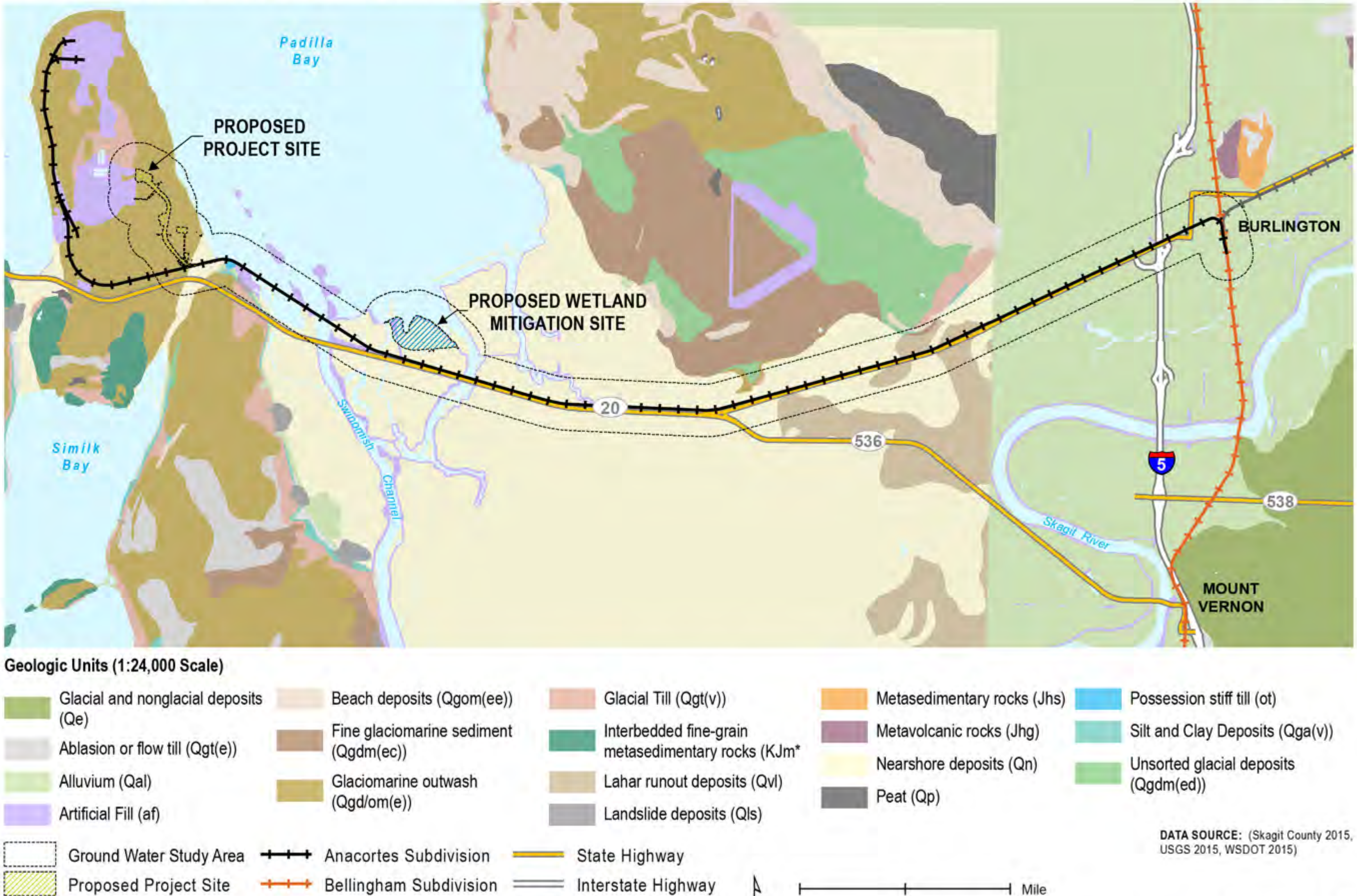

Figure 3.2-1

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.

