Draft Cleanup Action Plan

Port of Longview TPH
Longview, Washington

Facility Site ID No. 42978181/Cleanup Site ID No. 9152

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Prepared by:
Washington State Department of Ecology

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Executive Summary

INTRODUCTION AND BACKGROUND

This Cleanup Action Plan (CAP) presents Washington State Department of Ecology's (Ecology's) Selected Cleanup Action for the Port of Longview (Port) Total Petroleum Hydrocarbons (TPH) Site (Site) located in Longview, Washington, on the north side of the Columbia River, directly east of the Lewis and Clark Bridge (Figure 1). A CAP is required as part of the site cleanup process under the Model Toxics Control Act (MTCA; Washington Administrative Code [WAC] Chapter 173-340). This CAP was developed using information presented in the Remedial Investigation (RI)/ Feasibility Study (FS), which was prepared by Floyd|Snider in 2023 on behalf of the Port of Longview TPH Site Potentially Liable Parties Group in accordance with Agreed Order # DE 15907 (Agreed Order) for the Site. Ecology has selected the cleanup action described in this CAP because it will be protective of human health and the environment. Ecology will consider public input before finalizing the CAP.

The Site is currently zoned as heavy industrial and is used for Port operations and marine cargo operations, which includes a rail-dependent bulk export facility. The Site contains a ship berth, active railyard, and associated warehouse and transit shed buildings to accommodate the marine cargo (refer to Section 1.0).

Since the early 1900s, the Port has been operating at this location. During that time, other entities (and their predecessors), including Chevron U.S.A. Inc. (Chevron),[1] Georgia-Pacific LLC (Georgia-Pacific),[2] Wilson Oil, Inc. (Wilson),[3] and Smurfit Westrock LLC (WestRock),[4] have operated facilities at the Site. These facilities and years each entity operated them included the following:

- A set of pipelines referred to as the Standard Pipelines[5] were installed on the Site in 1926 and decommissioned by 1986 (Figure 2). The Standard Pipelines run parallel to Port Way beneath the rail lines and historically transferred petroleum products between a bulk plant located to the northeast of the Site and the shipping berths along the Columbia River.
- An 80,000-barrel aboveground storage tank (AST) was used for storage of Bunker C fuel, ballast seawater, and diesel (Figures 3 and 4). The AST was constructed by

[1] Standard Oil Company of California is Chevron U.S.A. Inc.'s predecessor. Chevron Environmental Management Company manages environmental matters for the Chevron family of companies.

[2] James River Corporation and Crown Zellerbach are corporate predecessors of Georgia-Pacific.

[3] Wilson is doing business as Wilcox & Flegel Oil Company.

[4] WestRock Longview, Longview Fibre Paper and Packaging, Inc., Longview Fibre Company, and KapStone Kraft Paper Corporation are predecessors to WestRock.

[5] Many of the named facilities were owned or operated by multiple potentially liable parties (PLPs). References to these facilities by name (e.g., Standard Pipelines or Longview Pipeline) are not intended to suggest that those entities, their predecessors, or their successors are liable or otherwise responsible for possible releases from them described in the Agreed Order, the RI/FS, or this CAP.

WestRock in approximately 1935, and the tank and approximately 5,000 cubic yards of surrounding soil was removed in 1996, as shown in Figure 3.

- A fuel loading station and a pipeline, referred to as the Longview Pipeline,[6] was located between the loading station and a wharf on the Columbia River at what is now Berth 2 (Figure 4). The Longview Pipeline and loading station were operated from 1935 to 1973 primarily to transfer and store Bunker C fuel from tanker ships for use as fuel.
- Several other pipelines constructed between 1926 and 1973 were used to transport a variety of petroleum products from ships berthed on the Columbia River to the Site. By 1986, the former Standard Pipelines beneath the Port property were reportedly cleaned, decommissioned, and abandoned in place.
- Several underground storage tanks (USTs) were located on the Site (Figure 4), including the following:
  - A 675-gallon gasoline UST was installed in the former Calloway Ross Parcel sometime prior to 1960 and was removed in 1991.
  - A 4,000-gallon gasoline UST and an 8,000-gallon gasoline UST, operated by the Port, were located in the former maintenance/mechanic's shop and removed in 1993.
  - A 2,800-gallon heating oil UST was located adjacent to the former U.S. Army Reserve building to supply fuel for the building's steam boiler. The UST was installed in approximately 1949 and reportedly cleaned out in the 1970s.

SITE DESCRIPTION

The Site is designated Ecology Facility Site ID No. 42978181 and is officially referred to as the Port of Longview TPH Site. It includes portions of four tax parcels and a section of the Port Way right of way:

- Parcels owned and operated by the Port (Cowlitz County Parcels 10171 and 10183)
- A small parcel owned by the Port and/or BNSF Railway Company that contains rail lines that the Port operates (Parcel 90293)
- A portion of the Washington State Department of Transportation (WSDOT) property on the west side of Port Way, Parcel 61634, and
- A segment of the City of Longview's right-of-way beneath Port Way located adjacent to/between the parcels identified above.

[6] Many of the named facilities were owned or operated by multiple PLPs. References to these facilities by name (e.g., Standard Pipelines or Longview Pipeline) are not intended to suggest that those entities, their predecessors, or their successors are liable or otherwise responsible for possible releases from them described in the Agreed Order, the RI/FS, or this CAP.

The Site is almost entirely paved, except for areas of rail track infrastructure and a material storage area north of the former Warehouse 9 building footprint and the WSDOT property. The Site will have similar land use in the future. A log export facility owned by Weyerhaeuser NR Company and an active bulk fuel facility owned by Wilson are located northwest- and northeast-adjacent to the Site, respectively. The Columbia River and Port property border the Site to the southwest and southeast, respectively. The Jones Stevedoring Company borders a small portion of the Site to the northwest. The rail lines are operated by the Port and owned by either the Port and/or BNSF Railway Company.

CONCEPTUAL SITE MODEL

The Site sits on a broad, flat alluvial floodplain consisting of unconsolidated and consolidated sediments. Soils across the Site generally consist of a sandy fill layer underlain by native alluvial sediments, which consist of varying mixtures of sand and silt, including some laterally extensive silt lenses in the central portion of the Site. The silt lenses separate the two sandy water-bearing units at the Site: the perched water-bearing zone (perched zone) and alluvial aquifer. Hydrogeologic data indicate that the perched zone and alluvial aquifer are distinct water-bearing units with negligible transmission of water through the low-permeability silt aquitard.

The contaminants of concern (COCs) at the Site are gasoline-range organics (GRO), total diesel-range organics (DRO) and oil-range organics (ORO), and benzene, which are present at the Site but concentrated primarily (1) on the former Calloway Ross Parcel, (2) in the area of the former loading racks, (3) along and around the subsurface Standard and Longview Pipelines beneath the rail lines, and (4) near the former 80,000-barrel AST. The extent of TPH-impacted soil, as shown in Figure 7, is defined by COC concentrations exceeding their respective cleanup levels (CULs). TPH-impacted soil in the central and northern parts of the Site is concentrated between approximately 8 and 17 feet below ground surface (bgs), which is below the estimated depth of the pipelines (3 to 4 feet bgs). In the southern portion, TPH-impacted soil is concentrated deeper, between approximately 13 and 28 feet bgs, which corresponds to the area where the pipelines are buried more deeply.

The extent of TPH impacts in groundwater is defined by COCs at concentrations exceeding their respective CULs (Figures 8 and 9). Groundwater impacts currently exist in both the perched zone and alluvial aquifer (Figures 8 and 9). The perched zone transmits negligible water to the alluvial aquifer due to a low-permeability silt aquitard at the base of the perched zone. In the perched zone, total DRO and ORO groundwater impacts are approximately centered on MW-09 and MW-28 and extend to the west beyond the edge of the Port's property to downgradient MW-04 and MW-30, respectively. Data gaps pertaining to the dissolved-phase extent within the perched zone and alluvial aquifer will be filled during a pre-design investigation prior to submittal of the Engineering Design Report. A smaller dissolved-phase GRO and benzene plume in the perched zone is centered on MW-09 beneath the railroad tracks. It correlates to areas with elevated GRO and benzene soil concentrations, which are located just west of the rail lines and northwest of the former loading racks. In the alluvial aquifer, dissolved-phase plumes of total DRO and ORO are present in three main areas underlying the rail tracks, former fuel loading rack area, and the

former Standard and Longview Pipelines. These plumes are associated with areas of greatest total DRO and ORO concentrations in soil. Measurable light non-aqueous phase liquid (LNAPL) is present only within the alluvial aquifer at MW-09.

Groundwater cleanup standards were developed to be protective of human health via drinking water exposure, and soil cleanup standards are protective of human exposure and groundwater via the direct contact and leaching pathways. Ecological receptors are not exposed to soil contamination at levels of concern. The groundwater flow direction in the southern portion of the Site is to the north and away from the Columbia River, and the southernmost monitoring wells do not show any exceedances of COCs; therefore, there is no pathway to surface water.

Site environmental investigations indicate that the primary historical sources of petroleum impacts to soil and groundwater include the following:

- Former Standard Pipelines
- Former 80,000-barrel AST
- Former Longview Pipeline
- Former fuel loading racks
- Former Calloway UST

Since the 1990s, remedial interim actions to remove impacted material have been performed at various areas of the Site, including within the vicinity of the AST, the former Calloway Ross parcel, the USTs associated with the former mechanic's shop, and the exposed pipelines beneath the berths (refer to Section 2.3 of the RI/FS).

DEVELOPMENT AND EVALUATION OF REMEDIAL ALTERNATIVES

In 2023, an RI/FS was prepared to evaluate the COC exposure pathways; define remedial action objectives (RAOs), applicable or relevant and appropriate requirements (ARARs), and CULs appropriate for the Site COCs; and present a preferred remedial alternative for the Site. The Ecology-approved RI/FS evaluated five remedial alternatives (Alternatives 1 through 5 in the RI/FS) to address the soil and groundwater impacts in two Cleanup Action Areas (CAAs): impacts outside of the active rail lines (CAA-1) and impacts within the active rail lines (CAA-2). The five remedial alternatives that were evaluated included combinations of the following technologies and cleanup elements:

- Surfactant injection and extraction
- Sorption and biodegradation
- In situ soil and groundwater remediation by in situ chemical oxidation (ISCO) injections
- Targeted excavation and disposal of soil with concentrations of COCs greater than selected CULs

- Institutional controls (ICs), which include a Contaminated Media Management Plan (CMMP)
- Monitored natural attenuation (MNA) of groundwater

These alternatives included the following:

- Alternative 1: LNAPL Removal, ICs, and MNA
- Alternative 2: In Situ Treatment Barrier, LNAPL Removal, ICs, and MNA
- Alternative 3: Targeted ISCO Injections, LNAPL Removal, ICs, and MNA
- Alternative 4: Limited Excavation, Targeted ISCO Injections, LNAPL Removal, ICs, and MNA
- Alternative 5: Plume-wide ISCO Injections, LNAPL Removal, ICs, and MNA

These alternatives were screened against the MTCA threshold requirements and evaluated according to MTCA's Disproportionate Cost Analysis (DCA) procedure. Additionally, resilience to climate change and impacts on likely vulnerable populations and overburdened communities were considered. Based on this evaluation and Ecology's approval of the RI/FS, Alternative 3 was selected as the Preferred Alternative because it is permanent to the maximum extent practicable and will treat approximately 77% of the hydrocarbon mass; the remaining 23% is currently located in and will remain in inaccessible areas on the Port property. The Alternative 3 approach is protective of human health and the environment by ensuring that residual TPH impacts remain inaccessible into the future, with ICs, and are properly handled if encountered during ground intrusion activities by following a CMMP. Additionally, the remaining groundwater impacts will undergo MNA.

The Selected Cleanup Action is a comprehensive remedy that complies with all the applicable remedy selection requirements under MTCA and provides the greatest environmental benefit for the associated cost based on the DCA. This remedy includes the following components:

- Surfactant injection (PetroCleanze) and LNAPL extraction activities within the vicinity of MW-09 (former fuel rack loading area)
- Targeted ISCO injections (PersulfOx and RegenOx) on the WSDOT property in the vicinities of MW-04 and MW-30
- Targeted ISCO injections within accessible areas where soil impacts exceed CULs (CAA-1)
- Targeted ISCO injections along the rail lines where soil concentrations exceed remediation levels (CAA-2)
- Installation of additional monitoring wells along the northwestern and northern Port property boundary
- Inspection of the former Longview Pipeline contents via targeted excavation

- Long-term groundwater monitoring for assessment of MNA
- Implementation of ICs and an CMMP to protect human health and the environment from exposure to areas where current isolated residual soil impacts will remain at the Site after active remediation is complete

The Selected Cleanup Action for soil and groundwater approved by Ecology meets the requirements for selection of a cleanup action under MTCA (WAC 173-340-360(3)) because it is protective of human health and the environment, complies with cleanup standards, complies with ARARs, and provides for compliance monitoring. The predicted restoration time frame for the Selected Cleanup Action to meet groundwater CULs at the downgradient western, northwestern, and northern property boundaries for this alternative is estimated to be approximately 2 to 5 years, and the Site-wide restoration is estimated to occur less than 10 years to approximately 28 years after remedy implementation is complete. During the time required to achieve Site-wide restoration, groundwater conditions will be monitored, and the Site will be managed with ICs to ensure there is no potential for ongoing exposures. The cleanup action meets Site RAOs and other MTCA requirements for selection of a cleanup action, including using permanent solutions to the maximum extent practicable, providing for a reasonable restoration time frame, and consideration of public concerns.

This executive summary was prepared for introductory purposes only, and the information provided should be used only in conjunction with the full text of this report. A complete description of the project and Selected Cleanup Action is contained within this report.

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List of Abbreviations

Abbreviation	Definition
Agreed Order	Agreed Order # DE 15907
AOPC	Area of potential concern
ARAR	Applicable or relevant and appropriate requirement
AST	Aboveground storage tank
bgs	Below ground surface
CAA	Cleanup Action Area
CAP	Cleanup Action Plan
CD	Consent Decree
Chevron	Chevron U.S.A. Inc.
CMP	Compliance Monitoring Plan
CMMP	Contaminated Media Management Plan
COC	Contaminant of concern
CPOC	Conditional point of compliance
CSM	Conceptual site model
CUL	Cleanup level

Abbreviation	Definition
DCA	Disproportionate Cost Analysis
DRO	Diesel-range organics
Ecology	Washington State Department of Ecology
EDR	Engineering Design Report
FS	Feasibility Study
Georgia-Pacific	Georgia-Pacific LLC
GMP	Groundwater Monitoring Plan
GPR	Ground-penetrating radar
GRO	Gasoline-range organics
HASP	Health and Safety Plan
IC	Institutional control
ISCO	In situ chemical oxidation
LNAPL	Light non-aqueous phase liquid
mg/kg	Milligrams per kilogram
MNA	Monitored natural attenuation
MTCA	Model Toxics Control Act
NAPL	Non-aqueous phase liquid
NAVD 88	North American Vertical Datum of 1988
OIP	Optical image profiler
ORO	Oil-range organics
OSHA	Occupational Safety and Health Act
PDI	Pre-design investigation
perched zone	Perched water-bearing zone
PLP	Potentially liable party
PLP Group	Port of Longview TPH Site PLP Group
POC	Point of compliance
Port	Port of Longview
RACR	Remedial Action Completion Report
RAO	Remedial action objective
REL	Remediation level

Abbreviation	Definition
RI	Remedial Investigation
RIWP	Remedial Investigation Work Plan
ROW	Right-of-way
SEPA	State Environmental Policy Act
Site	Port of Longview Total Petroleum Hydrocarbons Site
TEE	Terrestrial ecological evaluation
TPH	Total petroleum hydrocarbons
UIC	Underground injection control
UST	Underground storage tank
VI	Vapor intrusion
WAC	Washington Administrative Code
WestRock	WestRock Longview LLC
Wilson	Wilson Oil, Inc.
WSDOT	Washington State Department of Transportation

1.0 Introduction

This Cleanup Action Plan (CAP) presents Washington State Department of Ecology's (Ecology's) Selected Cleanup Action for the Port of Longview (Port) Total Petroleum Hydrocarbons (TPH) Site (Site) in Longview, Washington, on the north side of the Columbia River, directly east of the Lewis and Clark Bridge (Figure 1). The CAP was prepared per the requirements of Agreed Order # DE 15907 (Agreed Order) between the Port, Chevron U.S.A. Inc. (Chevron),[7] Georgia-Pacific LLC (Georgia-Pacific),[8] and Ecology. Other potentially liable parties (PLPs) include Wilson Oil, Inc. (Wilson)[9] and Smurfit Westrock LLC (WestRock).[10] References to a successor PLP include its predecessors, and references to a predecessor include its successors. The Port, Chevron, Georgia-Pacific, Wilson, and WestRock are collectively referred to as the Port of Longview TPH Site PLP Group (PLP Group). This CAP was developed using information presented in the Remedial Investigation (RI)/Feasibility Study (FS), which was prepared by Floyd|Snider in 2023 on behalf of the PLP Group in accordance with the Agreed Order for the Site. Ecology has selected the cleanup action described in this CAP because it will be protective of human health and the environment. Ecology will consider public input before finalizing the CAP. The Site cleanup is expected to be conducted under a Consent Decree (CD) between Ecology and the PLP Group.

1.1 PURPOSE AND OBJECTIVES OF REPORT

A CAP is required as part of the site cleanup process under the Model Toxics Control Act (MTCA; Washington Administrative Code [WAC] Chapter 173-340). The purpose of the CAP is to describe Ecology's Selected Cleanup Action for the Site and to provide an explanatory document for public review. Consistent with the requirements of WAC 173-340-380(5), this CAP includes the following information:

- Site description, background, and characterization;
- Cleanup standards and remediation levels (RELs) for each hazardous substance in each medium of concern;
- Description of the selected remedial action, including justification for the selection;
- Brief summary of the remedial action alternatives considered in the RI/FS;
- Implementation schedule and restoration time frame;
- Identification of residual contamination remaining on the Site after cleanup (refer to Section 2.7) and restrictions of future uses and activities at the Site to ensure continued protection of human health and the environment;

[7] Standard Oil Company of California is Chevron U.S.A. Inc.'s predecessor. Chevron Environmental Management Company manages environmental matters for the Chevron family of companies.

[8] James River Corporation and Crown Zellerbach are corporate predecessors of Georgia-Pacific.

[9] Wilson is doing business as Wilcox & Flegel Oil Company.

[10] WestRock Longview, Longview Fibre Paper and Packaging, Inc., Longview Fibre Company, and KapStone Kraft Paper Corporation are predecessors to WestRock.

- Discussion of compliance monitoring requirements; and
- Applicable state and federal laws.

Ecology has selected the cleanup action described in this draft CAP because it will be protective of human health and the environment and will comply with the requirements for selection of a cleanup action under WAC 173-340-360. Ecology will consider public input before finalizing the CAP.

As established in WAC 173-340-200, the Site was defined in the RI report by the vertical and lateral extent of the contaminants of concern (COCs) in soil and groundwater at concentrations exceeding their respective cleanup levels (CULs). The Site boundary and vicinity property ownership is shown on Figure 2.

1.2 PREVIOUS STUDIES

Multiple investigations were conducted between 1991 and 2019 to characterize the nature and extent of impacted soil and groundwater at the Site. Additionally, multiple interim actions, including excavation and off-site disposal of petroleum-impacted soil, capping of exposed pipelines, and removal and disposal of pipelines beneath the berths, have also been implemented during this time. The following is a list of previous investigations, which are summarized in the RI report.

- In February 1991, the Port retained Petroleum Services Unlimited, Inc., to investigate soil and possible impacts associated with a previously decommissioned 675-gallon underground storage tank (UST) on the Calloway Ross Parcel that reportedly contained gasoline hydrocarbon product (PSU 1991). Results indicated that diesel-range organics (DRO) and gasoline-range organics (GRO) impacts in soil were present north (downgradient) of the former UST.
- In September 1992, Golder Associates was retained to further investigate and delineate the diesel impacts identified in the 1991 Extent of Contamination Investigation. The Phase I investigation expanded the investigation area to include the former Calloway UST area, the pipelines underlying the east-adjacent railyard, and the 80,000-barrel aboveground storage tank (AST) and associated fuel area to further assess soil and groundwater contamination (Golder 1993a).
- In March 1993, Golder conducted a Phase II investigation, which included using ground-penetrating radar (GPR) to map locations of underground pipelines and collecting shallow soil samples to identify potential soil impacts related to the former Calloway UST, pipelines, and 80,000-barrel AST. Results confirmed three north–south target trends, parallel to and under the railroad tracks, varying from 3 to 6 feet in depth (Golder 1993b).
- After the 1993 Phase II investigation, Golder conducted a Phase III investigation, intending to further characterize the nature and extent of soil and groundwater impacts as well as identify potential source areas. This involved installing nine new

monitoring wells, MW-13 through MW-21, located in the 80,000-barrel AST vicinity and in the railroad tracks between the Calloway Ross Parcel and the AST, and sampling existing monitoring wells (Golder 1993c).

