Draft Interim Action Work Plan

Former Arkema Manufacturing Site

Agreed Order No. DE 5668
Facility/Site ID No. 1220
Cleanup Site ID No. 3405

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List of Acronyms

Acronym	Explanation
AO	Agreed Order
APS	Applied Professional Services
ARARs	Applicable or Relevant and Appropriate Requirements
ASTM	ASTM International (formerly American Society for Testing and Materials)
BAZ	Biologically Active Zone
bgs	Below Ground Surface
CAP	Cleanup Action Plan
Caustic	Sodium Hydroxide
CB/NT	Commencement Bay/Nearshore Tideflats
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CF	Chloroform
CL	Cleanup Level
cm/sec	Centimeters per Second
CMP	Compliance Monitoring Plan
COC	Constituent of Concern
CPOC	Conditional Point of Compliance
CSBC	Crushed Surfacing Base Course
CSM	Conceptual Site Model
DOF	Dalton, Olmsted, & Fuglevand, Inc.
Ecology	Washington State Department of Ecology
Eh	Activity of Electrons
FS	Feasibility Study
GGBFS	Ground Granular Blast Furnace Slag
GW	Groundwater
GWM	GW Monitoring
HASP	Health and Safety Plan
IA	Interim Action
IAWP	IA Work Plan
IDP	Inadvertent Discovery Plan
JARPA	Joint Aquatic Resource Permit Application

Acronym	Explanation
mg/kg	Milligrams per Kilogram
mg/L	Milligrams per Liter
MH	Inorganic Silt with High Liquid Limit
ML	Inorganic Silt with Low Liquid Limit
MLLW	Mean Lower Low Water
MTCA	Model Toxics Control Act
MW	Monitoring Well
NBA	North Boundary Area
NPDES	National Pollutant Discharge Elimination System
NSDS	Nylon-Screen Diffusion Sampler
NWSA	Northwest Seaport Alliance
OU	Operable Unit
PCE	Tetrachloroethylene
PDI	Pre-Design Investigation
PDI Work Plan	Barrier Wall PDI Work Plan
Penite	Sodium Arsenite
pH	Activity of Hydrogen Ions
PIONEER	PIONEER Technologies Corporation
POC	Point of Compliance
Port	Port of Tacoma
PPS	Pushpoint Sampler
P&T	Pump & Treat
PW	Pore Water
QC	Quality Control
RI	Remedial Investigation
RTC	Response to Comments
Site	Former Arkema Manufacturing Site
SL	Screening Level
SLR	Sea Level Rise
SMMP	Soil and Materials Management Plan
SPW	Sheet Pile Wall
SW	Surface Water

Acronym	Explanation
SWL	Static Water Level
TCE	Trichloroethylene
TCLP	Toxicity Characteristic Leaching Procedure
ug/L	Micrograms per Liter
USG	United States Gypsum
VC	Vinyl Chloride
VOC	Volatile Organic Compound
WAC	Washington Administrative Code
WMP	Waste Management Plan

SECTION 1: INTRODUCTION

1.1 Purpose

The purpose of this Interim Action (IA) Work Plan (IAWP) for the Former Arkema Manufacturing Site (Site) is to:

- Provide context for conducting an IA on the 2901 Taylor Way portion of the Site that consists of:
  - Installing a barrier wall around the arsenic groundwater (GW) plume core;
  - Installing an impervious cap over the barrier wall area (i.e., the barrier wall containment area cap); and
  - Installing a permanent asphalt cap in an approximately 24-acre area.
- Summarize the conceptual IA, the IA goals, and the Model Toxics Control Act (MTCA) rationale for conducting this proposed IA;
- Summarize the preliminary design (i.e., 30% design) for the IA;[1]
- Outline the path forward for completing the IA design and implementing the IA; and
- Enable Ecology to facilitate public participation and tribal engagement for this IAWP.

This IA only partially addresses the cleanup of this Site (in accordance with WAC 173-340-430(1)), and is not intended to serve as the final MTCA cleanup action. In other words, the final cleanup action for the Site has not been determined, and additional remedial actions will be necessary beyond the IA remedial components described in this IAWP. Furthermore, the IA will not preclude the final cleanup action as discussed in Section 3.4.3.

1.2 Site Location and Boundary

The relevant Arkema properties are an approximately 45-acre portion of a 64.8-acre parcel (tax parcel number 0321351053) located at 2901 Taylor Way and a 3.2-acre parcel (tax parcel number 0321362056) located at 2920 Taylor Way in Tacoma, Washington.[2,3] The combined Arkema property boundary is shown on Figure 1.[4] The Site boundary is the same as the Arkema property boundary with the following exceptions (see Figure 2):

- The North Boundary Area (NBA) cleanup action is being conducted as part of Agreed Order (AO) No. DE 3405 for the United States Gypsum (USG) Taylor Way Plant Site (Ecology 2021a; PIONEER Technologies Corporation [PIONEER] 2023b; Ecology 2024a).

[1] Following IAWP approval, the 90% plans and specifications for the barrier wall (including the barrier wall containment area cap) and asphalt cap will be developed in accordance with Washington Administrative Code (WAC) 173-340-400(4)(b) and provided to the Washington State Department of Ecology (Ecology) for review.

[2] The Port of Tacoma (Port) purchased these properties from Arkema in May 2007. The 3.2-acre Wypenn property is located at 2920 Taylor Way.

[3] The term Arkema refers to Arkema and all other companies that operated the former manufacturing facility (i.e., Tacoma Electrochemical Company, Pennsylvania Salt Manufacturing Company of Washington, Pennwalt Corporation, Atochem Inc., Elf Atochem North America, and Atofina Inc.).

[4] The Taylor Way right-of-way is not part of the Arkema property.

- A triangular-shaped portion of the Intermediate Aquifer on the adjacent Arkema Mound site is part of the Site boundary (Dalton, Olmsted, & Fuglevand, Inc. [DOF] 2013).

Key areas and features within or adjacent to the Arkema property referenced in this IAWP include (see Figure 2):

- The former Penite Manufacturing Building and the associated former aboveground storage tanks;
- The former Penite Pits #1 and #2 and the associated former conveyance to Penite Pit #2;
- The former pond and former dry pit located west of Penite Pit #2;
- The former Caustic Manufacturing Area;
- The former Taylor Lake area surface impoundments;
- The main arsenic plume;
- The existing sheet pile wall (SPW);
- The alignment of the proposed barrier wall;
- The former Central Manufacturing Area;
- The USG Taylor Way Plant Site which includes the NBA;
- Taylor Way; and
- The Wypenn property.

Consistent with Port practices, all references to direction (i.e., north, south, east, and west) in this document are in relation to "site north," which is parallel to the Hylebos Waterway shoreline (see Figure 2). "Site north" is approximately 45 degrees west (counterclockwise) from true north. Both "site north" and true north are shown on the figures for this document.

1.3 Property Plans

The upland 2901 Taylor Way portion of the Site has been vacant and unused since the Port purchased the property from Arkema in 2007. This portion of the Site is currently covered with vegetation, crushed rock, and numerous former infrastructure features at or below ground surface.

Since the upland 2901 Taylor Way portion of the Site is designated for Port Maritime and Industrial use in City of Tacoma zoning and the Port's Land Use Plan (Port 2014), the Port is now preparing plans to put this portion of the Site back into productive use. The Port's vision for the 2901 Taylor Way portion of the Site is the Hylebos Barge Terminal Concept. This concept includes removing/addressing the numerous former infrastructure features at or below ground surface, installing an upland working surface that is suitable for Port Maritime and Industrial Use across the 2901 Taylor Way portion of the Site, and enabling marine dependent use for this property (e.g., upgrading the existing dock). A conceptual schematic of the Hylebos Barge Terminal Concept is shown on Figure 3.

Following completion of this IA, the conceptual future work phases for implementing the Hylebos Barge Terminal Concept include:

- Completing the active remediation components of the NBA final cleanup action (i.e., excavation-related activities) and installing an asphalt cap across the northernmost upland portion of the 2901 Taylor Way property.[5]
- Completing the Site feasibility study (FS), the Site cleanup action plan (CAP), and implementing the Site CAP.
- Placing additional fill and installing an asphalt cap over the top of the barrier wall containment area cap installed during this IA to complete a comprehensive asphalt cap across the entire upland 2901 Taylor Way portion of the Site.
- Upgrading the existing dock.

These post-IA phases are mentioned in this IAWP to provide a holistic and integrated future land use vision of IA and post-IA grading, capping, and stormwater management components on this property.

1.4 Work Plan Organization

The remainder of this IAWP is organized as follows:

- Section 2: Summary of Background Information
- Section 3: IA Summary, Goals, and Rationale
- Section 4: Preliminary (30%) IA Design
- Section 5: IA Path Forward
- Section 6: References

[5] The NBA final cleanup action (i.e., excavation-related activities) will be conducted pursuant to a pending new AO for the USG Taylor Way Plant Site.

SECTION 2: SUMMARY OF BACKGROUND INFORMATION

A summary of the Site background information most pertinent to this IAWP is presented in this section. Since the IA is being conducted to (1) further reduce arsenic GW transport from the main arsenic plume towards the Hylebos Waterway, and (2) decrease infiltration and GW transport of arsenic and other constituents of concern (COCs) at the Site, this section is focused on background information related to those topics. For a more comprehensive presentation of Site background information, refer to the Remedial Investigation (RI) Report (DOF 2013), FS Data Gap Investigation Report (PIONEER 2019), and the draft FS Report (PIONEER 2021a).

2.1 Topography and Drainage

The Site is relatively flat, with the shoreline sloping to the Hylebos Waterway. Numerous former infrastructure features (e.g., building foundations, rail alignments, paved areas, piping systems) from the manufacturing operations remain at or below ground surface throughout much of the upland portion of the Site. Except for the shoreline, current topographic elevations for the upland portion of the Site generally range between +15 feet and +20 feet mean lower low water (MLLW; see Figure 4).[6] The current upland elevation adjacent to the top of the shoreline is typically +17 to +19 feet MLLW.

When the former manufacturing facility was operating, stormwater runoff was not considered a significant contaminant transport pathway (Ecology 1993). None of the stormwater infrastructure from the former manufacturing facility remains. Currently, virtually all stormwater infiltrates to Site soil.

2.2 Geology

The regional geology is dominated by Quaternary ice age glacial deposits. In general, regional glacial deposits include sand and gravel outwash and low permeability glacial till deposits containing clay and silt.

The Site is located within the tideflats of the Puyallup River delta. The pre-development tideflats generally consisted of alternating layers of lower permeability silt/clay and sandy deposits. Sediment dredged from Commencement Bay and its tributaries, as well as other fill material, were used to raise the land elevation during the industrial development of the tideflats.

The relevant lithologic units at the Site, from shallowest to deepest, include the following:

- **Fill**: The fill unit consists primarily of dredge sand and imported fill.
- **Upper Silt**: The upper silt unit consists primarily of clayey silt to fine sandy silt, with fibrous organic material associated with former tideflat vegetation at the top of the unit.

[6] A few isolated upland locations have slightly higher or slightly lower elevations. For instance, a small area around the former treatment building of the former arsenic GW pump-and-treat (P&T) system (i.e., near the southwestern corner of the proposed barrier wall) has a current elevation of 22 feet MLLW.

- **Intermediate Sand**: The intermediate sand unit consists primarily of native fine to medium sand with shell fragments and silt interbeds.
- **Lower Silt**: The lower silt unit consists primarily of clayey silt to fine sandy silt.
- **Lower Sand**: The lower sand unit primarily consists of fine to medium sand with silt interbeds.

2.3 Hydrogeology

The relevant hydrostratigraphic units at the Site, from shallowest to deepest, correspond to a specific lithologic unit and include the following:

- **Upper Aquifer**: The Upper Aquifer is the saturated portion of the fill unit. The thickness of the Upper Aquifer is typically on the order of ten to 15 feet. Upper Aquifer GW is typically encountered at depths of less than six feet below ground surface (bgs) in most portions of the Site, and is encountered at depths less than two feet bgs within portions of the main arsenic plume.
- **First Aquitard**: The First Aquitard is the upper silt unit. The thickness of the First Aquitard is typically five to ten feet. However, thin and/or leaky portions of the First Aquitard have been identified in many portions of the Site (see Figure 5).[7] Some of these thin/leaky First Aquitard areas are likely key preferential pathways for the past and current transport of arsenic from the Upper Aquifer to the Intermediate Aquifer.
- **Intermediate Aquifer**: The Intermediate Aquifer is the intermediate sand unit. The thickness of the Intermediate Aquifer is typically on the order of ten to 20 feet.
- **Second Aquitard**: The Second Aquitard is the lower silt unit. The thickness of the Second Aquitard is typically five to ten feet.
- **Deep Aquifer**: The Deep Aquifer is the lower sand unit. The thickness of the Deep Aquifer appears to be at least 20 feet thick.

In general, for the main arsenic plume, GW in all three aquifers flows east towards the Hylebos Waterway. There may also be localized GW flow in the Upper Aquifer and Intermediate Aquifer towards the north or south near the SPW. The Intermediate Aquifer and the Deep Aquifer are tidally influenced and can experience flow reversals. Tidal fluctuations and mixing occur seaward of the SPW in the Upper Aquifer but are less noticeable in the Upper Aquifer landward of the SPW. Vertical gradients between the Upper and Intermediate Aquifers are downward during both low and high tidal stages, while downward and/or upward vertical gradients are present between the Intermediate and Deep Aquifers depending on tidal stage and location (DOF 2013). Vertical gradients between the Intermediate and Deep Aquifers in monitoring well (MW) pairs between the former Penite Pits and the SPW are downward.

2.4 Overview of Operational History

The Site was used as a chemical manufacturing facility from 1927 to 1997, and the majority of the manufacturing operations were performed in the former Central Manufacturing Area (see Figure 2). The

[7] In some borings, the First Aquitard appears to be absent (or very thin).

products that were manufactured in that area included chlorine, sodium hydroxide (caustic), sodium chlorate, hydrochloric acid, and sodium arsenite (Penite). Penite, the product most relevant to this IAWP, was manufactured between circa 1944 and the early 1970s. The remaining chlorine-based manufacturing facility operations ceased in 1997, at which time the manufacturing facilities were dismantled and removed from the Site. The Port removed all remaining aboveground structures in 2008.

2.5 Overview of Regulatory Context

This MTCA Site is currently being addressed pursuant to AO No. DE 5668 between the Port and Ecology, which became effective on July 25, 2011. The MTCA RI Report was approved in 2013 (DOF 2013; Ecology 2013), and a draft FS Report was submitted to Ecology in April 2021 (PIONEER 2021a).[8] FS-related and IA preparation activities conducted since April 2021 are summarized in Section 2.11. This IA will be conducted in accordance with an amendment to the AO.

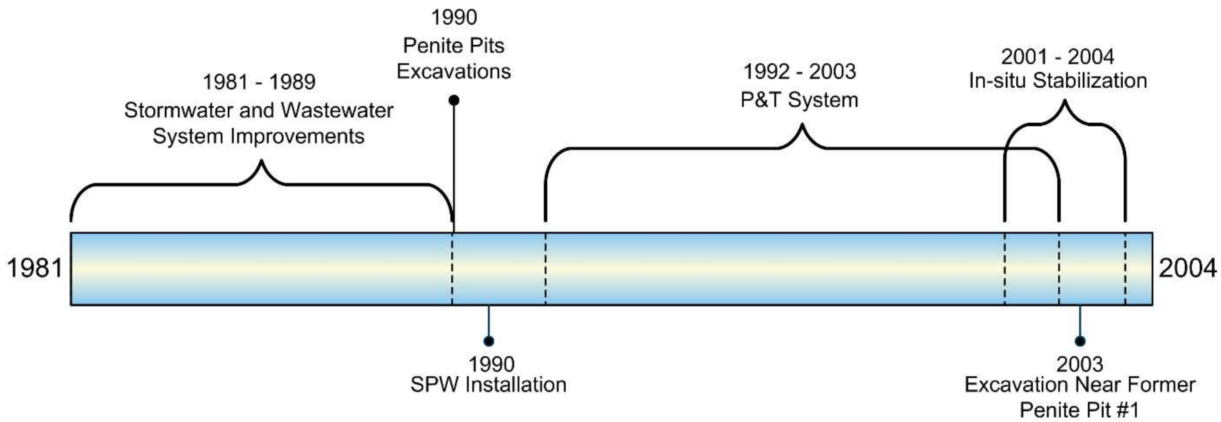
Prior to the 2011 AO, many important remedial actions were previously completed as summarized in the next section pursuant to (1) a 1987 Clean Water Act Consent Decree between Arkema and Ecology, and (2) the Head of the Hylebos cleanup for the Commencement Bay/Nearshore Tideflats (CB/NT) site. The Site is part of the larger CB/NT Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) site, and sediment dredging and shoreline capping actions were completed under CERCLA. The Site is one of many source areas included within Operable Unit (OU) 05 of the CB/NT site. Ecology is the lead agency for OU 05 source control actions, with United States Environmental Protection Agency coordination and oversight.

2.6 Overview of Completed Remedial Actions

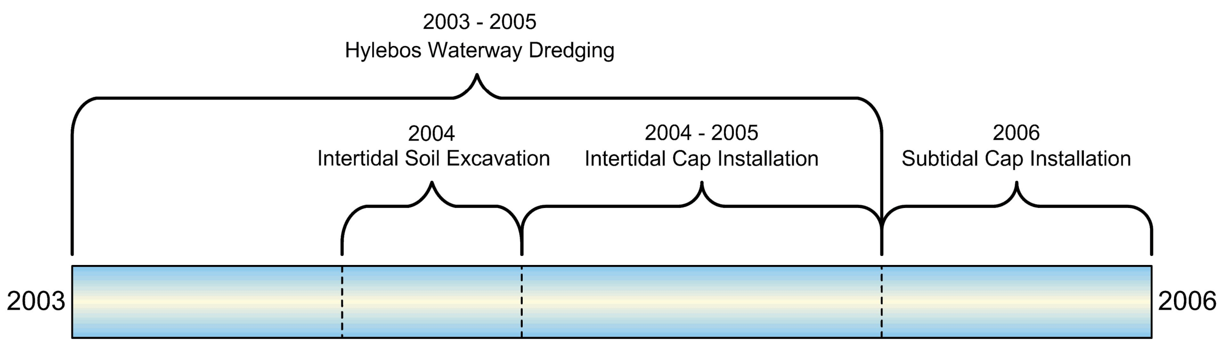
A substantial number of cleanup activities have been completed for the Site pursuant to the Clean Water Act, CERCLA, and MTCA. Approximately $16 million dollars have been spent through February 2021 to investigate and evaluate the Site, and approximately $66 million dollars have been spent through February 2021 to cleanup the Site (Groff Murphy Trachtenberg & Everard, PLLC 2006; DOF 2011; PIONEER 2016; 2021 personal correspondence with DOF and the Port). Completed remedial actions include improving previous stormwater and wastewater systems, removing soil and sediment, installing soil and sediment caps, installing an SPW, installing and operating a P&T system for the main arsenic plume, conducting in-situ stabilization for the main arsenic plume, remediating volatile organic compound (VOC) source areas, and completing remediation for miscellaneous other releases.