This page intentionally left blank

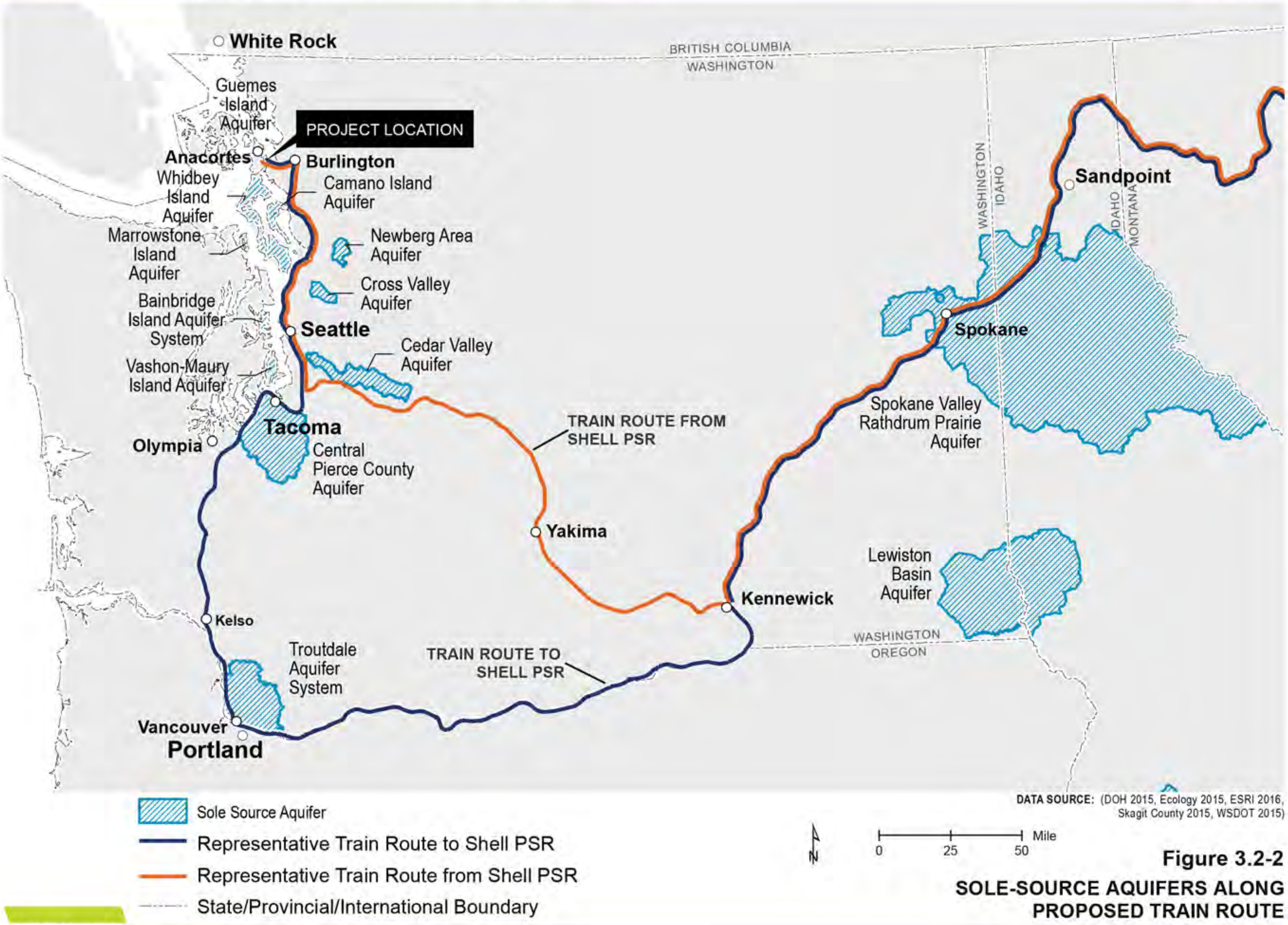

Figure 3.2-2

SOLE-SOURCE AQUIFERS ALONG PROPOSED TRAIN ROUTE

This page intentionally left blank

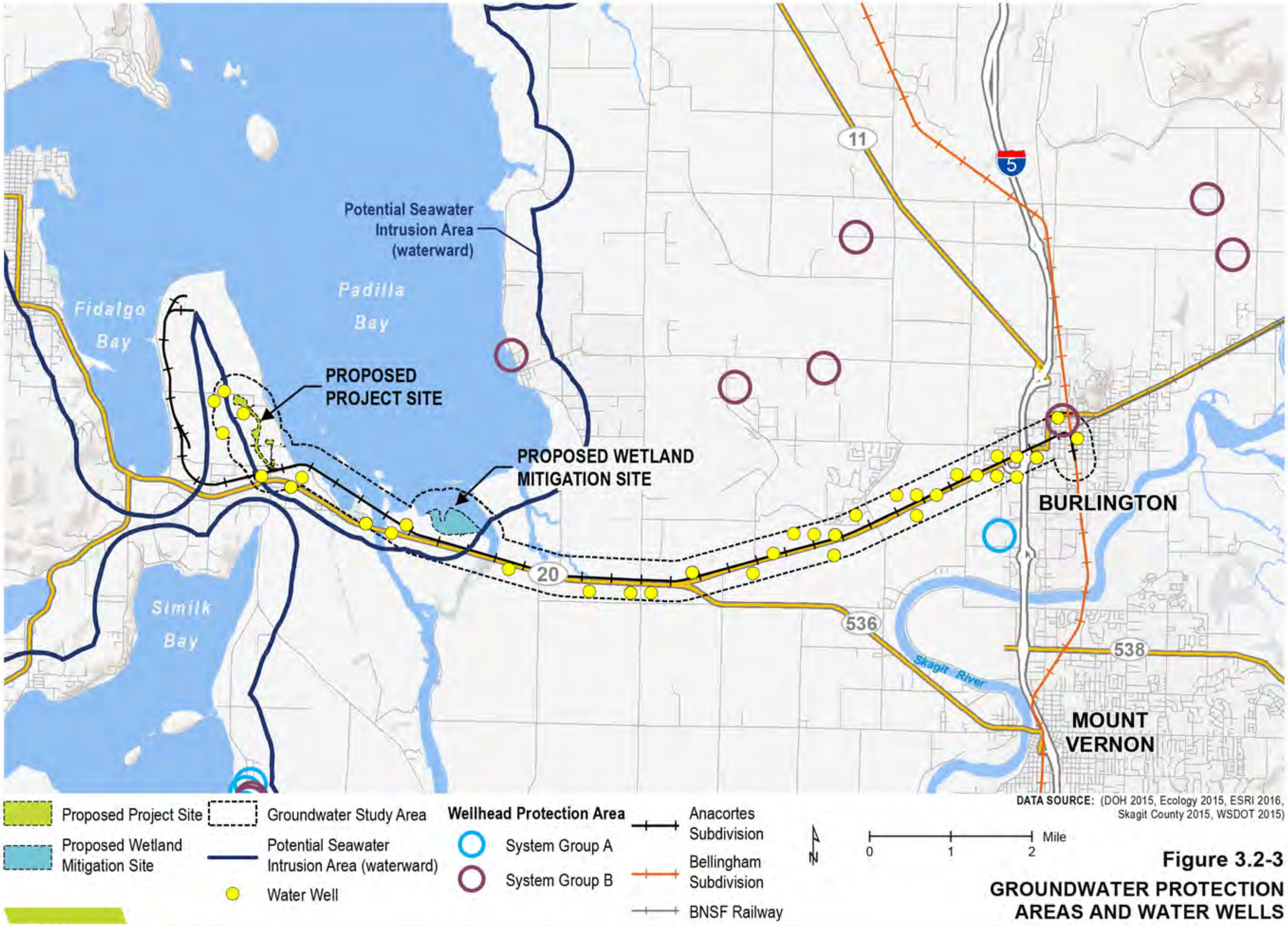

Figure 3.2-3

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.

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.

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.