- In July 1993, Golder performed a UST investigation of soil and groundwater surrounding two USTs that had recently been removed near the former mechanic's shop, in the southern portion of the study area, southeast of former Warehouse 9 and the Calloway Ross Parcel (Golder 1993d). Approximately 15 cubic yards of petroleum-contaminated soil was removed during the decommissioning of the 4,000- and 8,000-gallon gasoline USTs associated with the Port's former mechanic's shop.
- In March and June 1994, Golder performed a Phase IV investigation, which expanded the study area of the earlier investigations to the south and provided additional detail on sources of soil impacts as identified by previous GPR surveys and on the extent of southward groundwater impacts. GPR and visual inspections were used to confirm the location of the pipelines in the southern portion of the Site; the Standard Pipelines[11] were observed to "branch" approximately 50 feet south of the former mechanic's shop, with one branch terminating underneath present-day Berth 1 and the other under Berth 2 (Golder 1994).
- In August 1995, the 80,000-barrel AST was removed; two monitoring wells were installed (T-1 and T-2); and surface soil samples that were collected from the foundation sand immediately beneath the AST indicated TPH ranging in concentrations from 55 to 66,000 milligrams per kilogram (mg/kg). In 1996, Golder prepared focused FSs for two areas at the Site, the soil impacts on the Calloway Ross Parcel and soil impacts associated with the 80,000-barrel AST, based on results from their previous investigations (Golder 1996a, 1996b).
- In May 1996, TPH-impacted soil was excavated from three shallow excavations on the Calloway Ross Parcel and stockpiled on-site. On December 10, 1996, 800 cubic yards of stockpiled impacted soil was transported off-site for thermal treatment and disposal.
- In 1996, an interim cleanup action was conducted below and around the footprint of the former 80,000-barrel AST, during which approximately 5,000 cubic yards of petroleum-impacted soil was excavated and transported off-site for disposal. Twelve compliance soil samples were collected from below the footprint of the former AST. Concentrations from all compliance samples, except one floor sample, were less than their respective MTCA Method A CULs (Golder 1996b).
- In June 1998, three perimeter wells, MW-30, MW-31, and MW-32, were installed and included as part of the groundwater sampling program conducted by Golder between 1999 and 2014. The groundwater sampling program during this period included

[11] Many of the named facilities were owned or operated by multiple PLPs. References to these facilities by name (e.g., Standard Pipelines or Longview Pipeline) are not intended to suggest that those entities, their predecessors, or their successors are liable or otherwise responsible for possible releases from them described in the Agreed Order, the RI/FS, or this CAP.

groundwater monitoring at select monitoring wells along the perimeter (MW-1, MW-4, MW-23, MW-27, MW-30, MW-31, and MW-32) and interior (MW-10 and MW-12) of the groundwater contaminant plumes identified in previous Site investigations. All wells were sampled on an annual basis, except for MW-30, which was sampled quarterly between 1999 and 2000 before being sampled annually (Golder 2015).

- In 2015, Floyd|Snider conducted a priority data gaps investigation to fill priority data gaps related to the extent of soil and groundwater impacts at the Site; specifically, the southern and western edges of known impacts, uninvestigated areas adjacent to the pipelines in the southern portion of the property, and along the shoreline of the Columbia River (Floyd|Snider 2015). The results from the data gaps investigation were used to identify areas of potential concern (AOPCs) that needed further investigation to fully characterize the Site.
- In April and May 2019, an interim action was completed at the Port property to remove the deteriorating portions of the Standard and Longview Pipelines that were exposed under Berths 1 and 2. All activities associated with the interim action were in accordance with the Interim Action Work Plan, which is included as Exhibit C in the Agreed Order. The Final Interim Action Completion Report that documents the removal activities was submitted to Ecology in September 2019 (Floyd|Snider 2019a).
- Floyd|Snider performed groundwater monitoring and sampling activities between February 27 and March 1, 2019. The intent of the Site-wide sampling event was to collect data during winter from wells that have typically been dry at other times of year and to obtain current Site-wide groundwater data. MW-09 contained light non-aqueous phase liquid (LNAPL) at a thickness of 0.01 feet and was not sampled during this period. Absorbent socks were present in monitoring wells MW-03, MW-07, MW-09, and MW-20 and were removed and disposed of as non-hazardous waste, except for the sock in MW-09. The sock in MW-09 was raised to hang above the groundwater. The goal of removing the socks was to assess whether LNAPL thicknesses would recover (Floyd|Snider 2021).
- In accordance with the approved RI Work Plan (RIWP), site characterization activities were conducted at the Site between 2019 and 2021 to further evaluate and delineate environmental impacts from historical Site activities within nine AOPCs (Floyd|Snider 2019b). RI sampling was completed in accordance with the Agreed Order and WAC 173-340-350(5), which describes procedures for conducting an RI. All RI sample locations are shown on Figure 3.

After the completion of the above investigation activities at the Site, Ecology approved the final RI/FS and confirmed that the COCs are adequately characterized and the conceptual site model (CSM) well-defined for the purpose of development and evaluation of remedial alternatives. The Site COCs are DRO, oil-range organics (ORO), GRO, and benzene. An RI/FS, which describes the nature and extent of the contamination and was submitted in 2023, provides the technical basis for the cleanup actions to be conducted at the Site (Floyd|Snider 2023).

1.3 REGULATORY FRAMEWORK

The Site is currently being managed under the Agreed Order, which requires the PLPs to prepare a draft CAP for the Site. Ecology has determined that a cleanup conducted in conformance with this draft CAP will comply with the requirements for selection of a cleanup action under WAC 173-340-360. This draft CAP is being submitted for public review as an exhibit to a new CD between the PLP Group and the State of Washington through Ecology. The cleanup activities will be performed in accordance with all applicable or relevant and appropriate requirements (ARARs), and all appropriate permits will be obtained.

2.0 Site Description and Background

The Site description and background are provided in this section to provide sufficient background for the discussion of the selected remedial action. Additional details concerning the Site description and background are presented in the final RI/FS (Floyd|Snider 2023).

2.1 SITE DESCRIPTION

2.1.1 Definition of Site

In this document, "property" is used to refer to the property owned and operated by the Port (Cowlitz County Parcels 10171, and 10183), in addition to the small parcel owned by the Port and/or BNSF Railway Company that contains rail lines that the Port operates (Parcel 90293).

The Site is defined in Section 6.0 of the RI/FS, per MTCA, and includes the property and the areas surrounding and within the property where COCs in soil and groundwater exceed their respective CULs, which includes the following:

- A portion of the City of Longview's right-of-way (ROW) beneath Port Way to the west
- A portion of the Washington State Department of Transportation (WSDOT) property on the west side of Port Way, Parcel 61634

The Site is designated Ecology Facility Site ID No. 42978181 and is officially referred to as the Port of Longview TPH Site. The Site is located at 10 Port Way in Longview, Washington, Section 8/Township 7N/Range 2W. The total area of the Site, shown on Figures 1 and 2, is approximately 28.2 acres, and the mean Site elevation is approximately 25 feet North American Vertical Datum of 1988 (NAVD 88).

2.1.2 Site Description and Current Land Use

The Site is currently zoned as heavy industrial and is used for Port operations and marine cargo operations, which include a rail-dependent bulk export facility. Activities, uses, and structures in support of those operations include storage of cargo-handling equipment, cargo storage, conveyers, rail dump pit, baghouses, ship loader, office, maintenance shop, wastewater pre-treatment plant, transit sheds, and maintenance material storage. Site buildings include the former U.S. Army Reserve building and Former Port of Longview Administration Office. Both buildings contain office space and are occupied. The Site also has several unoccupied storage warehouses and sheds. The Site is almost entirely paved except for areas of rail track infrastructure and a material storage area north of the former Warehouse 9 building footprint.

The Site is expected to be used for heavy industrial purposes as currently zoned in the future. A log export facility owned by Weyerhaeuser NR Company and an active bulk fuel facility owned by Wilson are located northwest- and northeast-adjacent to the Site, respectively. The Columbia River and Port property (formerly owned by International Paper Company) border the

Site to the southwest and southeast, respectively. The rail lines are owned by the Port and/or BNSF Railway Company, and the Port operates the rail lines that traverse the Site (Figure 2).

2.2 HISTORICAL PROPERTY OWNERSHIP, DEVELOPMENT, OPERATIONS, AND LAND USE

The Port has been operating at this location on the Columbia River since the early 1900s, which supports a variety of regional, national, and international industries as a bulk and break-bulk marine cargo facility. The Port property, which includes portions of the Site and extends beyond the Site to the east, contains ship berths, a railyard, and associated warehouse and transit shed buildings to accommodate marine cargo operations. Historical Site features are shown in Figure 4. Many of the historical Site features were owned or operated by multiple PLPs. References to these facilities by name (e.g., Standard Pipelines or Longview Pipeline) are not intended to suggest that those entities, their predecessors, or their successors are liable or otherwise responsible for possible releases from them described in the Agreed Order, the RI/FS, or this CAP. The following summary is repeated from the Agreed Order findings of fact:

"A. The Port of Longview consists of multiple parcels along the Columbia River spanning approximately 835 acres. The parcel where the Site is primarily located is owned by the Port of Longview and is designated as Heavy Industrial in the City of Longview's zoning code (Chapter 19.58 Longview Municipal Code) and lies approximately 31 feet above mean sea level, and is depicted in Exhibit A [of the Agreed Order] (Port Property). The investigation data to date indicate the Site is approximately 28.2 acres in size, as depicted in Exhibit A [of the Agreed Order]. The Site is almost entirely paved, except for areas of rail track infrastructure.

"B. The Site is bordered in each direction by the following: The Columbia River to the southwest; Washington State Route 433 (Lewis & Clark Bridge) and an active lumber production facility owned by Weyerhaeuser NR Company to the northwest; an active bulk fuel facility (Bulk Plant) owned by Wilson and formerly owned by Chevron to the northeast; and property currently owned by the Port and formerly owned by International Paper Company to the southeast. BNSF Railway Company owns and operates rail lines that traverse the Site.

"C. The area of land within the Site has been owned primarily by the Port since the early 1900s. The Port formerly operated a 4,000-gallon underground storage tank (UST) and an 8,000-gallon UST on the Port Property (Port USTs). Calloway Ross, Inc. (Calloway) operated a 675-gallon UST (Calloway UST) on the Port Property. The United States Army Reserve operated a 2,800-gallon UST on the Port Property (Army UST). Correspondence between Wilson and the Port in 1993 suggests an additional UST used to store gasoline may have been located near the [former] army Reserve building on the Port Property.

"D. Chevron, or its predecessor, Standard Oil Company of California (Standard Oil) installed pipelines on the Site in 1926 that ran parallel to

Port Way beneath the BNSF rail lines, to transfer petroleum products between the Bulk Plant and shipping berths along the Columbia River (Standard Pipelines). Standard Oil or Chevron owned the Standard Pipelines until 1986, when they were conveyed to the Port under the terms of a Termination of License Agreement (Termination Agreement). In accordance with the Termination Agreement, Chevron removed hydrocarbon liquids from the Standard Pipelines, cleaned the Standard Pipelines between the Bulk Plant and their terminus at the shipping berths, and flushed the Standard Pipelines with water and air.

"E. KapStone (formerly Longview Fibre Company) constructed and began operating a pipeline (Longview Pipeline), fuel loading racks, and an 80,000-barrel aboveground storage tank (AST) on the Port Property in approximately 1935 to transfer and store petroleum products. The Longview Pipeline was positioned slightly east of the Standard Pipelines. In the 1950s, the AST was connected to the Standard Pipelines. After the connection was made, petroleum products were transferred to the AST from the Standard Pipelines. KapStone owned the Longview Pipeline, fuel loading racks, and AST until 1973, when it sold the AST to Crown Zellerbach Corporation ("Crown Zellerbach"), a corporate predecessor of Georgia-Pacific.

"F. Crown Zellerbach owned the AST from 1973 to 1983. Crown Zellerbach used the AST and Standard Pipelines to transfer and store petroleum products and ballast seawater from tanker ships.

"G. Wilson operated the Standard Pipelines on behalf of Chevron and Standard Oil between 1971 and 1985. Wilson operated the AST on behalf of Crown Zellerbach between 1974 and 1983.

"H. The Standard Pipelines, Longview Pipeline, loading racks, AST, Calloway UST, Port USTs, and Army UST have been abandoned and/or removed in various phases. No petroleum products have been stored or distributed at the Site since 1996.

"I. Petroleum contaminated soil and groundwater was first discovered in 1991 during the decommissioning and removal of the Calloway UST, located in the northwestern corner of the Site. The Port conducted several phases of subsurface investigations between 1992 and 1994 in response to this discovery. The results of the subsurface investigations are generally summarized in a *Phase IV Characterization Report – Bunker C and Diesel Fuel Investigation,* prepared by Golder Associates, dated December 7, 1994. A brief summary of each of these phases is provided below and a figure of the related areas is included in Exhibit A [of the Agreed Order].

"i. Phase 1: Gasoline, diesel fuel, and Bunker C were detected in soil and groundwater in the railyard east of [former] Warehouse 9, as well as in the area formerly leased by Calloway.

"ii. Phase 2: Petroleum contaminated soil and groundwater were detected and associated with the Calloway UST and the Standard Pipelines and Longview Pipeline.

"iii. Phase 3: Two separate zones of soil and groundwater contamination were characterized, suggesting that at least two separate and distinct leaks from pipes have occurred.

"iv. As a separate action from the investigations originating with the Calloway UST, the Port removed the Port USTs from the vicinity of the [former] mechanics shop at the time of the Phase 3 investigation. Analysis of groundwater samples near the mechanic shop indicated the presence of gasoline, diesel, and Bunker C. Because the USTs only contained gasoline, a Phase 4 investigation was conducted to investigate the mechanic shop area and the pipeline locations between the mechanics shop and the Columbia River for the source of diesel and Bunker C contamination.

"v. Phase 4: Soil and groundwater were found to contain significant concentrations of gasoline, diesel, and Bunker C throughout the investigation area. The identified impacts to soil and groundwater were generally located north of the [former] mechanics shop area along the pipeline corridor.

"J. The investigations identified petroleum products in the gasoline, diesel, and oil carbon-ranges, and other petroleum-related constituents (e.g., benzene, toluene, ethylbenzene, and xylenes) in the subsurface at concentrations exceeding MTCA Method A soil and groundwater cleanup levels for unrestricted land use. The investigations suggest the Standard Pipelines, the Longview Pipeline, the fuel loading racks, the AST, the Calloway UST, the Port USTs, the Army UST, and the practices commonly associated with the storage and transfer of fuel are likely the principal sources of subsurface contamination at the Site.

"K. Remedial activities at the Site began in the 1990s as part of an independent cleanup action. In 1992, gasoline was detected in soil at depths below the groundwater table on the southwest side of the AST, and diesel and Bunker C fuel were detected at depths between 1.5 to 8 feet below ground surface (bgs) on the east and south sides of the AST. The highest concentrations of petroleum in surface soils were located beneath the AST. In 1996, soil in the vicinity of the AST was excavated to the soil and groundwater interface at a depth of approximately six feet bgs. Confirmation samples taken from the final limits of the excavation indicated residual petroleum products in the diesel carbon-range were present at concentrations above the MTCA Method A soil cleanup level for unrestricted land use and were left in place in a localized area at the southern extent of the excavation. Further

excavation was limited by high groundwater, sandy soils, and the proximity to the BNSF rail lines.

"L. In spring 1996, approximately 800 cubic yards of surface soils impacted with petroleum were removed from the parcel formerly leased by Calloway. The impacts were likely related to historical activities occurring on the parcel. This remedial action did not fully address the subsurface impacts related to the Calloway UST.

"M. In December 2013, Ecology performed a Site Hazard Assessment (SHA) of the Site. The Site was given a hazard ranking of 2 out of 5 (1 being Ecology's highest priority for cleanup).

"N. In 2015, the Port retained Floyd|Snider to conduct a data gap analysis to further delineate the extent of soil and groundwater impacts at the Site (Floyd|Snider investigation). The Floyd|Snider investigation included 30 direct-push soil borings focused on the south and west portions of the Site, collection of 16 grab groundwater samples from those borings, and collection of a groundwater sample from an existing monitoring well. The Floyd|Snider investigation indicated that petroleum-impacted soils are primarily located beneath the BNSF rail lines and that petroleum-impacted groundwater does not extend beyond the Port Property boundary to the northwest and not extend to the Columbia River to the southwest. The Floyd|Snider investigation identified several additional tasks to aid in the development of the remedial investigation and feasibility study.

"O. In February 2016, approximately 5 gallons of petroleum product were released from abandoned pipelines beneath shipping berths 1 and 2 along the Columbia River through two separate corroded areas. The Port conducted spill response actions, plugged the leaks, and reported the releases to the United States Coast Guard and Ecology."

The land use at the Site is currently zoned as heavy industrial and will have the same land use in the future. The former Standard Oil Pipelines have been emptied and triple rinsed; the current condition of the former Longview Pipeline is unknown but will be addressed as described in Section 3.0 of this CAP.

2.3 GEOLOGIC AND HYDROGEOLOGIC SETTING

The geology and hydrogeology of the Site and surrounding area are pertinent to the CSM, contaminant migration, and the design of the cleanup action. Therefore, the following sections provide an overview of the geology and hydrogeology, with additional detail provided in the RI/FS (Floyd|Snider 2023).

2.3.1 Site Geology

The Site is located on the northern bank of the Columbia River, adjacent to its confluence with the Cowlitz River to the east. The Site lies on a relatively flat alluvial floodplain at elevations ranging from approximately 18 to 31 feet NAVD 88, situated in a topographic basin surrounded by bedrock uplands.

Soil borings advanced on the property characterize the shallow subsurface as fill material of unknown origin, reportedly placed during the late 1880s (Golder 2000), overlying alluvial sediments. The fill material consists of a heterogeneous mixture of predominantly silt and sand, with a maximum thickness of approximately 20 feet near the areas adjacent to the Columbia River. In the southwestern portion of the Site, underlying the shipping berths and transit sheds, Site boring logs and optical image profiler (OIP)/hydraulic profiling tool field measurements characterize multiple discrete silt lenses within the native sands. In the central portion of the Site, underlying the rail tracks and beneath the eastern side of the former Warehouse 9 footprint, the silt lenses occur more consistently and are more continuous within the native sands; two approximately 1 to 5 feet thick continuous silt lenses occur between 15 and 10 feet NAVD 88 and between 10 and 5 feet NAVD 88. However, these finer-grained silt lenses are thin or are not present at the outer edges of the Site (i.e., the silt lenses become thinner with increasing distance from the central rail lines). The continuous, less-permeable silt lenses in the central portion of the Site interrupts the downward migration of infiltrated groundwater, resulting in the presence of a thin layer of perched groundwater in this area.

2.3.2 Hydrogeology

Groundwater at the Site occurs in two laterally extensive, sandy water-bearing zones, the perched water-bearing zone (perched zone) and the alluvial aquifer, which are separated by silt lenses. Hydrogeologic data indicate that the perched zone and alluvial aquifer are distinct water-bearing units with limited hydraulic connection and that interaction between the units resembles slow leakage through a low-permeability, non-continuous aquitard.

Large head differences, aquitard soil parameters, and aquifer testing results indicate that there is negligible water transmitted from the perched zone to the alluvial aquifer through a low-permeability silt aquitard at the base of the perched zone. The perched zone occurs primarily in the central portion of the Site, extending from the location of the former mechanic's shop to MW-39 and spanning approximately between the rail lines and Port Way. Groundwater first occurs in the perched zone between approximately 4.65 and 18.45 feet bgs and is, on average, higher in the wetter months (Floyd|Snider 2023). Saturated thicknesses range between approximately 2.5 and 11 feet depending on the location and time of year, with the highest saturated thicknesses being observed in the central portion of the Site. Groundwater is inferred to flow outward from a localized high groundwater elevation point at MW-14 in the northern portion of the perched zone.

The laterally extensive alluvial aquifer underlies the Site, generally below elevations of approximately 9 feet NAVD 88 and below the silt lenses that delineate the perched zone in the

central portion of the Site. The alluvial aquifer is a predominantly coarse- to fine-grained sand unit with trace silt. A deep well log, located north of the Site, indicates that this sandy aquifer unit is approximately 85 feet thick and is underlain by a confining silt layer (KJC 2010). Measured depth to groundwater ranges between 9.35 and 25.34 feet bgs and is, on average, higher in the wetter months (Floyd|Snider 2023). The predominant groundwater flow direction is to the north-northwest, away from the Columbia River. Transducer data show that the absolute elevation of the Columbia River is consistently higher than alluvial aquifer groundwater, confirming a net hydraulic gradient to the north and a consistently northerly flow direction away from the river. Transducer data also indicate that the Consolidated Diking Improvement District #1 system located north of the Site acts as a constant head boundary for shallow groundwater, helping maintain heads in both water-bearing zones lower than the Columbia River.