A timeline of the most important completed remedial actions within the plume core of the main arsenic plume are presented in the following graphic.

[8] In addition, an Ecology-approved FS Data Gap Investigation Work Plan was prepared in 2017, a variety of FS Data Gap Investigation activities were conducted in 2017 and 2018, and an Ecology-approved FS Data Gap Investigation Report was prepared in 2019 (PIONEER 2017, 2019; Ecology 2017, 2019).



A timeline of the most important completed remedial actions along the shoreline and within the Hylebos Waterway (on the seaward side of the main arsenic plume) are presented in the following graphic.



2.7 Definition of Arsenic Plume Terms

To facilitate clear communication about arsenic in GW at the Site, the following terms are used for the purposes of this IAWP:

- Main arsenic plume: The main arsenic plume is conceptually defined as the plan-view area encompassed by the 2017 Upper Aquifer dissolved arsenic isoconcentration contour of 500 micrograms per liter (ug/L), areas downgradient of this contour, and associated areas with activity of hydrogen ions (pH) levels exceeding nine (see Figure 2). The main arsenic plume includes GW within this plan-view area in the Upper, Intermediate, and Deep Aquifers.
- Source Area: The source area for the main arsenic plume is generally defined as the area proximate to the known and potential Penite manufacturing features shown on Figure 2.
- Plume core: The plume core for the main arsenic plume is loosely defined as the areas where historical and/or 2017 arsenic concentrations in MWs exceeded 50,000 ug/L.
- GW: GW is defined in WAC 173-340-200 as "water in a saturated zone or stratum beneath the surface of land or below a surface water."
- Pore water (PW): PW is defined as the subset of GW that is located within the 0 - 10 centimeter biologically active zone (BAZ) used for the CB/NT site (DOF 2011).

- Surface water (SW): SW is defined in WAC 173-340-200 as “lakes, rivers, ponds, streams, inland waters, salt waters, and all other surface waters and water courses within the state of Washington or under the jurisdiction of the state of Washington.”

2.8 Summary of the Main Arsenic Plume CSM

A summary of the current conceptual site model (CSM) for the main arsenic plume is presented in this section. The CSM includes conceptual site fate and transport elements and a conceptual site exposure model. Additional details about CSM components are included in the FS Data Gap Investigation Report (PIONEER 2019). The CSM will continue to be updated as new information is obtained.

Key conceptual fate and transport elements are:

- Former Penite Pits #1 and #2 were/are primary arsenic sources and sludge-like material with extremely high arsenic soil concentrations was encountered in a soil boring advanced within the former Penite Pit #2 footprint in 2018. Based on April 2024 Response to Comments (RTC) Data Gaps Investigation results, it is suspected that a relatively small amount of Penite waste may have been placed in the former pond west of former Penite Pits #1 and #2.
- Although the former Penite Manufacturing Building, the former aboveground storage tanks, the former conveyance to Penite Pit #2, and/or the former dry pit (west of former Penite Pit #2) may have contributed to past arsenic releases, these features do not appear to be current sources based on existing arsenic soil data.[9,10]
- GW transport of arsenic in the main arsenic plume from the source area towards the Hylebos Waterway was historically due east consistent with the predominant GW flow direction.
- The completed remedial actions dramatically decreased arsenic concentrations within the main arsenic plume (see PIONEER 2019), and altered the distribution of arsenic and GW transport within the main arsenic plume.[11] For instance, arsenic soil and GW concentrations were decreased in key areas via source area excavations and operation of the arsenic P&T system, and in-situ stabilization preferentially transferred arsenic in GW to soil within the areas where in-situ stabilization was performed. Another example is the SPW decreased arsenic GW transport to the Hylebos Waterway, and increased vertical GW transport from the Upper Aquifer to the Intermediate Aquifer as well as northerly and southerly GW transport towards the SPW wings.

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[9] Approximately 185 cubic yards of soil immediately northwest of former Penite Pit #1 was excavated and disposed of off-site in 2003 to address elevated arsenic soil concentrations at that location (ERM 2003). The elevated arsenic soil concentrations in that excavation may have been caused by a historical release from the former aboveground storage tanks and/or the former conveyance to Penite Pit #2.

[10] Although an elevated arsenic soil concentration was present in the top of the First Aquitard in a 2024 boring immediately west of the former conveyance to Penite Pit #2, the relatively low arsenic in shallower soil samples from that boring suggest that the elevated First Aquitard result is attributable to a different nearby source (e.g., former Penite Pit #1).

[11] The nature and extent of arsenic in GW has changed over time in response to prior remedial actions. For instance, the portion of the main arsenic plume at and immediately downgradient of former Penite Pit #1 was arguably the most contaminated portion of the historical main arsenic plume (e.g., MW 6E1-1, which is located immediately downgradient of former Penite Pit #1, had the highest arsenic GW concentration ever measured at the Site [3,670,000 ug/L] and repeatedly had dissolved arsenic concentrations exceeding 1,000,000 ug/L up through 1993). However, the success of completed remediation actions within and downgradient of former Penite Pit #1 has substantially decreased arsenic concentrations in that portion of the current plume (which makes other portions of the current plume appear more prominent). Thus, one needs to consider the full body of data as well as the timing and locations of completed remedial actions when evaluating current data.

- Recent arsenic soil and GW concentrations suggest that the predominant current arsenic GW transport direction (following the completed remedial actions) is generally northeasterly from former Penite Pits #1 and #2 towards the vicinity of the Intermediate Aquifer vertical shoreline MW 124+00-2.
- Thin and/or leaky portions of the First Aquitard are present in key portions of the main arsenic plume (see Figure 5). The nature and distribution of these thin/leaky First Aquitard locations are based on the pre-fill depositional environment associated with small rivulets in the tideflats that were tributaries to Hylebos Creek (e.g., see RI Figure 3-8). A similar tideflats depositional environment with many rivulet tributaries can be seen today in the Nisqually Delta. The thin/leaky First Aquitard locations near/upgradient of 124+00-2 are preferential pathways that likely contribute to elevated dissolved arsenic concentrations at/near 124+00-2 and two 2017/2018 PW nylon-screen diffusion sampler (NSDS) locations near/downgradient of 124+00-2.[12]
- Completed remedial actions (i.e., soil excavations and operation of the arsenic P&T system) have removed substantial arsenic mass from the historical main arsenic plume.
- The overwhelming majority of arsenic remaining within the current main arsenic plume resides within the upper portion of First Aquitard soil.
- The majority of arsenic within the main arsenic plume is either precipitated or co-precipitated with highly stable minerals or co-precipitated with metal oxides.
- Elevated pH levels within the northern and southern portions of the main arsenic plume (see Figures 6-13 and 6-14 in PIONEER 2019) limit opportunities for sorption and cause reducing conditions (e.g., activity of electrons [Eh] less than 0 volts) that hamper sorption and limit co-precipitation with metal oxides in these areas.
- Although very high dissolved arsenic concentrations remain in portions of the Upper and Intermediate Aquifers, the main arsenic plume is stable or declining due to completed remedial actions and ongoing natural attenuation processes (see PIONEER 2019).
- The existing SPW, intertidal shoreline cap, and subtidal shoreline cap help attenuate arsenic concentrations in GW prior to discharge to SW.
- Highly favorable geochemical conditions for arsenic attenuation (i.e., precipitation or co-precipitated with highly stable minerals, co-precipitation with metal oxides, and sorption) are present near the shoreline due to mixing of marine SW with GW (e.g., highly oxidizing conditions [e.g., Eh greater than 0.2 V], neutral pH [e.g., between 6 and 8], high iron oxide concentrations [e.g., greater than 1,000 mg/kg], high conductivity values [e.g., greater than 15,000 uS/cm], and lower competitive anion concentrations; see Sections 5.2.2, 6.1, and 7.3 in PIONEER 2019).
- The mixing of SW within GW in the transition zone along the Site shoreline causes hydraulic tidal dispersion, which limits the amount of fresh GW discharged to SW (see Section 7.2 of PIONEER 2019).

The key exposure pathways for the purposes of this IAWP are those related to potential SW and sediment exposures:

[12] The exact cause(s) of elevated arsenic GW concentrations at, near, and downgradient of 124+00-2 have not been determined yet and continue to be studied as part of the ongoing RTC Data Gaps Investigation. However, it is currently suspected that preferential leakage through the SPW and thin/leaky First Aquitard locations near/upgradient of 124+00-2 are key contributors.

- Absorption by marine aquatic organisms
- Bioaccumulation by marine aquatic organisms
- Incidental ingestion and dermal contact with SW and sediment by recreators/fishers
- Consumption of marine aquatic organisms by recreators/fishers

Other complete and potentially complete exposure pathways relevant to the IAWP are:

- Incidental ingestion, dermal contact, and inhalation of particulates from surface soil by current and future remediation workers, current trespassers, and future industrial workers
- Incidental ingestion, dermal contact, and inhalation of particulates from subsurface soil by current and future remediation workers and utility workers
- Dermal contact with subsurface GW by current and future remediation workers and utility workers utility workers

2.9 Summary of Current GW Conditions

2.9.1 Main Arsenic Plume

The current GW conditions for the main arsenic plume and GW transport elements from the CSM that are most salient for this IAWP were identified (see following bullets) and are shown on Figure 5.

- The 5,000 ug/L and 50,000 ug/L dissolved arsenic isoconcentration contours, which highlight the areas with the highest remaining concentrations at the Site (e.g., current plume core).
- Upper Aquifer Angled Shoreline MW and Intermediate Aquifer pushpoint sampler (PPS) locations with a current dissolved arsenic concentration exceeding the MTCA screening level (SL) for protection of aquatic organisms (36 ug/L). Upper Aquifer Angled Shoreline MWs and Intermediate Aquifer PPSs are one of several potential point of compliance (POC) options for the main arsenic plume.
- Upper Aquifer and Intermediate Aquifer PW NSDS locations with a current dissolved arsenic concentration exceeding the MTCA SL for protection of aquatic organisms (36 ug/L). PW NSDSs are one of several potential POC options for the main arsenic plume.
- Locations of known and potential Penite manufacturing features, which include the primary sources (i.e., former Penite Pits #1 and #2).
- Locations where the First Aquitard is thin or leaky.[13]
- Locations where pH currently exceed or equal 10.
- Locations where active arsenic remediation components have already been completed and remain intact (i.e., soil and sediment removals, soil and sediment caps, SPW).

The key locations seaward of the SPW that have particularly elevated dissolved arsenic GW and PW concentrations seaward of the SPW are (see Figure 5):

[13] Locations with a thin First Aquitard that were identified in borings advanced during the Barrier Wall Pre-Design Investigation (PDI) and Tasks #1A and #2A of the RTC Data Gaps Investigation were added to Figure 5.

- The 2017 and 2018 concentrations in 124+00-2 (on the order of 50,000 ug/L) were one to four orders of magnitude higher than concentrations in the other Intermediate Aquifer vertical shoreline MWs and the Upper Aquifer vertical shoreline MWs.[14]
- One Upper Aquifer Angled Shoreline MW (125+50-0) and three Intermediate Aquifer PPS locations (120+75-ST1, 123+25-ST1, and 128+50-ST1) exceeded 36 ug/L in 2017 or 2018.[15]
- One Upper Aquifer PW NSDS location (125+50-0-DS) and two Intermediate Aquifer PW NSDS locations (123+25-ST1-DS and 125+00-ST1-DS) exceeded 36 ug/L in 2017 or 2018.[16]
- One PW NSDS location exceeded 360 ug/L in 2017 or 2018 (550 ug/L in 123+25-ST1-DS).

2.9.2 Other GW Cleanup Level Exceedances

Although the potential for GW transport of arsenic in the main arsenic plume to cause unacceptable exposures in Hylebos Waterway SW and sediment is clearly and rightfully the preeminent concern for this Site, there are also other GW cleanup level (CL) exceedances throughout the Site. Dissolved arsenic GW concentrations exceeded the 8 ug/L GW CL in 51 of the 53 Upper Aquifer MWs located landward of the shoreline that were sampled in 2017 (see Figure 6 for the approximate area with dissolved arsenic concentrations greater than 8 ug/L). GW CL exceedances for the other seven GW COCs (i.e., dissolved copper, dissolved mercury, dissolved nickel, tetrachloroethylene [PCE], trichloroethylene [TCE], vinyl chloride [VC], and chloroform [CF]) are also scattered across the Site. The 2017 sampling locations where one or more of these seven other GW COCs exceeded the associated GW CL established in the draft FS Report (PIONEER 2021a) are shown on Figure 6.

2.10 GW POC Options

The GW POC will emerge from the FS process currently underway. Several GW POC options are potentially applicable to this Site based on MTCA regulations for the protection of potential SW receptors. The standard GW POC, which is defined in WAC 173-340-720(8)(b) as all GW across a site, is potentially applicable to all sites. MTCA regulations allow two general types of GW conditional POCs (CPOCs) that could be applied to a complex shoreline site such as this Site. Per WAC 173-340-720(8)(c), the first general CPOC option is "as close as practicable to the source of hazardous substances" but not exceeding the property boundary. Since this Site abuts SW, a second general CPOC option per WAC 173-340-720(8)(d)(i) if certain criteria are met is “within the surface water as close as technically possible to the point or points where ground water flows into the surface water.” As a result, the standard GW POC and the four following CPOC locations in the Upper and Intermediate Aquifers (see Figure 7) were evaluated as potential POCs in the April 2021 FS Report:

1. Upper Aquifer and Intermediate Aquifer vertical shoreline MWs

[14] The dissolved arsenic concentrations in the 124+00-2 samples collected during 2017 and 2018 were 39,000 ug/L and 76,000 ug/L, respectively.

[15] Dissolved arsenic concentrations in 125+50-0, 120+75-ST1, 123+25-ST1, and 128+50-ST1 ranged from 75 ug/L to 110 ug/L, 48 ug/L to 280 ug/L, 160 ug/L to 190 ug/L, and 3.1 ug/L to 70 ug/L, respectively.

[16] Dissolved arsenic concentrations in 125+50-0-DS and 125+00-ST1-DS ranged from 39 ug/L to 44 ug/L and 6.4 ug/L to 44 ug/L, respectively. 123+25-ST1-DS was only sampled in 2018 (with a dissolved arsenic concentration of 550 ug/L).

2. Upper Aquifer Angled Shoreline MWs (located approximately two feet landward of the SW interface) and Intermediate Aquifer PPS locations (which have a pump intake approximately one foot landward of the SW interface)
3. Upper Aquifer and Intermediate Aquifer PW NSDSs conservatively located at the bottom of the BAZ (a depth of approximately 10 centimeters)
4. SW samples collected as close as technically possible to where GW flows into SW

2.11 Summary of Activity Since April 2021 FS Report Submittal

Ecology provided comments for the April 2021 FS Report on August 25, 2021 (Ecology 2021b). In general, key Ecology concerns regarded (1) some context presented in the report, (2) some FS evaluations, and (3) additional data needed to support some FS evaluations and/or selection of a recommended cleanup action alternative. The Port, Ecology, and PIONEER met to discuss Ecology's August 25, 2021 comments and the associated data gaps on September 14, 2021. The Port submitted a draft RTC Data Gaps Investigation Work Plan and an accompanying RTC table (PIONEER 2022) to Ecology in 2022 to address Ecology's concerns and facilitate the collection of data necessary to revise the FS Report and support the selection of a recommended cleanup action alternative. The final RTC Data Gaps Investigation Work Plan, which also included PDI activities to support the design of the barrier wall, was approved in 2023 (PIONEER 2023a, Ecology 2023b). The non-PDI portion of the RTC Data Gaps Investigation is still underway and results from the ongoing investigation will be documented separately in the future (since these results are relevant for the revised FS report, but not the IA design).

As part of the response to Ecology's August 25, 2021 FS Report comments, the Port, Ecology, and PIONEER also met on October 13, 2021 to discuss potential MTCA IA options. Specifically, the Port proposed to conduct a MTCA IA that consisted of (1) installing a barrier wall around the arsenic plume core (i.e., remedial component APR-5A in the April 2021 FS Report), and (2) capping approximately 24 acres of the Site (PIONEER 2021b). As a result, the Port started the barrier wall design process, and DOF completed a Barrier Wall Basis of Design Report in March 2023 (DOF 2023b). Three key outcomes from that report were (1) the barrier wall alignment was slightly expanded to minimize the potential for encountering subsurface obstacles (e.g., building foundations), (2) vibratory beam installation was the recommended installation method for the barrier wall, and (3) PDI activities were identified to support the barrier wall design. Barrier wall PDI activities were conducted between October 2023 and August 2024 in accordance with the Barrier Wall PDI Work Plan (PDI Work Plan; Appendix A in the RTC Data Gaps Investigation Work Plan [PIONEER 2023a]). Key barrier wall PDI results are summarized in the next section. An evaluation of four IA alternatives for the 24-acre area was also conducted, and the recommended IA alternative was installing an asphalt cap over the 24-acre area (see Section 3.5).

2.12 Summary of Barrier Wall PDI Results

The PDI Work Plan identified various tasks to provide design inputs for the barrier wall. Items scoped within the PDI Work Plan included:

- Locating, identifying, and documenting utilities and other potential subsurface obstructions via surface geophysics and shallow trenching along the barrier wall alignment.
- Collecting one composite soil sample during shallow trenching along the barrier wall alignment, and analyzing that sample for total metals and toxicity characteristic leaching procedure (TCLP) metals to evaluate on-site reuse and off-site disposal options for soil excavated from the trench.
- Advancing 15 soil borings along the barrier wall alignment and collecting geotechnical data (e.g., standard penetration tests, gradation analyses, Atterberg Limits, triaxial tests, consolidation tests).
- Evaluating different slurry mix design options.
- Completing permeability and compatibility testing for one or more slurry mix design options.

Field implementation of the PDI Work Plan was completed in October 2023, and laboratory work continued until August 2024. Based on field conditions observed during the October 2023 fieldwork (i.e., surface and subsurface obstructions), several very minor adjustments to the barrier wall alignment were made; these adjustments are reflected on applicable figures included in this IAWP.

2.12.1 Utilities and Subsurface Obstructions

In accordance with the PDI Work Plan, a subsurface utility locating field effort along and proximate to the barrier wall alignment was conducted by Applied Professional Services (APS) on October 4, 2023. APS used (1) direct current resistivity, low-frequency electromagnetic induction (i.e., loop-loop methods), and very low frequency electromagnetic induction to identify conductible subsurface utilities, and (2) ground penetrating radar to identify non-conductible subsurface utilities and obstructions. APS also opened vaults and manholes to assist in the identification of utilities.[17] All potentially identified utilities were marked on the ground surface with paint for further assessment and identification during the following trenching activities.