This page intentionally left blank

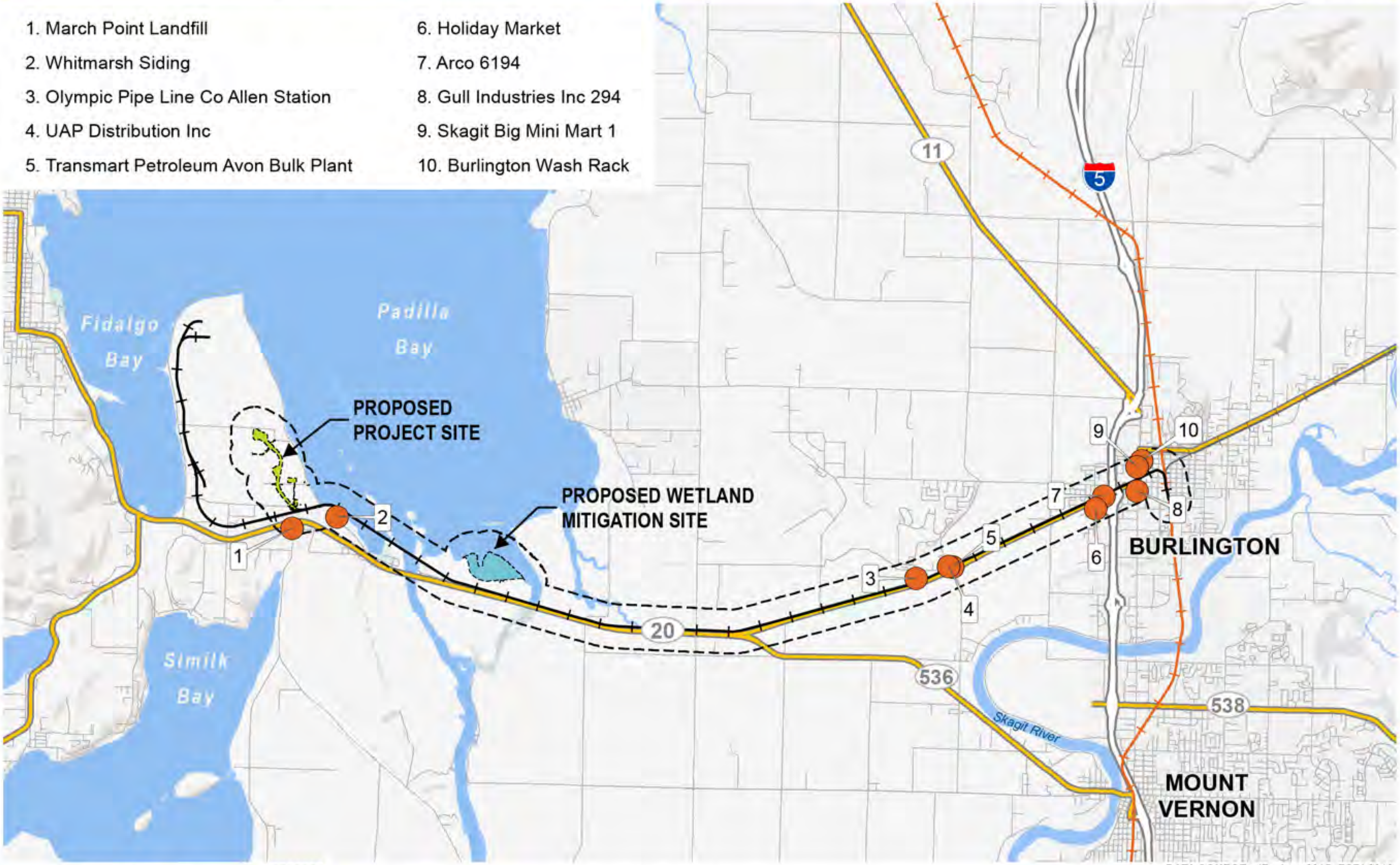

Figure 3.2-4
AREAS OF CURRENT AND HISTORICAL GROUNDWATER CONTAMINATION

This page intentionally left blank

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				

This page intentionally left blank

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.

This page intentionally left blank