Both water-bearing zones show some degree of tidal influence. In general, Columbia River tidal influence decreases with distance from the river, and alluvial aquifer groundwater levels show a greater degree of tidal influence than perched zone groundwater levels. Results from a constant rate pumping test indicate that the alluvial aquifer and perched zone are distinct water-bearing units with limited hydraulic connection, separated by a low-permeability silt aquitard. Calculated horizontal hydraulic conductivities for the alluvial aquifer ranged from 4.2×10^{-3} to 3.8×10^{-2} centimeters per second. Additional details on the hydrogeologic studies conducted at the Site are provided in the RI/FS (Floyd|Snider 2023).

2.4 HUMAN HEALTH AND ENVIRONMENTAL CONCERNS

Petroleum constituents have been detected in Site soil and groundwater. Therefore, soil and groundwater (with LNAPL) are impacted media. Soil vapor and groundwater to indoor air are not current pathways; however, air is considered an affected media and can be a potential pathway in the future, depending on redevelopment plans. The complete and potentially complete exposure pathways associated with each medium/source are discussed in the following sections, along with rational for including that pathway with additional detail provided in the RI/FS (Floyd|Snider 2023). A CSM of contaminant sources and migration pathways at the Site is included as Figure 5, and Figure 6 shows the complete and potentially complete exposure scenarios and receptors. The CSM is discussed in detail in Section 9.0 of the RI/FS (Floyd|Snider 2023).

2.4.1 Human Receptors

The Port's property and the WSDOT property are fenced and have limited access for Port and WSDOT employees. The human receptors include Port employees and contractors, tenants, and occasional visitors approved by the Port. Additionally, current and future site workers occasionally perform operations and maintenance activities, including routinely excavating shallow soil (within the top 15 feet) to maintain rail and utility lines within the Port property, and visitors that are escorted by Port personnel who may get close to the excavation activity. The human receptors also include the workers who are involved in ground disturbing activities at the impacted portions of Port Way and WSDOT property.

Despite the Site being only accessible to Port workers, Port-approved personnel, as identified above, and WSDOT employees, Ecology requires an assessment of affected communities within the vicinity of the Site. Therefore, in accordance with Ecology's Implementation Memorandum No. 25, the following criteria and resources were used to determine whether the potentially exposed population includes a likely vulnerable population and overburdened community:

1. The potentially exposed population is located in a census tract that ranks a 9 or 10 on the Environmental Health Disparities Index from the Washington State Department of Health's EHD Map.
2. The potentially exposed population is located in a census tract that is at or above the 80th Washington state percentile of the Demographic Index from the U.S. Environmental Protection Agency's EJScreen.
3. The potentially exposed population is located in a census tract that is at or above the 80th Washington state percentile of the Supplemental Demographic Index from the U.S. Environmental Protection Agency's EJScreen.

The Site is located within census tract 53015000300. It is ranked 7 on the Environmental Health Disparities Index from the EDH Map. According to EJScreening, the Demographic Index and Supplemental Demographic Index of the census tract are 74th and 90th Washington state percentile, respectively. A further examination of the Supplemental Demographic Index indicates that three vulnerable populations and overburdened communities are potentially impacted: Limited English Speaking (84th percentile), Less Than High School Education (94th percentile), and Low Income (87th percentile).

2.4.1.1 Soil and Soil Vapor Exposure Pathways

Soil and soil vapor are potential exposure pathways to future on-site workers during construction or redevelopment activities. The impacted soil is considered to present a potential direct-contact exposure pathway, leaching to groundwater pathway, and future soil vapor to indoor air pathway. Figure 7 shows the extent of soil contamination at the Site. The complete and potentially complete exposure pathways include the following:

- **Soil Direct Contact:** TPH-impacted soil in the central and northern parts of the Site is concentrated between approximately 8 and 17 feet bgs, which is below the estimated depth of the pipelines (3 to 4 feet bgs). In the southern portion, TPH-impacted soil is concentrated deeper, between approximately 13 and 28 feet bgs, which similarly corresponds to the depth of the pipelines. Because there is soil impacted with TPH in the top 15 feet and workers on occasion excavate shallow soil to maintain rail and utility lines within the Site, there is a potential for these workers to come into direct contact with shallow TPH-impacted soil, and soil direct contact is considered a primary exposure pathway, in accordance with WAC 173-340-740(6).
- **Soil Leaching to Groundwater:** Releases of petroleum products to the surface and subsurface soil that occurred during historical Site operations could result in a

continued release, or leaching, of contaminants entrained in soil to groundwater. Soil to groundwater is a primary exposure pathway.

- **Soil Vapor**: Volatile contaminants in soil have the potential to volatilize to the vapor phase. Based on an empirical demonstration with soil vapor samples collected at the Site, as further described in Section 6.1 of the RI/FS (Floyd|Snider 2023), this pathway is incomplete. The soil to air pathway is considered a secondary exposure pathway and will need to be re-evaluated if buildings are to be constructed within or adjacent to known soil impacts.

2.4.1.2 Groundwater Exposure Pathways

Although Site groundwater is not used as a source of drinking water, the highest beneficial use is assumed to be a future source of drinking water. As such, the impacted Site groundwater is considered to present a potential exposure pathway through ingestion or direct contact. Additionally, impacted groundwater to indoor air is considered a potential vapor intrusion (VI) pathway. Figures 8 and 9 show the extent of groundwater contamination at the Site within the perched zone and alluvial aquifer, respectively. The complete and potentially complete exposure pathways include the following:

- **Groundwater Potability and Direct Contact:** The perched zone and alluvial aquifer at or within the immediate vicinity of the Site are not currently used as a source of water for any purpose by any known individuals, and no known drinking water wells exist in the Site vicinity. The use of Site groundwater within the perched zone and shallow alluvial aquifer is highly unlikely given the industrial location and its non-potable characteristics. Perched zone groundwater is classified as non-potable, based on evaluation of the criteria presented in WAC 173-340-720(2). As noted previously, groundwater in this unit does not serve as a current source of drinking water. Groundwater is also not a potential source of future drinking water due to a low sustainable yield of less than 0.05 gallons per minute measured during the pumping test (Floyd|Snider 2023). In addition to the low sustainable yield, select perched zone monitoring wells (e.g., MW-04, MW-11, and MW-30) had very low water levels in the drier months relative to the wet season, indicating a seasonal sensitivity to local recharge, which may preclude the use of this water-bearing zone as a reliable source of future drinking water. Lastly, the large head difference between the perched zone and alluvial aquifer, the aquitard soil parameters, and aquifer testing results are consistent with negligible water transmitted between the units, indicating that impacts present in perched zone groundwater will not migrate to the alluvial aquifer. However, the alluvial aquifer does not meet the exclusion criteria listed under WAC 173-340-720(2), and therefore, this exposure pathway is considered complete.
- **Groundwater to Indoor Air:** RI results indicate that there is no VI risk from groundwater to air to occupied buildings at the Site, such as the former U.S. Army Reserve building (Floyd|Snider 2023). However, the groundwater to indoor air pathway is considered a potentially complete secondary exposure pathway and will

need to be re-evaluated if buildings are to be constructed within or immediately adjacent to known groundwater impacts (as shown on Figures 8 and 9).

2.4.2 Ecological Receptors

MTCA requires that a terrestrial ecological evaluation (TEE) be completed after the release of hazardous substances to soil to determine the potential impacts to terrestrial organisms at a site (WAC 173-340-7490). A TEE can be excluded if certain criteria are met (WAC 173-340-7491). However, the Site does not meet the exclusion criteria because there is more than 0.25 acres of contiguous undeveloped land within 500 feet of the Site. Therefore, in accordance with MTCA requirements, a simplified TEE was conducted for the Site. The evaluation found the Site does not pose a substantial potential risk to terrestrial receptors due to its commercial use and the surrounding developed land (Floyd|Snider 2023).

2.5 CLEANUP STANDARDS

According to the cleanup standards defined under MTCA, CULs must be attained at the point of compliance (POC) and must consider any additional regulatory requirements that may apply (WAC 173-340-200). CULs for soil and groundwater were presented in the RI/FS for each chemical that was identified as a COC and are summarized in the following sections. MTCA Method A CULs for soil and groundwater were selected. The COCs identified at the Site with concentrations in soil and groundwater that exceed their respective MTCA Method A CULs include GRO, total ORO and DRO, and benzene.

2.5.1 Groundwater Cleanup Levels

Groundwater CULs were derived in accordance with WAC 173-340-720 and 173-340-730, summarized as follows. Per MTCA (WAC 173-340-720(1)(a)), groundwater CULs are based on the highest beneficial use of groundwater and the reasonable maximum exposure expected to occur under current and future site use conditions. Because Site groundwater does not meet the requirements for non-potable groundwater under WAC 173-340-720(2), the highest beneficial use of Site groundwater is considered as a future source of drinking water. Therefore, the MTCA Method A CULs for all COCs are used for protection of groundwater.

2.5.2 Soil Cleanup Levels

For soil, the direct contact and soil to groundwater leaching pathways are considered complete and, therefore, these exposure pathways provided the basis for selection of CULs. Under MTCA Method A, the CULs are determined by the most stringent criterion specified under state and federal laws and Tables 720-1, 740-1, and 745-1 of MTCA.

2.5.3 Summary of COCs and Cleanup Standards

Groundwater and soil COCs and their cleanup standards are summarized in Table 1.

Table 1
Summary of Site COCs and Cleanup Standards

Chemical of Concern	Cleanup Level [1]		Point of Compliance
	Value	Basis	
Groundwater			
GRO	800 µg/L	Protection of drinking water	Site-wide
Total DRO and ORO	500 µg/L	Protection of drinking water	Site-wide
Benzene	5.0 µg/L	Protection of drinking water	Site-wide
Soil			
GRO	30 mg/kg	Protection of groundwater [2]	Site-wide
Total DRO and ORO	2,000 mg/kg	Protection of groundwater [2]	Site-wide
Benzene	0.030 mg/kg	Protection of groundwater [2]	Site-wide

Notes:
1 CULs are based on MTCA Method A protection of groundwater (Tables 720-1 and 740-1).
2 The CULs for protection of leaching to groundwater and protection of direct contact are equivalent for TPH including GRO and total DRO and ORO. CULs based on leaching for benzene are also protective of the direct contact pathway.

Abbreviation:
µg/L Micrograms per liter

In addition to risk-based CULs, MTCA requires that the CULs for petroleum hydrocarbons comply with the limitation on non-aqueous phase liquid (NAPL). Specifically, the CUL may not exceed a concentration that would result in the presence of NAPL in or on the groundwater (WAC 173-340-720(7)). MTCA further allows that "physical observations of groundwater at or above the CUL, such as the lack of a film, sheen, or discoloration of the groundwater or lack of sludge or emulsion in the groundwater may be used to determine compliance with this requirement" (WAC 173-340-720(7)(d)). Therefore, in addition to compliance with the MTCA Method A CULs for groundwater, compliance for this Site includes the elimination of NAPL until visual confirmation of removal is achieved.

2.6 CLEANUP ACTION AREAS

Remedial actions conducted within the rail lines would impact Port activities; remedial actions outside the rail lines would likely not interfere with Port activities. Therefore, the Site is divided into two Cleanup Action Areas (CAAs): CAA-1 and CAA-2 (Figure 10). CAA-1 encompasses the

entirety of the Site outside of the active rail lines and is subdivided into areas CAA-1A and CAA-1B. CAA-1A includes the impacted soil and groundwater present north, west, and east of the rail lines (Figure 4 shows the location CAA-1A). CAA-1B includes the City of Longview ROW and the portions of WSDOT property in the vicinities of MW-04 and MW-30 that have impacted groundwater. The off-property area is subdivided into CAA-1B because the different site conditions and ownership circumstances call for different approaches to achieving the remedial action objectives (RAOs). It is expected to be more practicable to remediate the WSDOT and City of Longview ROW without placing institutional controls (ICs) on these properties, which are not owned by the Port. Because all of CAA-1[12] is outside of the active rail lines, implementing remedial actions and technologies in this CAA is more accessible and feasible compared with CAA-2 (Figure 10).

CAA-2 encompasses the area within the active rail lines. Because the rail lines are an important part of the Port operations, remedial technologies implemented within CAA-2 will need to be implemented in a manner to accommodate current or future Port operations. Both CAA-1 and CAA-2 encompass areas of soil, groundwater, or both, with GRO, total DRO and ORO, benzene, or a combination, with concentrations above CULs.

2.7 REMEDIATION LEVELS

This section discusses the use of soil RELs at the Site, which are applied to the area within CAA-2. RELs are, as defined in WAC 173-340-200, concentrations that exceed CULs and are used when a combination of cleanup action components are necessary to achieve CULs at a POC or conditional POC (CPOC). The use of RELs, which are based on residual saturation levels of petroleum hydrocarbons in soil, is consistent with the requirements under MTCA. All remedial alternatives evaluated in the RI/FS (Floyd|Snider 2023) meet the minimum requirements under WAC 173-340-360 for selection of a cleanup action, including a determination that the alternatives are protective of human health and the environment.

TPH Soil RELs, based on residual saturation concentrations, will be used for CAA-2 and not for CAA-1, which is located outside of the rail lines. A residual saturation value is defined as the concentration at which the petroleum product is not mobile in groundwater. RELs are applied to CAA-2 to eliminate the potential for mobile LNAPL. Selection of residual saturation values as RELs is consistent with WAC 173-340-747(3)(g), which states that soil concentrations left on-site must not result in the accumulation of NAPL on or in groundwater. The RELs are 6,900 mg/kg for GRO and 18,000 mg/kg for total DRO and ORO, which were empirically demonstrated to be site-specific residual saturation levels as described in detail in Section 11.4.1 of the RI/FS (Floyd|Snider 2023). The distribution of GRO and total DRO and ORO in saturated soil at concentrations greater than the REL is shown on Figure 7.

Remedial activities to reduce COC concentrations in CAA-2 soil to the RELs will achieve both short- and long-term cleanup goals. After treating the soil COCs to the RELs, the remaining COCs present in soil at levels below RELs but above CULs in CAA-2 are not a risk to the public because they are inaccessible beneath rail lines; these remaining areas are shown on Figure 11 as the extent of

[12] When using "CAA-1," this CAP is referring to both CAA-1A and CAA-1B.

COC exceeding CULs that are outside the remedy implementation extent. Few exposure pathways exist within CAA-2, with limited possibility of exposure to affect human health and the environment. These pathways and remaining residual TPH impacts within CAA-2 will be managed with ICs. Natural attenuation will be monitored until groundwater achieves selected CULs.

3.0 Description of the Selected Cleanup Action

The Selected Cleanup Action approved by Ecology for implementation at the Site is shown on Figure 11 and is a combination of multiple components, which are described in detail in the following sections. More detailed plans will be developed in an Engineering Design Report (EDR), which will be prepared after conducting a pre-design investigation (PDI) and prior to implementation of the Selected Cleanup Action.

3.1 CLEANUP ACTION ALTERNATIVES, ANALYSIS, AND SELECTION

The RI/FS (Floyd|Snider 2023) presented five remedial alternatives to address both soil and groundwater contamination at the Site and to meet the RAOs. The five remedial alternatives were assembled from the retained technologies to meet Site RAOs and ARARs. They generally range from least to most complex, and they employ combinations of active and passive remedial technologies that either eliminate or manage current and potential future exposure to contaminated media at the Site. Each Site-wide remedial alternative is described in Table 2. The five remedial alternatives summarized in Table 2 and detailed in the RI/FS are as follows:

- Alternative 1: LNAPL Removal, ICs, and Monitored Natural Attenuation (MNA)
- Alternative 2: In Situ Treatment Barrier, LNAPL Removal, ICs, and MNA
- Alternative 3: Targeted In Situ Chemical Oxidation (ISCO) Injections, LNAPL Removal, ICs, and MNA
- Alternative 4: Limited Excavation, Targeted ISCO Injections, LNAPL Removal, ICs, and MNA
- Alternative 5: Plume-Wide ISCO Injections, LNAPL Removal, ICs, and MNA

Each of the five alternatives were screened using mandatory MTCA requirements provided in WAC 173-340-360(3). These five alternatives were also evaluated according to the MTCA Disproportionate Cost Analysis (DCA) procedures (WAC 173-340-360(5)(c)) to compare the costs and benefits of the cleanup alternatives and identify the alternative that is permanent to the maximum extent practicable. The rationale for selection was based on an evaluation of the following for each proposed alternative:

- Protectiveness
- Permanence
- Effectiveness over the long term
- Management of short-term risks
- Technical and administrative implementability
- Consideration of public concerns
- Cost

"Consideration of public concerns" was removed from the criteria and became one of the general requirements in the MTCA Revisions, which took effect in January 2024. However, this change does not change the DCA evaluation results as the public concerns weighted 10% in the previous ranking system and alternatives address the public concerns to the similar degree, except Alternative 1 which takes the longest time to meet the CULs and was not selected. The DCA evaluation is presented in Section 14.0 of the RI/FS (Floyd|Snider 2023).

In addition to the above requirements, potential impacts to vulnerable populations and overburdened communities identified in Section 2.4.1 are considered when selecting a cleanup action. The contamination is primarily located within the Port's property, where the land and groundwater resources are not accessible or used by the public, including the three identified vulnerable populations and overburdened communities. Therefore, the presence of these communities does not affect the results of the FS. The Selected Cleanup Action is still preferred because it will eliminate off-property contamination, which is more likely to be accessed by the public, and not require long-term closure of Port operations for cleanup actions. The remedial action selected limits impact on Port operations by keeping the rail lines open and operating. The rail lines are the main rail infrastructure for the Port's eight marine terminals which is vital to ongoing operations, economic welfare of the Port, tenants, and direct and indirect local, regional, national, and international jobs support by marine activities.

Ecology has determined that Alternative 3 is the Selected Cleanup Action for remediation of contaminated soil and groundwater at the Site.

3.2 DESCRIPTION OF THE SELECTED CLEANUP ACTION

The Selected Cleanup Action includes the following activities that will be applied to CAAs at the Site, as shown on Figure 11 and noted below. The key cleanup elements are as follows:

- Surfactant injection and LNAPL extraction activities within the vicinity of MW-09 (CAA-1)
- Off-property ISCO injections in the vicinities of MW-04 and MW-30 (CAA-1B) where groundwater impacts exceed CULs
- Targeted ISCO injections within accessible areas where soil impacts exceed CULs (CAA-1A)
- Targeted ISCO injections along the rail lines where soil concentrations exceed soil RELs (CAA-2)
- Installation of additional alluvial aquifer and perched zone monitoring wells along the downgradient western, northwestern, and northern Port property boundary (CAA-1A), which will be used to confirm that groundwater is in compliance at the downgradient property boundary
- Inspection of the former Longview Pipeline contents

- Compliance groundwater monitoring for assessment of MNA, which includes an evaluation of groundwater and MNA data to determine if the plume is stable and shrinking within estimated time frames and if contingency injections are required
- ICs on the Port property including the following provisions:
  - Restrictions on the use of both perched zone and alluvial aquifer groundwater
  - Implementation of a Contaminated Media Management Plan (CMMP) to address remaining small, isolated soil impacts that could be encountered during redevelopment activities or operation and maintenance of the rail lines and utilities
  - Re-evaluate VI risk for new buildings or modified buildings to be used for occupancy that are proposed within the lateral and vertical inclusion zones, in accordance with Ecology's VI guidance (Ecology 2022)

Together, these technologies would remove contaminant mass in soil and groundwater through destruction and LNAPL recovery. Approximately 77% of the impacted soil mass will be treated using targeted ISCO injections in both the perched zone and alluvial aquifer. The Selected Cleanup Action has a restoration time frame between 10 and approximately 28 years for achieving cleanup standards at the standard POC, with the majority of the Site expected to achieve compliance in less than 10 years. As detailed in Sections 14 and 15 of the RI/FS, the Selected Cleanup Action satisfies all ARARs under MTCA and provides the greatest environmental benefit for the associated cost.