In accordance with the PDI Work Plan, shallow trenching along the entire barrier wall alignment was performed by Clearcreek Contractors between October 9 and October 13, 2023. The trench excavation depths extended to 5 feet bgs or until a subsurface obstruction was encountered, whichever occurred first.[18] DOF personnel were on-site to document obstructions and conduit pathways crossing the barrier wall alignment. Each utility location was identified on both sides of the trench with a global positioning system to determine the utility orientation, and the characteristics of each utility (e.g., material type, depth, and size) were documented. In addition, a photo was taken of each subsurface structure encountered. The entire trench was backfilled by placing excavated soil back in the trench at original depths to the extent practicable and then compacting the backfilled soil by tamping with the excavator

[17] The vaults currently on the Site are associated with the former arsenic P&T system. These vaults contained tracer wire that facilitated locating other infrastructure related to the former P&T system. Manhole covers identified along the barrier wall alignment were observed to be abandoned with cementitious grout consisting of sand and Portland cement.

[18] Trench collapse was not observed and the vertical excavation sidewalls remained intact during excavation activities.

bucket.[19] Obstructions and conduit pathways encountered during trenching are shown in the 30% barrier wall plan set (see Section 4).

2.12.2 Trench Soil Sampling

In accordance with the PDI Work Plan, a composite soil sample of trench soil was collected and analyzed by Analytical Resources, LLC for total Resource Conservation and Recovery Act 8 metals and TCLP metals to evaluate on-site reuse and off-site disposal options for excavated soil generated during the IA that cannot be returned to the trench (due to trench volume limitations). Each discrete sampling location that contributed to the composite sample was collected from a depth of approximately 3 feet bgs using the excavator bucket.[20] All total metals concentrations (except arsenic) were less than current MTCA Method C soil direct contact CLs for industrial properties and all TCLP metal concentrations were less than the toxicity characteristics in WAC 173-303-090(8).[21] The arsenic soil concentration of 64.4 mg/kg in the composite sample is similar to or less than arsenic soil concentrations proximate to the barrier wall alignment trench (see Figure 1 in Appendix E). As a result, any trench soil generated during the IA will be reused on-site as common borrow within the barrier wall alignment. The final location(s) of this trench-generated soil will be indicated in the IA as-built.

2.12.3 PDI Borings

In accordance with the PDI Work Plan, 15 PDI borings were advanced by Cascade Drilling along the barrier wall alignment (roughly 150 feet apart) between October 19 and October 27, 2023 (see boring locations on Figure 4). Each PDI boring was advanced using a hollow-stem auger to approximately 40 feet bgs to better define (1) depths to the top (and bottom) of the Second Aquitard along the barrier wall alignment, (2) the density and gradation of existing soil throughout the entire depth of the barrier wall, and (3) the strength and consolidation characteristics throughout the entire depth of the barrier

[19] A vibratory plate compactor was not used to compact soil returned to the trench.

[20] The number of discrete sampling locations comprising the composite sample was tripled from what was specified in the PDI Work Plan (from one every 150 feet to one every 50 feet) to provide a more representative composite sample.

[21] The total metals and TCLP metals concentrations in the composite soil sample collected from the barrier wall trench are included in Appendix A. The total metals concentrations (and the corresponding MTCA Method C soil direct contact CLs in paratheses) are arsenic 64.4 mg/kg (88 mg/kg up until February 2025 and currently 20 mg/kg based on a natural background adjustment per WAC 173-340-745(6)(c)), barium 66.2 mg/kg (700,000 mg/kg), cadmium 0.14 mg/kg (3,500 mg/kg), chromium 23.3 mg/kg (260 mg/kg if all chromium is chromium VI up until January 2025 and currently 820 mg/kg if all chromium is chromium VI), lead 27.5 mg/kg (1,000 mg/kg), mercury 0.12 mg/kg (1,050 mg/kg), selenium 1.08 mg/kg (18,000 mg/kg), and silver 0.14 J mg/kg (18,000 mg/kg). The TCLP metals concentrations (and the corresponding toxicity characteristics in paratheses) are arsenic 0.08 J milligrams per liter (mg/L; 5 mg/L), barium < 0.015 mg/L (100 mg/L), cadmium 0.001 J mg/L (1 mg/L), chromium < 0.025 mg/L (5 mg/L), lead 0.008 J mg/L (5 mg/L), mercury 0.000009 J mg/L (0.2 mg/L), selenium < 0.25 mg/L (1 mg/L), and silver < 0.015 mg/L (5 mg/L).

wall.[22,23] The depth to the top of the Second Aquitard in each PDI boring is shown in Table 1, and the density, gradation, strength, and consolidation tests are discussed later in this section.

Soil samples were collected from each PDI boring on 2.5-foot intervals from 5 to 25 feet bgs, with continuous sampling thereafter to the final boring depth, unless a boring was in an area where a thin or absent First Aquitard was suspected (in which case continuous sampling was completed from 5 to 40 feet bgs). Disturbed soil samples were obtained from each boring in accordance with ASTM International (ASTM) D1586-11: Standard Test Method for Standard Penetration Test and Split-barrel Sampling of Soils.[24] Soil samples in each boring were classified and logged in the field by a licensed geologist using ASTM D2488 as a general guide. Visual observations of staining or other indications of potential soil contamination were also noted. The Standard Penetration Test results, the soil classifications and descriptions made by the licensed geologist, and other visual observations are presented in the boring logs (see Appendix A). In addition, select thin-walled tube (commonly referred to as a “Shelby Tube”) samples were collected in accordance with ASTM D1587/D1587M-15 to obtain intact specimens of fine-grained soils for geotechnical laboratory analyses of key soil properties for barrier wall design (e.g., strength, compressibility, permeability, and density). Drilling tools (e.g., augers, rods, samplers) were decontaminated between boring locations in accordance with the PDI Work Plan, and sampling tools were decontaminated between sampling locations in accordance with DOF Standard Operating Procedure 120 in Appendix B of the Expanded RTC Data Gaps Investigation Work Plan (PIONEER 2023a). Following sampling, each boring was decommissioned in accordance with Chapter 173-160 WAC.[25]

Budinger & Associates of Spokane, Washington performed the following geotechnical tests on select soil samples collected from the PDI borings:

- Gradation analyses (ASTM D6913-04) for 53 soil samples collected from different lithologic units from a variety of borings spaced throughout the alignment. Five of these soil samples also received hydrometer analyses by ASTM D7928.
- Atterberg Limits (ASTM D4318) for 9 soil samples collected from aquitards.
- Triaxial tests (ASTM D4767 and ASTM D7181) for 48 soil samples (i.e., 8 consolidated undrained strength tests and 4 consolidated drained strength tests for each lithologic unit [Upper Aquifer, First Aquitard, Intermediate Aquifer, Second Aquitard]).

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[22] Most PDI borings were advanced to 40 feet bgs. The shallowest PDI boring terminated at 36.5 feet bgs, and the deepest PDI boring terminated at 41 feet bgs.

[23] Odd numbered borings (e.g., DOF-B1, DOF-B3, etc.) were advanced first so that lithologic units in the even numbered borings could be interpolated to facilitate better accuracy in selecting sample depths for the thin-walled tube samples.

[24] This test and sampling method consists of driving a standard 2-inch outside diameter split barrel sampler 18 inches into the soil with a 140-pound hammer free falling for 30 inches. The number of blows for each 6-inch interval is recorded. The number of blows required to drive the sampler the final 12-inches is considered the Standard Penetration Resistance (“N”) or blow count. If a total of 50 blows was recorded within one 6-inch interval, the blow count was recorded as “50 blows for the number of inches of penetration. The resistance, or “N” value, provides a measure of the relative density of granular soils or the relative consistency of cohesive soils.

[25] Each borehole was filled by thoroughly mixing a bentonite grout and pumping the grout to the bottom of the borehole through a tremie pipe until the borehole was filled to an average of 10 feet of the ground surface, then the borehole was filled with medium bentonite chips and hydrated to the ground surface.

- Consolidation tests (ASTM D2435) for 8 soil samples (i.e., 2 for each lithologic unit [Upper Aquifer, First Aquitard, Intermediate Aquifer, Second Aquitard]).[26]

Geotechnical laboratory reports for the above analyses of soil samples collected from the PDI borings are provided as Appendix B. These results will be summarized, evaluated, and utilized as part of the design of the barrier wall.

2.12.4 Slurry Mix Design and Testing

A slurry mix design was determined based on the proven constructability and long-term effectiveness of a self-hardening slurry mix in low-permeability barrier walls at similar sites in the Pacific Northwest with high pH, marine water influences, and high metals GW concentrations (e.g., the Former Rhone-Poulenc site). The slurry mix design consists of 5% clay, 18% granular ground blast furnace slag (GGBFS), and 77% water.[27] Two specialty clays (i.e., attapulgite clay and sepiolite clay) are candidates for the clay component of the final slurry mix design because large portions of the barrier wall will be in contact with high pH GW and the bentonite clay commonly used in slurry walls is not suitable for high pH conditions. Attapulgite clay has performed well at sites with high pH. Sepiolite clay is also being considered for the clay component because it is expected to have similar properties to attapulgite clay and is commercially available closer to the Site.

Testing of the slurry mix design was conducted to evaluate the two clay options and determine the anticipated performance of the slurry mix design under neutral pH and high pH Site GW conditions. Three different water mixtures were evaluated for each clay option: (1) 100% tap water (which represents initial conditions since tap water will be used to create the slurry in the field and neutral pH Site GW conditions since tap water has a neutral pH like some of the Site GW), (2) a 50%-50% mix of tap water and high pH Site GW, and (3) 100% high pH Site GW (which represents high pH GW conditions and potential long-term conditions if high pH GW were to replace some or all of the original mix water in select areas). TerraSense Geotechnical Laboratory in Totowa, New Jersey assembled the six variations of the slurry mix design described above, and performed testing to assess the following (see Appendix C):

- The compatibility of both clays with high pH Site GW as a preliminary screening step;
- The strength and curing times for the six variations of the slurry mix design;
- The initial hydraulic conductivities for the six variations of the slurry mix design; and
- The long-term compatibility of the slurry mix design with Site GW.

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[26] The triaxial and consolidation tests are necessary to understand Site conditions in relation to maintaining an open slurry trench before the barrier wall material sets up. Following barrier wall installation, these data will also inform the potential drag down forces exerted on the barrier wall due to variable settlement induced by fluctuating GW elevations.

[27] The GGBFS (which was referred to as slag cement in Appendix C) was obtained from a local source (i.e., the Lafarge Corporation's concrete and cement manufacturing operations in Seattle). The Port (Brett Ozolin) emailed Ecology (Sam Meng and Andy Smith) the product specification sheet for the GGBFS on January 23, 2024. GGBFS is a pre-consumer recycled material produced to meet requirements of ASTM International C989 (Standard Specification for Slag Cement for Use in Concrete and Mortars) and American Association of State and Highway Transportation Officials (AASHTO) M 302 (Standard Specification for Slag Cement for Use in Concrete and Mortars) and is used in a wide variety of concrete construction applications.

Key results from testing the slurry mix design included (see Appendix C):

- Both clays had little reaction when exposed to Site GW and passed the preliminary compatibility screening for compatibility with high pH Site GW.
- The unconfined compressive strength of the self-hardening slurries continued to increase over time for all six mix variations, with no significant differences in strength or curing time between any of the mix variations. The unconfined compressive strength for the six variations after approximately 250 days of curing ranged from 170 to 218 pounds per square inch.
- The initial hydraulic conductivities for all six mix variations after approximately 120 days of curing ranged from 1.3×10^{-7} centimeters per second (cm/sec) for the attapulgite mixed with 100% Site GW to 1.1×10^{-9} cm/sec for the sepiolite mixed with 100% tap water (see Table 2).
- The attapulgite and sepiolite clays are compatible with high pH GW over the long-term because there was an overall decreasing trend in permeability as curing time increased for each mix variation, and the final hydraulic conductivities for attapulgite and sepiolite mixed with 100% Site GW after approximately 225 days of curing were 1.4×10^{-9} cm/sec and 8.6×10^{-10} cm/sec, respectively (see Table 2).

SECTION 3: IA SUMMARY, GOALS, AND RATIONALE

3.1 IA Summary Description

The IA design process outlined in Section 4 will determine the IA details. However, in general terms, the IA will consist of the following key elements:

- Implementing a variety of robust engineering controls during all construction activities for protection of human health and the environment (e.g., health and safety controls, temporary erosion and sediment controls, stormwater controls, spill prevention and controls, dust controls, Site controls, traffic controls, noise controls);
- Decommissioning, reinstalling, retrofitting, and/or installing MWs within the IA areas;
- Demolishing surface and subsurface obstructions (e.g., former building foundations) within the IA areas (see Figure 8) and crushing concrete and asphalt for future use as common near-surface fill underneath asphalt caps;
- Installing a continuous, low-permeability barrier wall along the proposed alignment;
- Installing a barrier wall containment area cap over the barrier wall area (which can be penetrated to facilitate any additional active remediation components within the barrier wall area and repaired following penetration);[28]
- Importing acceptable fill material, reusing crushed concrete and asphalt, and grading soil within the IA areas to (1) raise the overall ground surface elevation of the approximately 24-acre area that will receive an asphalt cap, and (2) facilitate stormwater collection for all IA areas;
- Installing a new stormwater outfall, modifying an existing stormwater outfall, and constructing a stormwater collection, conveyance, and treatment system for the IA areas (as well as other areas of the upland 2901 Taylor Way portion of the Site that will eventually receive an asphalt cap after the IA);
- Installing an 8-inch-thick asphalt cap (on top of 16 inches of crushed surfacing base course [CSBC]) across the approximately 24-acre area;
- Implementing a long-term monitoring plan to assess the effectiveness of the barrier wall, barrier wall containment area cap, and approximately 24-acre asphalt cap;
- Disposing of all waste generated during IA activities at an off-site facility permitted to accept the waste (although it is expected that relatively little waste will be generated during the IA given the nature of the IA); and
- Documenting all components of the IA.

The IA is a partial cleanup of Site impacts and is not intended to be the final cleanup action. In other words, a final cleanup action will be determined via the FS and CAP process.

3.2 IA Goals

The goals of this IA are to:

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[28] An asphalt cap will eventually be installed over the barrier wall containment area cap (once the non-cap active remediation components of the final cleanup action are completed) as outlined in Section 1.3.

- Contain the plume core and highest soil and GW concentrations within the main arsenic plume by installing a barrier wall to decrease dissolved arsenic concentrations seaward of the existing SPW;
- Contain an approximately 24-acre portion of the Site by installing an asphalt cap to minimize stormwater infiltration and decrease COC GW transport towards, and COC GW concentrations along, the Hylebos Waterway shoreline;
- Satisfy the MTCA regulation expectation in WAC 173-340-370(4) that "Ecology expects that active measures will be taken to prevent precipitation and subsequent runoff from coming into contact with contaminated soils and waste materials."
- Decrease risks to human health and the environment that are associated with the existing contamination;
- Not preclude reasonable alternatives for a final cleanup action;
- Comply with applicable federal, state, and local laws and regulations;
- Integrate the IA with future property plans (e.g., Hylebos Barge Terminal Concept in Section 1.3 and Figure 3):
- Consider public and tribal concerns;
- Utilize sustainable remediation principles (e.g., reuse of acceptable soil and materials) to the extent practicable; and
- Be cost-effective.

3.3 IA Cleanup Standards

In accordance with WAC 173-340-700(3), MTCA cleanup standards for a final cleanup action “consist of the following: (a) cleanup levels for hazardous substances present at the site; (b) the location where these cleanup levels must be met (point of compliance); and (c) other regulatory requirements that apply to the site because of the type of action and/or location of the site (‘applicable state and federal laws’).” The Site COCs were defined in the draft FS Report: arsenic, copper, lead (soil only), mercury, nickel, PCE, TCE, VC, and CF (PIONEER 2021a). The soil and GW CLs and POCs for these COCs are not particularly relevant for this IA because of the nature of the IA (i.e., installing a containment wall and a containment cap) and the fact that Site CLs and POCs will be established for the final cleanup action in the final FS Report and CAP. In other words, CLs and POCs are not necessary for this IA because the IA will "provide a partial cleanup, that is, clean up hazardous substances from all or part of the site, but not achieve cleanup standards" per WAC 173-340-430(2)(b). That said, current GW SLs were used to show the current extent of potential GW exceedances (see Figure 6) and will likely be used for evaluation of IA GW monitoring (GWM) results (unless GW CLs are developed in the future).[29] In addition, import materials including common borrow and CSBC will be tested and compared against appropriate acceptance criteria, in consultation with Ecology, to determine whether it is appropriate to use these

[29] The GW CLs are arsenic 8.0 ug/L, copper 3.1 ug/L, mercury 0.025 ug/L, nickel 8.2 ug/L, PCE 2.9 ug/L, TCE 0.70 ug/L, VC 0.18 ug/L, and CF 12 ug/L. These GW CLs are the most stringent of Method B Surface Water CLs and Method C GW Vapor intrusion Screening Levels from Ecology's Cleanup Levels and Risk Calculation database (Ecology 2025), with arsenic adjusted up to the Puget Sound Basin GW background concentration of 8 ug/L (Ecology 2022) in accordance with WAC 173-340-720(7)(c).

materials on the Site (see Section 4.2.3 and 4.4 for CSBC and common borrow, respectively).[30] Potentially applicable or relevant and appropriate requirements (ARARs; i.e., federal, state, and local laws and regulations) were identified and evaluated to determine requirements that apply to IA design and implementation (see Appendix D). Based on this evaluation, none of the laws and regulations prevent or preclude IA components from being implemented. However, the IA design will include and require measures to address the following ARARs for IA implementation as preliminarily outlined in Appendix D:

- Waste management requirements;
- Health and safety requirements;
- Obtaining permits/approvals from agencies for installing a new stormwater outfall and modifying an existing stormwater outfall via the Joint Aquatic Resources Permit Application (JARPA);
- Implementing the Inadvertent Discovery Plan (IDP);
- Obtaining applicable National Pollutant Discharge Elimination System (NPDES) permits for construction stormwater and discharges from the new stormwater utility system;
- Constructing, maintaining, and decommissioning MWs in accordance with Chapter 173-160 WAC;
- Obtaining applicable City of Tacoma permits or permit exemptions; and
- Implementing temporary erosion, stormwater, dust, and noise controls.

3.4 Regulatory Rationale for IA

This section demonstrates that the proposed IA satisfies MTCA requirements and expectations in WAC 173-340-430(1) through (5) for conducting an IA.

3.4.1 IA Purpose

The proposed IA meets the MTCA IA purpose in WAC 173-340-430(1) of only partially addressing the cleanup of the Site. More specifically, the proposed IA "is technically necessary to reduce a threat to human health or the environment by eliminating or substantially reducing one or more pathways for exposure to a hazardous substance at a facility" (WAC 173-340-430(1)(a)). The threat to human health and the environment that is being substantially reduced is GW transport of COCs towards Hylebos Waterway SW and sediment (by containing contaminated soil and GW).