3.2.1 Surfactant Injections and Extractions

The Selected Cleanup Action includes surfactant injections and extractions, which are designed to eliminate the presence of residual LNAPL, which currently exists in MW-09. In addition to decreasing the LNAPL viscosity, which renders it more recoverable, adding surfactant increases desorption potential of LNAPL from the soil matrix. Surfactant injection and extraction activities include the installation of up to four 4-inch-diameter injection/recovery wells within a 400-square-foot vicinity of MW-09 or within 10 to 20 feet downgradient and cross gradient of MW-09. Existing wells MW-09 and MW-10 would be used in combination with these new injection/recovery wells to conduct three injection and extraction events using PetroCleanze. A bench test will be conducted during the PDI to assess the performance of PetroCleanze. Soil samples within the vicinity of MW-09 will be collected and submitted to Regenesis to determine if PetroCleanze will meet expectations. Other surfactant may be used if PetroCleanze does not meet performance expectations. Based on the CSM developed in the RI and recommendations from the vendor, it is assumed that each injection and extraction event would consist of injecting up to approximately 280 gallons of surfactant at each of the six locations, followed by an extraction event that would remove approximately 2,000 to 3,000 gallons of groundwater from all six locations. These estimates will be revised and finalized during the preparation of the EDR. Extraction events would occur approximately 1 to 2 weeks after each injection event to achieve the most effective LNAPL removal, and subsequent injection events would occur immediately after extraction. Extraction events would be coordinated around Port operations and rail line

usage and may require temporary closure of some rail operation. Additional surfactant and extraction activities may be required if residual LNAPL is accumulating on the water table in any Site monitoring well in the future; refer to Section 3.7.

Extracted groundwater would be containerized and transported to an appropriate disposal or treatment facility in the area.

3.2.2 In Situ Soil and Groundwater Treatment

ISCO injections are the primary method of contaminant destruction used in the Selected Cleanup Action. ISCO injections focus on remediating impacted soil and groundwater in CAA-1 and CAA-2, as well as groundwater impacts on WSDOT property in the vicinity of MW-04 and MW-30, located across Port Way. To maximize the effectiveness and vertical extent of in situ soil and groundwater treatment, ISCO injections will be implemented in the wet season (i.e., October through March) when seasonal groundwater levels in both water-bearing zones are high. The EDR will include a decision-making process for modifying the ISCO injection portion of the Selected Cleanup Action in the event ISCO amendments daylight, which could be due to various factors such as subsurface soil and groundwater conditions. Possible adjustments if amendment daylighting occurs include using a smaller lateral injection spacing grid and lower injection volumes or injection pressures.

Off-Property ISCO Injections (CAA-1B): To reduce the extent and eliminate the presence of the dissolved-phase hydrocarbons beneath the WSDOT property, PersulfOx will be injected in the vicinity of MW-04 and MW-30, where recent groundwater monitoring results have exceeded CULs for TPH constituents (Figure 11). Up to 38 injection points will be advanced to a depth of 20 feet bgs on the WSDOT property: 24 injection points within a 3,850-square-foot area around MW-04 and 14 injection points within a 1,500-square-foot area around MW-30. Based on the CSM developed in the RI and recommendations from the vendor, the proposed spacing between injection points is between 12 and 14 feet, and the target injection interval is 10 to 20 feet bgs. Because the off-property injections are not expected to be within 10 feet of any known utility lines, PersulfOx is the preferred product in this area because one application is expected to reduce groundwater contaminant concentrations to less than CULs. Additional targeted injections will be considered if indicated by performance monitoring data or if groundwater does not achieve CULs in off-property wells within the estimated restoration time frame (approximately 2 to 5 years).

ISCO Injections Outside Rail Lines on Port Property (CAA-1A): Accessible areas in CAA-1A with TPH impacts in soil greater than the CULs will be targeted by ISCO injections. Up to 213 PersulfOx injection points will be advanced in accessible areas to destroy TPH contaminants in groundwater and soil through abiotic chemical oxidation reaction. Figure 11 shows the extent of PersulfOx injection locations within CAA-1A, which are focused in two areas: a 30,000-square-foot area encompassing part of the former Calloway Ross Parcel and former Warehouse 9 footprint (180 injection points) and a 5,650-square-foot area to the south (33 injection points). The spacing between injection points is between 12 and 14 feet, and the target injection interval is 10 to 20 feet bgs. OIP fluorescence data, collected as part of the RI/FS, will be used to identify and target intervals of soil TPH impacts in both the alluvial aquifer and perched zone within CAA-1A.

If groundwater does not achieve TPH CULs along the downgradient property boundary within the estimated restoration time frame (approximately 2 to 5 years), or if indicated by performance monitoring data, additional targeted in situ treatment may be considered to address remaining areas of groundwater contamination. Once groundwater CULs have been met along the downgradient property boundary, continued monitoring will be conducted on select wells to ensure that remaining residual TPH impacts in CAA-2 are not recontaminating groundwater within CAA-1A in a way that may affect compliance with TPH CULs along the downgradient property boundary. If groundwater data indicate that remaining soil impacts beneath CAA-2 are likely contributing to an increasing trend in dissolved-phase hydrocarbon concentrations in wells located in CAA-1 after remedy implementation, additional injections will be conducted. Locations for additional injections will be determined using the most recent groundwater data at that time, which could include, but would not be limited to, injections within CAA-2 or remaining source areas. Contingency actions are summarized in Section 3.7.

ISCO Injections Inside Rail Lines (CAA-2): ISCO treatment in CAA-2 is focused on areas of soil GRO and total DRO and ORO concentrations that exceed RELs. Targeted treatment in this area (as opposed to treating all soil exceeding CULs in CAA-2) would lessen the impact to Port activities and treat a significant volume of soil and groundwater impacts to reduce the overall hydrocarbon mass within the source area. ISCO injection events in CAA-2 will be coordinated around Port operations to the greatest degree possible but may require occasional, temporary closure of select rail lines. ISCO amendments will be injected in up to 202 locations within CAA-2 using a combination of PersulfOx and RegenOx, depending on locations and depths of subsurface utilities and pipelines. Figure 11 shows the three target treatment areas: a 5,000-square-foot area surrounding MW-39 (up to 36 injection points or to the extent practicable), a 16,000-square-foot area near MW-40 (113 injection points), and a 10,000-square-foot area centered on MW-26 (71 injection points). ISCO injections are effective in the saturated zone and not as effective in the vadose zone. Therefore, ISCO injections are not proposed for the soil impacts that extend to the east of MW-12 and within the vicinity of the former AST because these shallow impacts are within the vadose zone and are less than 1 foot thick.

PersulfOx has a larger radius of influence and requires fewer injection events than RegenOx, and thus it is the preferred product for ISCO in this area. However, because PersulfOx is corrosive to materials that are not stainless steel or polyvinyl chloride (i.e., utilities and pipelines composed of ductile iron), which are known to exist in the subsurface in CAA-2, treatment with RegenOx would be necessary in some locations. Areas of PersulfOx and RegenOx treatment would be clearly demarcated through extensive utility locating, which would include a GPR survey and coordination with Port staff prior to remedy implementation. Injection point spacing would be between 12 and 14 feet for PersulfOx injections and 10 and 14 feet for RegenOx injections. PersulfOx treatments would consist of one application, and RegenOx locations would be injected over three events separated by 2 to 4 weeks. OIP fluorescence data, collected as part of the RI/FS, will be used to identify and target intervals of soil TPH impacts in both the alluvial aquifer and perched zone within CAA-2. If groundwater results along the downgradient property boundary do not meet CULs within the restoration time frame (approximately 2 to 5 years) or if MNA data do not indicate that groundwater will achieve TPH CULs Site-wide within the estimated maximum

restoration time frame of approximately 28 years, additional measures will be considered using the most recent groundwater data at that time.

3.2.3 Installation of Additional On-Property Downgradient Monitoring Wells (CAA-1A)

The Selected Cleanup Action includes the installation of at least two additional 2-inch-diameter monitoring wells along the downgradient northwestern and northern edges of the Port property (just east of Port Way), likely equally spaced between existing wells MW-05 and MW-35. The additional monitoring wells will be part of the compliance monitoring network, which will also include other existing wells screened in both the alluvial aquifer and perched zone near the property boundary. The number of wells, locations, and installation details will be proposed, in consultation with Ecology, in a PDI Work Plan, prior to submittal of the EDR.

3.2.4 Former Longview Pipeline Inspection

As requested by Ecology in its 2019 RIWP review (Ecology 2019), the Selected Cleanup Action includes a limited inspection of the former Longview Pipeline to determine the presence/absence of residual product. This inspection will be done prior to remedy implementation activities during the PDI activities. The limited inspection would involve excavating approximately 125 cubic feet (5-foot by 5-foot by 5-foot excavation) of surface soil overlying the pipeline in the northern portion of the Site between the rail lines and the former 80,000-barrel AST, where the pipeline is known to lie at a shallow depth of approximately 5 feet bgs (Golder 1994). Once the pipeline is exposed, spill response measures and air monitoring would be put into place in and around the excavation. The top of the pipeline would be cut open using either a small drill bit or a saw, and using this hole, the interior of the pipeline would be inspected for residual product. If residual product exists within the pipeline, observations, including approximate volume, color, odor, viscosity, and any other notable characteristics, will be noted. After the inspection, the pipeline will be resealed. Excavated soil will be stockpiled and tested for Site COCs and, pending analytical results, will be used to backfill the excavation if results indicate COC concentrations are less than their respective MTCA CULs. The inspection results will be evaluated to confirm the presence/absence of residual product in the pipeline. If product is present, its general characteristics and relative mobility, and the condition of the pipeline will be recorded based on a visual inspection at the location of exposure. In the event that product is present and mobile, a cost-benefit analysis will be prepared to assess the feasibility of a contingency action. Details of the pipeline inspection work plan will be included as part of the PDI Work Plan. The selection of contingency action for the Longview Pipeline, if determined that one is required, will be subject to Ecology's approval. If remedial action is required for the Longview Pipeline, it can be completed within the proposed restoration time frame for other portions of the Site.

3.2.5 Monitored Natural Attenuation and Groundwater Monitoring

MNA and groundwater monitoring are components of the Selected Cleanup Action for long-term groundwater recovery, after the ISCO injections treat a majority of the soil source contamination at the Site. Natural attenuation processes typically occur at all contaminated sites, but to varying degrees of effectiveness depending on the types and concentrations of contaminants present

and the physical, chemical, and biological characteristics of the soil and groundwater. One of the most important components of natural attenuation at a petroleum-contaminated site is biodegradation, which is typically based upon microbial respiration. Through this process, microbes gain energy from the consumption or oxidation of electron donors coupled to the utilization or reduction of electron acceptors. Contaminants serve as either electron donors or electron acceptors, depending on the conditions. The occurrence of biodegradation can be determined from monitoring changes in groundwater bulk geochemistry at a site, presence of metabolic byproducts, and the depletion of electron acceptors and donors.

MNA groundwater data collected during RI sampling indicate that the groundwater plumes in both the perched zone and alluvial aquifer are stable or shrinking. This suggests that biodegradation of contaminants is occurring in Site groundwater. Following ISCO injections, performance monitoring will be implemented for up to 1 year to confirm that injections meet the performance goals within each CAA. Afterwards, long-term groundwater monitoring for MNA parameters will be conducted throughout the groundwater plumes in both water-bearing zones, downgradient and upgradient of in situ source treatment, to assess the efficacy and status of MNA at the Site. Select MNA parameters, including dissolved oxygen, oxidation-reduction potential, nitrate, ferrous iron, sulfate, soluble manganese, total alkalinity, and methane, will be monitored and tracked to ensure that biodegradation is ongoing within the Site groundwater plumes and continues to contribute to long-term groundwater recovery. MNA parameters from locations inside and downgradient of the source treatment area will be compared to results from an upgradient background location.

3.2.6 Institutional Controls

ICs are legal and administrative controls intended to minimize the potential for human exposure to contamination or protect the integrity of the implemented remedy. ICs, including an environmental covenant, would be included as part of the cleanup action for the Site where contaminants in soil and groundwater are left in place exceeding the cleanup standards. The Selected Cleanup Action will address off-property impacts, which avoids placing ICs on properties not owned by the Port.

ICs at the Site will include the following requirements:

- ICs would include restrictions on the use of both perched zone and alluvial aquifer groundwater until CULs are met across the Site.
- A VI assessment must be performed on any part of the Site within CAA-1 or CAA-2 consistent with current Ecology guidance or regulation prior to the construction of new buildings on the Site. If the assessment indicates no soil or groundwater contamination in or near enough to affect future building areas, then no further action is necessary. However, if building will occur over or near areas of residual groundwater or soil contamination, then a more detailed assessment of the potential VI must be performed.

- Although ISCO injections target all saturated soil with TPH concentrations greater than CULs in CAA-1A, there will be shallow, discontinuous, and limited small areas of soil within the vadose zone in CAA-2 with residual impacts exceeding Site-specific direct-contact CULs for total TPH. To manage possible exposure to these residual soil impacts during Site redevelopment or rail and utility line operation and maintenance, an Ecology-approved CMMP would be prepared as part of the Compliance Monitoring Plan (CMP). The CMMP will specify soil and groundwater management procedures for future excavation and health and safety requirements for subsurface work in areas where contamination concentrations greater than CULs remain. These procedures will be applicable to any future site redevelopment or maintenance that involves removal or disturbance of subsurface material. The CMMP will be prepared for Ecology approval concurrent with the construction completion report and will include specifications for the following:
    - Methods to identify and assess areas where soil and groundwater remains at the Site with COC concentrations greater than the CUL
    - Health and safety requirements for working in and handling Site soils and groundwater
    - Best management practices for soil stockpiling, dust control, and erosion control
    - Requirements for off-site disposal and associated recordkeeping
    - Requirements for Ecology notification and reporting
- Long-term monitoring until groundwater CULs are achieved. Monitoring will follow a schedule outlined in an Ecology-approved CMP.

The ICs will be implemented as environmental covenants executed by the property owners and recorded with the Cowlitz County register of deeds for all affected properties in accordance with WAC 173-340-440. Environmental covenants will be consistent with Ecology's Model Environmental Covenant. Copies of draft environmental covenants will be included in the EDR per WAC 173-340-400(4)(a)(xix).

3.3 CLEANUP STANDARDS AND POINT OF COMPLIANCE

As discussed in Section 2.6 and described in the RI/FS (Floyd|Snider 2023), because of the relatively few hazardous substances present at the Site, MTCA Method A CULs were used for Site COCs.

A POC is defined in MTCA as the point or points on a site where CULs must be met. MTCA defines a standard POC as being throughout the site, and unless a site qualifies for a CPOC, CULs must be met in all media at the standard POC (i.e., throughout the site).

3.3.1 Soil Cleanup Standards and Point of Compliance

The standard POC for soil is pathway-dependent, as defined in WAC 173-340-740(6)(b-d), and the standard POC for each potentially active soil exposure pathway is used for this Site. The POC

for soil to protect humans from direct contact is throughout the Site from the ground surface to 15 feet bgs. The POC for protection of groundwater from the leaching of contaminants from the soil is also throughout the Site. Soil vapor results from the RI indicate that VI from groundwater to current occupied buildings is not an exposure pathway of concern. However, VI risk will be assessed if future occupied buildings are proposed within areas of known TPH impacts.

3.3.2 Groundwater Cleanup Standards and Point of Compliance

Under MTCA (WAC 173-340-720(8)(b)), the standard POC for groundwater is defined as "throughout the site from the uppermost level of the saturated zone extending vertically to the lowest most depth which could potentially be affected by the site," which implies that groundwater would need to meet CULs throughout the Site. If it can be demonstrated that it is not practicable to meet groundwater CULs at the standard POC within a reasonable restoration time frame using all practicable methods of treatment in the cleanup, then a CPOC may be approved by Ecology per WAC 173-340-720(8)(c). If a CPOC is necessary, MTCA requires that a CPOC be set as close to the source area as practicable, not to exceed the property boundary.

Based on current conditions, the standard POC for groundwater is selected for the Site. However, in the future, the northwestern and northern Port property boundaries could serve as a CPOC once dissolved-phase hydrocarbons in groundwater at off-property and on-property downgradient perimeter wells attenuate to concentrations less than CULs and it can be demonstrated that it is not practicable (due to technological limitations, environmental conditions, or other factors) to meet the CULs throughout the Site within a reasonable restoration time frame.

There is no exposure to groundwater at the Site through the drinking water pathway, which is expected to be permanently ensured with an environmental covenant restricting groundwater use.

3.4 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Compliance with ARARs is a minimum requirement for cleanup actions. ARARs are divided into location-specific, action-specific, and chemical-specific, and are summarized in Table 3. The applicability of the ARARs to the cleanup action, and how the cleanup action will meet the ARARs, are described as follows. Additional information that is needed to address applicable requirements will be provided in the EDR per WAC 173-340-400(4)(a)(xvii).

- **Location-Specific ARARs:** The location-specific ARARs are not applicable to the cleanup action, which does not include removal of soil or other ground-disturbing activities or demolition of structures. However, Table 3 includes potentially applicable ARARs that were considered.
- **Action-Specific ARARs:** The action-specific ARARs potentially applicable to the cleanup action include the ARARs governing noise that may be generated during injection (i.e., the Noise Control Act of 1974), the Washington State Underground Injection Control (UIC) Program, City of Longview codes regarding ROW and hydrant water use,

and Occupational Safety and Health Act (OSHA) regulations applicable to Site workers involved in cleanup implementation. Compliance with the UIC Program will be achieved by obtaining the appropriate UIC permits from Ecology. Injection work in ROWs would be performed in accordance with City of Longview standards, and a hydrant permit, if needed for injection of water-based reagents, would be obtained from the City of Longview. A Health and Safety Plan (HASP) detailing hazards and necessary controls associated with cleanup action implementation will be prepared for Site workers to meet OSHA requirements.

- **Chemical-Specific ARARs:** The chemical-specific ARARs are all applicable to the cleanup action and would be met through compliance with CULs.
- **State Environmental Policy Act:** A State Environmental Policy Act (SEPA) review will be conducted by Ecology in conjunction with this CAP, or in conjunction with the CD, to evaluate SEPA/National Environmental Policy Act compliance. The SEPA will be included as an exhibit to the CD for public comments during the public comment period.

Cleanup actions conducted under an agreed order with Ecology are exempt from state and local ARAR procedural requirements; however, the Selected Cleanup Action would be implemented in compliance with the substantive requirements of the appliable state and local requirements.

3.5 RESTORATION TIME FRAME

Surfactant injections and extractions and ISCO injections will destroy a large portion of the hydrocarbon contaminant mass at the Site (approximately 77%) within 1 to 2 years, which will promote natural attenuation and reduce the restoration time frame to meet groundwater CULs when compared to relying on MNA as a stand-alone alternative. Because the Selected Cleanup Action targets the source areas with the largest mass of hydrocarbon contaminants, the contaminant mass left in place will be relatively thin and spread out. A sharp decline in groundwater hydrocarbon concentrations is expected within 6 months of the last round of ISCO injections. Additionally, surfactant injections and extractions are expected to remove LNAPL from the MW-09 vicinity within approximately 6 to 8 weeks after the first round of surfactant injections. ICs would be implemented to manage future exposures while contamination remains and attenuates via natural breakdown processes.

The restoration time frame for soil and groundwater to be in compliance with CULs Site-wide was evaluated based on the estimated rate of biodegradation for Site conditions after in situ treatment (refer to Appendix D of the RI/FS [Floyd|Snider 2023]). Based on this evaluation, Site-wide soil and groundwater hydrocarbon concentrations are expected to attenuate to less than CULs in less than 10 years to approximately 28 years after remedy implementation is complete. Importantly, the restoration time frame analysis found that the majority of the currently impacted areas of soil and groundwater, including near the western, northwestern, and northern property boundaries, would attain CULs within approximately 2 to 5 years after implementation. The analysis estimates the relatively small area where residual hydrocarbon mass in soil will remain after remedy implementation would take the longest amount of time to attenuate to concentrations below CULs, up to approximately 28 years.

3.6 COMPLIANCE MONITORING

Compliance monitoring requirements associated with remedy implementation consist of protection monitoring during construction activities, performance monitoring to ensure remedy construction is in accordance with the project plans and design, and confirmation monitoring after remedy completion to confirm the long-term effectiveness of the remedy.

The CMP will incorporate a comprehensive Groundwater Monitoring Plan (GMP) that will include collecting baseline data and monitoring the performance of ISCO and MNA and will describe long-term confirmation groundwater monitoring and adaptive management to ensure the long-term protectiveness of the Selected Cleanup Action. The CMP will be included as an appendix to the EDR and will include a HASP, Sampling and Analysis Plan, and Quality Assurance Project Plan for monitoring and sample collection before and after remedy implementation.

3.6.1 Protection Monitoring

Protection monitoring will be conducted during both remedy construction and operation and maintenance activities to confirm the protection of human health and the environment. Protection monitoring requirements will be described in a HASP addressing worker activities during remedy construction and in the CMMP regarding future operations associated with the constructed remedy or ICs. Any activities conducted at the Site after remedy implementation that have the possibility of disturbing potential contamination left in place will require adherence to the CMMP and a post-remediation HASP that will describe worker protection monitoring requirements.