3.4.2 General Requirements

The proposed IA satisfies the IA general requirements pursuant to WAC 173-340-430(2)(b) since the proposed IA will "provide a partial cleanup, that is, clean up hazardous substances from all or part of the site, but not achieve cleanup standards."

[30] Testing plans will be prepared when there are feasible sources to be evaluated, and testing results will be documented in the IA Report.

3.4.3 Relationship to the Cleanup Action

The IA satisfies the requirement in WAC 173-340-430(3) via WAC 173-340-430(3)(b) since none of the IA remedial components will foreclose reasonable alternatives for the unknown final clean action. Almost all of the active remediation components contemplated in draft FS cleanup action alternatives (PIONEER 2021a) are located either (1) within the proposed barrier wall footprint (e.g., focused source area excavation, focused GW treatment, extensive in-situ solidification/stabilization), or (2) along the shoreline (e.g., subtidal shoreline cap extension, focused Upper and Intermediate Aquifer permeable reactive barriers) because these areas are where the highest arsenic concentrations and/or key potential exposures are located. The barrier wall containment area cap outlined in Section 4.1.5 is being designed so that this cap can be penetrated to facilitate any additional active remediation components within the barrier wall area (e.g., soil excavation, in-situ solidification/stabilization, in-situ GW treatment) and then repaired following penetration. Four IA alternatives were evaluated for the 24-acre area outside the barrier wall footprint, and the asphalt cap alternative was the recommend IA alternative (see Section 3.5). Thus, all practicable remedial components can still be implemented after the barrier wall is installed, the barrier wall containment area cap is installed, and the approximately 24-acre asphalt cap is installed. Further, there will be no access restrictions associated with IA remedial components that will prevent the implementation of the final cleanup action.

3.4.4 Timing

The proposed IA satisfies the IA timing requirement in WAC 173-340-430(4) because (1) an IA "may occur anytime during the cleanup process" per WAC 173-340-430(4)(a), (2) the IA will not be used to delay or supplant the cleanup process, and (3) the IA will be followed by completing the FS and CAP.

3.4.5 Administrative Options

In accordance with WAC 173-340-430(5), an IA can be conducted under any of the MTCA administrative options, including AOs.

3.5 IA Alternatives Considered

A variety of cleanup action alternatives were considered in the draft FS Report (PIONEER 2021a). However, based on Ecology's FS comments and subsequent discussions, it became apparent that installing (1) a low-permeability GW barrier wall (which was remedial component APR-5A in the draft FS Report) and (2) a surface cap that was larger than the cap remedial components previously contemplated in the draft FS Report was a practicable interim solution that would decrease Site risks and comprise important elements of the final cleanup action. Several different alternatives for barrier wall construction were considered, and the vibratory beam technology was determined to be best for the Site (DOF 2023b). Likewise, several different cap designs were considered for the approximately 24-acre area (DOF 2023a). The asphalt cap for the approximately 24-acre area based on that initial 2023 analysis consisted of 8 inches of asphalt on top of 16 inches of compacted CSBC. In addition, four IA alternatives were considered and evaluated for the 24-acre area (see Appendix E). Installing the asphalt cap over the 24-acre was the recommended IA alternative for the 24-acre area. GW modeling results estimate that the 24-acre asphalt cap will decrease the arsenic mass discharge to the Hylebos Waterway by 34% compared to a non-capped situation (see Appendix E).

3.6 Vulnerable Populations and Overburdened Communities

Based on Section 4.2 of Toxics Cleanup Program Implementation Memo #25, the Site is located within a census tract where a potentially exposed population is likely a vulnerable population or overburdened community (Ecology 2024b). Specifically, the census tract ranks a 10 on the Environmental Health Disparities Index from the Washington State Department of Health's Environmental Health Disparities Map and is at the 85th Washington state percentile of the Demographic Index from the United States Environmental Protection Agency's EJScreen mapping tool. However, the IA is not expected to have any impacts on vulnerable populations or overburdened communities.[31] The IA will occur at a vacant, restricted, and fenced Site within a highly industrial area that will remain zoned Port Maritime and Industrial for the foreseeable future. There are no structures, residents, occupants, or workers (other than periodic remediation workers) at the Site. No residential neighborhoods or communities are located adjacent to the Site, and the closest residential neighborhood is approximately a quarter mile east of the eastern portion of the Site. The IA will not generate regulated air emissions or haul substantial quantities of waste to other communities.

3.7 Climate Change Resiliency

Site-specific vulnerabilities to climate change were assessed to determine if the long-term effectiveness of the barrier wall and asphalt cap have a high likelihood of being severely comprised (and if so, what sort of climate change resilience may be needed for the barrier wall and asphalt cap).[32] The potential vulnerabilities that were assessed per Ecology's Sustainable Remediation guidance were: (1) sea level rise (SLR), (2) severe storms, (3) flooding, (4) landslides, (5) wildfires, and (6) droughts (Ecology 2023a). The vulnerability assessment was based on data from the Northwest Seaport Alliance's (NWSA's) robust and detailed January 2024 Vulnerability Assessment (see Appendix F).[33] A key concept for this assessment is the difference between current ground surface elevations and future ground surface elevations. The future upland elevation adjacent to the top of the shoreline will increase by 3 to 6 feet from the current typical elevation of approximately 17 to 19 feet MLLW to a future elevation of 22 to 23

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[31] Even though the consideration of impacts on likely vulnerable populations or overburdened communities is a CAP requirement for final cleanup actions per WAC 173-340-380(5)(c), this potential was also considered for this IA.

[32] The WAC 173-340-360(3)(a)(v) requirement for cleanup actions to "provide resilience to climate change impacts that have a high likelihood of occurring and severely compromising its long-term effectiveness" does not technically apply to this IA since WAC 173-340-200 excludes IAs from the cleanup action definition. However, the potential need for climate change resiliency was evaluated for the barrier wall and asphalt cap since these IA components are expected to remain in place for a long time. The barrier wall containment area cap is expected to be covered with additional fill and an asphalt cap within a relatively a short timeframe.

[33] The NWSA assessment addresses vulnerabilities for coastal flooding (including SLR), flooding, severe weather, wildfires and smoke, landslides, earthquakes, tsunamis, and volcanic activity for the Port of Tacoma, the Port of Seattle, and other strategic "Gateway" locations in the region.

feet MLLW (see Figure 4 and Sheet C2.0 in Appendix H for current and future ground surface elevations, respectively). The barrier wall and asphalt cap were assessed in the Ecology 2023a long-term risk scenario (e.g., through the year 2100) since these IA components are expected to remain in place for the foreseeable future.

The key assessment details and results for each of the six potential vulnerabilities were:

- SLR: Since the IA is in the long-term risk scenario, a conservative four to six feet of SLR was considered per Ecology 2023a guidance.[34] Predicted inundation of the current ground surface where portions of the barrier wall and asphalt cap will be located does not begin until mean higher-high water plus 5 feet of SLR (see Appendix F). Four to six feet of SLR is not expected to overtop the future shoreline since the future upland elevation adjacent to the top of the shoreline will increase by 3 to 6 feet from the current typical elevation. Perhaps more importantly, SLR is expected to have little to no impact on the long-term effectiveness of the barrier wall or asphalt cap based on the nature and locations of these IA components.[35]
- Severe Storms: Although infrequent severe storms (e.g., extreme storm surges, extreme precipitation events) will occur more frequently in the future and will increase the potential for inundation when combined with SLR, severe storms are expected to have little to no impact on the long-term effectiveness of the barrier wall or asphalt cap based on the nature and location of these IA components, the increased future elevation for the top of shoreline, and the existing resilience measures outlined below.
- Flooding: The barrier wall and asphalt cap are not located within the 100-year or 500-year floodplain (see Appendix F). Although the potential for flooding will increase in the future due to SLR and severe storms, flooding is expected to have little to no impact on the long-term effectiveness of the barrier wall or asphalt cap based on the nature and location of these IA components, the increased future elevation for the top of shoreline, and the existing resilience measures outlined below.[36]
- Landslides: Although small portions of the Site have been identified as susceptible to future landslides (see Appendix F), a landslide at the Site is highly unlikely given the current topography.[37] More importantly, the future Site topography will be even less susceptible to landslides. Thus, landslides are expected to have little to no impact on the long-term effectiveness of the barrier wall or asphalt cap.

[34] This is a conservative assumption since the Washington Coastal Resilience Project predicts a high-end SLR estimate between 1.9 and 3.3 feet for the Port of Tacoma by the year 2100 (see Appendix F), and the University of Washington Climate Impacts Group predicts a 2 – 5% chance for four feet of SLR and a 0 – 1% chance for six feet of SLR at the Site by the year 2100 (University of Washington Climate Impacts Group 2018).

[35] For instance, (1) there are no aboveground infrastructure components for the barrier wall or asphalt cap, (2) the barrier wall and asphalt cap do not require active operations or routine maintenance that could be compromised by a severe storm, (3) the future ground surface will eventually consist of a continuous asphalt cap that collects any water on the paved surface, and (4) the barrier wall will eventually be located beneath the asphalt ground surface.

[36] The highest Site elevations will be at the top of the shoreline and the lowest elevations will be at Taylor Way so that the land surface generally slopes downward from east to west. Thus, any flooding that may affect the Site would originate from flooding of Taylor Way (rather than the Hylebos Waterway).

[37] The small areas shown in Appendix F with a susceptibility for future landslides are presumably due to the historical or current shoreline slope and current soil stockpiles in the NBA.

- Wildfires: The Site is not vulnerable to wildfires because it is not proximate to wildlands (e.g., forested and grassland areas) and is considered "non-burnable" in the context of wildland fire potential (see Appendix F). Further, the Site currently has limited vegetation, and the future asphalt cap is non-burnable. Thus, wildfires are expected to have little to no impact on the long-term effectiveness of the barrier wall or asphalt cap.
- Droughts: The Port of Tacoma area has a very low drought risk for the United States (see Appendix F), there is no current or future Site vegetation that would be affected by droughts, and droughts would not be expected to affect the functioning of the barrier wall or asphalt cap. Thus, droughts are expected to have little to no impact on the long-term effectiveness of the barrier wall or asphalt cap.

In conclusion, it is highly unlikely that climate change impacts would severely compromise the long-term effectiveness of the barrier wall or asphalt cap. Thus, additional IA measures are not needed to provide climate change resilience for the barrier wall and asphalt cap. Nonetheless, it should be recognized that Site-specific climate change resilience measures already exist, including (1) raising the overall ground surface elevation of the Site and substantially raising the top of the shoreline bank elevation, (2) having a stabilized shoreline to help protect the barrier wall and asphalt cap from inundation, flooding, and severe storm events, (3) not having an IA that is contingent upon a specific GW elevation, GW flow regime, or geochemical condition, (4) conducting long-term IA GWM of the barrier wall and asphalt cap, (5) recognizing that any increased mixing of neutral pH seawater with elevated pH GW would decrease arsenic transport by creating more favorable geochemistry for arsenic sorption and co-precipitation of arsenic with metal oxides (see Section 7 of PIONEER 2019), and (6) industry-standard design practices will be used throughout the design, implementation, and monitoring activities to minimize the potential impacts of climate change vulnerabilities. In addition, the Port will continue to implement resilient strategies and actions as outlined in NWSA's January 2024 Response Framework (see Appendix F).

SECTION 4: PRELIMINARY (30%) IA DESIGN

The final (100%) IA design will consist of final plan sets and specifications for the barrier wall (including the barrier wall containment area cap) and the asphalt cap as well as Engineer-prepared plans (i.e., Waste Management Plan [WMP], Compliance Monitoring Plan [CMP], Health and Safety Plan [HASP], IDP, and Soil and Materials Management Plan [SMMP]) that will accompany and supplement these final plan sets and specifications. The IA design is currently in the preliminary (i.e., 30%) design phase. The 30% design plan sets for the barrier wall and asphalt cap are presented in Appendix G and Appendix H, respectively.[38] Some of the key 30% design concepts for the barrier wall and asphalt cap are summarized in Sections 4.1 and 4.2, respectively. The DOF HASP and the IDP are completed and included in this section, while the preliminary (30%) design for the WMP, CMP, and SMMP are summarized in this section. The design will be further developed and finalized as outlined in Section 5.2.

4.1 Barrier Wall Design

The barrier wall is being designed to contain the plume core of the main arsenic plume, the vast majority of the arsenic mass at the Site, and the highest arsenic soil and GW at the Site. The barrier wall is also being designed to meet the IA goals and IA cleanup standards in Sections 3.2 and 3.3, respectively. The barrier wall design is based on the barrier wall PDI results (see Section 2.12), other Site-specific data and information, and industry-standard design practices.

The barrier wall will be a continuous vertical slurry wall that keys into the Second Aquitard to provide containment for arsenic in the Upper Aquifer, First Aquitard, and Intermediate Aquifer. This barrier wall will be installed using vibratory beam technology since it has clear advantages over the other slurry wall installation methods, including (1) providing the lowest wall permeability, (2) enabling wall installation in tight spaces (e.g., limiting the space between the barrier wall and the existing SPW, making tight turns to address encountered obstacles), (3) generating less waste, (4) greatly decreasing the possibility of slurry loss that could affect the Hylebos Waterway, and (5) being less invasive. In addition, the vibratory beam technology has a proven record of successfully attaining the required barrier wall installation depths. A barrier wall containment area cap is also included in the design to minimize infiltration within the barrier wall alignment. Key 30% barrier wall design concepts are outlined in the following subsections.

4.1.1 Barrier Wall Dimensions

The proposed barrier wall alignment is shown on all IAWP figures (except for Figures 1, 3, and 7) and is shown in Appendix G. As mentioned above, this alignment will fully contain the vast majority of arsenic

[38] Although the IA only includes installing an asphalt cap on an approximately 24-acre area, an asphalt cap will eventually be installed on the remaining approximately 16-acres of the upland 2901 Taylor Way portion of the Site (see Section 1.3). As a result, the 30% design plan sets for the asphalt cap in Appendix H includes asphalt paving for the entire upland 2901 Taylor Way portion of the Site to show how the ground surface elevations, the asphalt cap, and stormwater collection system will ultimately be integrated to put this property back to beneficial use.

at the Site. In addition, this alignment allows for implementation of future active remedial components within the barrier wall (e.g., source area excavations or in-situ solidification/stabilization). The total length of the barrier wall alignment is approximately 2,200 linear feet. The northeastern and eastern extent of barrier wall will be placed as close as practicable to the existing SPW (e.g., within three to five feet), effectively replacing the prior function of the SPW in those areas.[39] The alignment was designed to avoid known surface and subsurface obstacles (e.g., former foundations, rail lines, roads). Other potential obstructions and conduit pathways encountered during PDI trenching are shown on Sheets G2.1 through G2.4 of Appendix G. If an unavoidable subsurface obstruction is encountered during barrier wall construction, the obstacle will be removed using an excavator or drill rig, or the alignment will be adjusted to avoid the obstacle.[40]

The barrier wall will be keyed into the competent and continuous Second Aquitard, which is comprised of fine-grained soils that have the Unified Soil Classification System designations of MH (inorganic silt with low liquid limit) and ML (inorganic silt with high liquid limit). The design depth for each section of the barrier wall is based on the Second Aquifer depth in the 15 barrier wall PDI borings (see Section 2.12.3). The depth to the top of the Second Aquitard in the PDI borings ranged from 26.5 feet bgs to 33 feet bgs (see Table 1). The barrier wall will be installed to a depth of up to 3 feet below the top of the Second Aquitard to eliminate Intermediate Aquifer GW flow below the barrier wall. The Second Aquitard thicknesses and the corresponding barrier wall design depths are shown on Sheets C1.1 and C1.2 of Appendix G.

The barrier wall thickness will be approximately 6 inches, which is the thickness capability of the vibratory beam technology. However, the barrier wall permeability will be substantially less than the wall permeabilities of other slurry wall installation technologies, which will result in an equivalent or better containment wall than the thicker traditional slurry walls. See Section 5.3 for construction QC measures to ensure wall thickness and permeabilities.

4.1.2 Barrier Wall Slurry Mix and Permeability

As summarized in Section 2.12.4, the slurry mix used to construct the barrier wall will consist of 5% clay, 18% GGBFS, and 77% tap water. Since both clay options for this Site (i.e., attapulgite clay and sepiolite clay) performed well in laboratory testing (see Section 2.12.4 and Table 2), the decision on which clay to use will be made in the final design based on the availability and cost of both clay options at that time. Sepiolite and attapulgite are mined in Nevada and Florida, respectively. Regardless of which clay is selected during final design and the GW conditions in different portions of the barrier wall alignment,

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[39] It is anticipated that large equipment, such as a 150-ton crane and a large trackhoe, would be used to install the barrier wall and excavate the slurry trench. This equipment is expected to require 10-feet on either side of the slurry trench with the inboard side of the slurry trench slightly wider to allow for slurry mixing and handling of materials.

[40] If a one or more portions of the barrier wall alignment need to be significantly adjusted (e.g., moved greater than 75 feet from the proposed alignment) due to an obstruction, an additional soil boring will be advanced to identify the Second Aquitard depth for each significant adjustment. Also, any alignment adjustments will be documented in the IA Report (along with any deviations from the final design as indicated in Section 5.7).

laboratory results indicate the final barrier wall permeability will be on the order of 10^{-9} cm/sec to 10^{-11} cm/sec (see Table 2), which is two to three orders of magnitude better than the maximum permeability design criteria of 1 x 10^{-7} cm/s (DOF 2023b). In addition, both clays are compatible with high pH GW over the long-term as discussed in Section 2.12.4.

When creating the slurry mixes in the field, the GGBFS will be added to the water first, and then the clay component will be added to the water/GGBFS mixture second based on the bench-scale laboratory experience with these mixes (see Appendix C).

4.1.3 Preventing Slurry Loss and Transport

Protective measures will be included in the design to prevent slurry loss and transport from active slurry trench construction operations to the critical habitat of the Hylebos Waterway via (1) surface runoff, (2) manmade conduits (e.g., pipelines, utility trenches, infiltration trenches, and associated bedding gravel), and (3) subsurface soil/rock with large void spaces. Specifically, the potential for slurry loss and transport will be controlled as follows:

- The relatively flat Site ground surface (see Figure 4) and construction and maintenance of temporary secondary containment berms around the active slurry trench working area will be used to contain any slurry loss from surface runoff and prevent stormwater run-on. All slurry-related activities (e.g., preparation, material storage, mixing, and hydraulic transport) will be located away from the Hylebos Waterway and always conducted within the secondary containment berms.
- The many existing manmade conduits located along the barrier wall alignment (see Section 2.12 and Sheets G2.1 through G2.4 of Appendix G) will be decommissioned prior to barrier wall installation. All manmade conduits will be decommissioned by removing all conduit components (including bedding gravel) located within three feet of barrier wall alignment and sealing the area with the removed conduit components with a non-shrinking grout.
- Although there is very limited concern with slurry loss and transport within subsurface soil given the total lack of soil/rock with large void spaces (e.g., alluvial or glacial outwash gravel deposits) in the Upper and Intermediate Aquifers and First and Second Aquitards at the Site, if rock obstructions or gravels containing less than 15 percent sand or fines are encountered during construction, these materials will be removed and replaced with a low-permeability material such as bentonite to prevent slurry loss and transport.[41]

4.1.4 Desiccation

Since exposure to arid weather conditions could cause some desiccation in the barrier wall that might result in shrinking and/or cracking, a geotextile and liner will be used to minimize the potential for wall desiccation. A non-woven geotextile will be placed directly on top of the barrier wall after the barrier wall is constructed, and then an impervious 30-mil polyvinyl chloride liner will be placed on top of the geotextile. The geotextile and liner installed over the barrier wall will be terminated into a key-in trench

[41] No rock obstructions or gravels (beyond the bedding gravel associated with the manmade conduits) were identified during barrier wall PDI activities.

immediately outside the barrier wall (see Sheet C1.3 of Appendix G). The geotextile and liner will extend inside the barrier wall to create the rest of the barrier wall containment area cap described in the next section.

4.1.5 Barrier Wall Containment Area Cap

Following barrier wall installation, a cap will be installed in the barrier wall containment area (see Figure 8) to minimize stormwater infiltration within the barrier wall alignment, while also enabling future implementation of any additional active remediation components associated with the final cleanup remedy (see Section 3.4.3). The base of the barrier wall containment area cap will consist of a non-woven geotextile placed on the existing ground surface, with an impervious 30-mil polyvinyl chloride liner placed on top of the geotextile (identical to the materials used to prevent wall desiccation as indicated in Section 4.1.4). A 5/8-inch minus CSBC material (or similar material) from a virgin quarry source will be placed over the liner, graded, and compacted to facilitate positive stormwater drainage via sheet flow on top of the compacted CSBC to the new stormwater system (see Section 4.2.2).[42] The compacted CSBC will be sloped downwards to the west towards new stormwater catch basins that will be located outside the barrier wall alignment and connected to the new stormwater system for treatment and discharge (see Sheet C1.4 of Appendix G). The acceptance criteria for chemical testing of virgin quarry material such as this CSBC is included in Appendix I.

In addition to the primary barrier wall containment area cap components described in the previous paragraph, the barrier wall alignment portion of the barrier wall containment area cap will receive additional cap components to protect the barrier wall from deforming due to surface loads (e.g., heavy equipment uses during subsequent IA construction and monitoring activities). The design includes two types of additional cap components, depending on location. Locations along the barrier wall alignment where heavy equipment will travel for IA construction and monitoring purposes will receive additional cap components on top of the geotextile and liner to support traffic loading up to H-20 (see Detail 1 on Sheet C1.3 of Appendix G). Areas of the barrier wall alignment that will not be subject to any traffic load during IA construction and monitoring will receive less rigorous cap components on top of the geotextile and liner (see Detail 2 on Sheet C1.3 of Appendix G). These additional cap components are not the final cap for either location.

4.2 Asphalt Cap Design

The asphalt surface cap is being designed to contain an approximately 24-acre portion of the Site by minimizing stormwater infiltration and decreasing COC GW transport towards, and COC GW concentrations along, the Hylebos Waterway shoreline. The asphalt cap is also being designed to meet the IA goals and IA cleanup standards in Sections 3.2 and 3.3, respectively. In addition, the asphalt cap

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[42] Although compacting the 5/8-inch minus CSBC material is not expected to damage the liner, the design (i.e., Details 1 and 2 on Sheet C1.3 in Appendix G) will be updated in the next version of the plan set to include the installation of a non-woven geotextile between the liner and the CSBC to help protect the liner.

will help facilitate the beneficial use of this Port Maritime and Industrial property in accordance with local zoning. The asphalt cap design is based on Site-specific data and information, anticipated future property use, and industry-standard design practices. The asphalt cap locations and sequencing for two phases of cap installation (following installation of the barrier wall and the barrier wall containment area cap) are shown on Figure 8. Key 30% asphalt cap design concepts are outlined in the following subsections.

4.2.1 Underground Utilities

Applicable underground utilities necessary for Port Maritime and Industrial use of the property will be installed in conjunction with installing the asphalt cap. Specifically, stormwater (see Section 4.2.2), fire protection water, and lighting utilities will be installed within the approximately 24-acre area that will receive an asphalt cap during the IA (see Appendix H).[43,44] These underground utilities are being installed in conjunction with the asphalt cap to maximize the long-term integrity of the asphalt cap and avoid compromising the asphalt cap by installing utilities after the cap has already been constructed.

4.2.2 Stormwater Management

A stormwater collection, conveyance, and treatment system will be installed in conjunction with the asphalt cap. The IA asphalt cap surface elevations and topography will direct stormwater to 7 new stormwater treatment vaults (see Sheet C2.0 in Appendix H).[45] These shallow vaults will treat stormwater at the point of collection and convey stormwater to two outfalls discharging to the Hylebos Waterway. The northern half of the Site will discharge to a new outfall located north of the existing dock, and the southern half of the Site will discharge to the existing Arkema Mound site outfall (see Sheets C2.5 and C2.7 in Appendix H). Due to increased stormwater flows to the existing Arkema Mound site outfall, the slope of this outfall pipe will be increased from 0.2% to 0.5% slope and the head structure will be deepened. In addition, the southern wing of the existing SPW will be penetrated to enable the conveyance piping to connect to the head structure. To minimize impacts to the SPW, the penetration will be made perpendicular to the SPW alignment and the annular space between the penetration and the conveyance piping will be filled with a low permeability material such as cementitious controlled density fill, bentonite, or a combination of both.

4.2.3 Pavement Section

A robust 2-foot pavement section has been designed to satisfy the IA goals in Section 3.2 (e.g., expectations in WAC 173-340-370(4) "to prevent precipitation and subsequent runoff from coming into contact with contaminated soils") and allow for long-term Port Maritime and Industrial use of the

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[43] Although Appendix H shows the installation of these utilities inside and outside of the IA areas (at final buildout), utilities will only be installed during the IA within the approximately 24-acre area that is receiving an asphalt cap during the IA.

[44] If a specific need for other utilities is identified prior to construction, additional utilities may be added to the final design.

[45] Four additional stormwater vaults will be installed in the northernmost portion and the barrier wall area once those areas are eventually capped with asphalt.

upland 2901 Taylor Way portion of the Site. The pavement section is expected to be comprised of 8 inches of compacted hot mix asphalt on top of 16 inches of a compacted virgin quarry CSBC material, which will be constructed on top of the compacted prepared subgrade (see Sheet C1.9 in Appendix H).[46] This pavement section will limit infiltration of stormwater, allow conveyance to treatment structures, and provide adequate support for the intended use of the property. The acceptance criteria for chemical testing of virgin quarry material such as this CSBC is included in Appendix I.

4.3 General Construction Sequence

The general construction sequence will include the following three sequential phases (see Figure 8), although Phase 2 and Phase 3 will ideally be combined:

- Phase 1: Install the barrier wall, install the barrier wall containment area cap over the barrier wall area, and install/modify the two stormwater outfalls
- Phase 2: Install an asphalt cap over the "southern 12 acres" area
- Phase 3: Install an asphalt cap over the "northern 12 acres" area

4.4 Site Preparation

Site preparation activities will be conducted within applicable IA areas during each construction phase. Key preparation activities will include clearing and grubbing, demolishing key surface and subsurface obstructions (e.g., former building foundations), retrofitting/decommissioning existing MWs, importing clean common borrow material, and grading material to create the designed topography. Key preparation concepts for 30% design are:

- Former building and tank foundations will be demolished to limit the potential for differential settlement of the asphalt cap over time. Any crushed concrete that is reused on-site will only be placed on top of the existing ground surface in areas that already have a GW pH greater than 9 and will be capped with the asphalt cap. MWs near the crushed concrete will be sampled during compliance monitoring to evaluate if the crushed concrete further increases the GW pH in these areas (see Section 4.7.3).
- All existing MWs within a given IA area will be retrofitted or decommissioned in accordance with Chapter 173-160 WAC. For instance, existing MWs on or immediately adjacent to the barrier wall alignment (e.g., 5E1-1, 5E2-1, 5E8-1, 5E1-2) will be decommissioned prior to installing the barrier wall, and the existing MWs inside the barrier wall alignment will be retrofitted in conjunction with installing that cap and/or decommissioned prior to installing the barrier wall containment area cap. New replacement MWs will be installed for many of the decommissioned MW locations. The plan for decommissioning/retrofitting existing MWs and installing replacement MWs will be determined as the design proceeds towards 100%.
- The acceptance of clean common borrow material (e.g., dredged sediment) that is needed to increase Site elevations and grade the Site for stormwater management will be evaluated on a

[46] The expected asphalt permeability is on the order of 6×10^{-4} cm/sec based on a California asphalt study (University of California Pavement Research Center 2018). The compaction specification will require the asphalt is compacted to 92% of the Rice density and the asphalt binder shall be PG 58-22 in accordance with Port standards. Additionally, the CSBC founding the asphalt will be compacted to 95% of the maximum dry density.

case-by-case basis based on chemical testing results in consultation with Ecology. For instance, based on chemical testing results, Ecology approved the placement of Middle Blair dredge material for potential common borrow material at the Site on March 18, 2025.

- Any subsurface soil generated within the barrier wall alignment (via grading or excavation activities) will remain within the barrier wall footprint to ensure soil that may contain elevated arsenic concentrations remain within the barrier wall alignment. The final location(s) of any generated subsurface soil will be indicated in the IA as-built.

4.5 Engineering Controls

Engineering controls and construction quality control (QC) will be important components for both the barrier wall (including barrier wall containment area cap) and asphalt cap designs. A variety of robust engineering controls will be required pursuant to the final IA design and implemented for the protection of human health and the environment throughout all IA construction activities. Engineering controls will include, but are not limited to, health and safety controls, temporary erosion and sediment controls, stormwater controls, spill prevention and controls, dust controls, Site controls, traffic controls, and noise controls. Construction QC will also be required pursuant to the IA design and will be implemented during IA construction activities. The preliminary construction QC elements for 30% design are outlined in Section 5.3.

4.6 Waste Management Plan

The characterization, transportation, treatment, storage, and disposal of all waste generated during IA implementation will be conducted in accordance with applicable federal, state, and local waste management regulations. All waste generated during the IA will be disposed of at an off-site facility permitted to receive the waste. However, it is expected that very little waste will be generated during the IA given the nature of the IA. For instance, on-site surface soil will be re-graded prior to capping, and concrete and asphalt will be crushed on-site and used as fill material under the asphalt cap.

A WMP will be prepared during IA design to describe the characterization, transportation, treatment (if applicable), storage, and disposal of wastes generated during the IA. The WMP will be included with the 90% design submittal to Ecology. The WMP will:

- Identify all anticipated waste streams;
- Identify the expected temporary storage, labeling, and disposition for each anticipated waste stream;
- Identify the proposed or candidate off-site disposal facility(ies) for each anticipated waste stream;
- Provide approved waste profiles from off-site disposal facilities (if applicable);
- Specify requirements for temporary soil stockpiles (e.g., approved locations for creating stockpiles, stockpile covering requirements, maintenance, tracking, and recordkeeping requirements); and
- Specify requirements for any temporary waste containers (e.g., approved locations for containers, type of containers to be used, tracking and recordkeeping requirements).

The anticipated waste streams for this IA are currently expected to be:

- Any vegetation generated during clearing and grubbing that is designated as a waste (i.e., vegetation that cannot be composted for some reason);
- Any generated asphalt that is designated as a waste (i.e., asphalt that is not being crushed and reused on-site);
- Any generated concrete that is designated as a waste (i.e., concrete that is not being crushed and reused on-site);
- Any generated soil that is designated as a waste (i.e., soil that is not reused on-site);
- Investigation-derived waste (e.g., soil and water generated during installation and development of MWs);
- Water generated from equipment and personnel decontamination;
- Personal protective equipment; and
- Miscellaneous construction debris (e.g., slurry materials designated as waste, disposable equipment/materials, rail ties, general trash).

4.7 Compliance Monitoring Plan

A CMP for IA activities will be prepared during IA design in accordance with the requirements of WAC 173-340-410. The CMP will be included with the 90% design submittal to Ecology. The CMP will be supported as necessary by a Sampling and Analysis Plan/Quality Assurance Project Plan prepared in accordance with WAC 173-340-820, WAC 173-340-830, and applicable components of Ecology guidance (Ecology 1995, 2016). There are three types of compliance monitoring defined in WAC 173-340-410: protection monitoring, performance monitoring, and confirmation monitoring. The anticipated elements for each type of IA compliance monitoring are summarized in the following sub-sections.

4.7.1 Protection Monitoring

Per WAC 173-340-410(1)(a), the purpose of protection monitoring is to "confirm that human health and the environment are adequately protected during construction and the operation and maintenance period of an interim action or cleanup action as described in the health and safety plan [HASP]." Protection monitoring for this IA will consist of (1) DOF's implementation of the DOF HASP (see Section 4.8), (2) the Remediation Contractor's development and implementation of a Remediation Contractor HASP (see Section 4.8), and (3) employee adherence to the applicable HASP. In addition, it is anticipated that IA protection monitoring will likely include arsenic-specific training for all on-site workers, dust monitoring, and air sampling of worker breathing zones.

4.7.2 Performance Monitoring

Per WAC 173-340-410(1)(b), the purpose of performance monitoring is to "confirm that the interim action or cleanup action has attained cleanup standards and, if appropriate, remediation levels or other performance standards such as construction quality control measurements or monitoring necessary to demonstrate compliance with a permit or, where a permit exemption applies, the substantive requirements of other laws." Performance monitoring for this IA will consist of "other performance standards such as construction quality control measurements or monitoring necessary to demonstrate compliance with a permit or, where a permit exemption applies, the substantive requirements of other laws." Specifically, the applicable performance monitoring for this IA will consist of DOF oversight of the Remediation Contractor to ensure:

- Successful completion of all construction QC components included in the final design (see Section 5.3);
- Adherence to the plan sets and specifications for the barrier wall (including barrier wall containment area cap) and asphalt cap;
- Appropriate implementation of the WMP, CMP, Remediation Contractor HASP, and IDP; and
- Compliance with all requirements for IA-related permits and the substantive requirements of any exempt permits (see Section 5.4), including any permit-required monitoring.

4.7.3 Confirmation Monitoring

Per WAC 173-340-410(1)(c), the purpose of confirmation monitoring is to "confirm the long-term effectiveness of the interim action or cleanup action once cleanup standards and, if appropriate, remediation levels or other performance standards have been attained." Because (1) cleanup standards and remediation levels have not yet been established for the Site, (2) the FS is still ongoing, and (3) a final cleanup action has not been developed, it is premature to propose confirmation monitoring as part of the IA. However, as outlined in the next two paragraphs, periodic GWM will be conducted to evaluate the effectiveness of the barrier wall and caps, and periodic asphalt cap inspections will be conducted.

A preliminary IA GWM plan has been developed as outlined in Table 3. This IA GWM plan includes six IA GWM tasks: a Site-wide baseline GWM event (Task 1), a baseline GWM event for barrier wall MWs (Task 2), monthly static water level measurements in key barrier wall MWs (Task 3), periodic GWM events to assess arsenic concentrations in key barrier wall MWs (Task 4), periodic GWM events for all COCs in all barrier wall MWs (Task 5), and periodic GWM events for all COCs in all cap MWs (Task 6). These six IA GWM tasks will provide the data to evaluate the ability of the barrier wall and caps to attenuate GW transport of arsenic and other COCs prior to GW discharge to the Hylebos Waterway. The IA GWM sampling locations are identified in Table 3, and the MWs for IA GWM Tasks 2 through 6 are shown on Figure 9. The barrier wall and cap MWs were selected based on the IA GWM objectives, proximity to the barrier wall and shoreline, the CSM, and locations with elevated arsenic GW concentrations (relative to other nearby MWs within the same aquifer). In addition, periodic GW monitoring of pH will be conducted in all areas that receive crushed concrete in order to evaluate potential changes to GW pH in those areas. If existing MWs are not suitable for obtaining representative pH data, installation and sampling of additional new MWs may be required by Ecology.

An Asphalt Cap Inspection and Maintenance Plan will be prepared and implemented to determine if there are cracks or holes within the asphalt cap that could compromise the cap's ability to minimize infiltration. Inspections of the IA asphalt cap will be performed annually. In addition, asphalt cap inspections will be performed if there is an earthquake with a magnitude of 6.0 or greater within 50 miles of the Site. If a substantial crack or hole that fully penetrates the 8-inch-thick asphalt is discovered during a cap inspection, the Port will repair that portion of the asphalt cap.[47] The Port will repair the asphalt cap after any excavation (or similar activity) that temporarily disturbs or removes a portion of the cap. Likewise, the Port will repair the barrier wall containment area cap for any activities that penetrate that cap (e.g., a component of the final cleanup action).

4.8 DOF Health and Safety Plan

DOF has prepared a HASP for DOF employees and subcontractors who may perform IA fieldwork such as Remediation Contractor oversight (see Appendix J). In addition, IA specifications will require the Remediation Contractor to prepare and implement its own HASP (that is at least as stringent as the DOF HASP) for all IA activities conducted by Remediation Contractor employees and subcontractors. IA specifications will also require the Remediation Contractor to (1) submit its HASP to the Port and DOF for approval, and (2) utilize 40-hour hazardous waste operations and emergency response-trained personnel with current refresher certifications for all IA fieldwork.

4.9 Inadvertent Discovery Plan

In accordance with WAC 173-340-815(3)(a) and Governor Executive Order 21-02, Ecology will consult with the Department of Archaeology and Historic Preservation and affected tribes prior to IA implementation about the potential effects of the IA on potential cultural resources at the Site.

Although the potential for encountering cultural resources (e.g., human remains, tribal artifacts, historical resources, archaeological resources) during the IA is likely low, an IDP was developed and will be implemented if a cultural resource is inadvertently discovered during IA activities (see Appendix K). The IDP will be readily available during all IA implementation activities and IA field staff will review the IDP prior to working at the Site. If anyone involved with IA implementation suspects the inadvertent discovery of a cultural resource during IA activities, all ground disturbing activities, and other activities proximate to the discovery, shall immediately cease and the IDP in Appendix K shall be implemented. All field personnel shall follow the IDP procedures and treat all cultural resources with respect.