3.6.2 Performance Monitoring

Performance monitoring activities will occur during and immediately after the injection remedy is implemented. Performance monitoring will consist of sampling and analysis of groundwater on a semiannual basis and of select soil locations for COCs and other parameters for the following reasons:

- Confirm that ISCO injections within CAA-2 are performed within the extent of areas with residual saturation levels developed in the RI/FS by using a surveyor and the OIP data collected
- Optimize dosing and injection spacing based on field observations
- Confirm that concentrations are declining and will meet CULs along the downgradient property boundary within approximately 2 to 5 years
- Estimate treatment effectiveness and mass removal efficiency
- Determine if and where additional injections are required
- Monitor for migration of the plume and for potential mobilization of metals at concentrations of concern from soil, if this potential is identified based on soil sampling during the PDI

Performance monitoring will continue until CULs are met off-property and along the downgradient Port property boundary, which is estimated to be within 2 to 5 years. Additionally, quality control monitoring for implementation activities will be conducted, such as surveys to confirm the extent of ISCO injections within CAA-1 and CAA-2.

3.6.3 Confirmation Monitoring

Confirmation monitoring will consist of long-term monitoring to confirm protectiveness and assess compliance with CULs. Long-term monitoring will begin as annual groundwater sampling when performance monitoring indicates that off-property monitoring wells are less than CULs and when CULs have been met at the downgradient property boundary. Groundwater compliance will be determined by comparing groundwater sampling results to Site CULs (Section 2.6).

The frequency of long-term monitoring will change to efficiently assess monitoring objectives, including indicating that CULs have been met, confirming that CULs have been met in wet and dry seasons, and providing a dataset suitable for a compliance demonstration under MTCA. Long-term groundwater monitoring will be conducted on an annual basis on select wells until concentrations are less than Site CULs. After that, long-term monitoring will go back to being conducted on a semiannual basis on select monitoring wells to determine if CULs are met Site-wide during the wet and dry seasons. Once the semiannual results collected during the wet and dry seasons show that Site-wide groundwater is in compliance with CULs groundwater monitoring will be conducted on a quarterly basis to meet MTCA requirements of four consecutive quarters with COC concentrations less than CULs.

The data collected during the long-term groundwater monitoring will also inform the MNA evaluation, and if MNA is effective. If long-term monitoring results indicate that groundwater CULs will not be met Site-wide by 10 years, and the MNA evaluation indicates it will take longer than 28 years for the groundwater to meet the Site CULs, Ecology may require the Port to evaluate practicable contingency remedial actions, summarized in Section 3.7, if ICs are not protective of human health and the environment.

As indicated in Section 3.3, based on current conditions, the standard POC for groundwater will be applied. However, under future conditions, the northwestern and northern Port property boundary could serve as a CPOC once impacted dissolved-phase hydrocarbons in groundwater at off-property and on-property downgradient perimeter wells attenuate to concentrations less than CULs and it can be demonstrated that it is not practicable (due to technological limitations, environmental conditions, or other factors) to meet the CUL throughout the Site within a reasonable restoration time frame.

3.7 CONTINGENCY ACTIONS

Contingency actions may be required if additional remediation measures are needed after implementation of the Selected Cleanup Action. Details regarding the triggers and scope of contingency actions will be outlined in the EDR, and contingency action triggers will be updated,

as needed, in the CMP after cleanup action implementation. For example, contingency actions, such as additional targeted in situ treatment, may be considered if groundwater does not achieve CULs within the estimated restoration time frame. Groundwater results after remedial implementation will be evaluated to determine if and where additional injections would be appropriate. Additional surfactant and extraction activities may be required if residual LNAPL is still accumulating on the water table in MW-09 after three injection/extraction events or if LNAPL is detected at a measurable thickness in other Site wells.

Contingency actions may also be considered if residual product is encountered within the Longview Pipeline that is sufficiently mobile to potentially result in a release to the environment. Additionally, if future redevelopment plans include proposed occupied buildings within or immediately adjacent to known soil and groundwater impacts, VI will need to be assessed. If the VI assessment indicates that there would be a VI risk to future occupants, potential mitigation actions will be evaluated.

If the situations described above arise, Ecology may require the Port to evaluate contingency actions. After Ecology's review of the contingency action evaluation, a contingency action will be selected and PLPs will prepare a contingency work plan for Ecology review and approval. After Ecology's approval, PLPs will implement the selected contingency action.

3.8 INSTITUTIONAL AND ENGINEERING CONTROLS

ICs are a necessary component of the Selected Cleanup Action. Specific ICs for the Site would include restrictions on land use and resource use (i.e., prohibit the use of groundwater within Site boundaries as drinking water, domestic water, irrigation, or industrial uses). In addition, as stated in Section 3.2.6, an CMMP would be prepared as part of the ICs to identify where contaminated soil remains on-site. Any proposed excavation or subsurface maintenance activities within these restricted areas would require compliance with the CMMP, which would outline health and safety protocols along with soil handling and management procedures. The CMMP will also provide details for routine inspection (i.e., inspections performed under the pier and of monitoring wells) and will be part of the CMP for the Site.

3.9 PUBLIC PARTICIPATION AND TRIBAL ENGAGEMENT

3.9.1 Public Participation

Public participation will be accomplished in accordance with WAC 173-340-600. This CAP will be distributed to the public through a combination of methods noted in WAC 173-340-600(4) that Ecology deems most appropriate. These methods of distribution could include but are not limited to publication of notice in the Site Register, local newspapers or mailers, and public meetings (if requested by the public). As noted in Section 3.13, the public will be provided with 30 calendar days to comment on the draft RI/FS and draft CAP. Additionally, the public will be given an opportunity to comment on any plans prepared under WAC 173-340-400 that represent a substantial change from this CAP. During cleanup action implementation, it is anticipated that updates will be provided through Ecology's website.

Requirements for local government notification concerning environmental covenants will also be met in accordance with WAC 173-340-440.

3.9.2 Tribal Engagement

Tribal engagement is an integral part of Ecology's responsibilities under WAC 173-340-620. The Confederated Tribes and Bands of the Yakama Nation (Yakama Nation) holds reserved fishing rights and is co-manager of fisheries in the Columbia River and its tributaries. In accordance with a Memorandum of Understanding that was entered into by and between Ecology and the Yakama Nation in 2015, Ecology has been sharing the progress at the Site with the Yakama Nation by providing updates and documents for each major decision point. Ecology will maintain meaningful engagement with all potentially impacted tribes throughout the cleanup process.

3.10 FIVE-YEAR REVIEW

Because the cleanup actions described in this CAP are expected to result in substances remaining at the Site at concentrations exceeding CULs, and because environmental covenants are included as part of the remedy, Ecology will review the Selected Cleanup Action described in this CAP every 5 years to ensure protection of human health and the environment until CULs have been met at the POC (or a future CPOC). Consistent with the requirements of WAC 173-340-420, the 5-year review shall include the following:

- A review of the title of the real property subject to the environmental covenant to verify that the covenant is properly recorded
- A review of available monitoring data to verify the effectiveness of completed cleanup actions, including ICs, in limiting exposure to hazardous substances remaining at the Site
- A review of new scientific information for individual hazardous substances or mixtures present at the Site
- A review of new applicable state and federal laws for hazardous substances present at the Site
- A review of current and projected future land and resource uses at the Site
- A review of the availability and practicability of more permanent remedies
- A review of the availability of improved analytical techniques to evaluate compliance with CULs

Ecology will publish a notice of all periodic reviews in the Site Register and will provide an opportunity for review and comment by the PLPs and the public. If Ecology determines that substantial changes in the cleanup action are necessary to protect human health and the environment at the Site, a revised CAP will be prepared and provided for tribal and public review and comment in accordance with WAC 173-340-380 and 173-340-600.

3.11 CULTURAL RESOURCES

The Site is located near the Columbia River; however, up to 20 feet of fill material of an unknown origin was reportedly placed during the late 1880s (Golder 2000). Despite the import of fill material, the Native American Graves Protection and Repatriation Act (25 USC 3001 through 3013; 43 CFR 10) and Washington's Indian Graves and Records Law (RCW 27.44) prohibit the destruction or removal of Native American cultural items and require written notification of inadvertent discovery to the appropriate agencies and Native American tribe(s). These programs are applicable to the remedial action if cultural items are found during any soil-disturbance activities.

For an Ecology-supervised remedial action, MTCA requires Ecology to consult with the Department of Archeology and Historic Preservation and affected Indian tribes the potential effects of planned remedial actions on cultural resources at the site unless the remedial action is subject to Section 106 review under the National Historic Preservation Act of 1966. An inadvertent discovery plan will be prepared by the PLPs using the applicable form provided by Ecology or an equivalent document that includes the same or more comprehensive responses if cultural items are encountered or if archaeological items are discovered during implementation of the Selected Cleanup Action or other excavations, such as during the pipeline investigation, or future utility repairs or utility installations within areas of known impacts.

3.12 ADAPTATION STRATEGIES FOR RESILIENT CLEANUP REMEDIES

In Washington, MTCA requires adequate characterization of cleanup sites, including understanding potential impacts and vulnerabilities associated with climate change. This ensures that remedial alternatives with climate resilience are selected and carried out. The resilience of the remedial alternatives to climate change impacts were evaluated in the draft RI/FS using Ecology's guide (Ecology 2023). Based on the assessment, the remedial alternatives considered are not considered vulnerable to projected sea level rise and or flooding. The ISCO injections will destroy a large portion of the hydrocarbon contaminant mass at the Site within 1 to 2 years, which will promote natural attenuation and reduce the restoration time frame to meet groundwater CULs within 28 years. However, the Site still has a long-term risk of being affected by climate change because (i) it is located along a shoreline, (ii) the remedy may operate for an estimated 28 years, and (iii) limited residual TPH impacts in soil will be left in place during this time to attenuate. During the lifespan of the remedial action, the Site may experience sea level rise and increasing severe storms. The EDR will present considerations and adaptations designed to be resilient under the expected effects of climate change over the life of the project.

3.13 SCHEDULE FOR IMPLEMENTATION

Table 4 presents the anticipated schedule for the remaining project design milestones, project implementation, completion reporting, and long-term groundwater monitoring. Cleanup actions conducted under a CD or agreed order with Ecology are exempt from the state and local ARAR procedural requirements; however, a SEPA Checklist will be developed and submitted to Ecology for review prior to the public comment period. The SEPA Checklist will be included along with the

RI/FS for public comments during the public comment period. Any additional permits that may be required, such as UIC permits, will be prepared and submitted during the preparation of the EDR. The following estimated durations are provided for discussion and planning purposes only. Implementation of the Cleanup Action from EDR preparation through the initiation of long-term groundwater monitoring is likely to take 2 to 3 years. The 2 to 3 months of cleanup action activities can occur only during the wet season of October through March. Therefore, depending on the timing of Ecology's approval of the EDR, the start of these activities could be delayed until the following wet season.

Table 4
Cleanup Action Implementation Schedule

Implementation Step	Estimated Duration
Preparation of a Draft EDR	Within 90 days of submitting the final RI/FS and CAP after the public review process
EDR finalization and preparation of all applicable permit applications	Schedule will be determined in the CD; however, likely within 60 days after receipt and incorporation of Ecology final comments on the Draft EDR
Cleanup Action Activities; assume duration of 2 to 3 months, wet season only (October through March)	Schedule to be determined in the CD; however, coordination of cleanup action activities will be initiated within 60 days of Ecology approval of the EDR or after permit acquisition and contractor notice to proceed
Execution of performance monitoring	Initiate after completion of the surfactant injection and/or ISCO injections
Groundwater Monitoring Report	Due to Ecology as specified in the GMP
Submit Draft Remedial Action Completion Report (RACR) and CMP	180 days after the groundwater monitoring report indicates meeting the goals of injections
Submit Final RACR and CMP	45 days after receipt of Ecology's final comments
Implement Final CMP	In accordance with schedules established in the Final CMP; groundwater compliance monitoring to begin no later than 1 year after cleanup action completion
Draft of Environmental Covenants	Due to Ecology 30 days after approval of RACR and CMP
Final Environmental Covenants	Due to Ecology 15 days after receipt of Ecology's comments on draft Environmental Covenant
Environmental Covenants Recorded	10 days after approval by Ecology
Long-Term Groundwater Monitoring	In accordance with CMP until achievement of groundwater CULs
Annual Reports	Due yearly after approval of CMP and GMP until cleanup standards are achieved
5-Year Review	Conducted by Ecology every 5 years

4.0 References

Floyd|Snider. 2015. *Port of Longview TPH Site Data Gaps Report*. Prepared for the Port of Longview. December.

_____. 2019a. *Port of Longview TPH Site Interim Action Completion Report.* Prepared for the Port of Longview. September.

_____. 2019b. *Port of Longview TPH Site Remedial Investigation Work Plan*. Prepared for the Port of Longview. October.

_____. 2021. *Port of Longview TPH Site Interim Data Report.* Prepared for the Port of Longview. June.

_____. 2023. *Port of Longview TPH Remedial Investigation and Feasibility Study.* Prepared for the Port of Longview. September.

Golder Associates (Golder). 1993a. *Interim Data Report Bunker C and Diesel Fuel Investigation, Port of Longview, Longview, Washington*. 9 March.

_____. 1993b. *Environmental Assessment Report Calloway Ross Site, Port of Longview, Longview, Washington*. 20 April.

_____. 1993c. *Phase III Characterization Report Bunker C and Diesel Fuel Investigation, Port of Longview, Longview, Washington*. 13 August.

_____. 1993d. *Underground Storage Tank Site Characterization, Port of Longview.* 18 August.

_____. 1994. *Phase IV Characterization Report Bunker C and Diesel Fuel Investigation, Port of Longview, Longview, Washington*. 7 December.

_____. 1996a. *Focused Feasibility Study Unit A, Port of Longview, Longview, Washington.* 25 January.

_____. 1996b. *Focused Feasibility Study Unit B, Port of Longview, Longview, Washington.* 27 March.

_____. 2000. *Historic Site Investigation and Remediation Summary Report, Port of Longview, 10 Port Way Longview, Washington*. October.

_____. 2015. *Report on 2014 Annual Groundwater Monitoring.* Letter report from Jeremy Jones and Lee K. Holder, Golder Associates, to Lisa Hendriksen, Port of Longview, 25 February.

Kennedy/Jenks Consultants (KJC). 2010. *City of Longview Mint Farm Regional Water Treatment Plant Preliminary Design Report Part 2A Hydrogeologic Characterization*. Prepared for the City of Longview. March.

Petroleum Service Unlimited, Inc. (PSU). 1991. Extent of Contamination Investigation, Port of Longview. 26 June.

Washington State Department of Ecology (Ecology). 2019. Ecology Comments on Remedial Investigation Work Plan. 18 July.

_____. 2022. *Guidance for Evaluating Vapor Intrusion in Washington State: Investigation and Remedial Action.* Publication No. 09-09-047. Originally published October 2009. Revised February 2016, April 2018, November 2021, and March 2022.

_____. 2023. *Sustainable Remediation: Climate Change Resiliency and Green Remediation*. Plication No. 17-09-052. Originally published November 2017. Revised January 2023.

Cleanup Action Plan

Port of Longview TPH Site

Tables

Table 2
Summary of Cleanup Action Alternatives

Alternatives	Summary Description	Conceptual Components	Benefits	Issues/Considerations	Sustainability	Estimated Total Alternative Cost [1]
Alternative 1 - LNAPL Removal and MNA	- Surfactant injection and LNAPL extraction activities in MW-09 - Installation of additional downgradient wells along the western, northwestern, and northern Port property boundary - Inspection of the former Longview Pipeline contents - Long-term groundwater monitoring and MNA - Institutional Controls and SMP	- Surfactant injection and extraction activities including installation of additional 4-inch-diameter recovery wells within the vicinity of MW-09, which would be used during injections and extraction activities - Surfactant and water extraction, soil handling/disposal - Institutional controls indefinitely (or until MNA) including an SMP - MNA monitoring - indefinite	- Low cost, low disturbance from minimal active construction. - Surfactant injection and extraction would help eliminate residual LNAPL in soil and groundwater.	- Requires ICs on Port, City of Longview, and WSDOT properties; ICs on City of Longview and WSDOT properties may not be acceptable to those entities. - Does not address the majority of the soil source contamination present in CAA-2. - Indefinite long-term monitoring. - There might be public and tribal concerns with off-property migration.	- Small negative balance of environmental impact due to carbon dioxide emissions from implementation. The small carbon footprint due to raw material consumption (fuels and electricity) and greenhouse gas emissions (heavy equipment) is more sustainable than the other alternatives.	Low. $1,600,000
Alternative 2 - In Situ Treatment Barrier and LNAPL Removal	- Installation of in situ treatment barrier with PetroFix - Off-property ISCO injections in the vicinities of MW-04 and MW-30 - Surfactant injection and LNAPL extraction activities in MW-09 - Installation of additional downgradient wells along the western, northwestern, and northern Port property boundary - Inspection of the former Longview Pipeline contents - Long-term groundwater monitoring and MNA - Institutional Controls and SMP	- Installation of a PetroFix barrier in area outside the rail lines within the footprint of the former Calloway Ross Parcel and former Warehouse 9 footprint - Surfactant injection and extraction activities including installation of additional 4-inch-diameter recovery wells within the vicinity of MW-09, which would be used during injections and extraction activities - In situ injections to address off-property downgradient plume on WSDOT property - Institutional controls indefinitely (or until MNA) including an SMP - MNA and compliance monitoring	- Prevents off-property migration onto WSDOT and City of Longview property. - PetroFix expected to last from 5 to 10 years as long as there are terminal electron acceptors. - Surfactant injection and extraction would help reduce hydrocarbon mass and eliminate LNAPL. - Low disturbance to rail activities.	- Containment remedy that would not address source areas in CAA-1 and CAA-2, resulting in indefinite restoration time frame - Long-term O&M costs to maintain treatment barrier to meet CULs at at the downgradient Port property boundary, which includes a potential for re-injection of PetroFix barrier to restore electron acceptors	- Small negative balance of environmental impact due to carbon dioxide emissions from implementation. The small carbon footprint due to raw material consumption (fuels and electricity) and greenhouse gas emissions (heavy equipment) is more sustainable than Alternatives 3 through 5.	Low to Moderate implementation cost, with greater long-term O&M cost than other options. $4,200,000
Alternative 3 - Targeted ISCO Injections and LNAPL Removal	- Targeted ISCO injections within accessible areas where soil COC concentrations exceed proposed CULs (CAA-1) - Targeted ISCO injections along the rail lines within hotspots or where soil COC concentrations exceed RELs (CAA-2) - Off-property ISCO injections in the vicinities of MW-04 and MW-30 - Surfactant injection and LNAPL extraction activities in MW-09 - Installation of additional downgradient wells along the western, northwestern, and northern Port property boundary - Inspection of the former Longview Pipeline contents - Long-term groundwater monitoring and MNA - Institutional Controls and SMP	- Accessible areas outside the rail lines: In situ injections within extent of MTCA Method A soil exceedances to protect groundwater; PersulfOx injections within alluvial aquifer and RegenOx in perched water-bearing zone - Within the rail lines: Focused PersulfOx injections within alluvial aquifer and RegenOx in perched water-bearing zone - In situ RegenOx injections to address off-property downgradient plume on WSDOT property - LNAPL removal via surfactant injections and extractions within the vicinity of MW-09 - Institutional controls including an SMP - Performance monitoring and long-term monitoring	- Would prevent off-property migration to City of Longview and WSDOT properties. - Would more quickly achieve CULs in accessible areas than Alternative 1 and 2 and allow the Port to develop and lease the areas outside of the rail lines. - Least-invasive injection alternative, would use RELs for remediating soil exceeding residual saturation levels within rail lines to reduce impact to Port activities. - Lower expected cost than aggressive injections and excavation.	- Would not address impacts less than residual saturation levels within the rail lines resulting in long restoration time frame for Site-wide impacts; however, the restoration time frame to meet groundwater CULs at the downgradient Port property boundary is 5 to 10 years. - Some uncertainty concerning whether the injections would reach all intended areas. - Access constraints, disruption to rail activities (approximately a total of up to 30 days of injection activities in the rail lines) but less impact than Alternative 5. - May require supplemental injections to meet remedial action goals.	- Small negative balance of environmental impact due to carbon dioxide emissions from implementation. The small carbon footprint due to raw material consumption (fuels and electricity) and greenhouse gas emissions (heavy equipment) is not as sustainable as Alternatives 1 and 2 but is more sustainable than Alternative 4.	Moderate. $4,200,000

Table 2
Summary of Cleanup Action Alternatives

Alternatives	Summary Description	Conceptual Components	Benefits	Issues/Considerations	Sustainability	Estimated Total Alternative Cost [1]
Alternative 4 - Limited Excavation, Targeted ISCO Injections, and LNAPL Removal	- Excavation of approximately 13,000 cubic yards of impacted soil exceeding proposed CULs (CAA-1) - Targeted ISCO injections along the rail lines within hotspots or where soil concentrations exceed RELs (CAA-2) - Off-property ISCO injections in the vicinities of MW-04 and MW-30 - Surfactant injection and LNAPL extraction activities in MW-09 - Installation of additional downgradient wells along the western, northwestern, and northern Port property boundary - Inspection of the former Longview Pipeline contents - Long-term groundwater monitoring and MNA - Institutional Controls and SMP	- Excavation of approximately 13,000 cubic yards of impacted soil in areas outside the rail lines within the footprint of the former Calloway Ross Parcel and former Warehouse 9 footprint; impacts present to depths up to 23 feet bgs; ORC-A applied in excavation - PersulfOx injections within hotspots beneath rail lines in alluvial aquifer and RegenOx within hotspots beneath rail lines in perched water-bearing zone - Surfactant injection and extraction activities including installation of additional 4-inch-diameter recovery wells within the vicinity of MW-09, which would be used during injections and extraction activities - In situ injections to address off-property downgradient plume on WSDOT property - Insitutional controls including an SMP - Performance monitoring and long-term monitoring	- Would prevent off-property migration to City of Longview and WSDOT properties more quickly than all other alternatives - Moderate disruption during injection activities - More effective than excavation alone within accessible areas - Would more quickly achieve CULs in accessible areas than Alternatives 1, 2 and 3, and would allow the Port to develop and lease the areas outside of the rail lines - Would use RELs for remediate soil exceeding residual saturation levels within rail lines to reduce impact to Port activities - Lower cost than a full Site-wide excavation - Has a potential to more quickly meet groundwater CULs at the downgradient Port property boundary than Alternative 3, but similar restoration time frame within the rail lines as Alternative 3.	- Would not address impacts less than residual saturation levels within the rail lines, resulting in long restoration time frame for Site-wide impacts; however, the restoration time frame to meet groundwater CULs at the downgradient Port property boundary is 5 to 10 years. - Access constraints and disruption to rail lines (approximately a total of up to 30 days of injection activities in the rail lines) but less impact than Alternative 5 - Some uncertainty concerning if the injections would reach all intended areas - Excavation depths would require extensive, high-cost shoring to protect rail lines and expected to require geotechnical evaluation. - Dewatering may be needed to dewater perched water-bearing zone and reach required depths.	- There is a negative balance of environmental impact due to carbon dioxide emissions from numerous trucks hauling impacted soil and clean backfill to and from the Site. The increase in the carbon footprint due to raw material consumption (fuels and electricity) and greenhouse gas emissions (heavy equipment) is not as sustainable as the other alternatives.	High. $10,200,000
Alternative 5 - Plume-Wide ISCO Injections and LNAPL Removal	- ISCO injections throughout the entire extent of groundwater impacts exceeding proposed CULs, including in the vicinity of off-property locations MW-04 and MW-30 - Surfactant injection and LNAPL extraction activities in MW-09 - Installation of additional downgradient wells along the western, northwestern, and northern Port property boundary - Inspection of the former Longview Pipeline contents - Long-term groundwater monitoring and MNA - Institutional Controls and SMP	-Installation of additional 4-inch-diameter wells within the vicinity of MW-09 to assist with surfactant injection and extraction -PersulfOx injections in alluvial aquifer and RegenOx in the perched water-bearing zone within the entire extent of groundwater impacts; both with close injection point spacing to maximize contaminant destruction - Horizontal injection wells as potential alternative implementation option - In situ injections to address off-property downgradient plume on WSDOT property - Insitutional controls including an SMP - Performance and compliance monitoring	- Would prevent off-property migration to City of Longview and WSDOT properties - More cleanup certainty by addressing the entire dissolved-phase plumes within the perched water-bearing zone and alluvial aquifer - Quicker compliance throughout plume, which would allow the Port to redevelop portions of the Site - Most permanent option that will treat all soil to meet leaching pathway CULs	- Access constraints, disruption to rail activities - Potential use of horizontal wells would involve technical and administrative difficulties and concerns about boring beneath active rail lines - High cost to treat entire dissolve-phase plumes and soil impacts exceeding most conservative screening levels - Some uncertainty concerning if the injections would reach all intended areas - May require supplemental injections to meet remedial action goals within the estimated restoration time frame at downgradient Port property boundary, but this is less of a concern when compared to Alternative 3	- Small negative balance of environmental impact due to carbon dioxide emissions from implementation. The small carbon footprint due to raw material consumption (fuels and electricity) and greenhouse gas emissions (heavy equipment) is not as sustainable as Alternatives 1 and 2 but is more sustainable than Alternative 4.	Moderate to high. $8,300,000

Description of Regenesis In Situ Technologies:

PetroCleanze PetroCleanze is a customized formulation of the widely used RegenOx ISCO technology. This two-part reagent contains purposefully enhanced, detergent-like properties that significantly increase the desorption rates of hydrocarbons bound in saturated soils. Once the hydrocarbons are liberated into the dissolved phase, they are more readily available for removal using a range of enhanced recovery techniques. PetroCleanze is designed to increase the viability and efficiency of enhanced recovery techniques such as dual-phase extraction, vacuum-enhanced extraction, and pump-and-treat systems.

PetroFix PetroFix is an activated carbon-based reagent that uses 1- to 2-micrometer activated carbon in a water-based suspension along with added nutrients. The nutrients—either sulfate or sulfite, and nitrate—are to stimulate bioremediation on and around the activated carbon. PetroFix is easily injectable and can last for multiple years as a long as there are terminal electron acceptors for contamination biodegradation.

PersulfOx PersulfOx is an advanced ISCO reagent that destroys organic contaminants found in groundwater and soil through abiotic chemical oxidation reactions. It is an all-in-one product with a built-in catalyst that activates the sodium persulfate component and generates contaminant-destroying free radicals without the costly and potentially hazardous addition of a separate activator. The patented catalyst enhances the oxidative destruction of both petroleum hydrocarbons and chlorinated contaminants in the subsurface.

RegenOx RegenOx is a calcium percarbonate-based reagent that is engineered to be safe near utilities. The downside to RegenOx is its short-lived and highly reactive nature. RegenOx is typically injected over a minimum of three events separated by 2 to 4 weeks each. Oxygen (O_2) is often rapidly produced when RegenOx contacts organic matter or contamination. Should the suggested volume not be possible, the percentage of the RegenOx mixture may be increased or point spacing may be tightened. RegenOx is a metal- and utility-safe product.

Note:

1 Detailed cost estimate information for each alternative is provided in Appendix I.

Abbreviations:

bgs Below ground surface
CUL Cleanup level
ft Feet
GW Groundwater
ISCO In situ chemical oxidation
LNAPL Light non-aqueous phase liquid
LTM Long-term monitoring
MNA Monitored natural attenuation
MTCA Model Toxic Controls Act
O&M Operations and maintenance
ORC Oxygen release compound
REL Remediation Levels
ROW Right-of-way
SMP Soil Management Plan
sq. ft. Square feet
WSDOT Washington State Department of Transportation

Table 3
Applicable or Relevant and Appropriate Requirements for the Selected Cleanup Action

Standard, Requirement, or Limitation [(1)]	Description
Location-Specific ARARs [(2)]	
Longview Critical Areas Regulations (17.10 LMC)	This chapter establishes regulations pertaining to the development within or adjacent to critical areas, which include areas that provide a variety of biological and physical functions that benefit the City of Longview and its residents, including water quality protection, fish and wildlife habitat, and food chain support.
Endangered Species Act (16 USC 1531 et seq.; 50 CFR 17, 225, and 402) Migratory Bird Treaty Act (16 USC 742a-j and 40 CFR 10.13)	These statutes regulate the incidental take of migratory birds (such as Canada geese) and other endangered species by facility operations and construction activities.
Native American Graves Protection and Repatriation Act (25 USC 3001 through 3013; 43 CFR 10) Washington's Indian Graves and Records Law (RCW 27.44)	These statutes prohibit the destruction or removal of Native American cultural items and require written notification of inadvertent discovery to the appropriate agencies and Native American tribe. These programs are applicable to the remedial action if cultural items are found. The activities must cease in the area of the discovery; a reasonable effort must be made to protect the items discovered; and notice must be provided.
Archaeological Resources Protection Act (16 USC 470aa et seq.; 43 CFR 7)	This program sets forth requirements that are triggered when archaeological resources are discovered. These requirements only apply if archaeological items are discovered during implementation of the selected remedy.
National Historic Preservation Act (16 USC 470 et seq.; 36 CFR parts 60, 63, and 800)	This program sets forth a national policy of historic preservation and provides a process that must be followed to ensure that impacts of actions on archaeological, historic, and other cultural resources are protected.
Action-Specific ARARs [(3)]	
State Environmental Policy Act (RCW 43.21C, WAC 197-11)	Establishes the state's policy for protection and preservation of the natural environment. Applies to cleanup actions conducted under MTCA.
Resource Conservation and Recovery Act (42 USC 6921-6949a; 40 CFR Part 268, Subtitles C and D)	Establishes requirements for the identification, handling, and disposal of hazardous and nonhazardous waste.
Dangerous Waste Regulations (RCW 70.105; WAC 173-303)	Establishes regulations that are the state equivalent of RCRA requirements for determining whether a solid waste is a state dangerous waste. This regulation also provides requirements for the management of dangerous wastes.
Solid Waste Disposal Act (42 USC Sec. 6901-6992; 40 CFR 257-258) Federal Land Disposal Requirements (40 CFR 268)	Protects health and the environment and promotes conservation of valuable material and energy resources. The Solid Waste Disposal Act establishes a framework for regulation of solid waste disposal. Federal land disposal requirements promulgated under the authority of the Solid Waste Disposal Act set minimum safety requirements for landfills including limitations on storage and land disposal for hazardous substances.
Department of Transportation Hazardous Materials Regulations (49 CFR 172)	Regulates the safe and secure transportation of hazardous materials, including documentation and handling requirements for shipping.
Washington Minimum Functional Standards for Solid Waste Handling (WAC 173-304)	Sets minimum functional standards for the proper handling of all solid waste materials originating from residences, commercial, agricultural, and industrial operations, as well as other sources.
Washington Solid Waste Handling Standards (RCW 70.95 and WAC 173-350)	Establishes minimum standards for handling and disposal of solid waste. Solid waste includes wastes that are likely to be generated as a result of site remediation, including contaminated soils, construction and demolition wastes, and garbage.
Noise Control Act of 1974 (RCW 70.107, WAC 173-60)	Establishes maximum noise levels.
Washington State Underground Injection Control Program (WAC 173-218)	Washington is authorized under CWA Sections 144 through 147 to administer a statewide Underground Injection Control program to protect groundwater by regulating the discharge of fluid from injection wells including temporary injection points.
Occupational Safety and Health Act 29 USC 651 (29 CFR 1910)	Applies to onsite workers involved in cleanup implementation.
City of Longview Streets and Sidewalks Code (12.30 LMC)	The City of Longview code regulates construction use and permitting in the right of way.
National Electrical Code (NFPA 70) and the Seattle Electric Code Supplement for Class 1 Division 2 Environments.	Establishes restrictions and guidelines for temporary and/or permanent electrical installations.
City of Longview Water Utilities Code (15.10 LMC)	Establishes rules for hydrant water use.
City of Longview Sewage Disposal Code (15.26 LMC)	Regulates discharge of liquid waste to the wastewater (sanitary sewer) system.

Table 3
Applicable or Relevant and Appropriate Requirements for the Selected Cleanup Action

Standard, Requirement, or Limitation [1]	Description
Action-Specific ARARs [3] (cont.)	
Federal, State, and Local Air Quality Protection Programs State Implementation of Ambient Air Quality Standards NWAPA Ambient and Emission Standards Regional Standards for Fugitive Dust Emissions Toxic Air Pollutants	Regulations promulgated under the federal Clean Air Act (42 USC 7401) and the Washington State Clean Air Act (RCW 70.94) govern the release of airborne contaminants from point and nonpoint sources. Local air pollution control authorities such as PSCAA have also set forth regulations for implementing these air quality requirements. These requirements may be applicable to the Site for the purposes of demolition or dust control. PSCAA requires notification prior to demolition of any building with asbestos-containing material. Both PSCAA (under Regulation III) and WAC 173-460 establish ambient source impact levels for arsenic.
Chemical-Specific ARARs [4]	
Model Toxics Control Act (WAC 173-340)	Establishes Washington administrative processes and standards to identify, investigate, and clean up facilities where hazardous substances are located.
Drinking Water Standards—State MCLs (WAC 246-290-310)	Establishes standards for contaminant levels in drinking water for water system purveyors.
Water Quality Standards for Groundwaters of the State of Washington (WAC 173-200)	Implements the Water Pollution Control Act and the Water Resources Act of 1971 (90.54 RCW).
National Recommended Water Quality Standards (40 CFR 131) Washington Maximum Contaminant Levels (WAC 246-290-310)	These water quality standards define the water quality goals of the water body by designating the use or uses to be made of the water and by setting criteria necessary to protect the uses. States adopt water quality standards from 40 CFR 131 to protect public health or welfare, enhance the quality of water, and serve the purposes of the CWA. Washington water quality standards (MCLs) are presented in WAC.

Notes:

1 Projects conducted under a consent decree are exempt from the procedural requirements of most state and local permits (RCW 70.105D.090); however, the remedial actions must still comply with the substantive requirements of the exempt permits. Therefore, for exempt permits, the statutory review timelines do not apply; actual timelines will be based on negotiations with the jurisdiction or agency, which should result in an expedited review timeline.

2 Location-specific ARARs are requirements that are applicable to the specific area where the Site is located, and can restrict the performance of activities, including cleanup actions, solely because they occur in specific locations.

3 Action-specific ARARs are requirements that are applicable to certain types of activities that occur or technologies that are used during the implementation of cleanup actions.

4 Chemical-specific ARARs are applicable to the types of contaminants present at the Site. The cleanup of contaminated media at the Site must meet the CULs developed under MTCA; these CULs are considered chemical-specific ARARs.

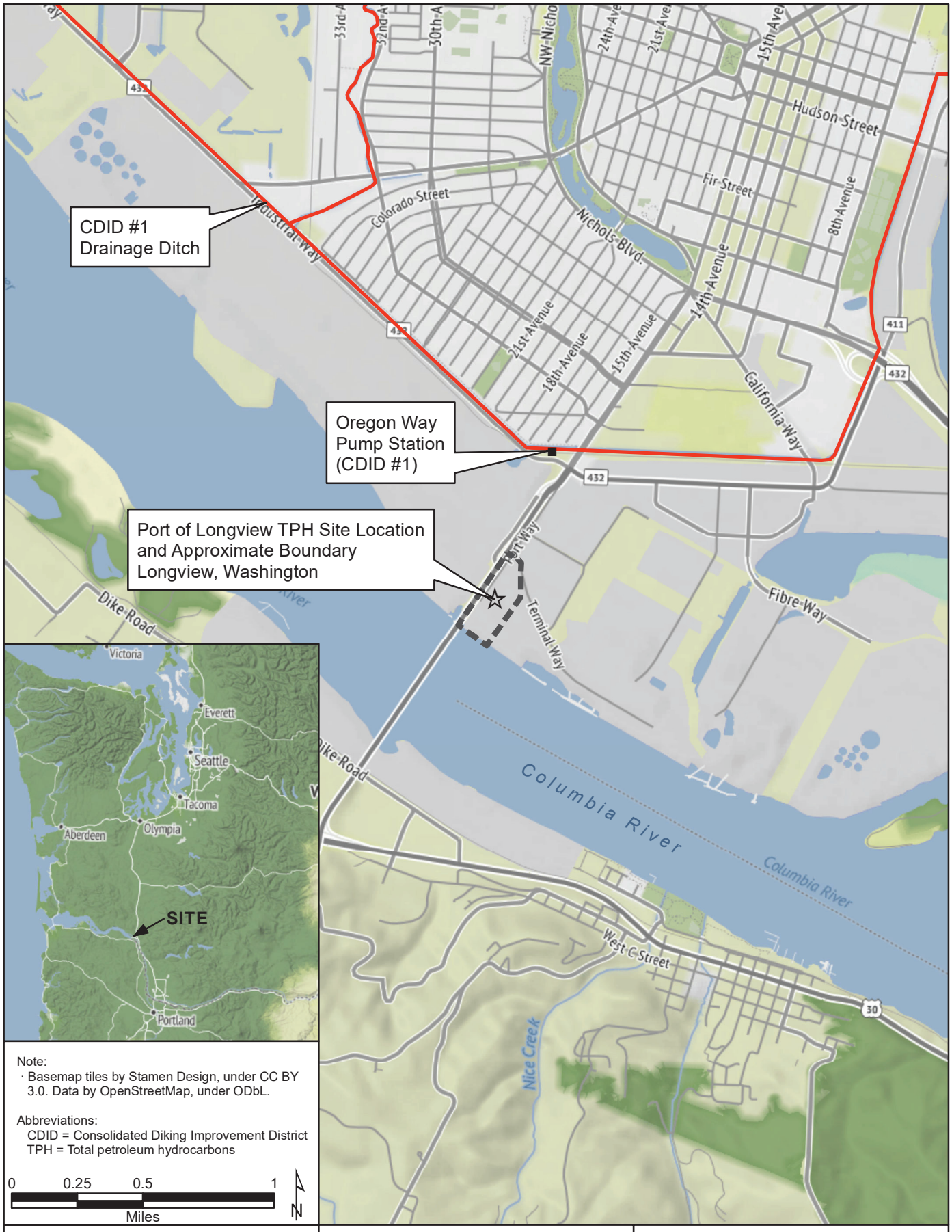
Abbreviations:

ARAR	Applicable or Relevant and Appropriate Requirement
CFR	Code of Federal Regulations
CUL	Cleanup level
CWA	Clean Water Act
MCL	Maximum Contaminant Level
MTCA	Model Toxics Control Act
NPDES	National Pollutant Discharge Elimination System
NWAPA	Northwest Air Pollution Authority
PSCAA	Puget Sound Clean Air Agency
RCRA	Resource Conservation and Recovery Act
RCW	Revised Code of Washington
USC	U.S. Code
WAC	Washington Administrative Code

Cleanup Action Plan

Port of Longview TPH Site

Figures



Cleanup Action Plan
Port of Longview TPH Site
Longview, Washington

Figure 1
Vicinity Map

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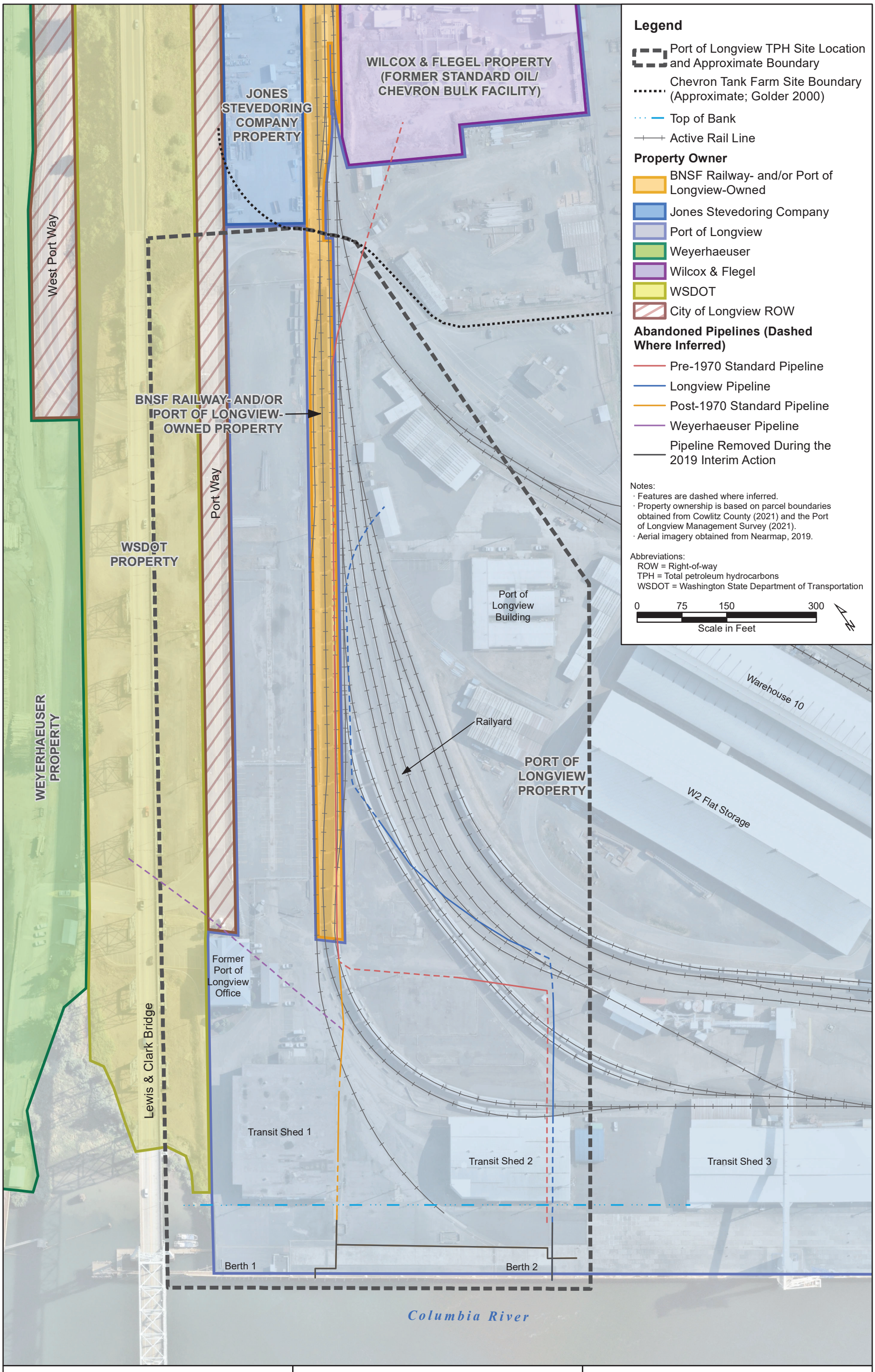