4.10 Soil and Materials Management Plan

A SMMP will be prepared during IA design to provide a management framework for any soil, GW, and materials generated underneath the asphalt cap during excavation or development activities (e.g., utility installation, building construction). While the other Engineer-prepared plans (e.g., WMP, CMP, DOF HASP, IDP) will be implemented during IA construction, the SMMP will only be implemented when post-cap excavation or development activities occur. The SMMP will enable future Port personnel and contractors to make informed decisions about managing potentially-contaminated soil, GW, and materials generated from underneath the asphalt cap to protect Site workers and the environment. The

[47] A substantial crack will be conservatively defined as a crack that (1) is wider than 1/4 of an inch, (2) is longer than 3 feet, and (3) fully penetrates the asphalt. A substantial hole will be conservatively defined as a hole that is larger than 6 inches in diameter and fully penetrates the asphalt. A small diameter boring may be advanced to determine if a crack or hole fully penetrates the asphalt. All such borings will be backfilled with a suitable low-permeability material.

SMMP will include (1) Site background information (e.g., summaries of historical operations, regulatory setting, existing infrastructure, and investigation results), (2) Site-specific obligations and considerations for characterizing, handling, storing, and deciding whether to reuse or dispose of soil, GW, and materials generated from beneath the asphalt cap, and (3) protocols for notifying Ecology about ground-disturbing activities and characterization results. A key SMMP principle will be that any soil, GW, or materials inside the barrier wall that will be reused at the Site must stay inside the barrier wall. In addition, the SMMP will require future contractors conducting subsurface activities and/or soil, GW, and materials management activities to prepare and implement a project-specific HASP in accordance with state and federal regulations. The initial SMMP will be included with the 90% design submittal to Ecology. It is anticipated that the SMMP will be updated as necessary following installation of both asphalt cap phases and/or selection of the final cleanup action in the CAP.

SECTION 5: IA PATH FORWARD

5.1 Public Participation and Tribal Engagement for the IAWP

Pursuant to WAC 173-340-430(6)(a) and WAC 173-340-600(18), Ecology will engage the public about the proposed IA described in this IAWP before approving the IAWP. The public will have the opportunity to review this IAWP, an associated AO amendment, and Ecology's determination on a State Environmental Policy Act Checklist for this IA. Ecology will utilize multiple methods to notify the public about these documents in accordance with WAC 173-340-600(2)(a), which includes the following notification methods: publishing on Ecology's website, emailing an electronic alert to people who request an electronic alert, publishing in the Contaminated Site Register, mailing written notices to people who request a written notice, mailing written notices to people residing within the potentially affected vicinity of the IA, sending a written notice to appropriate news media, and publishing in an appropriate newspaper. Ecology will invite members of the public to review and comment on these documents for at least 30 days per WAC 173-340-600(2)(b). Comments received by Ecology during the public participation period will be considered by Ecology before these documents are finalized and approved. If ten or more persons request a public meeting regarding these documents, Ecology will host a public meeting for the purpose of receiving comments from the public. If necessary, this section of the IAWP may be updated to summarize Ecology's responses to public comments prior to finalizing the IAWP.

In accordance with WAC 173-340-620, Ecology will:

- Develop a tribal engagement plan for this Site;
- Initiate meaningful engagement with affected tribes about this IA before approving the IAWP; and
- Engage with affected tribes in addition to and independent of the public participation process.[48]

5.2 Finalizing the IA Design

Washington-licensed professional engineers are (and will continue to be) in responsible charge for the preparation and completion of the IA design. Applicable portions of the engineering design report, plans, and specifications in WAC 173-340-400(4)(a) and (b) that are not already completed and included in the IAWP will be further developed and documented as the IA design is finalized.[49] The Port team will continue advancing (1) the plan sets for the barrier wall (including barrier wall containment area cap) and asphalt cap, (2) the specifications for the barrier wall (including barrier wall containment area cap) and asphalt cap, and (3) the currently uncompleted Engineer-prepared plans (i.e., WMP, CMP, and SMMP) from 30% design to 90% design. The 90% plan sets, specifications, WMP, CMP, and SMMP will

[48] Given the Port's long-standing relationship and ongoing coordination with the Puyallup Tribe of Indians on a wide variety of projects, the Port will also engage with the Puyallup Tribe of Indians on this IA project. For instance, the Port provided the Puyallup Tribe of Indians with an IA project description in August 2024 and a draft Executive Order 21-02 EZ Project Form in September 2024 to initiate meaningful engagement for this IA.

[49] The DOF HASP and the IDP are already completed and are included in this IAWP (Appendix J and K, respectively).

be submitted to Ecology for review. Following any Ecology comments on the 90% design, the final (100%) IA design will be prepared and submitted to Ecology for approval.

5.3 Construction Quality Control

Construction QC is part of design and will be finalized along with the plan sets, specifications, and associated Engineer-prepared plans. The IA design will include a variety of construction QC requirements to ensure that the IA construction activities being conducted by the Remediation Contractor are completed correctly, effectively, and safely. The construction QC requirements will include, but are not limited to:

- Continually monitoring the slurry volume in the slurry trench to ensure the barrier wall thickness is being achieved;
- Implementing measures to prevent slurry loss and transport;
- Verifying actual barrier wall installation depths match the depths indicated in the final design;
- Lowering a steel plate wider than the individual slurry wall panels to the bottom of the slurry trench to verify continuity between the individual slurry wall panels;
- Collecting samples from slurry mixing operations, allowing these samples to cure, and analyzing the permeability of the cured samples to ensure acceptable wall permeabilities are being achieved;
- Obtaining Ecology approval before importing common borrow such as dredged material (see Section 4.4);
- Utilizing the acceptance criteria for evaluating chemical testing results of virgin quarry material (see Appendix I);
- Completing materials testing for compaction of compacted fill material and hot mix asphalt;
- Implementing the engineering controls;
- Implementing the WMP;
- Implementing the CMP;
- Implementing the HASPs and associated health and safety requirements;
- Implementing the IDP if necessary;
- Conducting oversight of all Remediation Contractor activities to ensure compliance with the plan sets, specifications, Engineer-prepared plans, and permit requirements.

5.4 Permitting

5.4.1 Exempt Permits/Approvals

Per the MTCA law, WAC 173-340-710(9), and Section VIII.P.2 of AO No. DE 5668, the Port is exempt from the procedural requirements of local permits/approvals and select state permits/approvals (although the Port must comply with the associated substantive requirements). The purpose of MTCA's permit/approval exemptions is to expedite cleanup of contaminated sites. The Port has preliminary identified the following permit/approval exemptions for this IA.[50]

- City of Tacoma Site Development Permit
- City of Tacoma Shoreline Substantial Development Permit (including Conditional Use Permit)
- City of Tacoma Right-of-Way Work Order Permit
- City of Tacoma Building Permit
- Washington State Department of Fish and Wildlife Hydraulic Project Approval

The Port and Ecology will collaborate and coordinate to finalize the list of exempt permits/approvals and identify the associated substantive requirements in consultation with the City of Tacoma and applicable state agencies. Per Toxics Cleanup Program Policy 710A, "Ecology will make a final determination on what substantive requirements will apply to the site" and "Ecology shall ensure compliance with substantive permit requirements" (Ecology 2015). The public participation requirement for exempt permits/approvals will be fulfilled during the IAWP public participation period.

5.4.2 Non-Exempt Permits/Approvals

In conjunction with finalizing the IA design, the Port will lead efforts to submit permit applications and coordinate with permitting agencies to obtain necessary non-exempt permits/approvals.[51] The permitting milestones for the non-exempt permits/approvals are expected to be:

- Obtaining coverage under a general construction stormwater NPDES permit;
- Obtaining permits/approvals from the United States Army Corps of Engineers and Ecology for installing a new stormwater outfall and modifying an existing stormwater outfall; and
- Updating/obtaining applicable NPDES permit coverage for future stormwater discharges via the new stormwater utility system.

5.5 Public Works Contracting

The Port will competitively bid the IA implementation work for the to-be-determined Remediation Contractor as a public works solicitation. The solicitation will include this IAWP, the final plan sets, the final specifications, and the final Engineer-prepared plans as attachments. The solicitation will be posted and advertised in accordance with standard Port procurement procedures, such as posting on the Port's procurement website (https://www.portoftacoma.com/business/contracting/procurement) and sending email updates to all Port procurement subscribers. The bidding process will include opportunities for bidders to ask questions and attend a Site visit with the Port. The Port will collect bids on the time and date advertised. The Port will review each bid proposal with the evaluation requirements included in the

[50] The exempt permits previously identified in Exhibit D of AO No. DE 5668 were based on what was "known at the time of entry of this order" and were revised to reflect the components of this IA.

[51] Other approvals may need to be obtained by the Remediation Contractor during construction. For instance, it is currently anticipated that the Remediation Contractor will be responsible for obtaining applicable waste disposal authorizations from permitted disposal facilities to dispose of generated waste.

solicitation and select the Remediation Contractor that best satisfies the evaluation requirements. The Port will then enter into a contract with the selected Remediation Contractor.

5.6 Key Anticipated IA Roles and Responsibilities

The key anticipated IA roles and responsibilities are summarized in Table 4. Contact information in this table will be updated following the Port's selection of and contracting with the Remediation Contractor.

5.7 IA Reporting

After completing each phase of the IA, a draft phase-specific IA Report will be prepared and submitted to Ecology for review. Although each phase-specific IA Report may be slightly different, at a minimum each report will include (1) as-built drawings (including the locations of any subsurface soil generated and reused during the barrier wall construction), (2) a summary of the Remediation Contractor's construction activities and the DOF oversight activities, (3) a photolog of representative photos taken during the phase, (4) a discussion of any deviations from the final design, (5) applicable testing and construction QC results (including laboratory reports if applicable), and (6) waste disposal documentation (e.g., bills of lading/waste manifests).

5.8 IA Schedule

The phased IA is expected to take place over several years. The IA schedule is contingent upon a variety of factors, including (1) approval of this IAWP, (2) agency approvals of technical documents and permit applications outlined in this IAWP, (3) Port contracting, and (4) obtaining suitable common borrow material prior to installing the asphalt cap. As a result, the IA implementation schedule will be refined over time as the IAWP is approved, the final design is approved, permits are obtained, the Port contracts with a Remediation Contractor, and the full Blair Waterway dredging schedule is determined. In the meantime, the current schedule assumptions for key IA tasks include:

- September 2024 - February 2025: JARPA for the stormwater outfalls approved and permit issued.
- July 2025 - February 2026: Finalizing exempt permits and substantive requirements.
- November or December 2025: Public participation period.
- November or December 2025: 90% barrier wall and asphalt cap plan sets, specifications, WMP, CMP, and SMMP submitted to Ecology.
- February 2026: 100% barrier wall and asphalt cap plan sets, specifications, WMP, CMP, and SMMP submitted to and approved by Ecology.
- February - October 2026: Contracting for and construction of barrier wall (Phase 1) and stormwater outfalls.
- 2027 - 2029: Contracting for and construction of asphalt cap (Phases 2 and 3).

SECTION 6: REFERENCES

DOF. 2011. Remedial Action Construction Report. Head of the Hylebos Waterway Problem Area Commencement Bay Nearshore/Tideflats Superfund Site Tacoma, Washington. August.

DOF. 2013. Final Remedial Investigation Report for Former Arkema Manufacturing Plant. 2901 & 2920 Taylor Way, Tacoma, Washington. September. Available at https://apps.ecology.wa.gov/cleanupsearch/site/3405#site-documents.

DOF. 2023a. 24-Acre Protective Cover Alternatives Assessment Report, Former Arkema Manufacturing Site. February 23.

DOF. 2023b. Barrier Wall Basis of Design Report, Former Arkema Manufacturing Site. March 17.

Ecology. 1993. Milestone 2 Source Control Status Report for Head of Hylebos: Commencement Bay Nearshore/Tideflats Superfund Site. May 19.

Ecology. 1995. Guidance on Sampling and Data Analysis Methods. January.

Ecology. 2013. Email from Dominick Reale (Ecology) to Matt Dalton (DOF) titled "RE: Arkema Draft RI - Revised Exec Summary." September 9.

Ecology. 2015. Toxics Cleanup Program Policy 710A: Permit Exemptions for Remedial Actions under MTCA. November 9.

Ecology. 2016. Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies. December.

Ecology. 2017. Email from Mohsen Kourehdar (Ecology) to Troy Bussey (PIONEER) titled "RE: Wedge Area." February 24.

Ecology. 2019. Email from Mohsen Kourehdar (Ecology) to Scott Hooton (Port) titled "Data Gap Study - Arkema - FSID 1220." September 12.

Ecology. 2021a. Letter from Joyce Mercuri to Nizar Hindi and Scott Hooton with a subject of "Re: Agreed Order No. DE 3405: Expansion of scope for Remedial Actions at the USG Taylor Way Plant Site (Cleanup Site ID #5003), under Agreed Order No. DE 3405, to include contamination within the North Boundary Area." January 13.

Ecology. 2021b. Letter from Andy Smith (Ecology) to Rob Healy (Port) titled “Review Feasibility Study, Arkema Site, FSID# 1220.” August 25. Available at https://apps.ecology.wa.gov/cleanupsearch/site/3405#site-documents.

Ecology. 2022. Natural Background Groundwater Arsenic Concentrations in Washington State - Study Results, Publication No. 14-09-044. January.

Ecology. 2023a. Sustainable Remediation: Climate Change Resiliency and Green Remediation, Publication No. 17-09-052. January.

Ecology. 2023b. Email from Andy Smith (Ecology) to Troy Bussey (PIONEER) titled "RE: Ecology Comments on Arkema Expanded RTC Data Gaps Work Plan." July 7.

Ecology. 2024a. Draft Cleanup Action Plan, Former USG Taylor Way Plant Site. January 12.

Ecology. 2024b. Implementation Memorandum No. 25: Identifying Likely Vulnerable Populations and Overburdened Communities Under the Cleanup Regulations. January.

Ecology. 2025. Toxics Cleanup Program's Cleanup Levels and Risk Calculations database, https://fortress.wa.gov/ecy/clarc/CLARCHome.aspx, February update.

ERM. 2003. Soil Interim Remedial Action Work Plan. ATOFINA Chemicals, Inc. Tacoma, Washington. May.

Groff Murphy Trachtenberg & Everard, PLLC. 2006. Letter from Stephen T. Parkinson to Dom Reale, Bob Warren, Rebecca Lawson, and Elliott Furst regarding the State of Washington, Department of Ecology v. Pennwalt Corporation, Inc. Thurston County Superior Court, Case No. 87-2-01199-0. October 12.

PIONEER. 2016. Presentation to Ecology titled "Overview of Proposed FS Data Gap Investigation Activities." March 30.

PIONEER 2017. FS Data Gap Investigation Work Plan, Former Arkema Manufacturing Site. February.

PIONEER. 2019. Feasibility Study Data Gap Investigation Report, Former Arkema Manufacturing Site. July. Available at https://apps.ecology.wa.gov/cleanupsearch/site/3405#site-documents.

PIONEER. 2021a. Feasibility Study Report, Former Arkema Manufacturing Site. April. Available at https://apps.ecology.wa.gov/cleanupsearch/site/3405#site-documents.

PIONEER. 2021b. MTCA Path Forward and Redevelopment presentation slides prepared on October 7, 2021 and used during October 13, 2021 meeting with Rebecca Lawson (Ecology), Andy Smith (Ecology), Rob Healy (Port), Scott Hooton (Port), and Troy Bussey (PIONEER).

PIONEER. 2022. Table 1: Responses to Ecology's August 25, 2021 Comments on the April 2021 Former Arkema Manufacturing Site FS Report. July 14.

PIONEER. 2023a. Expanded RTC Data Gaps Investigation Work Plan, Former Arkema Manufacturing Site. June. Available at https://apps.ecology.wa.gov/cleanupsearch/site/3405#site-documents.

PIONEER. 2023b. North Boundary Area Focused Feasibility Study Report, Former USG Taylor Way Plant Site. October.

Port. 2014. Land Use & Transportation Plan 2014. June.

University of California Pavement Research Center. 2018. Permeability Testing on Dense-Graded Hot Mix Asphalt (HMA) and Gap-Graded Rubberized Hot Mix Asphalt (RHMA-G) Surfaces. Prepared for California Department of Transportation. March.

University of Washington Climate Impacts Group. 2018. Interactive Sea Level Rise Data Visualizations, Visualization #2: Likelihood of a given sea level change by year. Retrieved from: https://cig.uw.edu/projects/interactive-sea-level-rise-data-visualizations/.

Figures

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Site Location
Interim Action Work Plan
Former Arkema Manufacturing Site

Figure 1

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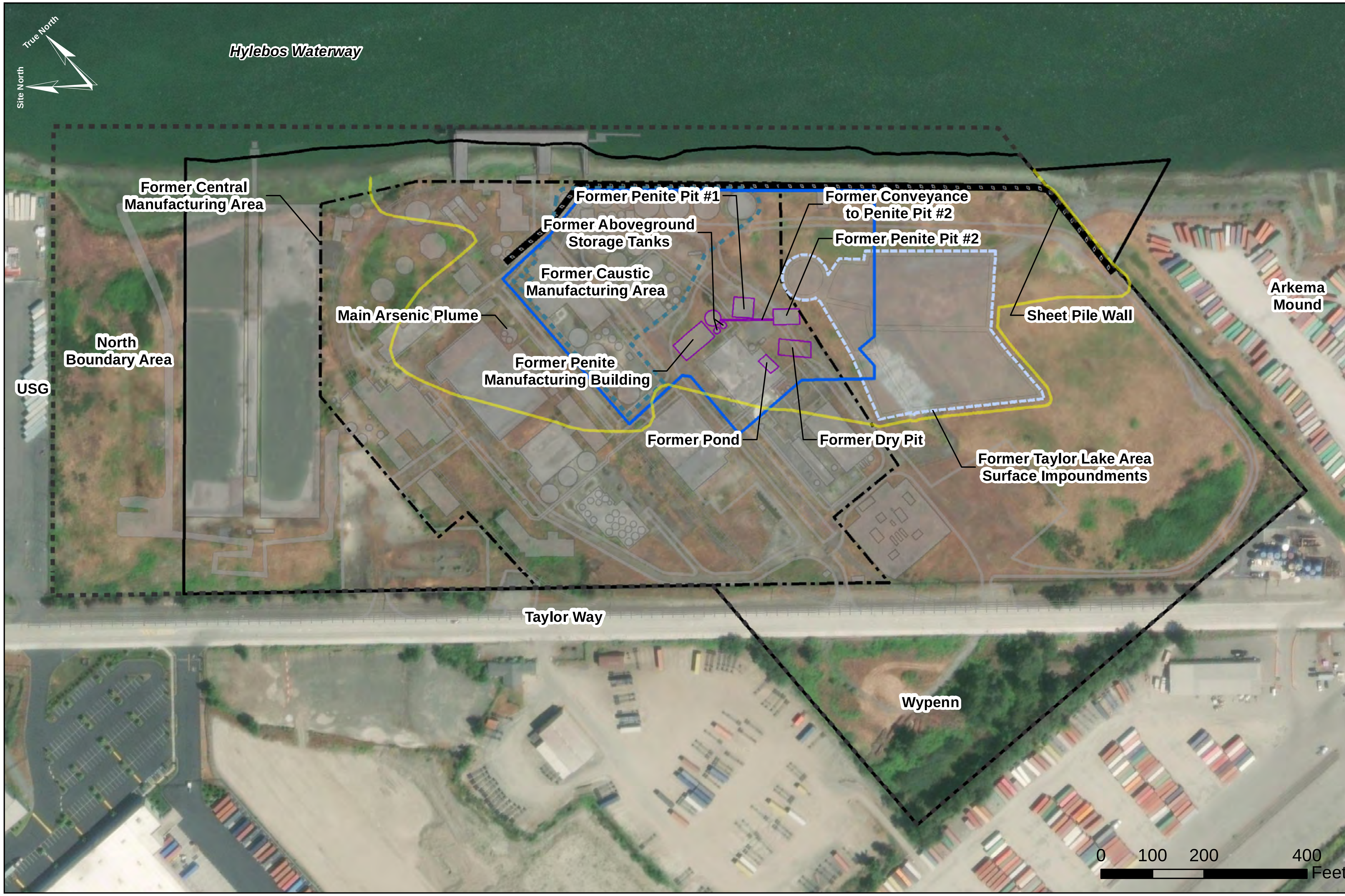

Legend

- Alignment of Proposed Barrier Wall
- Arkema Property Boundary
- Site Boundary
- Former Central Manufacturing Area
- Known and Potential Penite Manufacturing Features
- Former Caustic Manufacturing Area
- Former Taylor Lake Area Surface Impoundments
- Main Arsenic Plume
- Sheet Pile Wall
- Historical Infrastructure

Notes:
-Geospatial data were provided by other consultants or georeferenced from reports by other consultants. All locations are approximate.
- The main arsenic plume is conceptually defined in the 2021 draft FS Report as the plan-view area encompassed by the 2017 Upper Aquifer dissolved arsenic isoconcentration contour of 500 ug/L, areas downgradient of this contour, and associated areas with pH levels > 9. The main arsenic plume includes groundwater within this plan-view area in the Upper, Intermediate, and Deep Aquifers.