Cleanup Action Plan
Port of Longview TPH Site
Longview, Washington

Figure 2
Site Map and Vicinity Property Ownership

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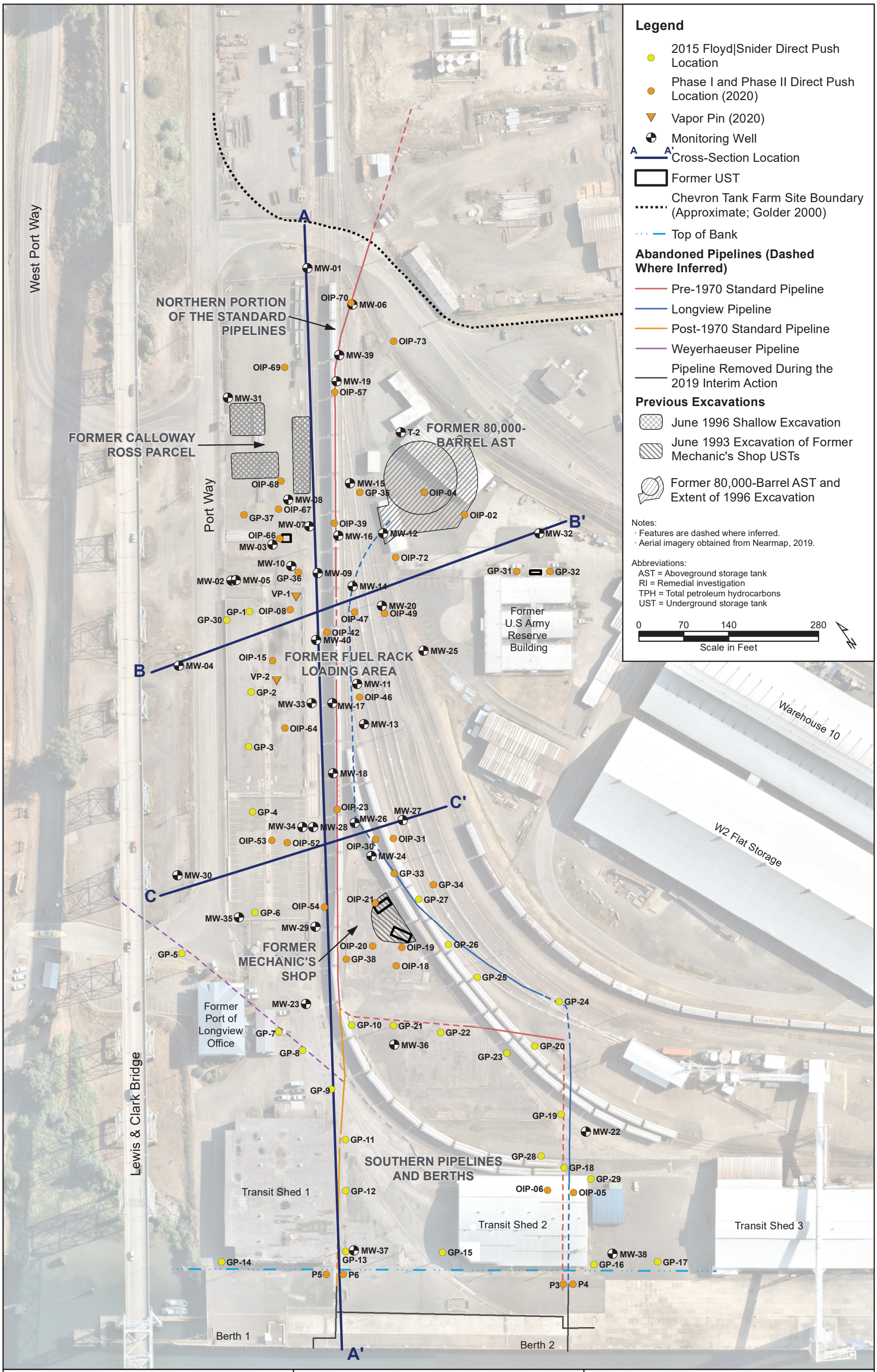

Cleanup Action Plan
Port of Longview TPH Site
Longview, Washington

Figure 3
RI Soil Sample and Monitoring Well Locations

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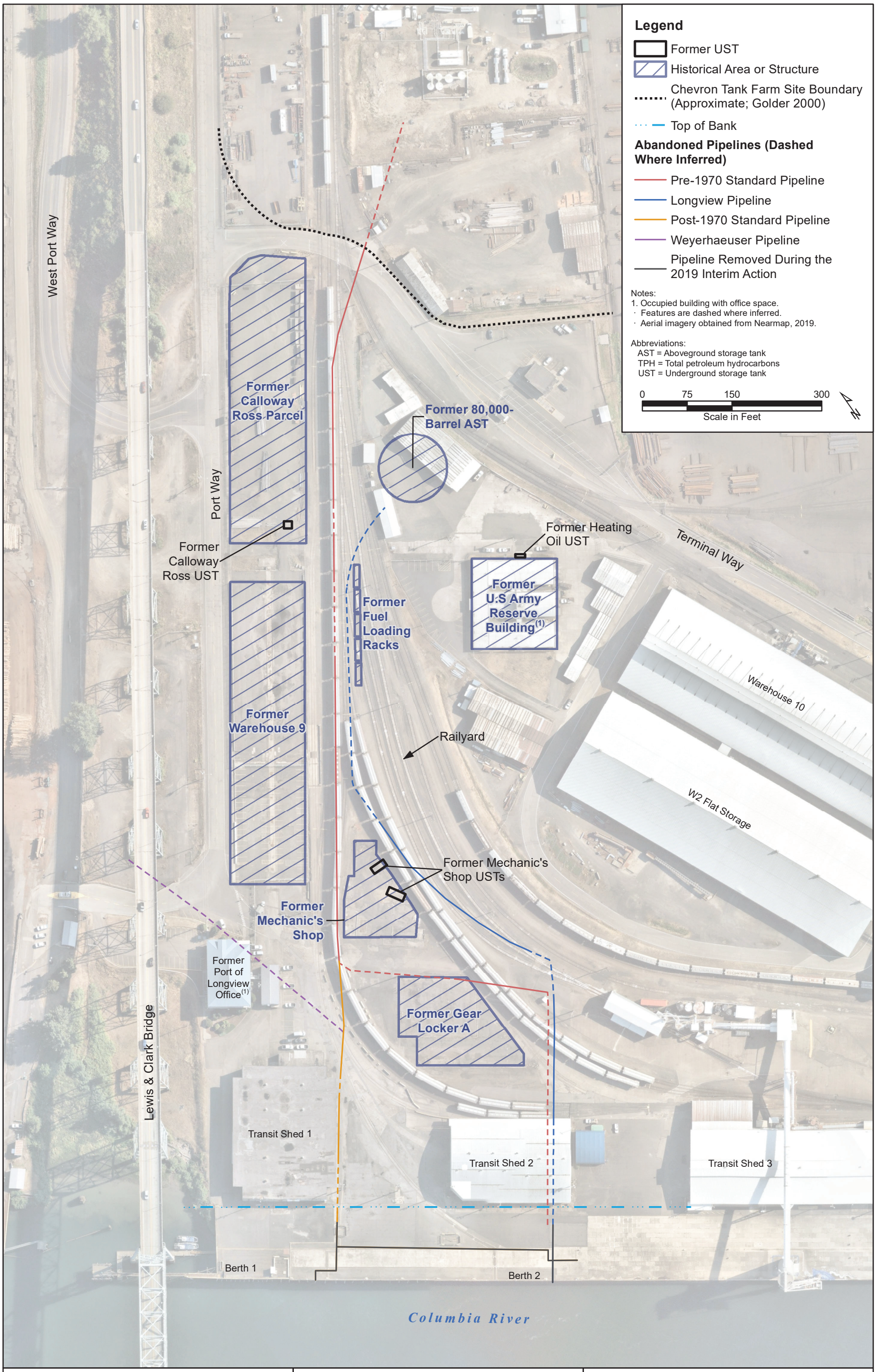

	Cleanup Action Plan **Port of Longview TPH Site** **Longview, Washington**	Figure 4 Historical Site Features

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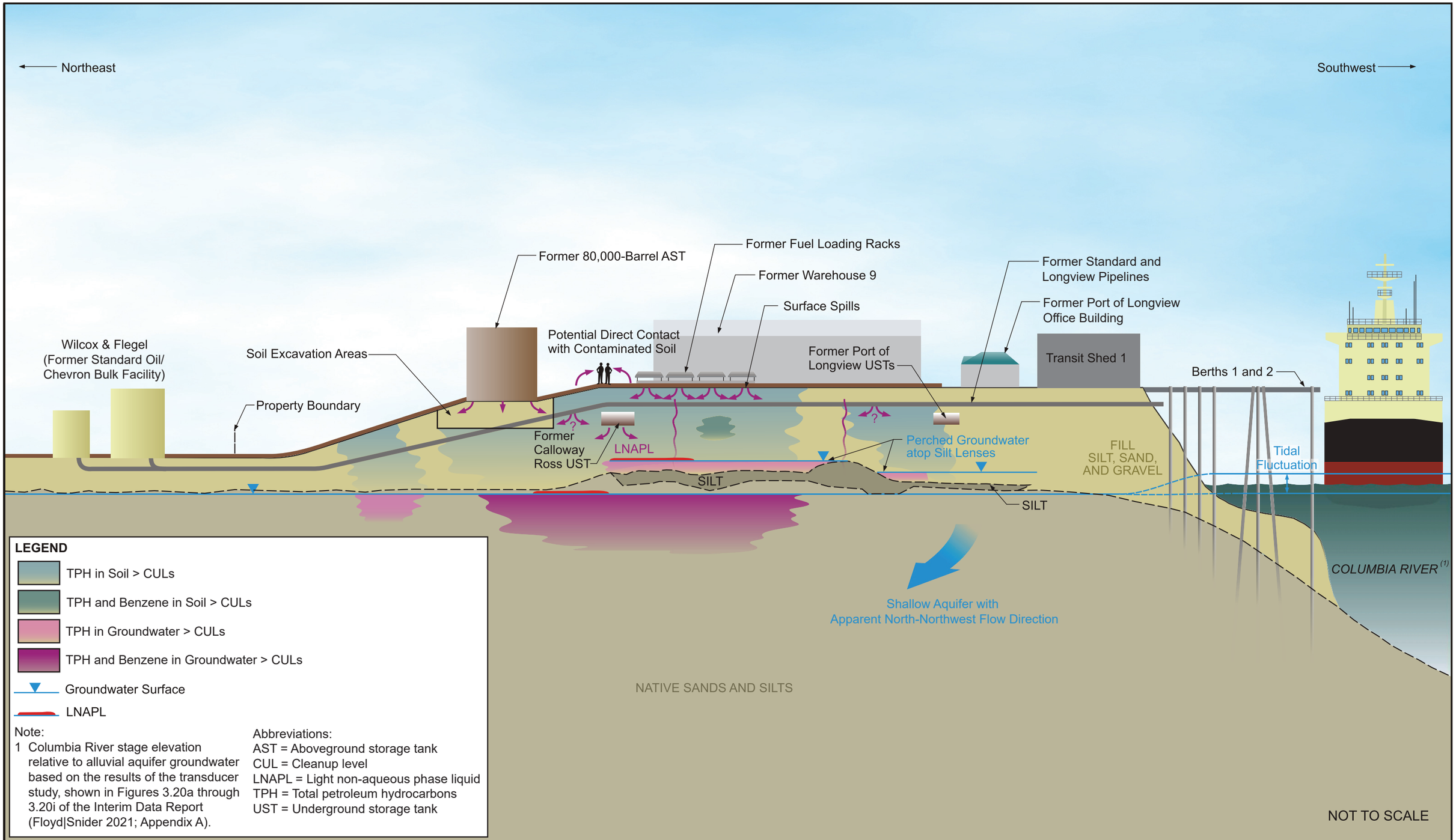

Cleanup Action Plan
Port of Longview TPH Site
Longview, Washington

Figure 5
Conceptual Site Model

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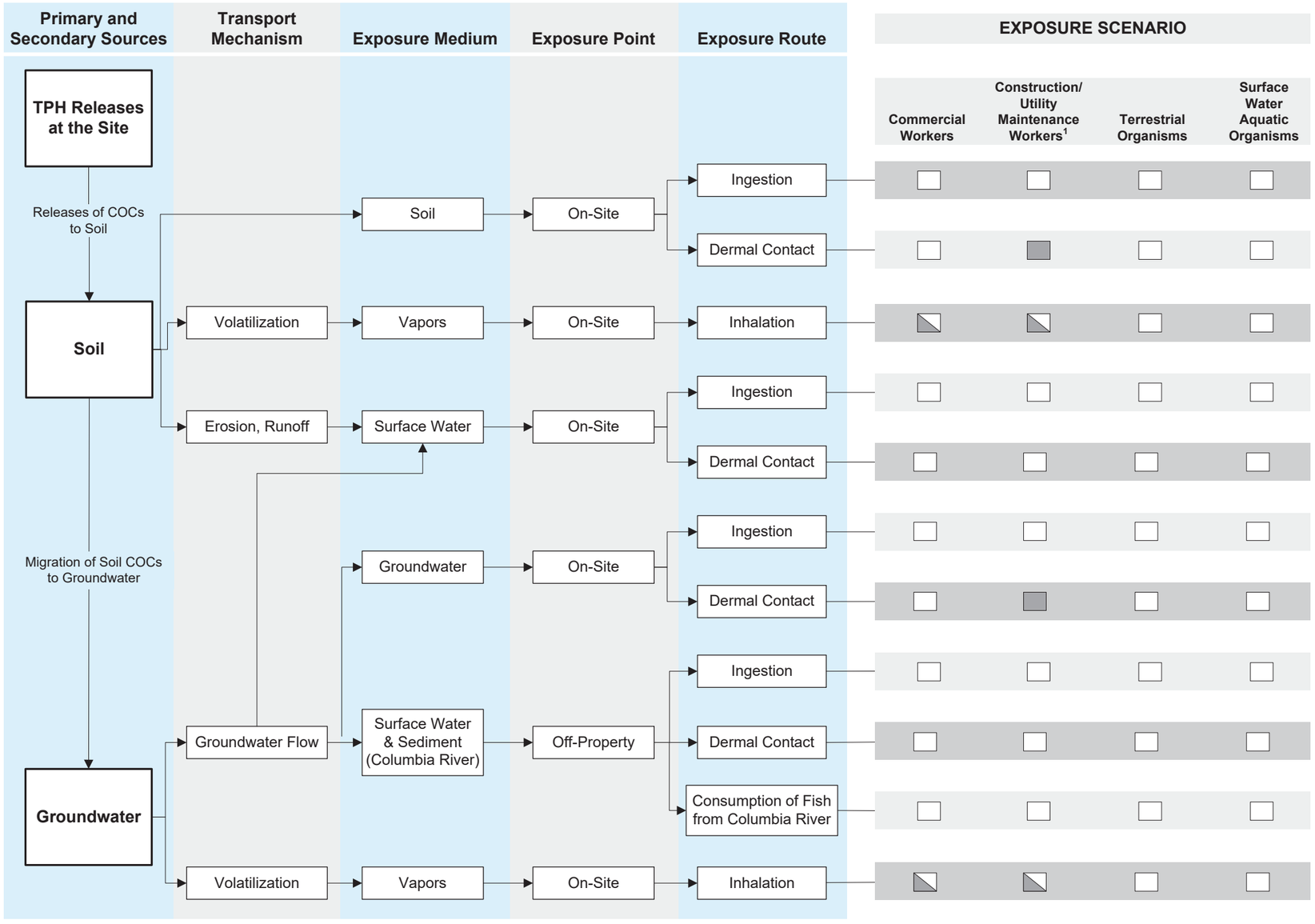


These exposure scenarios are reasonable maximum exposure scenarios. Therefore, these scenarios are considered protective of other similar exposure scenarios. All potential receptors are on-site, unless otherwise noted.

1 Shallow soil contamination is limited to areas adjacent to or within the rail lines with a potential for workers conducting utility repairs or rail maintenance to come into direct contact with impacted soil at concentrations exceeding the site-specific direct contact Model Toxics Control Act Method C cleanup level. This will be addressed with a soil management plan as a component of the remedial action.

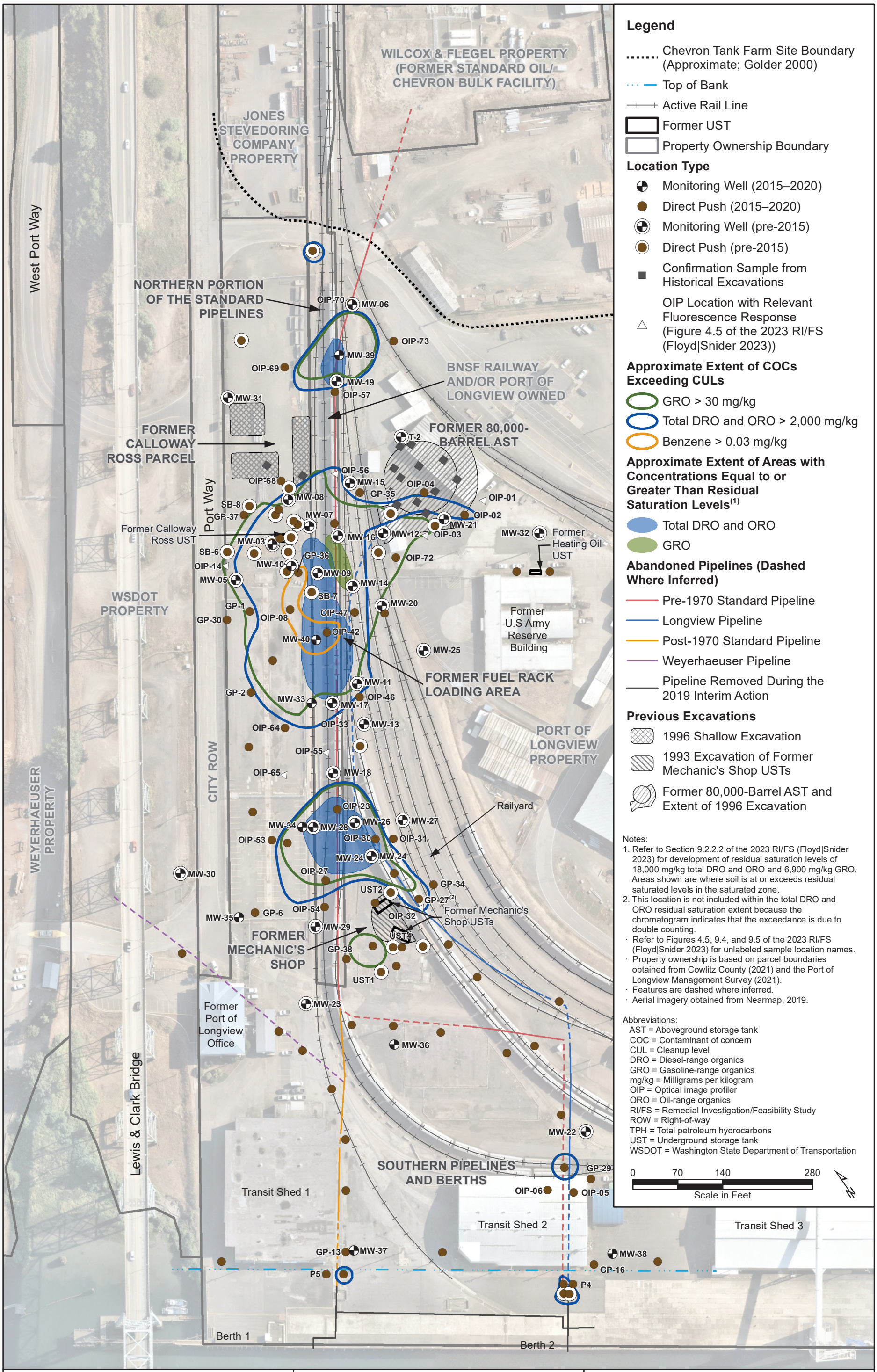
Legend

- Complete Exposure Pathway
- Potentially Complete Exposure Pathway
- Incomplete Exposure Pathway

Cleanup Action Plan
Port of Longview TPH Site
Longview, Washington

Figure 6
Conceptual Site Model of
Potential Exposure Scenarios and Receptors

10/27/2022



Legend

- Chevron Tank Farm Site Boundary (Approximate; Golder 2000)
- Top of Bank
- Active Rail Line
- Former UST
- Property Ownership Boundary

Location Type

- Monitoring Well (2015–2020)
- Direct Push (2015–2020)
- Monitoring Well (pre-2015)
- Direct Push (pre-2015)
- Confirmation Sample from Historical Excavations
- OIP Location with Relevant Fluorescence Response (Figure 4.5 of the 2023 RI/FS (Floyd|Snider 2023))

Approximate Extent of COCs Exceeding CULs

- GRO > 30 mg/kg
- Total DRO and ORO > 2,000 mg/kg
- Benzene > 0.03 mg/kg

Approximate Extent of Areas with Concentrations Equal to or Greater Than Residual Saturation Levels(1)

- Total DRO and ORO
- GRO

Abandoned Pipelines (Dashed Where Inferred)

- Pre-1970 Standard Pipeline
- Longview Pipeline
- Post-1970 Standard Pipeline
- Weyerhaeuser Pipeline
- Pipeline Removed During the 2019 Interim Action

Previous Excavations

- 1996 Shallow Excavation
- 1993 Excavation of Former Mechanic's Shop USTs
- Former 80,000-Barrel AST and Extent of 1996 Excavation

Notes:
1. Refer to Section 9.2.2.2 of the 2023 RI/FS (Floyd|Snider 2023) for development of residual saturation levels of 18,000 mg/kg total DRO and ORO and 6,900 mg/kg GRO. Areas shown are where soil is at or exceeds residual saturated levels in the saturated zone.
2. This location is not included within the total DRO and ORO residual saturation extent because the chromatogram indicates that the exceedance is due to double counting.

- Refer to Figures 4.5, 9.4, and 9.5 of the 2023 RI/FS (Floyd|Snider 2023) for unlabeled sample location names.
- Property ownership is based on parcel boundaries obtained from Cowlitz County (2021) and the Port of Longview Management Survey (2021).
- Features are dashed where inferred.
- Aerial imagery obtained from Nearmap, 2019.

Abbreviations:
AST = Aboveground storage tank
COC = Contaminant of concern
CUL = Cleanup level
DRO = Diesel-range organics
GRO = Gasoline-range organics
mg/kg = Milligrams per kilogram
OIP = Optical image profiler
ORO = Oil-range organics
RI/FS = Remedial Investigation/Feasibility Study
ROW = Right-of-way
TPH = Total petroleum hydrocarbons
UST = Underground storage tank
WSDOT = Washington State Department of Transportation

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Port of Longview TPH Site
Longview, Washington

Figure 7
Extent of COCs in Soil Exceeding CULs

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4/30/2024

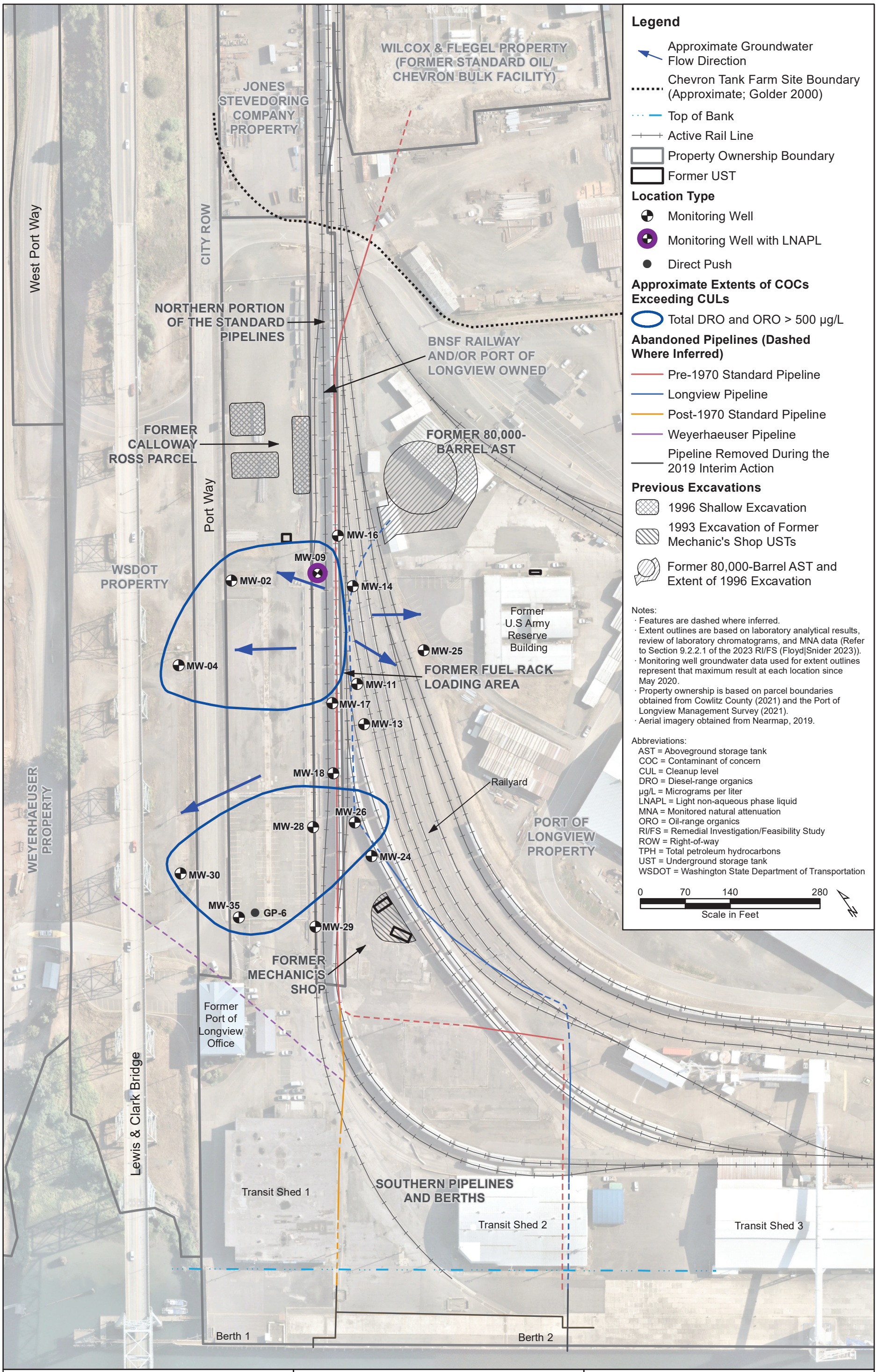

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Figure 8
Extent of COCs in Perched Zone Groundwater Exceeding CULs

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4/30/2024

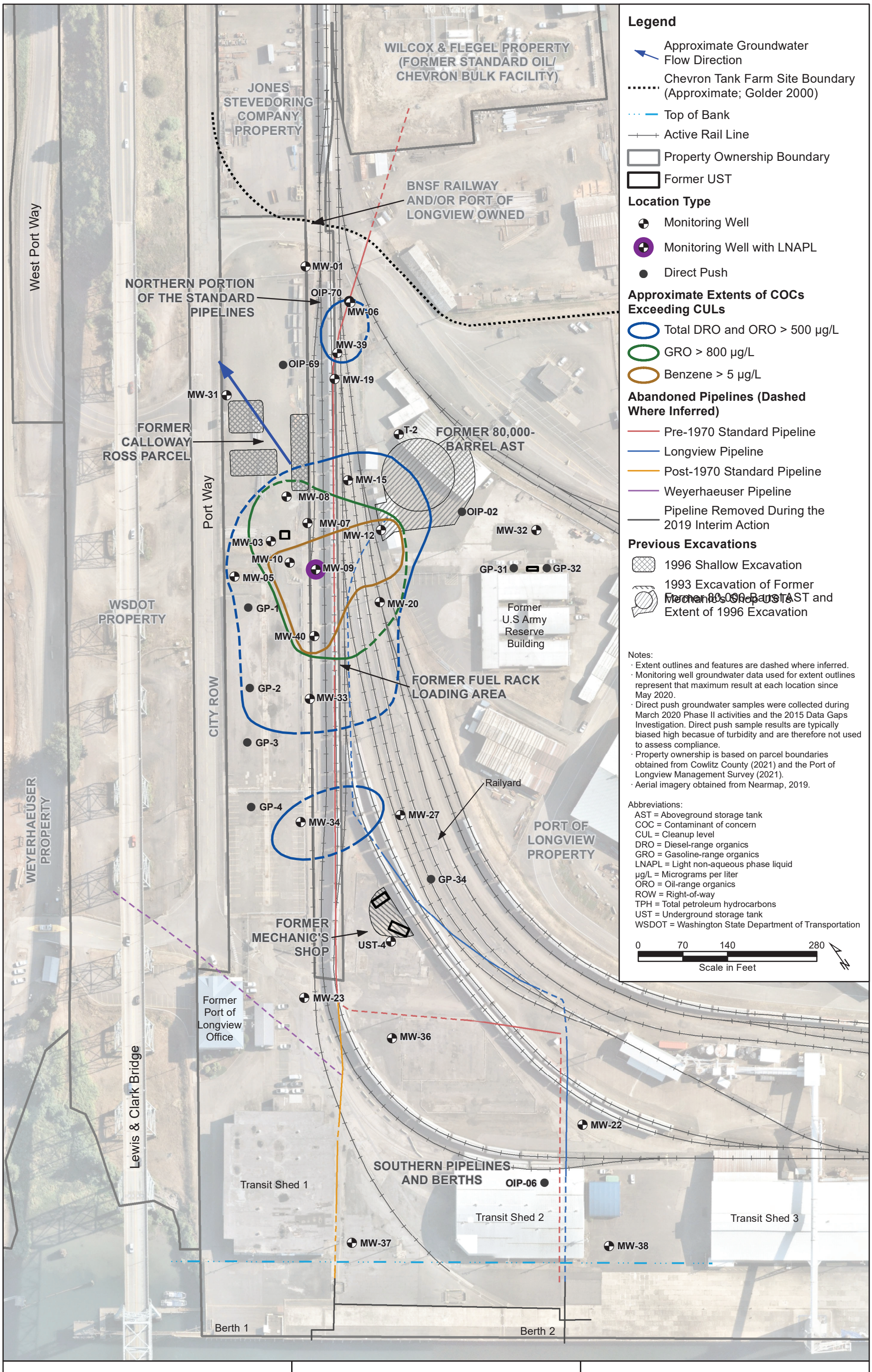

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Figure 9
Extent of COCs in Alluvial Aquifer Groundwater Exceeding CULs

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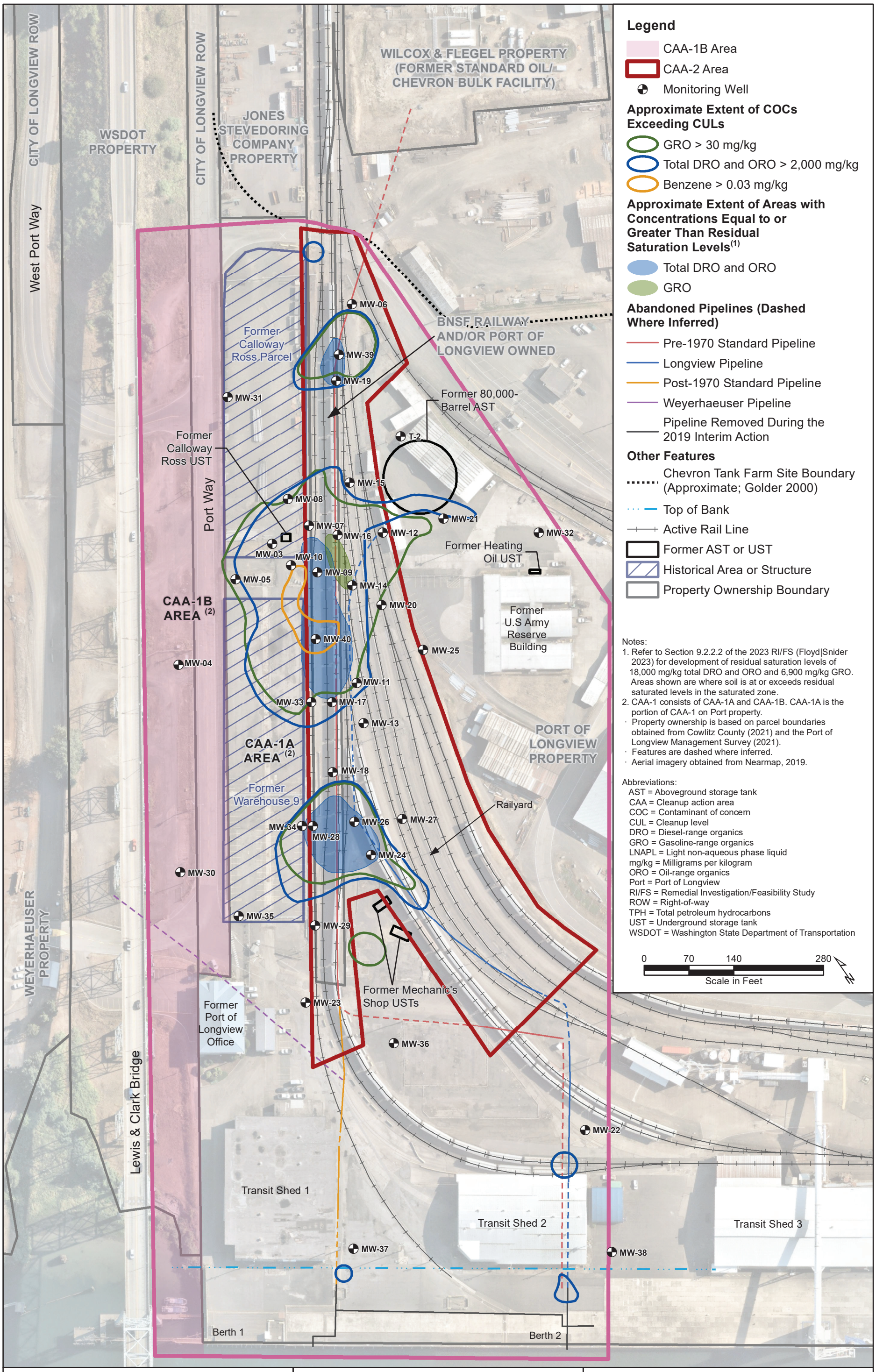
4/30/2024



Legend

- CAA-1B Area
- CAA-2 Area
- Monitoring Well

Approximate Extent of COCs Exceeding CULs

- GRO > 30 mg/kg
- Total DRO and ORO > 2,000 mg/kg
- Benzene > 0.03 mg/kg

Approximate Extent of Areas with Concentrations Equal to or Greater Than Residual Saturation Levels(1)

- Total DRO and ORO
- GRO

Abandoned Pipelines (Dashed Where Inferred)

- Pre-1970 Standard Pipeline
- Longview Pipeline
- Post-1970 Standard Pipeline
- Weyerhaeuser Pipeline
- Pipeline Removed During the 2019 Interim Action

Other Features

- Chevron Tank Farm Site Boundary (Approximate; Golder 2000)
- Top of Bank
- Active Rail Line
- Former AST or UST
- Historical Area or Structure
- Property Ownership Boundary

Notes:
1. Refer to Section 9.2.2.2 of the 2023 RI/FS (Floyd|Snider 2023) for development of residual saturation levels of 18,000 mg/kg total DRO and ORO and 6,900 mg/kg GRO. Areas shown are where soil is at or exceeds residual saturated levels in the saturated zone.
2. CAA-1 consists of CAA-1A and CAA-1B. CAA-1A is the portion of CAA-1 on Port property.

· Property ownership is based on parcel boundaries obtained from Cowlitz County (2021) and the Port of Longview Management Survey (2021).
· Features are dashed where inferred.
· Aerial imagery obtained from Nearmap, 2019.

Abbreviations:
AST = Aboveground storage tank
CAA = Cleanup action area
COC = Contaminant of concern
CUL = Cleanup level
DRO = Diesel-range organics
GRO = Gasoline-range organics
LNAPL = Light non-aqueous phase liquid
mg/kg = Milligrams per kilogram
ORO = Oil-range organics
Port = Port of Longview
RI/FS = Remedial Investigation/Feasibility Study
ROW = Right-of-way
TPH = Total petroleum hydrocarbons
UST = Underground storage tank
WSDOT = Washington State Department of Transportation

0 70 140 280
Scale in Feet

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Figure 10
Cleanup Action Areas

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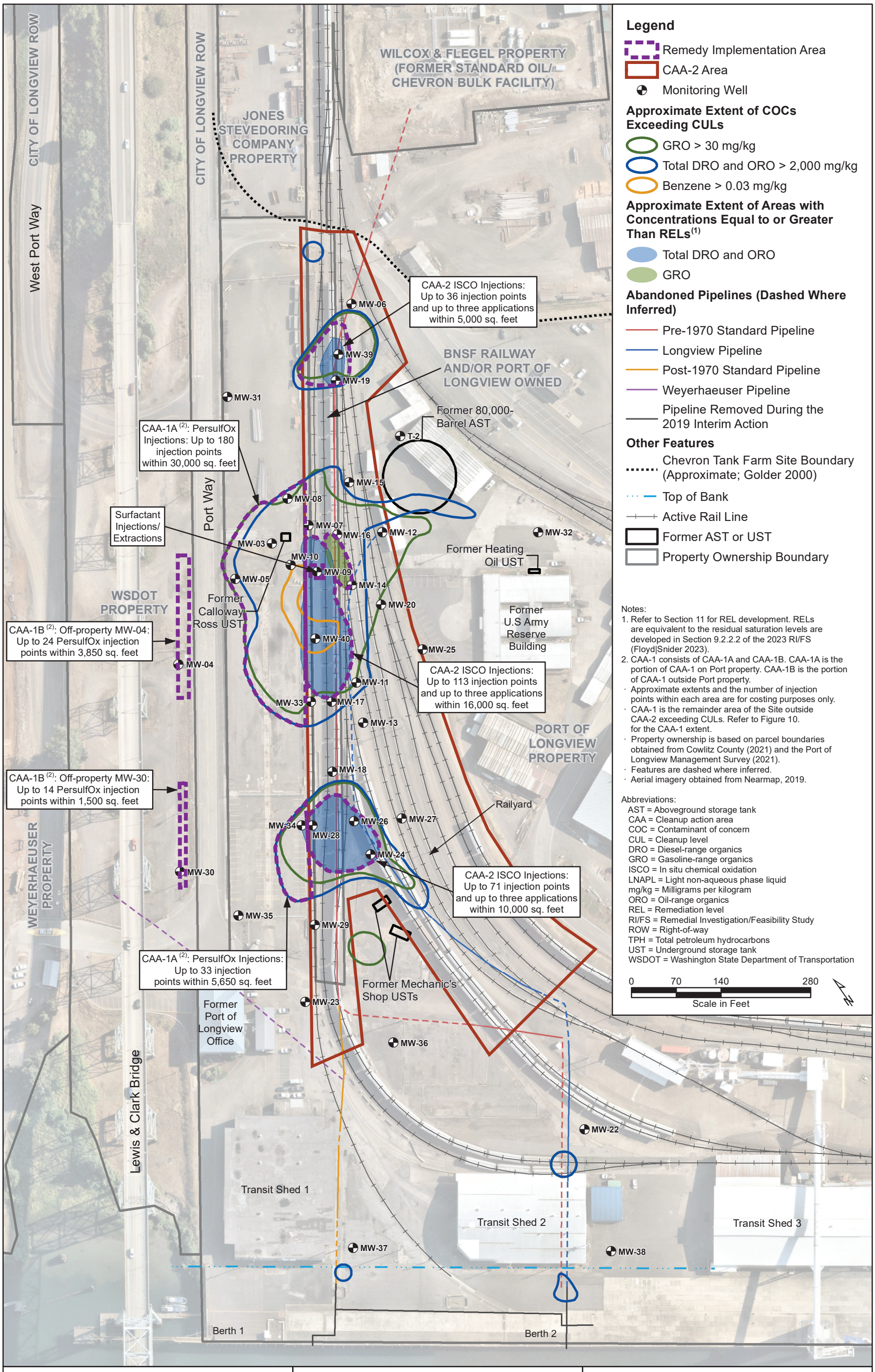

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Figure 11
Selected Cleanup Action

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