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Key Site Areas
Interim Action Work Plan
Former Arkema Manufacturing Site

Figure 2

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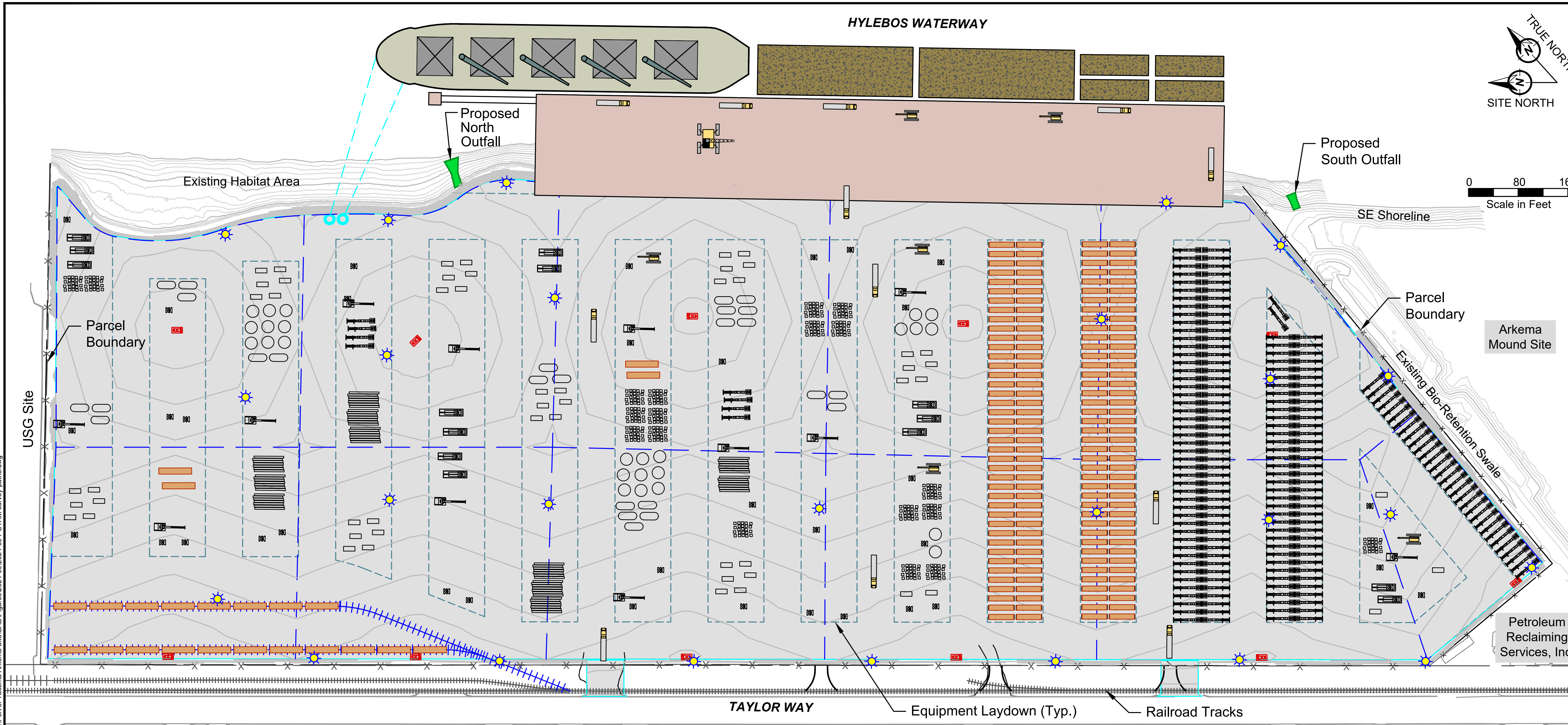

Legend

- Proposed Stormwater Vault
- Proposed Yard Light
- Proposed Railroad Spur
- Proposed Contour
- Breakline
- Proposed Outfall
- Asphalt
- Equipment Laydown
- Fence

Features Legend

- Ship
- Land-based Anchor Point
- Barge
- Upgraded Dock
- Truck
- Harbor Crane
- Creeper Crane
- Railroad Car

Port of Tacoma - Former Arkema Manufacturing Site
2901 Taylor Way - Tacoma, WA
Interim Action Work Plan

Hylebos Barge Terminal Concept

DOF DALTON OLMSTED FUGLEVAND

FIGURE 3

09/13/2024

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Legend

- 22 – Existing Ground Surface Elevations
- PDI Boring Location
- Alignment of Proposed Barrier Wall

Other Site Features

- Arkema Property Boundary
- Site Boundary

Notes:
-Geospatial data were provided by other consultants or georeferenced from reports by other consultants. All locations are approximate.
-Verticle datum is MLLW.

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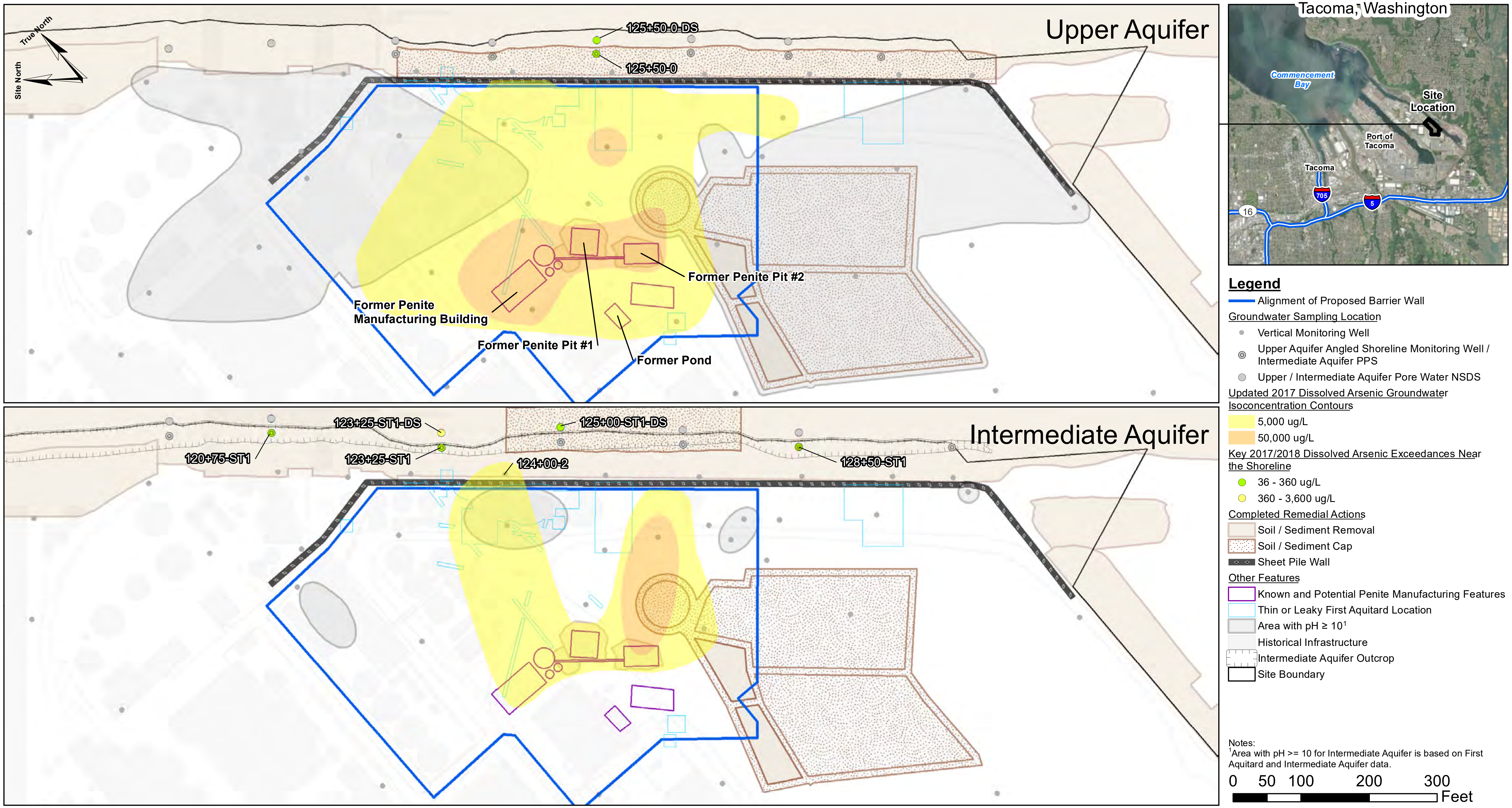
Existing Surface Topography and PDI Boring Locations
Interim Action Work Plan
Former Arkema Manufacturing Site

Figure 4



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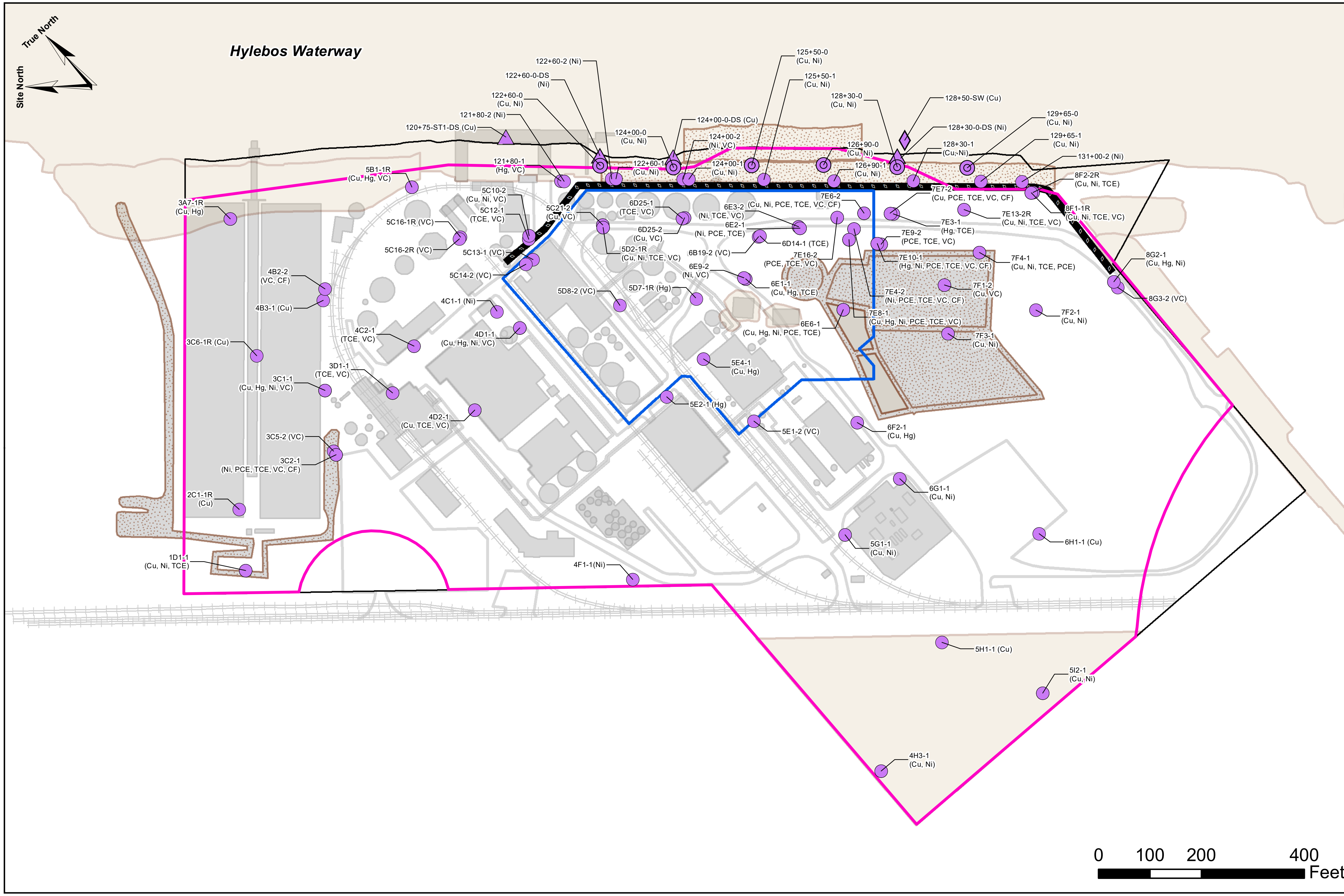
Summary of Main Arsenic Plume Conditions
Interim Action Work Plan
Former Arkema Manufacturing Site

Figure 5



Legend

Alignment of Proposed Barrier Wall

COC Exceedances in 2017 Upper Aquifer and Intermediate Aquifer Groundwater Samples

- Approximate Area with Dissolved Arsenic > 8 ug/L
- Sample with a Dissolved Copper, Dissolved Mercury, Dissolved Nickel, PCE, TCE, VC, and/or CF Groundwater Cleanup Level Exceedances

Sample Type

- Monitoring Well
- Upper Aquifer Angled Shoreline Monitoring Well or Intermediate Aquifer PPS
- Upper Aquifer or Intermediate Aquifer Pore Water NSDS
- Surface Water Sample

Completed Remedial Actions

- Soil / Sediment Removal
- Soil / Sediment Cap
- Sheet Pile Wall

Other Features of Interest

- Historical Infrastructure
- Site Boundary

Notes:
-Groundwater cleanup levels are:
arsenic 8.0 ug/L (updated based on natural background), copper 3.1 ug/L, mercury 0.025 ug/L, nickel 8.2 ug/L, PCE 2.9 ug/L, TCE 0.70 ug/L, VC 0.18 ug/L, and CF 12 ug/L.
-The non-arsenic constituents with a groundwater cleanup level exceedance at a given location are listed in the location label.
-Geospatial data were provided by other consultants or georeferenced from reports by other consultants. All locations are approximate.
-Some pore water and surface water samples were co-located. The symbols for these samples were adjusted slightly for visibility.

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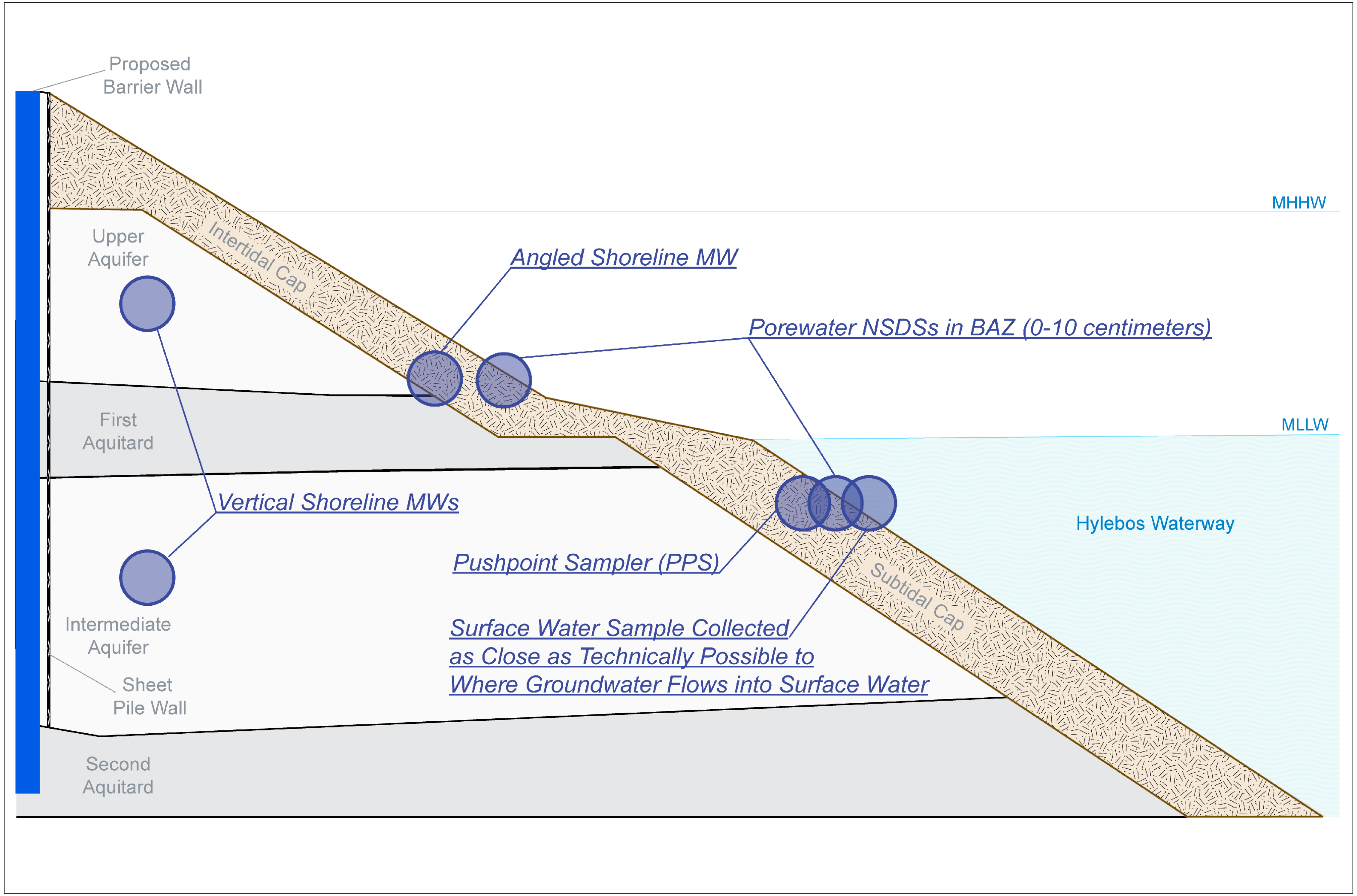
Groundwater Exceedances Across the Site
Interim Action Work Plan
Former Arkema Manufacturing Site

Figure 6



Legend

Potential Groundwater Conditional Point of Compliance Location

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Potential Groundwater Conditional Point of Compliance Locations
Interim Action Work Plan
Former Arkema Manufacturing Site

Figure 7

Legend

IA Areas and Implementation Phases
- Phase 1 - Barrier Wall Installation
- Phase 1 - Barrier Wall Containment Area Cap
- Phase 2 - Asphalt Cap on Southern 12 Acres
- Phase 3 - Asphalt Cap on Northern 12 Acres

Other Site Features
- Arkema Property Boundary
- Site Boundary

Notes:
-Geospatial data were provided by other consultants or georeferenced from reports by other consultants. All locations are approximate.
-Vertical datum is MLLW.

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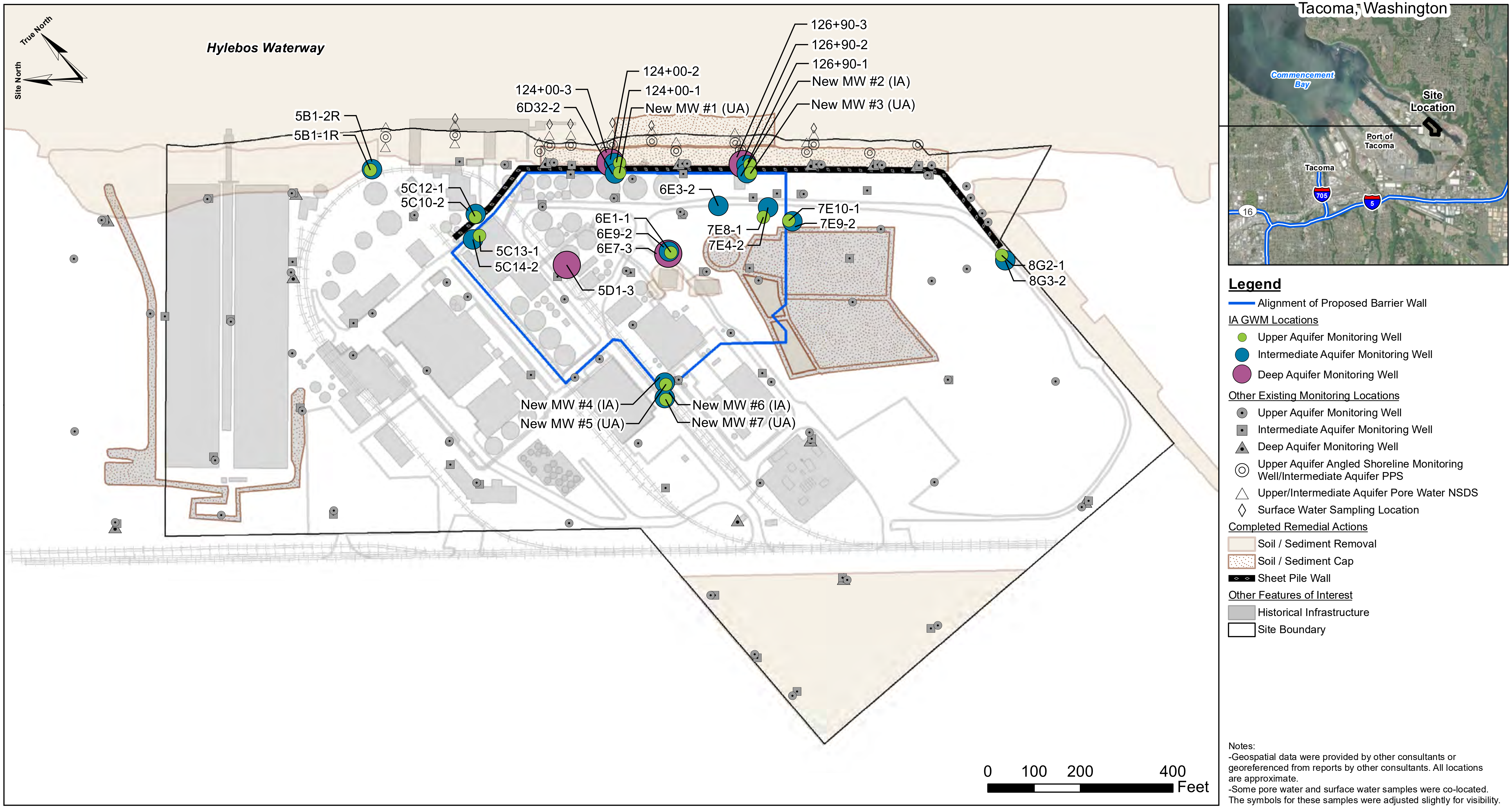
IA Areas and Implementation Phases
Interim Action Work Plan
Former Arkema Manufacturing Site

Figure 8



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IA GWM Locations
Interim Action Work Plan
Former Arkema Manufacturing Site

Figure 9

Tables

Table 1: Top of Second Aquitard Depths in PDI Borings

PDI Boring	Depth to Top of Second Aquitard (feet below ground surface)
DOF-B1	32.5
DOF-B2	28.5
DOF-B3	28.5
DOF-B4	26.5
DOF-B5	29.5
DOF-B6	29.5
DOF-B7	31
DOF-B8	31.5
DOF-B9	31
DOF-B10	33
DOF-B11	28
DOF-B12	30
DOF-B13	31
DOF-B14	29.5
DOF-B15	31

Table 2: Barrier Wall Permeability Bench-Scale Testing Results

Mixture Description [1]		Scenario	Initial Hydraulic Conductivity [3] (cm/sec)	Final Hydraulic Conductivity [4] (cm/sec)
Clay Type	Mix Water [2]			
Sepiolite	100% tap water	Initial conditions and neutral pH Site GW conditions	1.1×10^{-9}	4.9×10^{-10}
	50% tap water and 50% high pH GW		3.4×10^{-9}	1.6×10^{-10}
	100% high pH GW	High pH GW conditions and potential long-term conditions in areas with high pH GW	2.0×10^{-8}	8.6×10^{-10}
Attapulgite	100% tap water	Initial conditions and neutral pH Site GW conditions	7.8×10^{-9}	4.4×10^{-11}
	50% tap water and 50% high pH GW		6.1×10^{-9}	4.0×10^{-11}
	100% high pH GW	High pH GW conditions and potential long-term conditions in areas with high pH GW	1.3×10^{-7}	1.4×10^{-9}

Notes:

(1) Each sample mix was prepared with 5% clay, 18% ground granular blast furnace slag (GGBFS), and 77% mix water by mass.

(2) The Site GW used as mix water was obtained from MW 4D1-1, which was used to simulate worst-case pH conditions at the Site. pH values in 2012, 2017, and 2018 GW samples collected from 4D1-1 were 12.1, 11.1, and 11.5, respectively. Even though tap water will be used for actual barrier wall installation, the mix designs with this Site GW conservatively simulate the long-term performance of the slurry under assumed worst-case high pH Site conditions.

(3) After approximately 120 days of curing.

(4) After approximately 225 days of curing.

Table 3: Overview of IA GWM Plan

Task #	Objective	Locations	Measurements and Analyses	Frequency
1	Conduct comprehensive Site GWM event to establish Site-wide baseline groundwater conditions prior to IA implementation and support the revised FS report (e.g., updated plume stability evaluation).	• Existing barrier wall IA MWs (1) • All cap IA MWs (2) • Existing shoreline sampling locations (3) • Other key plume stability MWs (4)	• SWLs • Field water quality parameters (5) • All 8 groundwater COCs (6)	One time (prior to IA implementation)
2	Conduct baseline GWM event of barrier wall IA MWs to establish baseline groundwater conditions inside and outside of the barrier wall as soon as possible after barrier wall is installed. (7)	• All barrier wall IA MWs (1)	• SWLs • Field water quality parameters (5) • All 8 groundwater COCs (6)	One time (e.g., within approximately one month after barrier wall construction is completed)
3	Monitor potential changes in groundwater elevations in key MWs inside and outside of the barrier wall.	• Select barrier wall IA MWs (i.e., 5C13-1 & 5C12-1; 5C14-2 & 5C10-2; New MW #1 (UA) & 124+00-1; 6D32-2 & 124+00-2; New MW #3 (UA) & 126+90-1; New MW #2 (IA) & 126+90-2; 7E8-1 & 7E10-1; 7E4-2 & 7E9-2; New MW #5 (UA) & New MW #7 (IA); New MW #4 (IA) & New MW #6 (IA); and 6E1-1, 6E9-2, 6E7-3)	• SWLs	Monthly for six months, then quarterly (8)
4	Monitor dissolved arsenic concentrations in key MWs outside and inside of the barrier wall to identify any unexpected concentration changes at key locations.	• Select barrier wall IA MWs (i.e., 5C12-1, 5C10-2, 124+00-1, 124+00-2, 124+00-3, 126+90-1, 126+90-2, 126+90-3, 7E10-1, 7E9-2, 6E7-3, 5D1-3)	• SWLs • Field water quality parameters (5) • Dissolved arsenic	TBD based on ongoing design and modeling work
5	Conduct periodic and comprehensive GWM events for barrier wall IA MWs to evaluate the long-term effectiveness of the barrier wall.	• All barrier wall IA MWs (1)	• SWLs • Field water quality parameters (5) • All 8 groundwater COCs (6)	TBD based on ongoing design and modeling work, although frequency will be less frequent than Task 4
6	Conduct periodic GWM events for cap IA MWs to evaluate the long-term effectiveness of the barrier wall containment area cap and asphalt cap.	• All cap IA MWs (2)	• Field water quality parameters (5) • All 8 groundwater COCs (6)	TBD based on ongoing design and modeling work, although frequency will likely be similar to Task 5

Notes:

GWM: groundwater monitoring; SWL: static water level; TBD: to be determined

This groundwater monitoring is for this IA only (i.e., barrier wall, barrier wall containment area cap, and asphalt cap). Additional compliance monitoring for the final cleanup action will be conducted pursuant to the future Cleanup Action Plan.

(1) Upper and Intermediate Aquifer pairs inside and outside the barrier wall (5C13-1 & 5C12-1; 5C14-2 & 5C10-2; New MW #1 (UA) & 124+00-1; 6D32-2 & 124+00-2; New MW #3 (UA) & 126+90-1; New MW #2 (IA) & 126+90-2; 7E8-1 & 7E10-1; 7E4-2 & 7E9-2; New MW #5 (UA) & New MW #7 (IA); New MW #4 (IA) & New MW #6 (IA)) and select key MWs to monitor potential arsenic plume changes (6E1-1, 6E9-2, 6E7-3, 6E3-2, 5D1-3, 124+00-3, 126+90-3). See Figure 9.

(2) 5B1-1R, 5B1-2R, 124+00-1, 124+00-2, 124+00-3, 126+90-1, 126+90-2, 126+90-3, 8G2-1, and 8G3-2 (see Figure 9). Although some of the cap IA MWs are also barrier wall IA MWs, these double duty MWs are included in case the barrier wall and cap IA monitoring are on a different sampling frequency.

(3) 6 Upper Aquifer Angled Shoreline MWs (122+60-0, 124+00-0, 125+50-0, 126+90-0, 128+30-0, and 129+65-0), 7 Upper Aquifer pore water NSDSs (119+25-0-DS, 120+75-0-DS, 122+60-0-DS, 124+00-0-DS, 125+50-0-DS, 126+90-0-DS, 128+30-0-DS), 9 Intermediate Aquifer groundwater PPSs (119+25-ST1, 120+75-ST1, 122+60-ST1, 123+25-ST1, 124+00-ST1, 125+00-ST1, 126+80-ST1, 128+50-ST1, 130+75-ST1), 8 Intermediate Aquifer pore water NSDSs (119+25-ST1-DS, 120+75-ST1-DS, 122+60-ST1-DS, 123+25-ST1-DS, 124+00-ST1-DS, 125+00-ST1-DS, 126+80-ST1-DS, 128+50-ST1-DS), and 6 surface water locations (120+75-SW, 122+60-SW, 123+25-SW, 124+00-SW, 125+00-SW, 128+50-SW). See

(4) 30 Upper Aquifer MWs (121+80-1, 122+60-1, 125+50-1, 128+30-1, 129+65-1, 131+00-1, 3A7-1R, 4B4-1, 4C1-1, 4D1-1, 5C16-1R, 5D2-1R, 5D5-1, 5D7-1R, 5E1-1, 5E2-1, 5E4-1, 5E8-1, 6D14-1, 6D25-1, 6E2-1, 6E5-1, 6E6-1, 6F2-1, 7E3-1, 7F2-1, 7F3-1, 7F4-1, 7G1-1, 8F1-1R), 24 Intermediate Aquifer MWs (120+75-2, 121+80-2, 122+60-2, 125+50-2, 128+30-2, 129+65-2, 131+00-2, 3A6-2R, 4B4-2, 4E1-2, 5C16-2R, 5C21-2, 5D8-2, 5E1-2, 6B19-2, 6D25-2, 6E12-2, 6F1-2, 7E6-2, 7E7-2, 7E13-2R, 7E16-2, 7F1-2, 8F2-2R), and 9 Deep Aquifer MWs (122+60-3, 125+50-3, 128+30-3, 129+65-3, 131+00-3, 4B2-3, 5B1-3R, 6E8-3, and 7E5-3). See PIONEER 2019.

(5) Field water parameters are pH, conductivity, temperature, dissolved oxygen, oxidation reduction potential, and turbidity.

(6) The 8 groundwater COCs are dissolved arsenic, dissolved copper, dissolved nickel, dissolved mercury, PCE, TCE, VC, and CF.

(7) The seven new barrier wall IA MWs will not be installed prior to construction to avoid adding additional construction obstacles and minimize the potential for MW damage. The seven new barrier wall IA MWs (and any other MWs necessary to replace proposed IA MWs that were inadvertently damaged during construction) will be installed and developed immediately after barrier wall construction.

(8) Select MWs will most likely have installed transducers (rather than monthly SWL measurements). Also, the SWL frequency may decrease from quarterly in the future.

Table 4: Key Anticipated IA Roles and Responsibilities

Role	Name	Contact Information	Key Responsibilities
Ecology Site Manager	Sam Meng	same461@ecy.wa.gov 360-999-9587 (O)	▪ Lead public participation and tribal engagement for IAWP ▪ Review and approve IAWP ▪ Review and approve IA plans and specifications ▪ Field oversight as necessary
Ecology Site Hydrogeologist	Tia Misuraca	tmis461@ecy.wa.gov (360) 742-2807 (O)	▪ Support Ecology Site Manager with hydrogeologic components
Port Engineering PM	Brett Ozolin	bozolin@portoftacoma.com 253-241-0207 (O)	▪ Provide Port engineering direction for IA implementation ▪ Lead remediation contractor bidding and contracting process ▪ Ensure necessary permits are obtained ▪ Manage team performance, budget, and schedule for IA implementation ▪ Facilitate IA communication with Ecology
Port Environmental PM	Scott Hooton	shooton@portoftacoma.com 253-383-9428 (O)	▪ Port's Designated Project Coordinator for Agreed Order DE 5668 ▪ Provide Port technical support for IA implementation ▪ Ensure integration of IA and FS ▪ Support IA communication with Ecology
DOF PM	Trevor Louviere	tlouviere@dofnw.com 206-502-1125 (O) 425-785-6322 (C)	▪ Complete barrier wall design, plans, and specifications ▪ Coordinate final design of the entire IA ▪ Communicate and coordinate with Port PMs and consultant team ▪ Evaluate and document barrier wall and capping performance ▪ Prepare IA Report
Sitts & Hill PM	Rick Hand	rickhand@sitts-hill-engineers.com (253) 474-9449 (O)	▪ Complete capping design, plans, and specifications ▪ Conduct all land surveying
PIONEER PM	Troy Bussey	busseyt@uspioneer.com 360-570-1700 (O) 360-810-0640 (C)	▪ Prepare IAWP ▪ Support DOF and Port PMs with Site-specific knowledge and integration of IA and FS activities ▪ Support evaluation and documentation of performance monitoring ▪ Support preparation of IA Report
On-Site Field PM (DOF)	TBD		▪ Supervise and provide overall oversight of all Site field operations ▪ Prepare technical memo(s) documenting field implementation
DOF SSO	Anthony Cerruti	acerruti@dofnw.com 215-767-7749 (C)	▪ Ensure appropriate implementation of DOF HASP ▪ Provide oversight of implementation of remediation contractor HASP
Remediation Contractor (1)	TBD		▪ Communicate and coordinate with the Port Engineering PM, DOF PM, and On-Site Field PM ▪ Adhere to plans, specifications, contract requirements, and permit requirements ▪ Ensure appropriate implementation of remediation contractor HASP
Licensed Driller (Cascade Drilling)	Kasey Goble	kgoble@cascade-env.com 425-466-8588	▪ Decommission, install, and develop MWs as necessary
Primary Laboratory (ARI)	Kelly Bottem	kellyb@arilabs.com 206-695-6200 (O)	▪ Perform all analyses, except for analyses conducted by Brooks ▪ Perform associated laboratory quality control
Specialty Laboratory (Brooks)	Jeremy Maute	jeremy@brooksapplied.com 206-753-6116 (O)	▪ Perform all sample analyses of locations waterward of the barrier wall ▪ Perform associated laboratory quality control
Data Quality Validator (QA/QC Solutions)	James McAteer	jjmcateer@msn.com 503-763-6948	▪ Perform independent data quality validation for all laboratory data
Data Management and Risk Assessment Support (PIONEER)	Chris Waldron	waldronc@uspioneer.com 360-570-1700 (O)	▪ Provide data management support as necessary ▪ Provide risk assessment support as necessary

Notes:

PM: project manager; SSO: site safety officer; TBD: to be determined

(1) Key remediation contractor roles are anticipated to include PM, supervisor/foreman, and SSO.